



Answer the following questions: (two marks for each right choice)

- A molecular compound which dissolves in water and it does **not** ionize:-
 A. C_2H_5OH B. C_6H_6 C. NH_4Cl D. HF
- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
- At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
- What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
- The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. 0.24 B. 0.12 C. 0.36 D. 0.72
- The boiling point of an aqueous solution containing a nonelectrolyte that freezes at $-3.72^\circ C$, is:
 if ($K_f = -1.86^\circ C/m$) ($K_b = 0.51^\circ C/m$)
 A. $102.04^\circ C$ B. $1.02^\circ C$ C. $101.02^\circ C$ D. $100.51^\circ C$
- In this reaction: $CN^-(aq) + H_2O(l) \rightleftharpoons HCN(aq) + OH^-(aq)$, which of the following is **incorrect**?
 A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyzed D. none of them
- Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. both (A and C)
- A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. NH_3
- An acid is used as a fungicide:-
 A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
- The net ionic equation for which of the following reaction is: $H_3O^+(aq) + OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow$
 C. $Zn(s) + HCl(aq) \rightarrow$
 B. $Sr(OH)_2(aq) + HCl(aq) \rightarrow$
 D. both (A and B)
- In the following reaction: $HNO_2(aq) + H_2O(l) \rightleftharpoons NO_2^-(aq) + H_3O^+(aq)$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. HNO_2 C. H_2O D. none of them
- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them
- The correct order according the pOH value for the following solution is:-
 A. $NaCl > CH_3COOK > NH_4NO_3$ B. $NH_4NO_3 > NaCl > CH_3COOK$
 C. $CH_3COOK > NaCl > NH_4NO_3$ D. $NH_4NO_3 > CH_3COOK > NaCl$

15. Which of the following is **correct** at all temperature in pure water?

- A. $K_w = [H_3O^+][OH^-]$ B. $[H_3O^+][OH^-] = 1 \times 10^{-14}$
 C. $[H_3O^+] = [OH^-] = 1 \times 10^{-7} M$ D. all of them.

SN: 000001

16. Suppose that 20mL of 0.01M $Ca(OH)_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?

- A. $[HCl] = 0.02M$ B. $[HCl] = 0.04M$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)

17. If the pH of sea water at $25^\circ C$ is equal to 8.3, which of the following is **correct**?

- A. $[OH^-] = 2.0 \times 10^{-6} M$ B. the sea water is basic C. $[OH^-] = 5.0 \times 10^{-9} M$ D. both (A and B)

18. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?

- A. KNO_3 B. KF C. NaF D. both (B and C)

19. If 49J of energy are added to 35g of a material at $20^\circ C$, what will the final temperature of the material be? ($C_p = 0.07 J/(g.K)$)

- A. $25^\circ C$ B. 298K C. 40K D. $40^\circ C$

20. In the following reaction: $CaCO_3(s) + 179.2 kJ \rightarrow CaO(s) + CO_2(g)$, what is the ΔH_f° value for CaO ?
 If the ΔH_f° value for each of CO_2 and $CaCO_3$ equal to (-393.5 , -1207.6) kJ/mol respectively

- A. $-814.1 kJ/mol$ B. $+814.1 kJ/mol$ C. $-634.9 kJ/mol$ D. $+634.9 kJ/mol$

21. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.

- A. specific heat B. nature C. temperature D. all of them

22. The entropy increases by:-

- A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them

23. The following reaction: $NH_4Cl(s) + 176 kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-

- A. if ΔS value = 176kJ B. if ΔS value > 176kJ C. if ΔS value < 176kJ D. at all temperature

24. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree ($1^\circ C$) or one kelvin (1K) is:-

- A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion

25. In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a is:-(place the reactants at energy level zero).

- A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol

26. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?

- A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant

27. The rate law for the following hypothetical reaction: $A + B \rightarrow C$, is $R = k[A]^2[B]$, by what factor does the rate increase if the concentration of each A and B is tripled?

- A. 27 B. 16 C. 18 D. 8

28. By using the information in the adjacent table, which of the following is catalyst?

A. MnO_2

B. H_2O_2

C. H_2O

D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

29. At which of the following situation the reaction solid zinc with solution of HCl is faster?

A. 0.1M HCl at 25°C

B. 0.1M HCl at 50°C

C. 1M HCl at 50°C

D. 1M HCl at 25°C

30. In the following reaction: $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \longrightarrow 2\text{NO}_2$, which of following is **correct**?

A. NO is intermediate

B. NO_3 is intermediate

C. $R=k[\text{NO}][\text{O}_2]$

D. both(B and C)

31. In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-

A. 0.005

B. 0.05

C. 20

D. 200

32. In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?

A. the value of K at 500°C is greater than the value of K at 700°C

B. the value of K at both temperatures are equal

C. the value of K at 500°C is less than the value of K at 700°C

D. none of them

33. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$

A. ionic product $> K_{sp}$

B. ionic product $< K_{sp}$

C. ionic product $= K_{sp}$

D. precipitate isn't form

34. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-

A. NaCN

B. KCl

C. KNO_2

D. NH_4Br

35. At equilibrium :-

A. all reaction have ceased

B. only the forward reaction continues

C. only the reverse reaction continues

D. both the forward and reverse reactions continue.

36. At which of the following situation the pH do not change?

A. adding NH_4NO_3 solution to the NH_3 solution

B. adding KCN solution to the HCN solution

C. adding a small amount of HCl to NH_3 and NH_4Cl solution

D. all of them

37. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$

A. the quantity of N_2 decreases

B. the quantity of NO decreases

C. the quantity of NO increases

D. the quantities do not change

38. Salts of weak acids and weak bases can produce basic aqueous solution if:-

A. $K_a = K_b$

B. $K_a > K_b$

C. $K_b > K_a$

D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$

39. Increasing the percentage of branched-chain alkanes in gasoline causes to:-

A. increase octane rating

B. decrease octane rating

C. increase boiling point

D. both (A and C)

40. All of the following pair compounds are structural isomers to each ether **except**:-

A. pentane and 2,2-dimethyl propane

B. hexene and cyclohexane

C. pentane and cyclopentane

D. 1,1-dichloro ethane and 1,2-dichloro ethane

41. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-

A. 6

B. 10

C. 8

D. 12

42. The correct name for this compound: () according to IUPAC system is:

A. 1-ethyl-4-methyl cyclohexane

B. 1-ethyl-4-methyl benzene

C. 1-methyl-4-ethyl benzene

D. 1-methyl-4- ethyl cyclohexane

43. A chemical formula that shows the type of covalent bond in organic compound:-

A. molecular formula

B. empirical formula

C. structural formula

D. ionic formula

44. According to IUPAC system the compound: $(\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COH})$, is called:-

A. 1-butanol

B. propanal

C. butanone

D. butanal

45. When compared dimethyl ether and ethanol, which of the following is **correct**?

A. both have the same a functional group

B. both have the same boiling point

C. both dissolved in water.

D. all of them

46. The.....compounds contribute to the destruction of ozone in the upper atmosphere.

A. C_2F_4

B. CFCs

C. MTBE

D. PVA

47. Which of the following is **incorrect**?

A. the reaction type of methane gas with chlorine gas is addition

B. the alkynes don't have geometric formula

C. the graphite is a good electrical conductor

D. none of them

48. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-

A. substitution

B. addition

C. condensation

D. elimination

49. The molecular formula for the ethyl ethanoate compound is :-

A. $\text{C}_4\text{H}_{10}\text{O}_2$

B. $\text{C}_4\text{H}_8\text{O}_2$

C. $\text{C}_4\text{H}_{10}\text{O}$

D. $\text{C}_4\text{H}_8\text{O}$

50. Which of the following is heated with sulfur atoms in vulcanization process?

A. isoprene

B. neoprene

C. poly isoprene

D. 2-methyl-1,3 butadiene



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- The molecular formula for the ethyl ethanoate compound is :-
 A. $C_4H_{10}O_2$ B. $C_4H_8O_2$ C. $C_4H_{10}O$ D. C_4H_8O
- According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
- In the following gaseous equilibrium reaction: $PCl_5 \rightleftharpoons PCl_3 + Cl_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
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- Which of the following is correct at all temperature in pure water?
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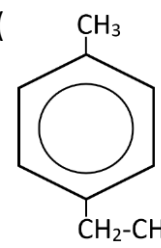
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26. A chemical formula that shows the type of covalent bond in organic compound:-

- A. molecular formula B. empirical formula C. structural formula D. ionic formula

27. The correct name for this compound: () according to IUPAC system is:

- A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane

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A. 27 B. 16 C. 18 D. 8
29. By decreasing pressure on the following equilibrium system: $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases **D. the quantities do not change**
30. At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues **D. both the forward and reverse reactions continue.**
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 A. presence of catalyst **B. changing concentration of product**
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35. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
A. increase octane rating B. decrease octane rating
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 If the ΔH_f° value for each of CO_2 and $CaCO_3$ equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol **C. -634.9kJ/mol** D. +634.9kJ/mol
39. In the following gaseous equilibrium system: $2CO_2 + 167kJ \rightleftharpoons 2CO + O_2$, which of the following is **true**?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
C. the value of K at 500°C is less than the value of K at 700°C
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40. At which of the following situation the pH do not change?
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43. The entropy increases by:-
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44. Which of the following is **incorrect**?
A. the reaction type of methane gas with chlorine gas is addition
B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them
45. The correct order according the pOH value for the following solution is:-
 A. $NaCl > CH_3COOK > NH_4NO_3$ **B. $NH_4NO_3 > NaCl > CH_3COOK$**
 C. $CH_3COOK > NaCl > NH_4NO_3$ D. $NH_4NO_3 > CH_3COOK > NaCl$
46. The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 **B. CFCs** C. MTBE D. PVA
47. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 **B. 10** C. 8 D. 12
48. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}M$, which of the following is **correct**? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5}mol/L$
A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
49. In the following reaction: $2NO + O_2 \rightarrow 2NO_2$, the reaction for the fast step is: $NO_3 + NO \rightarrow 2NO_2$, which of following is **correct**?
 A. NO is intermediate B. NO_3 is intermediate C. $R = k[NO][O_2]$ **D. both(B and C)**
50. By using the information in the adjacent table, which of the following is catalyst?

- A. MnO_2**
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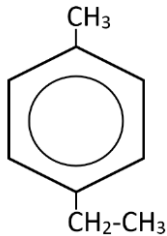


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 if ($K_f = -1.86^\circ C/m$) ($K_b = 0.51^\circ C/m$)
 A. 102.04°C B. 1.02°C **C. 101.02°C** D. 100.51°C
 SN: 000003
- The net ionic equation for which of the following reaction is: $H_3O^+(aq) + OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow$ **B. $Sr(OH)_2(aq) + HCl(aq) \rightarrow$**
 C. $Zn(s) + HCl(aq) \rightarrow$ D. both (A and B)
- Suppose that 20mL of 0.01M $Ca(OH)_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[HCl]=0.02M$ B. $[HCl]=0.04M$ C. the spectator ions are Ca^{2+} and Cl^- **D. both (B and C)**
- Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a=K_b$ B. $K_a>K_b$ **C. $K_b>K_a$** D. $[H_3O^+]>[OH^-]$
- The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
 A. substitution B. addition **C. condensation** D. elimination
- Increasing the percentage of branched-chain alkanes in gasoline causes to:-
A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)
- The following reaction: $NH_4Cl(s) + 176kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-
 A. if ΔS value = 176kJ **B. if ΔS value > 176kJ** C. if ΔS value < 176kJ D. at all temperature
- Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 **D. both (A and C)**
- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst **B. changing concentration of product**
 C. changing temperature D. changing concentration of reactant
- At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues **D. both the forward and reverse reactions continue.**
- An acid is used as a fungicide:-
A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
- All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
 A. NaCN **B. KCl** C. KNO_3 D. NH_4Br
- All of the following pair compounds are structural isomers to each ether **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
- At which of the following situation the pH do not change?
 A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them

27. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
28. In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. HNO_2 C. H_2O D. none of them
29. The molecular formula for the ethyl ethanoate compound is :-
 A. $\text{C}_4\text{H}_{10}\text{O}_2$ B. $\text{C}_4\text{H}_8\text{O}_2$ C. $\text{C}_4\text{H}_{10}\text{O}$ D. $\text{C}_4\text{H}_8\text{O}$
30. The rate law for the following hypothetical reaction: $\text{A} + \text{B} \rightarrow \text{C}$, is $R = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
31. In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is true?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
 C. the value of K at 500°C is less than the value of K at 700°C
 D. none of them
32. The correct order according the pOH value for the following solution is:-
 A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
33. At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
34. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
35. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. 0.24 B. 0.12 C. 0.36 D. 0.72
36. By using the information in the adjacent table, which of the following is catalyst?
 A. MnO_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|------------------------|----------------------|--------------|----------------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
37. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change
38. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is correct? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
39. If the pH of sea water at 25°C is equal to 8.3, which of the following is correct?
 A. $[\text{OH}^-] = 2.0 \times 10^{-6}\text{M}$ B. the sea water is basic C. $[\text{OH}^-] = 5.0 \times 10^{-9}\text{M}$ D. both (A and B)
40. According to IUPAC system the compound: $(\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{COH})$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal

41. A molecular compound which dissolves in water and it does not ionize:-
 A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF
42. The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
43. In the following reaction: $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \rightarrow 2\text{NO}_2$, which of following is correct?
 A. NO is intermediate B. NO_3 is intermediate C. $R = k[\text{NO}][\text{O}_2]$ D. both(B and C)
44. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
45. Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene
46. The correct name for this compound:  according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
47. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 B. KF C. NaF D. both (B and C)
48. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. temperature D. all of them
49. What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
50. Which of the following is correct at all temperature in pure water?
 A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$ B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
 C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7}\text{M}$ D. all of them.



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D

Answer the following questions: (two marks for each right choice)

- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
- The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 B. 10 C. 8 D. 12
- The molecular formula for the ethyl ethanoate compound is :-
 A. $C_4H_{10}O_2$ B. $C_4H_8O_2$ C. $C_4H_{10}O$ D. C_4H_8O
- In this reaction: $CN^-(aq) + H_2O(l) \rightleftharpoons HCN(aq) + OH^-(aq)$, which of the following is **incorrect**?
 A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyzed D. none of them
- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4} M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4} M$, which of the following is **correct**? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5} mol/L$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
- The rate law for the following hypothetical reaction: $A + B \rightarrow C$, is $R = k[A]^2[B]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
- According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
- The correct order according the pOH value for the following solution is:-
 A. $NaCl > CH_3COOK > NH_4NO_3$ B. $NH_4NO_3 > NaCl > CH_3COOK$
 C. $CH_3COOK > NaCl > NH_4NO_3$ D. $NH_4NO_3 > CH_3COOK > NaCl$
- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene
- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them
- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. temperature D. all of them
- What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
- A molecular compound which dissolves in water and it does **not** ionize:-
 A. C_2H_5OH B. C_6H_6 C. NH_4Cl D. HF
- In the following reaction: $HNO_2(aq) + H_2O(l) \rightleftharpoons NO_2^-(aq) + H_3O^+(aq)$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. HNO_2 C. H_2O D. none of them

15. Which of the following is **correct** at all temperature in pure water?

- A. $K_w = [H_3O^+][OH^-]$ B. $[H_3O^+][OH^-] = 1 \times 10^{-14}$
 C. $[H_3O^+] = [OH^-] = 1 \times 10^{-7} M$ D. all of them.

SN: 000004

16. The.....compounds contribute to the destruction of ozone in the upper atmosphere.

- A. C_2F_4 B. CFCs C. MTBE D. PVA

17. In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a^- is:-(place the reactants at energy level zero).
 A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol

18. A chemical formula that shows the type of covalent bond in organic compound:-

- A. molecular formula B. empirical formula C. structural formula D. ionic formula

19. A molecule that donates one electron pair to form a covalent bond is:-

- A. BF_3 B. NH_4^+ C. CH_4 D. NH_3

20. In the following reaction: $2NO + O_2 \rightarrow 2NO_2$, the reaction for the fast step is: $NO_3 + NO \rightarrow 2NO_2$, which of following is **correct**?

- A. NO is intermediate B. NO_3 is intermediate C. $R = k[NO][O_2]$ D. both(B and C)

21. Which of the following is **incorrect**?

- A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them

22. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-

- A. NaCN B. KCl C. KNO_2 D. NH_4Br

23. In the following reaction: $CaCO_3(s) + 179.2 kJ \rightarrow CaO(s) + CO_2(g)$, what is the ΔH_f° value for CaO ?
 If the ΔH_f° value for each of CO_2 and $CaCO_3$ equal to (-393.5, -1207.6) kJ/mol respectively

- A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol

24. In the following gaseous equilibrium system: $2CO_2 + 167 kJ \rightleftharpoons 2CO + O_2$, which of the following is **true**?

- A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
 C. the value of K at 500°C is less than the value of K at 700°C
 D. none of them

25. Increasing the percentage of branched-chain alkanes in gasoline causes to:-

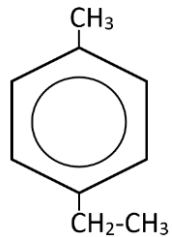
- A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)

26. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?

- A. $[OH^-] = 2.0 \times 10^{-6} M$ B. the sea water is basic C. $[OH^-] = 5.0 \times 10^{-9} M$ D. both (A and B)

27. At which of the following situation the pH do not change?

- A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them

28. If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p=0.07\text{J}/(\text{g.K})$) A. 25°C B. 298K C. 40K D. 40°C
29. The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq})+\text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
 A. $\text{Ba}(\text{OH})_2(\text{aq})+\text{H}_2\text{SO}_4(\text{aq}) \longrightarrow$ B. $\text{Sr}(\text{OH})_2(\text{aq})+\text{HCl}(\text{aq}) \longrightarrow$
 C. $\text{Zn}(\text{s})+\text{HCl}(\text{aq}) \longrightarrow$ D. both (A and B)
30. The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
31. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
32. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C, is:
 if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)
 A. 102.04°C B. 1.02°C C. 101.02°C D. 100.51°C
33. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g})+ \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change
34. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
35. When compared dimethyl ether and ethanol, which of the following is correct?
 A. both have the same a functional group B. both have the same boiling point
 C. both dissolved in water. D. all of them
36. At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
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37. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 B. KF C. NaF D. both (B and C)
38. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. 0.24 B. 0.12 C. 0.36 D. 0.72
39. An acid is used as a fungicide:-
 A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
40. All of the following pair compounds are structural isomers to each ether **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane

41. Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a=K_b$ B. $K_a>K_b$ C. $K_b>K_a$ D. $[\text{H}_3\text{O}^+]>[\text{OH}^-]$
42. Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is correct?
 A. $[\text{HCl}]=0.02\text{M}$ B. $[\text{HCl}]=0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)
43. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
 A. substitution B. addition C. condensation D. elimination
44. Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. both (A and C)
45. The following reaction: $\text{NH}_4\text{Cl}(\text{s}) +176\text{kJ} \longrightarrow \text{NH}_3(\text{g})+\text{HCl}(\text{g})$, occurs spontaneously:-
 A. if $T\Delta S$ value = 176kJ B. if $T\Delta S$ value > 176kJ C. if $T\Delta S$ value < 176kJ D. at all temperature
46. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant
47. The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
48. At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
49. By using the information in the adjacent table, which of the following is catalyst?
 A. MnO_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|------------------------|----------------------|--------------|----------------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
- B. H_2O_2
 C. H_2O
 D. O_2
50. In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3+\text{Cl}_2$,the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005 B. 0.05 C. 20 D. 200



Answer the following questions: (two marks for each right choice)

- The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
 A. substitution B. addition C. condensation D. elimination
- The molecular formula for the ethyl ethanoate compound is :-
 A. C₄H₁₀O₂ B. C₄H₈O₂ C. C₄H₁₀O D. C₄H₈O
- The rate law for the following hypothetical reaction: A + B → C, is R=k[A]²[B], by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
- A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula C. structural formula D. ionic formula
- The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C₂F₄ B. CFCs C. MTBE D. PVA
- Suppose that 20mL of 0.01M Ca(OH)₂ is required to neutralize 10mL of HCl solution, which of the following is correct?
 A. [HCl]=0.02M B. [HCl]=0.04M C. the spectator ions are Ca²⁺ and Cl⁻ D. both (B and C)
- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg²⁺ B. Ca²⁺ C. Pb²⁺ D. Al³⁺
- By decreasing pressure on the following equilibrium system: N₂(g)+ O₂(g) ⇌ 2NO(g)
 A. the quantity of N₂ decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change
- At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
- When compared dimethyl ether and ethanol, which of the following is correct?
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- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them
- Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. K_a=K_b B. K_a>K_b C. K_b>K_a D. [H₃O⁺]>[OH⁻]
- In the following reaction: CaCO₃(s)+ 179.2kJ → CaO (s)+ CO₂(g), what is the ΔH_f⁰ value for CaO?
 If the ΔH_f⁰ value for each of CO₂ and CaCO₃ equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol

14. At which of the following situation the pH do not change?

- A. adding NH₄NO₃ solution to the NH₃ solution B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH₃ and NH₄Cl solution D. all of them

SN: 000005

15. The following reaction: NH₄Cl(s) +176kJ → NH₃(g)+HCl(g) , occurs spontaneously:-

- A. if TΔS value = 176kJ B. if TΔS value > 176kJ C. if TΔS value < 176kJ D. at all temperature

16. All of the following pair compounds are structural isomers to each ether except:-

- A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane

17. If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? (C_p=0.07J/(g.K)) A. 25°C B. 298K C. 40K D. 40°C

18. In the following gaseous equilibrium reaction: PCl₅ ⇌ PCl₃+Cl₂ ,the mole number for each of PCl₅ ,PCl₃ and Cl₂ at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-

- A. 0.005 B. 0.05 C. 20 D. 200

19. A molecule that donates one electron pair to form a covalent bond is:-

- A. BF₃ B. NH₄⁺ C. CH₄ D. NH₃

20. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?

- A. 5M B. 1M C. 0.001M D. all of them

21. If the pH of sea water at 25°C is equal to 8.3, which of the following is correct?

- A. [OH⁻]=2.0x10⁻⁶M B. the sea water is basic C. [OH⁻]=5.0x10⁻⁹M D. both (A and B)

22. What colligative properties are displayed when antifreeze is added to a car's cooling system?

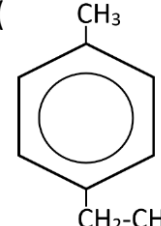
- A. vapor-pressure elevation B. boiling point elevation
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23. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-

- A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion

24. After mixing Ca²⁺ ions with concentration 2.4x10⁻⁴M and CO₃²⁻ ions with concentration 1.2x10⁻⁴M , which of the following is correct? If the solubility of CaCO₃ in its saturated solution is 5.3x10⁻⁵mol/L

- A. ionic product>K_{sp} B. ionic product<K_{sp} C. ionic product=K_{sp} D. precipitate isn't form

25. The correct name for this compound: () according to IUPAC system is:

- A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane

26. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?

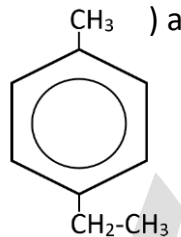
- A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant

27. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is:
if ($K_f = -1.86^{\circ}\text{C}/m$) ($K_b = 0.51^{\circ}\text{C}/m$)
A. 102.04°C B. 1.02°C C. 101.02°C D. 100.51°C
28. A molecular compound which dissolves in water and it does **not** ionize:-
A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF
29. In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol , the value of E_a^- is:-(place the reactants at energy level zero).
A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
30. In the following reaction: $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \longrightarrow 2\text{NO}_2$, which of following is **correct**?
A. NO is intermediate B. NO_3 is intermediate C. $R = k[\text{NO}][\text{O}_2]$ D. both(B and C)
31. By using the information in the adjacent table, which of the following is catalyst?
A. MnO_2
B. H_2O_2
C. H_2O
D. O_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|------------------------|----------------------|--------------|----------------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
32. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
A. 6 B. 10 C. 8 D. 12
33. The entropy increases by:-
A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
34. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
A. KNO_3 B. KF C. NaF D. both (B and C)
35. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
A. 0.24 B. 0.12 C. 0.36 D. 0.72
36. An acid is used as a fungicide:-
A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
37. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
A. specific heat B. nature C. temperature D. all of them
38. Which of the following is **incorrect**?
A. the reaction type of methane gas with chlorine gas is addition
B. the alkynes don't have geometric formula
C. the graphite is a good electrical conductor
D. none of them
39. The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
A. $\text{Ba}(\text{OH})_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow$
B. $\text{Sr}(\text{OH})_2(\text{aq}) + \text{HCl}(\text{aq}) \longrightarrow$
C. $\text{Zn}(\text{s}) + \text{HCl}(\text{aq}) \longrightarrow$
D. both (A and B)

40. Which of the following oxides when reacted with water forms acid solution?
A. CO_2 B. CaO C. SO_3 D. both (A and C)
41. Which of the following is heated with sulfur atoms in vulcanization process?
A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene
42. In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
A. the value of K at 500°C is greater than the value of K at 700°C
B. the value of K at both temperatures are equal
C. the value of K at 500°C is less than the value of K at 700°C
D. none of them
43. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
A. increase octane rating B. decrease octane rating
C. increase boiling point D. both (A and C)
44. In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-
A. H_3O^+ B. HNO_2 C. H_2O D. none of them
45. Which of the following is **correct** at all temperature in pure water?
A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$ B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7}\text{M}$ D. all of them.
46. At equilibrium :-
A. all reaction have ceased B. only the forward reaction continues
C. only the reverse reaction continues D. both the forward and reverse reactions continue.
47. The correct order according the pOH value for the following solution is:-
A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
48. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?
A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyze D. none of them
49. According to IUPAC system the compound: $(\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{COH})$, is called:-
A. 1-butanol B. propanal C. butanone D. butanal
50. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
A. NaCN B. KCl C. KNO_2 D. NH_4Br



Answer the following questions: (two marks for each right choice)

- The molecular formula for the ethyl ethanoate compound is :-
 A. $C_4H_{10}O_2$ B. $C_4H_8O_2$ C. $C_4H_{10}O$ D. C_4H_8O
- Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree ($1^\circ C$) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
- The net ionic equation for which of the following reaction is: $H_3O^+(aq) + OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq) + H_2SO_4(aq) \longrightarrow$ B. $Sr(OH)_2(aq) + HCl(aq) \longrightarrow$
 C. $Zn(s) + HCl(aq) \longrightarrow$ D. both (A and B)
- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. temperature D. all of them
- The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
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- According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
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- Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. both (A and C)
- The boiling point of an aqueous solution containing a nonelectrolyte that freezes at $-3.72^\circ C$, is:
 if $(K_f = -1.86^\circ C/m)$ $(K_b = 0.51^\circ C/m)$
 A. $102.04^\circ C$ B. $1.02^\circ C$ C. $101.02^\circ C$ D. $100.51^\circ C$
- The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4} M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4} M$, which of the following is correct? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5} mol/L$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
- Which of the following is incorrect?
 A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them

12. By using the information in the adjacent table, which of the following is catalyst?

- A. MnO_2
 B. H_2O_2
 C. H_2O
 D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

13. Which of the following is heated with sulfur atoms in vulcanization process?

- A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene

14. In the following gaseous equilibrium reaction: $PCl_5 \rightleftharpoons PCl_3 + Cl_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-

- A. 0.005 B. 0.05 C. 20 D. 200

15. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?

- A. 0.24 B. 0.12 C. 0.36 D. 0.72

16. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-

- A. 6 B. 10 C. 8 D. 12

17. At which of the following situation the reaction solid zinc with solution of HCl is faster?

- A. 0.1M HCl at $25^\circ C$ B. 0.1M HCl at $50^\circ C$ C. 1M HCl at $50^\circ C$ D. 1M HCl at $25^\circ C$

18. Increasing the percentage of branched-chain alkanes in gasoline causes to:-

- A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)

19. In the following gaseous equilibrium system: $2CO_2 + 167kJ \rightleftharpoons 2CO + O_2$, which of the following is true?

- A. the value of K at $500^\circ C$ is greater than the value of K at $700^\circ C$
 B. the value of K at both temperatures are equal
 C. the value of K at $500^\circ C$ is less than the value of K at $700^\circ C$
 D. none of them

20. In the following reaction: $2NO + O_2 \longrightarrow 2NO_2$, the reaction for the fast step is: $NO_3 + NO \longrightarrow 2NO_2$, which of following is correct?

- A. NO is intermediate B. NO_3 is intermediate C. $R = k[NO][O_2]$ D. both(B and C)

21. A molecular compound which dissolves in water and it does not ionize:-

- A. C_2H_5OH B. C_6H_6 C. NH_4Cl D. HF

22. If the pH of sea water at $25^\circ C$ is equal to 8.3, which of the following is correct?

- A. $[OH^-] = 2.0 \times 10^{-6} M$ B. the sea water is basic C. $[OH^-] = 5.0 \times 10^{-9} M$ D. both (A and B)

23. If 49J of energy are added to 35g of a material at $20^\circ C$, what will the final temperature of the material be? ($C_p = 0.07 J/(g.K)$)

- A. $25^\circ C$ B. $298K$ C. $40K$ D. $40^\circ C$

24. The entropy increases by:-

- A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them

25. Which of the following is correct at all temperature in pure water?

- A. $K_w = [H_3O^+][OH^-]$ B. $[H_3O^+][OH^-] = 1 \times 10^{-14}$
 C. $[H_3O^+] = [OH^-] = 1 \times 10^{-7} M$ D. all of them.

26. A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. NH_3
27. The following reaction: $\text{NH}_4\text{Cl(s)} + 176\text{kJ} \longrightarrow \text{NH}_3\text{(g)} + \text{HCl(g)}$, occurs spontaneously:-
 A. if ΔS value = 176kJ B. if ΔS value > 176kJ C. if ΔS value < 176kJ D. at all temperature
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30. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
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31. What colligative properties are displayed when antifreeze is added to a car's cooling system?
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32. By decreasing pressure on the following equilibrium system: $\text{N}_2\text{(g)} + \text{O}_2\text{(g)} \rightleftharpoons 2\text{NO(g)}$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change
33. In this reaction: $\text{CN}^-\text{(aq)} + \text{H}_2\text{O(l)} \rightleftharpoons \text{HCN(aq)} + \text{OH}^-\text{(aq)}$, which of the following is incorrect?
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 A. H_3O^+ B. HNO_2 C. H_2O D. none of them
39. When compared dimethyl ether and ethanol, which of the following is correct?
 A. both have the same a functional group B. both have the same boiling point
 C. both dissolved in water. D. all of them
40. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
41. The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 B. CFCs C. MTBE D. PVA
42. All of the following pair compounds are structural isomers to each ether except:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
43. Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a = K_b$ B. $K_a > K_b$ C. $K_b > K_a$ D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
44. At which of the following situation the pH do not change?
 A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
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45. Suppose that 20mL of 0.01M Ca(OH)_2 is required to neutralize 10mL of HCl solution, which of the following is correct?
 A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)
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48. A chemical formula that shows the type of covalent bond in organic compound:-
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49. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
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50. In the following reaction: $\text{CaCO}_3\text{(s)} + 179.2\text{kJ} \longrightarrow \text{CaO(s)} + \text{CO}_2\text{(g)}$, what is the ΔH_f° value for CaO ?
 If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol



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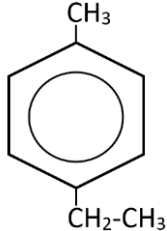
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- The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
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29. The correct order according the pOH value for the following solution is:-
 A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ **B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$**
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
30. In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2\text{kJ} \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO? If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol **C. -634.9kJ/mol** D. +634.9kJ/mol
31. At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C **C. 1M HCl at 50°C** D. 1M HCl at 25°C
32. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
 A. $[\text{OH}^-] = 2.0 \times 10^{-6}\text{M}$ B. the sea water is basic C. $[\text{OH}^-] = 5.0 \times 10^{-9}\text{M}$ **D. both (A and B)**
33. If 49J of energy are added to 35g of a material at 20°C, what will the final temperature of the material be? ($C_p = 0.07\text{J}/(\text{g}\cdot\text{K})$)
 A. 25°C B. 298K C. 40K **D. 40°C**
34. The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 **B. CFCs** C. MTBE D. PVA
35. An acid is used as a fungicide:-
 A. **CH_3COOH** B. HCl C. HNO_3 D. H_3PO_4
36. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$
 A. **ionic product $> K_{sp}$** B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
37. When compared dimethyl ether and ethanol, which of the following is **correct**?
 A. both have the same a functional group B. both have the same boiling point
 C. **both dissolved in water.** D. all of them
38. Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a = K_b$ B. $K_a > K_b$ **C. $K_b > K_a$** D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
39. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 **B. KF** C. NaF D. both (B and C)
40. Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene **C. poly isoprene** D. 2-methyl-1,3 butadiene

41. Which of the following is **incorrect**?
 A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them
42. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M **D. all of them**
43. Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 **D. both (A and C)**
44. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 **B. 10** C. 8 D. 12
45. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. **0.24** B. 0.12 C. 0.36 D. 0.72
46. According to IUPAC system the compound: $(\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COH})$, is called:-
 A. 1-butanol B. propanal C. butanone **D. butanal**
47. The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
48. At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues **D. both the forward and reverse reactions continue.**
49. The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases **D. all of them**
50. By using the information in the adjacent table, which of the following is catalyst?

A. MnO_2

B. H_2O_2

C. H_2O

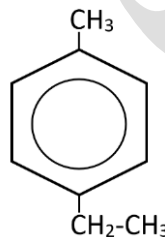
D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5



Answer the following questions: (two marks for each right choice)

- What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
- A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. NH_3
- A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula C. structural formula D. ionic formula
- All of the following pair compounds are structural isomers to each other **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
- At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
- The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
 A. $\text{Ba}(\text{OH})_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow$ B. $\text{Sr}(\text{OH})_2(\text{aq}) + \text{HCl}(\text{aq}) \longrightarrow$
 C. $\text{Zn}(\text{s}) + \text{HCl}(\text{aq}) \longrightarrow$ D. both (A and B)
- The following reaction: $\text{NH}_4\text{Cl}(\text{s}) + 176\text{kJ} \longrightarrow \text{NH}_3(\text{g}) + \text{HCl}(\text{g})$, occurs spontaneously:-
 A. if ΔS value = 176kJ B. if ΔS value > 176kJ C. if ΔS value < 176kJ D. at all temperature
- In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. HNO_2 C. H_2O D. none of them
- At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues D. both the forward and reverse reactions continue.
- By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change
- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant

12. The correct name for this compound: () according to IUPAC system is:

- A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane

13. A molecular compound which dissolves in water and it does **not** ionize:-

- A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF

14. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 SN: 000008

- A. 5M B. 1M C. 0.001M D. all of them

15. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is:
 if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)

- A. 102.04°C B. 1.02°C C. 101.02°C D. 100.51°C

16. Increasing the percentage of branched-chain alkanes in gasoline causes to:-

- A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)

17. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?

- A. $[\text{OH}^-] = 2.0 \times 10^{-6}\text{M}$ B. the sea water is basic C. $[\text{OH}^-] = 5.0 \times 10^{-9}\text{M}$ D. both (A and B)

18. Which of the following is heated with sulfur atoms in vulcanization process?

- A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene

19. Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?

- A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)

20. If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p = 0.07\text{J}/(\text{g.K})$)

- A. 25°C B. 298K C. 40K D. 40°C

21. Which of the following oxides when reacted with water forms acid solution?

- A. CO_2 B. CaO C. SO_3 D. both (A and C)

22. Which of the following is **incorrect**?

- A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them

23. Salts of weak acids and weak bases can produce basic aqueous solution if:-

- A. $K_a = K_b$ B. $K_a > K_b$ C. $K_b > K_a$ D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$

24. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-

- A. substitution B. addition C. condensation D. elimination

25. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-

- A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}

26. The entropy increases by:-

- A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them

27. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?

- A. KNO_3 B. KF C. NaF D. both (B and C)

- 28.** After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4} \text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4} \text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5} \text{mol/L}$
A. ionic product > K_{sp} **B. ionic product < K_{sp}** **C. ionic product = K_{sp}** **D. precipitate isn't form**
- 29.** The rate law for the following hypothetical reaction: $\text{A} + \text{B} \longrightarrow \text{C}$, is $R = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?
A. 27 **B. 16** **C. 18** **D. 8**
- 30.** In the following gaseous equilibrium system: $2\text{CO}_2 + 167 \text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
A. the value of K at 500°C is greater than the value of K at 700°C
B. the value of K at both temperatures are equal
C. the value of K at 500°C is less than the value of K at 700°C
D. none of them
- 31.** By using the information in the adjacent table, which of the following is catalyst?
A. MnO_2
B. H_2O_2
C. H_2O
D. O_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|------------------------|----------------------|--------------|----------------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
- 32.** The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
A. 6 **B. 10** **C. 8** **D. 12**
- 33.** In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
A. 0.005 **B. 0.05** **C. 20** **D. 200**
- 34.** According to IUPAC system the compound: $(\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COH})$, is called:-
A. 1-butanol **B. propanal** **C. butanone** **D. butanal**
- 35.** When compared dimethyl ether and ethanol, which of the following is **correct**?
A. both have the same a functional group **B.** both have the same boiling point
C. both dissolved in water. **D. all of them**
- 36.** At which of the following situation the pH do not change?
A. adding NH_4NO_3 solution to the NH_3 solution **B.** adding KCN solution to the HCN solution
C. adding a small amount of HCl to NH_3 and NH_4Cl solution **D. all of them**
- 37.** In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol , the value of E_a^- is:- (place the reactants at energy level zero).
A. 65kJ/mol **B. -65kJ/mol** **C. 35kJ/mol** **D. 135kJ/mol**
- 38.** In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?
A. OH^- is conjugate base **B. H_2O is amphoteric** **C.** CN^- ion is hydrolyzed **D. none of them**
- 39.** Which of the following is **correct** at all temperature in pure water?
A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$ **B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$**
C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7} \text{M}$ **D. all of them.**

- 40.** In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2 \text{kJ} \longrightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO ? If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5 , -1207.6) kJ/mol respectively
A. -814.1kJ/mol **B. $+814.1 \text{kJ/mol}$** **C. -634.9kJ/mol** **D. $+634.9 \text{kJ/mol}$**
- 41.** An acid is used as a fungicide:-
A. CH_3COOH **B. HCl** **C. HNO_3** **D. H_3PO_4**
- 42.** Which theories of acids and bases belong to acids and bases conjugate?
A. Arrhenius **B. Lewis** **C. Bronsted-Lowry** **D. none of them**
- 43.** The molecular formula for the ethyl ethanoate compound is :-
A. $\text{C}_4\text{H}_{10}\text{O}_2$ **B. $\text{C}_4\text{H}_8\text{O}_2$** **C. $\text{C}_4\text{H}_{10}\text{O}$** **D. $\text{C}_4\text{H}_8\text{O}$**
- 44.** The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
A. 0.24 **B. 0.12** **C. 0.36** **D. 0.72**
- 45.** The.....compounds contribute to the destruction of ozone in the upper atmosphere.
A. C_2F_4 **B. CFCs** **C. MTBE** **D. PVA**
- 46.** If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
A. specific heat **B. nature** **C. temperature** **D. all of them**
- 47.** Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
A. specific heat **B. enthalpy of reaction** **C. enthalpy of formation** **D. enthalpy of combustion**
- 48.** The correct order according the pOH value for the following solution is:-
A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ **B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$**
C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ **D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$**
- 49.** All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
A. NaCN **B. KCl** **C. KNO_2** **D. NH_4Br**
- 50.** In the following reaction: $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \longrightarrow 2\text{NO}_2$, which of following is **correct**?
A. NO is intermediate **B. NO_3 is intermediate** **C. $R = k[\text{NO}][\text{O}_2]$** **D. both(B and C)**

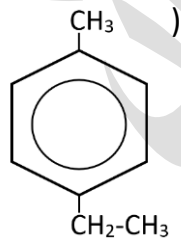


Answer the following questions: (two marks for each right choice)

- Which of the following is **correct** at all temperature in pure water?
 A. $K_w=[H_3O^+][OH^-]$ B. $[H_3O^+][OH^-]=1 \times 10^{-14}$
 C. $[H_3O^+]=[OH^-]=1 \times 10^{-7}M$ D. all of them.
- A molecular compound which dissolves in water and it does **not ionize**:-
 A. C_2H_5OH B. C_6H_6 C. NH_4Cl D. HF
- All of the following pair compounds are structural isomers to each other **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. **pentane and cyclopentane** D. 1,1-dichloro ethane and 1,2-dichloro ethane
- A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. **NH_3**
- If the pH of sea water at $25^\circ C$ is equal to 8.3, which of the following is **correct**?
 A. $[OH^-]=2.0 \times 10^{-6}M$ B. the sea water is basic C. $[OH^-]=5.0 \times 10^{-9}M$ D. **both (A and B)**
- Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. **both (A and C)**
- In a reaction, the value of the forward activation energy equals $100kJ/mol$ and the enthalpy change for reverse reaction equals $-35kJ/mol$, the value of E_a^- is:-(place the reactants at energy level zero).
 A. **$65kJ/mol$** B. $-65kJ/mol$ C. $35kJ/mol$ D. $135kJ/mol$
- Increasing the percentage of branched-chain alkanes in gasoline causes to:-
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 C. increase boiling point D. both (A and C)
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- Which theories of acids and bases belong to acids and bases conjugate?
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- The correct order according the pOH value for the following solution is:-
 A. $NaCl > CH_3COOK > NH_4NO_3$ B. **$NH_4NO_3 > NaCl > CH_3COOK$**
 C. $CH_3COOK > NaCl > NH_4NO_3$ D. $NH_4NO_3 > CH_3COOK > NaCl$
- By decreasing pressure on the following equilibrium system: $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. **the quantities do not change**

- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. **poly isoprene** D. 2-methyl-1,3 butadiene
- According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
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 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. **both (B and C)**
- The molecular formula for the ethyl ethanoate compound is :-
 A. $C_4H_{10}O_2$ B. **$C_4H_8O_2$** C. $C_4H_{10}O$ D. C_4H_8O
- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. **changing concentration of product**
 C. changing temperature D. changing concentration of reactant
- The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
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- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
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- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}M$, which of the following is **correct**? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5}mol/L$
 A. **ionic product $> K_{sp}$** B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
- In the following reaction: $CaCO_3(s) + 179.2kJ \longrightarrow CaO(s) + CO_2(g)$, what is the ΔH_f^0 value for CaO? If the ΔH_f^0 value for each of CO_2 and $CaCO_3$ equal to (-393.5 , -1207.6) kJ/mol respectively
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 A. 6 B. **10** C. 8 D. 12
- A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula C. **structural formula** D. ionic formula
- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. **Ca^{2+}** C. Pb^{2+} D. Al^{3+}

29. In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ **B. HNO_2** C. H_2O D. none of them
30. If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p = 0.07\text{J}/(\text{g}\cdot\text{K})$) A. 25°C B. 298K C. 40K **D. 40°C**
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32. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?
 A. OH^- is conjugate base **B. H_2O is amphoteric** C. CN^- ion is hydrolyzed D. none of them
33. At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C **C. 1M HCl at 50°C** D. 1M HCl at 25°C
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35. The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
 A. $\text{Ba}(\text{OH})_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow$ **B. $\text{Sr}(\text{OH})_2(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow$**
 C. $\text{Zn}(\text{s}) + \text{HCl}(\text{aq}) \rightarrow$ D. both (A and B)
36. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
 A. NaCN **B. KCl** C. KNO_2 D. NH_4Br
37. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is:
 if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)
 A. 102.04°C B. 1.02°C **C. 101.02°C** D. 100.51°C
38. In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
C. the value of K at 500°C is less than the value of K at 700°C
 D. none of them
39. At which of the following situation the pH do not change?
 A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
40. The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 **B. CFCs** C. MTBE D. PVA

41. The correct name for this compound: () according to IUPAC system is:

- A. 1-ethyl-4-methyl cyclohexane
B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane

42. By using the information in the adjacent table, which of the following is catalyst?

A. MnO_2

B. H_2O_2

C. H_2O

D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

43. In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
A. 0.005 B. 0.05 C. 20 D. 200

44. In the following reaction: $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \rightarrow 2\text{NO}_2$, which of following is **correct**?

A. NO is intermediate B. NO_3 is intermediate C. $R = k[\text{NO}][\text{O}_2]$ **D. both(B and C)**

45. The following reaction: $\text{NH}_4\text{Cl}(\text{s}) + 176\text{kJ} \rightarrow \text{NH}_3(\text{g}) + \text{HCl}(\text{g})$, occurs spontaneously:-

A. if ΔS value = 176kJ **B. if ΔS value > 176kJ** C. if ΔS value < 176kJ D. at all temperature

46. Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?

A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- **D. both (B and C)**

47. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?

A. KNO_3 **B. KF** C. NaF D. both (B and C)

48. Salts of weak acids and weak bases can produce basic aqueous solution if:-

A. $K_a = K_b$ B. $K_a > K_b$ **C. $K_b > K_a$** D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$

49. Which of the following is **incorrect**?

A. the reaction type of methane gas with chlorine gas is addition

B. the alkynes don't have geometric formula

C. the graphite is a good electrical conductor

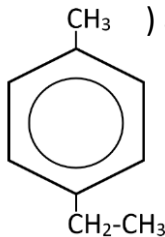
D. none of them

50. The entropy increases by:-

A. decreasing the pressure B. increasing the temperature C. mixing gases **D. all of them**



Answer the following questions: (two marks for each right choice)

- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them
- In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005 B. 0.05 C. 20 D. 200
- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4} \text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4} \text{M}$, which of the following is correct? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5} \text{mol/L}$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
- At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues D. both the forward and reverse reactions continue.
- At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. temperature D. all of them
- The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
- An acid is used as a fungicide:-
 A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
- At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
- All of the following salts effect on the H_3O^+ and OH^- concentration when added to water except:-
 A. NaCN B. KCl C. KNO_2 D. NH_4Br
- In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. HNO_2 C. H_2O D. none of them
- The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is:
 if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)
 A. 102.04°C B. 1.02°C C. 101.02°C D. 100.51°C

13. The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?

- A. $\text{Ba}(\text{OH})_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow$ B. $\text{Sr}(\text{OH})_2(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow$
 C. $\text{Zn}(\text{s}) + \text{HCl}(\text{aq}) \rightarrow$ D. both (A and B)
 SN: 000010

14. At which of the following situation the pH do not change?

- A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them

15. By using the information in the adjacent table, which of the following is catalyst?

- A. MnO_2
 B. H_2O_2
 C. H_2O
 D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

16. When compared dimethyl ether and ethanol, which of the following is correct?

- A. both have the same a functional group B. both have the same boiling point
 C. both dissolved in water. D. all of them

17. The.....compounds contribute to the destruction of ozone in the upper atmosphere.

- A. C_2F_4 B. CFCs C. MTBE D. PVA

18. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$

- A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change

19. A molecule that donates one electron pair to form a covalent bond is:-

- A. BF_3 B. NH_4^+ C. CH_4 D. NH_3

20. The entropy increases by:-

- A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them

21. What colligative properties are displayed when antifreeze is added to a car's cooling system?

- A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)

22. Which of the following is correct at all temperature in pure water?

- A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$ B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
 C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7} \text{M}$ D. all of them.

23. In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2 \text{kJ} \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO?

If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5 , -1207.6) kJ/mol respectively

- A. -814.1kJ/mol B. $+814.1 \text{kJ/mol}$ C. -634.9kJ/mol D. $+634.9 \text{kJ/mol}$

24. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-

- A. substitution B. addition C. condensation D. elimination

25. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-

- A. 6 B. 10 C. 8 D. 12

26. If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p = 0.07 \text{J}/(\text{g.K})$)

- A. 25°C B. 298K C. 40K D. 40°C

27. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 B. KF C. NaF D. both (B and C)
28. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?
 A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyzed D. none of them
29. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. 0.24 B. 0.12 C. 0.36 D. 0.72
30. Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)
31. A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula C. structural formula D. ionic formula
32. Which of the following is **incorrect**?
 A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them
33. The rate law for the following hypothetical reaction: $\text{A} + \text{B} \rightarrow \text{C}$, is $\text{R} = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
34. According to IUPAC system the compound: $(\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COH})$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
35. Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. both (A and C)
36. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
 A. $[\text{OH}^-] = 2.0 \times 10^{-6}\text{M}$ B. the sea water is basic C. $[\text{OH}^-] = 5.0 \times 10^{-9}\text{M}$ D. both (A and B)
37. All of the following pair compounds are structural isomers to each ether **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
38. Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene
39. A molecular compound which dissolves in water and it does **not** ionize:-
 A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF
40. The following reaction: $\text{NH}_4\text{Cl}(\text{s}) + 176\text{kJ} \rightarrow \text{NH}_3(\text{g}) + \text{HCl}(\text{g})$, occurs spontaneously:-
 A. if ΔS value = 176kJ B. if ΔS value > 176kJ C. if ΔS value < 176kJ D. at all temperature

41. The correct order according the pOH value for the following solution is:-
 A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
42. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
 A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)
43. The molecular formula for the ethyl ethanoate compound is :-
 A. $\text{C}_4\text{H}_{10}\text{O}_2$ B. $\text{C}_4\text{H}_8\text{O}_2$ C. $\text{C}_4\text{H}_{10}\text{O}$ D. $\text{C}_4\text{H}_8\text{O}$
44. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
45. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant
46. In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
 C. the value of K at 500°C is less than the value of K at 700°C
 D. none of them
47. In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a^- is:-(place the reactants at energy level zero).
 A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
48. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
49. Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a = K_b$ B. $K_a > K_b$ C. $K_b > K_a$ D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
50. In the following reaction: $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \rightarrow 2\text{NO}_2$, which of following is **correct**?
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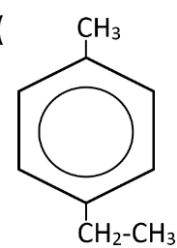


Answer the following questions: (two marks for each right choice)

- When compared dimethyl ether and ethanol, which of the following is **correct**?
 A. both have the same a functional group
 B. both have the same boiling point
 C. both dissolved in water.
 D. all of them
- In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005
 B. 0.05
 C. 20
 D. 200
- According to IUPAC system the compound: $(\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COH})$, is called:-
 A. 1-butanol
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- Which of the following is **incorrect**?
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- The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. 0.24
 B. 0.12
 C. 0.36
 D. 0.72
- Which of the following is **correct** at all temperature in pure water?
 A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$
 B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
 C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7}\text{M}$
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 B. HNO_2
 C. H_2O
 D. none of them
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 A. BF_3
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- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
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 C. temperature
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- The correct order according the pOH value for the following solution is:-
 A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$
 B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$
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SN: 000011

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 A. increase octane rating
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 C. increase boiling point
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- Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}] = 0.02\text{M}$
 B. $[\text{HCl}] = 0.04\text{M}$
 C. the spectator ions are Ca^{2+} and Cl^-
 D. both (B and C)
- By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
 A. the quantity of N_2 decreases
 B. the quantity of NO decreases
 C. the quantity of NO increases
 D. the quantities do not change
- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius
 B. Lewis
 C. Bronsted-Lowry
 D. none of them
- If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
 A. $[\text{OH}^-] = 2.0 \times 10^{-6}\text{M}$
 B. the sea water is basic
 C. $[\text{OH}^-] = 5.0 \times 10^{-9}\text{M}$
 D. both (A and B)
- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+}
 B. Ca^{2+}
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 A. adding NH_4NO_3 solution to the NH_3 solution
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 C. 40K
 D. 40°C
- At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C
 B. 0.1M HCl at 50°C
 C. 1M HCl at 50°C
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- A. 6 B. 10 C. 8 D. 12

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- A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them

36. By using the information in the adjacent table, which of the following is catalyst?

A. MnO_2

B. H_2O_2

C. H_2O

D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

37. Which of the following oxides when reacted with water forms acid solution?

- A. CO_2 B. CaO C. SO_3 D. both (A and C)

38. All of the following pair compounds are structural isomers to each ether **except**:-

- A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane

39. The following reaction: $\text{NH}_4\text{Cl}(\text{s}) + 176\text{kJ} \longrightarrow \text{NH}_3(\text{g}) + \text{HCl}(\text{g})$, occurs spontaneously:-

- A. if ΔS value = 176kJ B. if ΔS value > 176kJ C. if ΔS value < 176kJ D. at all temperature

40. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?

- A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyzed D. none of them

41. The molecular formula for the ethyl ethanoate compound is :-

- A. $\text{C}_4\text{H}_{10}\text{O}_2$ B. $\text{C}_4\text{H}_8\text{O}_2$ C. $\text{C}_4\text{H}_{10}\text{O}$ D. $\text{C}_4\text{H}_8\text{O}$

42. At equilibrium :-

- A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues D. both the forward and reverse reactions continue.

43. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-

- A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion

44. In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2\text{kJ} \longrightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO ? If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively

- A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol

45. The rate law for the following hypothetical reaction: $\text{A} + \text{B} \longrightarrow \text{C}$, is $R = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?

- A. 27 B. 16 C. 18 D. 8

46. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-

- A. NaCN B. KCl C. KNO_2 D. NH_4Br

47. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-

- A. substitution B. addition C. condensation D. elimination

48. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?

- A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant

49. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$

- A. ionic product > K_{sp} B. ionic product < K_{sp} C. ionic product = K_{sp} D. precipitate isn't form

50. An acid is used as a fungicide:-

- A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4



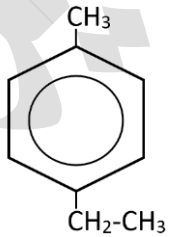
Answer the following questions: (two marks for each right choice)

- Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a=K_b$ B. $K_a>K_b$ C. $K_b>K_a$ D. $[H_3O^+]>[OH^-]$
- An acid is used as a fungicide:-
 A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
- The following reaction: $NH_4Cl(s) + 176kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-
 A. if ΔS value = 176kJ B. if ΔS value > 176kJ C. if ΔS value < 176kJ D. at all temperature
- The molecular formula for the ethyl ethanoate compound is :-
 A. $C_4H_{10}O_2$ B. $C_4H_8O_2$ C. $C_4H_{10}O$ D. C_4H_8O
- In the following gaseous equilibrium reaction: $PCl_5 \rightleftharpoons PCl_3 + Cl_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005 B. 0.05 C. 20 D. 200
- By decreasing pressure on the following equilibrium system: $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change
- By using the information in the adjacent table, which of the following is catalyst?
 A. MnO_2 B. H_2O_2 C. H_2O D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5
- A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. NH_3
- When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 B. KF C. NaF D. both (B and C)
- The boiling point of an aqueous solution containing a nonelectrolyte that freezes at $-3.72^\circ C$, is:
 if ($K_f = -1.86^\circ C/m$) ($K_b = 0.51^\circ C/m$)
 A. $102.04^\circ C$ B. $1.02^\circ C$ C. $101.02^\circ C$ D. $100.51^\circ C$
- At which of the following situation the pH do not change?
 A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
- A molecular compound which dissolves in water and it does not ionize:-
 A. C_2H_5OH B. C_6H_6 C. NH_4Cl D. HF

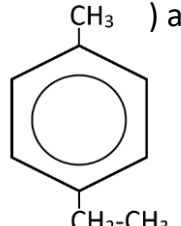
- At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues D. both the forward and reverse reactions continue.
- In the following gaseous equilibrium system: $2CO_2 + 167kJ \rightleftharpoons 2CO + O_2$, which of the following is true?
 SN: 000012
 A. the value of K at $500^\circ C$ is greater than the value of K at $700^\circ C$
 B. the value of K at both temperatures are equal
 C. the value of K at $500^\circ C$ is less than the value of K at $700^\circ C$
 D. none of them
- If the pH of sea water at $25^\circ C$ is equal to 8.3, which of the following is correct?
 A. $[OH^-] = 2.0 \times 10^{-6} M$ B. the sea water is basic C. $[OH^-] = 5.0 \times 10^{-9} M$ D. both (A and B)
- The net ionic equation for which of the following reaction is: $H_3O^+(aq) + OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow$ B. $Sr(OH)_2(aq) + HCl(aq) \rightarrow$
 C. $Zn(s) + HCl(aq) \rightarrow$ D. both (A and B)
- In the following reaction: $2NO + O_2 \rightarrow 2NO_2$, the reaction for the fast step is: $NO_3 + NO \rightarrow 2NO_2$, which of following is correct?
 A. NO is intermediate B. NO_3 is intermediate C. $R = k[NO][O_2]$ D. both(B and C)
- In the following reaction: $HNO_2(aq) + H_2O(l) \rightleftharpoons NO_2^-(aq) + H_3O^+(aq)$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. HNO_2 C. H_2O D. none of them
- Which of the following is correct at all temperature in pure water?
 A. $K_w = [H_3O^+][OH^-]$ B. $[H_3O^+][OH^-] = 1 \times 10^{-14}$
 C. $[H_3O^+] = [OH^-] = 1 \times 10^{-7} M$ D. all of them.
- According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
- The rate law for the following hypothetical reaction: $A + B \rightarrow C$, is $R = k[A]^2[B]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
- All of the following pair compounds are structural isomers to each ether except:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene
- All of the following salts effect on the H_3O^+ and OH^- concentration when added to water except:-
 A. $NaCN$ B. KCl C. KNO_2 D. NH_4Br
- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
- The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 B. CFCs C. MTBE D. PVA

27. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
28. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. 0.24 B. 0.12 C. 0.36 D. 0.72
29. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 B. 10 C. 8 D. 12
30. Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. both (A and C)
31. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
32. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
 A. substitution B. addition C. condensation D. elimination
33. Which of the following is **incorrect**?
 A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them
34. When compared dimethyl ether and ethanol, which of the following is **correct**?
 A. both have the same a functional group B. both have the same boiling point
 C. both dissolved in water. D. all of them
35. If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p = 0.07\text{J}/(\text{g.K})$) A. 25°C B. 298K C. 40K D. 40°C
36. At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
37. Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)
38. In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2\text{kJ} \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO ?
 If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol
39. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
40. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
 A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)

41. Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them
42. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?
 A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyze D. none of them
43. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. temperature D. all of them
44. The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
45. What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
46. A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula C. structural formula D. ionic formula
47. The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
48. The correct order according the pOH value for the following solution is:-
 A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
49. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant
50. In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a^- is:-(place the reactants at energy level zero).
 A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol



Answer the following questions: (two marks for each right choice)

- The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
- If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p=0.07J/(g.K)$)
 A. 25°C B. 298K C. 40K **D. 40°C**
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- The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
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- In the following reaction: $2NO+O_2 \longrightarrow 2NO_2$,the reaction for the fast step is: $NO_3+NO \longrightarrow 2NO_2$, which of following is **correct**?
 A. NO is intermediate B. NO_3 is intermediate C. $R=k[NO][O_2]$ **D. both(B and C)**
- In this reaction: $CN^-(aq)+ H_2O(l) \rightleftharpoons HCN(aq)+ OH^-(aq)$,which of the following is **incorrect**?
 A. OH^- is conjugate base **B. H_2O is amphoteric** C. CN^- ion is hydrolyzez D. none of them
- If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
 A. $[OH^-]=2.0 \times 10^{-6}M$ B. the sea water is basic C. $[OH^-]=5.0 \times 10^{-9}M$ **D. both (A and B)**
- Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
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- The net ionic equation for which of the following reaction is: $H_3O^+(aq)+OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq)+H_2SO_4(aq) \longrightarrow$ **B. $Sr(OH)_2(aq)+HCl(aq) \longrightarrow$**
 C. $Zn(s)+HCl(aq) \longrightarrow$ D. both (A and B)
- The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases **D. all of them**
- By decreasing pressure on the following equilibrium system: $N_2(g)+ O_2(g) \rightleftharpoons 2NO(g)$
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- What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
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A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
32. According to IUPAC system the compound: $(\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COH})$, is called:-
A. 1-butanol B. propanal C. butanone D. butanal
33. In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is true?
A. the value of K at 500°C is greater than the value of K at 700°C
B. the value of K at both temperatures are equal
C. the value of K at 500°C is less than the value of K at 700°C
D. none of them
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36. A molecular compound which dissolves in water and it does not ionize:-
A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF
37. In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-
A. H_3O^+ B. HNO_2 C. H_2O D. none of them
38. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water except:-
A. NaCN B. KCl C. KNO_2 D. NH_4Br
39. Salts of weak acids and weak bases can produce basic aqueous solution if:-
A. $K_a = K_b$ B. $K_a > K_b$ C. $K_b > K_a$ D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$

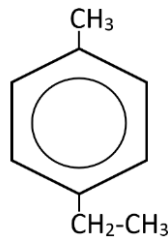
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A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
41. By using the information in the adjacent table, which of the following is catalyst?
A. MnO_2
B. H_2O_2
C. H_2O
D. O_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|------------------------|----------------------|--------------|----------------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
42. The molecular formula for the ethyl ethanoate compound is :-
A. $\text{C}_4\text{H}_{10}\text{O}_2$ B. $\text{C}_4\text{H}_8\text{O}_2$ C. $\text{C}_4\text{H}_{10}\text{O}$ D. $\text{C}_4\text{H}_8\text{O}$
43. Which of the following is correct at all temperature in pure water?
A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$ B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7}\text{M}$ D. all of them.
44. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
45. An acid is used as a fungicide:-
A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
46. In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
A. 0.005 B. 0.05 C. 20 D. 200
47. At which of the following situation the reaction solid zinc with solution of HCl is faster?
A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
48. The correct order according the pOH value for the following solution is:-
A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
49. A molecule that donates one electron pair to form a covalent bond is:-
A. BF_3 B. NH_4^+ C. CH_4 D. NH_3
50. The rate law for the following hypothetical reaction: $\text{A} + \text{B} \rightarrow \text{C}$, is $R = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?
A. 27 B. 16 C. 18 D. 8



Answer the following questions: (two marks for each right choice)

- Which of the following is **correct** at all temperature in pure water?
 A. $K_w=[H_3O^+][OH^-]$ B. $[H_3O^+][OH^-]=1 \times 10^{-14}$
 C. $[H_3O^+]=[OH^-]=1 \times 10^{-7}M$ D. all of them.
 - The boiling point of an aqueous solution containing a nonelectrolyte that freezes at $-3.72^\circ C$, is:
 if ($K_f = -1.86^\circ C/m$) ($K_b = 0.51^\circ C/m$)
 A. $102.04^\circ C$ B. $1.02^\circ C$ C. **$101.02^\circ C$** D. $100.51^\circ C$
 - In a reaction, the value of the forward activation energy equals $100 kJ/mol$ and the enthalpy change for reverse reaction equals $-35 kJ/mol$, the value of E_a^- is:-(place the reactants at energy level zero).
 A. **$65 kJ/mol$** B. $-65 kJ/mol$ C. $35 kJ/mol$ D. $135 kJ/mol$
 - All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
 A. NaCN B. **KCl** C. KNO_2 D. NH_4Br
 - After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}M$, which of the following is **correct**? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5} mol/L$
 A. **ionic product $> K_{sp}$** B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
 - The following reaction: $NH_4Cl(s) + 176 kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-
 A. if ΔS value = $176 kJ$ B. **if ΔS value $> 176 kJ$** C. if ΔS value $< 176 kJ$ D. at all temperature
 - Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a = K_b$ B. $K_a > K_b$ C. **$K_b > K_a$** D. $[H_3O^+] > [OH^-]$
 - What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. **both (B and C)**
 - By using the information in the adjacent table, which of the following is catalyst?
 A. **MnO_2**
 B. H_2O_2
 C. H_2O
 D. O_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|----------|--------|-------|---------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. **changing concentration of product**
 C. changing temperature D. changing concentration of reactant
 - At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues D. **both the forward and reverse reactions continue.**

- In the following reaction: $HNO_2(aq) + H_2O(l) \rightleftharpoons NO_2^-(aq) + H_3O^+(aq)$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. **HNO_2** C. H_2O D. none of them
- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. **poly isoprene** D. 2-methyl-1,3 butadiene
- Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. **both (A and C)**
- In the following reaction: $CaCO_3(s) + 179.2 kJ \rightarrow CaO(s) + CO_2(g)$, what is the ΔH_f° value for CaO ?
 If the ΔH_f° value for each of CO_2 and $CaCO_3$ equal to (-393.5 , -1207.6) kJ/mol respectively
 A. $-814.1 kJ/mol$ B. $+814.1 kJ/mol$ C. **$-634.9 kJ/mol$** D. $+634.9 kJ/mol$
- Suppose that $20 mL$ of $0.01M$ $Ca(OH)_2$ is required to neutralize $10 mL$ of HCl solution, which of the following is **correct**?
 A. $[HCl] = 0.02M$ B. $[HCl] = 0.04M$ C. the spectator ions are Ca^{2+} and Cl^- D. **both (B and C)**
- In this reaction: $CN^-(aq) + H_2O(l) \rightleftharpoons HCN(aq) + OH^-(aq)$, which of the following is **incorrect**?
 A. OH^- is conjugate base B. **H_2O is amphoteric** C. CN^- ion is hydrolyzed D. none of them
- If $49 J$ of energy are added to $35 g$ of a material at $20^\circ C$, what will the final temperature of the material be? ($C_p = 0.07 J/(g.K)$)
 A. $25^\circ C$ B. $298 K$ C. $40 K$ D. **$40^\circ C$**
- The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 B. **10** C. 8 D. 12
- A molecular compound which dissolves in water and it does **not ionize**:-
 A. **C_2H_5OH** B. C_6H_6 C. NH_4Cl D. HF
- The net ionic equation for which of the following reaction is: $H_3O^+(aq) + OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow$ B. **$Sr(OH)_2(aq) + HCl(aq) \rightarrow$**
 C. $Zn(s) + HCl(aq) \rightarrow$ D. both (A and B)
- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. **Bronsted-Lowry** D. none of them
- When $50 mL$ of $0.1M$ monoprotic weak acid titrated with $50 mL$ of $0.1M$ potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 B. **KF** C. NaF D. both (B and C)
- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. **Ca^{2+}** C. Pb^{2+} D. Al^{3+}
- The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 B. **CFCs** C. MTBE D. PVA
- All of the following pair compounds are structural isomers to each ether **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. **pentane and cyclopentane** D. 1,1-dichloro ethane and 1,2-dichloro ethane

27. The correct name for this compound: () according to IUPAC system is:
- 1-ethyl-4-methyl cyclohexane
 - 1-ethyl-4-methyl benzene**
 - 1-methyl-4-ethyl benzene
 - 1-methyl-4- ethyl cyclohexane
28. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
- the quantity of N_2 decreases
 - the quantity of NO decreases
 - the quantity of NO increases
 - the quantities do not change**
29. At which of the following situation the reaction solid zinc with solution of HCl is faster?
- 0.1M HCl at 25°C
 - 0.1M HCl at 50°C
 - 1M HCl at 50°C**
 - 1M HCl at 25°C
30. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
- 5M
 - 1M
 - 0.001M
 - all of them**
31. The entropy increases by:-
- decreasing the pressure
 - increasing the temperature
 - mixing gases
 - all of them**
32. The molecular formula for the ethyl ethanoate compound is :-
- $\text{C}_4\text{H}_{10}\text{O}_2$
 - $\text{C}_4\text{H}_8\text{O}_2$**
 - $\text{C}_4\text{H}_{10}\text{O}$
 - $\text{C}_4\text{H}_8\text{O}$
33. An acid is used as a fungicide:-
- CH_3COOH**
 - HCl
 - HNO_3
 - H_3PO_4
34. The correct order according the pOH value for the following solution is:-
- $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$
 - $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$**
 - $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$
 - $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
35. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
- $[\text{OH}^-] = 2.0 \times 10^{-6}\text{M}$
 - the sea water is basic
 - $[\text{OH}^-] = 5.0 \times 10^{-9}\text{M}$
 - both (A and B)**
36. A molecule that donates one electron pair to form a covalent bond is:-
- BF_3
 - NH_4^+
 - CH_4
 - NH_3**
37. A chemical formula that shows the type of covalent bond in organic compound:-
- molecular formula
 - empirical formula
 - structural formula**
 - ionic formula
38. Which of the following is **incorrect**?
- the reaction type of methane gas with chlorine gas is addition**
 - the alkynes don't have geometric formula**
 - the graphite is a good electrical conductor
 - none of them
39. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
- increase octane rating**
 - decrease octane rating
 - increase boiling point
 - both (A and C)
40. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
- specific heat
 - nature
 - temperature**
 - all of them

41. At which of the following situation the pH do not change?
- adding NH_4NO_3 solution to the NH_3 solution
 - adding KCN solution to the HCN solution
 - adding a small amount of HCl to NH_3 and NH_4Cl solution**
 - all of them
42. The rate law for the following hypothetical reaction: $\text{A} + \text{B} \longrightarrow \text{C}$, is $\text{R} = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?
- 27**
 - 16
 - 18
 - 8
43. In the following reaction: $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \longrightarrow 2\text{NO}_2$, which of following is **correct**?
- NO is intermediate
 - NO_3 is intermediate
 - $\text{R} = k[\text{NO}][\text{O}_2]$
 - both(B and C)**
44. According to IUPAC system the compound: $(\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COH})$, is called:-
- 1-butanol
 - propanal
 - butanone
 - butanal**
45. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
- 0.24**
 - 0.12
 - 0.36
 - 0.72
46. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
- substitution
 - addition
 - condensation**
 - elimination
47. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
- specific heat**
 - enthalpy of reaction
 - enthalpy of formation
 - enthalpy of combustion
48. In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
- the value of K at 500°C is greater than the value of K at 700°C
 - the value of K at both temperatures are equal
 - the value of K at 500°C is less than the value of K at 700°C**
 - none of them
49. When compared dimethyl ether and ethanol, which of the following is **correct**?
- both have the same a functional group
 - both have the same boiling point
 - both dissolved in water.**
 - all of them
50. In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
- 0.005**
 - 0.05
 - 20
 - 200



Answer the following questions: (two marks for each right choice)

- In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
A. 0.005 B. 0.05 C. 20 D. 200
- If 49J of energy are added to 35g of a material at 20°C, what will the final temperature of the material be? ($C_p = 0.07 \text{ J/(g.K)}$)
A. 25°C B. 298K C. 40K D. 40°C
- Which of the following is **incorrect**?
A. the reaction type of methane gas with chlorine gas is addition
B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them
- In the following gaseous equilibrium system: $2\text{CO}_2 + 167 \text{ kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
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 B. the value of K at both temperatures are equal
C. the value of K at 500°C is less than the value of K at 700°C
 D. none of them
- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene **C. poly isoprene** D. 2-methyl-1,3 butadiene
- At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M **D. all of them**
- The following reaction: $\text{NH}_4\text{Cl(s)} + 176 \text{ kJ} \rightarrow \text{NH}_3\text{(g)} + \text{HCl(g)}$, occurs spontaneously:-
A. if ΔS value = 176kJ **B. if ΔS value > 176kJ** C. if ΔS value < 176kJ D. at all temperature
- In this reaction: $\text{CN}^-\text{(aq)} + \text{H}_2\text{O(l)} \rightleftharpoons \text{HCN(aq)} + \text{OH}^-\text{(aq)}$, which of the following is **incorrect**?
 A. OH^- is conjugate base **B. H_2O is amphoteric** C. CN^- ion is hydrolyzed D. none of them
- Suppose that 20mL of 0.01M Ca(OH)_2 is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- **D. both (B and C)**
- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$
A. ionic product > K_{sp} B. ionic product < K_{sp} C. ionic product = K_{sp} D. precipitate isn't form
- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst **B. changing concentration of product**
 C. changing temperature D. changing concentration of reactant

12. At equilibrium :-

- A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues **D. both the forward and reverse reactions continue.**

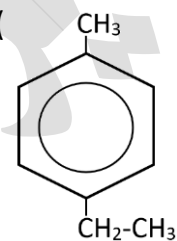
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13. The entropy increases by:-

- A. decreasing the pressure B. increasing the temperature C. mixing gases **D. all of them**

14. Salts of weak acids and weak bases can produce basic aqueous solution if:-

- A. $K_a = K_b$ B. $K_a > K_b$ **C. $K_b > K_a$** D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$

15. The correct name for this compound: () according to IUPAC system is:

- A. 1-ethyl-4-methyl cyclohexane
B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane

16. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-

- A. NaCN **B. KCl** C. KNO_2 D. NH_4Br

17. What colligative properties are displayed when antifreeze is added to a car's cooling system?

- A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression **D. both (B and C)**

18. Which theories of acids and bases belong to acids and bases conjugate?

- A. Arrhenius B. Lewis **C. Bronsted-Lowry** D. none of them

19. When compared dimethyl ether and ethanol, which of the following is **correct**?

- A. both have the same a functional group B. both have the same boiling point
C. both dissolved in water. D. all of them

20. All of the following pair compounds are structural isomers to each ether **except**:-

- A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane

21. The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+\text{(aq)} + \text{OH}^-\text{(aq)} \rightleftharpoons 2\text{H}_2\text{O(l)}$?

- A. $\text{Ba(OH)}_2\text{(aq)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow$ **B. $\text{Sr(OH)}_2\text{(aq)} + \text{HCl(aq)} \rightarrow$**
 C. $\text{Zn(s)} + \text{HCl(aq)} \rightarrow$ D. both (A and B)

22. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?

- A. KNO_3 **B. KF** C. NaF D. both (B and C)

23. The correct order according the pOH value for the following solution is:-

- A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ **B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$**
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$

24. In the following reaction: $\text{CaCO}_3\text{(s)} + 179.2 \text{ kJ} \rightarrow \text{CaO (s)} + \text{CO}_2\text{(g)}$, what is the ΔH_f° value for CaO? If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively

- A. -814.1kJ/mol B. +814.1kJ/mol **C. -634.9kJ/mol** D. +634.9kJ/mol

25. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)
26. Which of the following is **correct** at all temperature in pure water?
A. $K_w=[H_3O^+][OH^-]$ B. $[H_3O^+][OH^-]=1 \times 10^{-14}$
 C. $[H_3O^+]=[OH^-]=1 \times 10^{-7}M$ D. all of them.
27. An acid is used as a fungicide:-
A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
28. In the following reaction: $HNO_2(aq)+H_2O(l) \rightleftharpoons NO_2^-(aq)+H_3O^+(aq)$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ **B. HNO_2** C. H_2O D. none of them
29. According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
 A. 1-butanol B. propanal C. butanone **D. butanal**
30. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at $-3.72^\circ C$, is:
 if $(K_f = -1.86^\circ C/m)$ $(K_b = 0.51^\circ C/m)$
 A. $102.04^\circ C$ B. $1.02^\circ C$ **C. $101.02^\circ C$** D. $100.51^\circ C$
31. The rate law for the following hypothetical reaction: $A+B \rightarrow C$, is $R=k[A]^2[B]$, by what factor does the rate increase if the concentration of each A and B is tripled?
A. 27 B. 16 C. 18 D. 8
32. Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 **D. both (A and C)**
33. If the pH of sea water at $25^\circ C$ is equal to 8.3, which of the following is **correct**?
 A. $[OH^-]=2.0 \times 10^{-6}M$ B. the sea water is basic C. $[OH^-]=5.0 \times 10^{-9}M$ **D. both (A and B)**
34. The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 **B. CFCs** C. MTBE D. PVA
35. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 **B. 10** C. 8 D. 12
36. By decreasing pressure on the following equilibrium system: $N_2(g)+O_2(g) \rightleftharpoons 2NO(g)$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases **D. the quantities do not change**
37. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
A. 0.24 B. 0.12 C. 0.36 D. 0.72
38. A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 **D. NH_3**
39. A molecular compound which dissolves in water and it does **not ionize**:-
A. C_2H_5OH B. C_6H_6 C. NH_4Cl D. HF
40. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
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41. In the following reaction: $2NO+O_2 \rightarrow 2NO_2$, the reaction for the fast step is: $NO_3+NO \rightarrow 2NO_2$, which of following is **correct**?
 A. NO is intermediate B. NO_3 is intermediate C. $R=k[NO][O_2]$ **D. both(B and C)**
42. At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at $25^\circ C$ B. 0.1M HCl at $50^\circ C$ **C. 1M HCl at $50^\circ C$** D. 1M HCl at $25^\circ C$
43. The molecular formula for the ethyl ethanoate compound is :-
 A. $C_4H_{10}O_2$ **B. $C_4H_8O_2$** C. $C_4H_{10}O$ D. C_4H_8O
44. By using the information in the adjacent table, which of the following is catalyst?
A. MnO_2
 B. H_2O_2
 C. H_2O
 D. O_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|----------|--------|-------|---------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
45. A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula **C. structural formula** D. ionic formula
46. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} **B. Ca^{2+}** C. Pb^{2+} D. Al^{3+}
47. In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a is:-(place the reactants at energy level zero).
A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
48. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature **C. temperature** D. all of them
49. At which of the following situation the pH do not change?
 A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
50. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree ($1^\circ C$) or one kelvin (1K) is:-
A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion



Answer the following questions: (two marks for each right choice)

- In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol , the value of E_a^- is:-(place the reactants at energy level zero).
 A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
- Which of the following oxides when reacted with water forms acid solution?
 A. CO₂ B. CaO C. SO₃ D. both (A and C)
- The rate law for the following hypothetical reaction: $A + B \rightarrow C$, is $R = k[A]^2[B]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
- At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
- The molecular formula for the ethyl ethanoate compound is :-
 A. C₄H₁₀O₂ B. C₄H₈O₂ C. C₄H₁₀O D. C₄H₈O
- The following reaction: $NH_4Cl(s) + 176kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-
 A. if ΔS value = 176kJ B. if ΔS value > 176kJ C. if ΔS value < 176kJ D. at all temperature
- When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO₃ B. KF C. NaF D. both (B and C)
- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene
- Increasing the percentage of branched-chain alkanes in gasoline causes to:-
 A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)
- If the pH of sea water at 25°C is equal to 8.3, which of the following is correct?
 A. $[OH^-] = 2.0 \times 10^{-6}M$ B. the sea water is basic C. $[OH^-] = 5.0 \times 10^{-9}M$ D. both (A and B)
- An acid is used as a fungicide:-
 A. CH₃COOH B. HCl C. HNO₃ D. H₃PO₄
- Which of the following is correct at all temperature in pure water?
 A. $K_w = [H_3O^+][OH^-]$ B. $[H_3O^+][OH^-] = 1 \times 10^{-14}$
 C. $[H_3O^+] = [OH^-] = 1 \times 10^{-7}M$ D. all of them.
- When compared dimethyl ether and ethanol, which of the following is correct?
 A. both have the same a functional group B. both have the same boiling point
 C. both dissolved in water. D. all of them

14. In the following reaction: $2NO + O_2 \rightarrow 2NO_2$, the reaction for the fast step is: $NO_3 + NO \rightarrow 2NO_2$, which of following is correct?

- A. NO is intermediate B. NO₃ is intermediate C. $R = k[NO][O_2]$ D. both(B and C)

15. In the following gaseous equilibrium reaction: $PCl_5 \rightleftharpoons PCl_3 + Cl_2$, the mole number for each of PCl₅, PCl₃ and Cl₂ at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-

- A. 0.005 B. 0.05 C. 20 D. 200

16. Which of the following is incorrect?

- A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them

17. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C, is: if ($K_f = -1.86^\circ C/m$) ($K_b = 0.51^\circ C/m$)

- A. 102.04°C B. 1.02°C C. 101.02°C D. 100.51°C

18. Which theories of acids and bases belong to acids and bases conjugate?

- A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them

19. In the following reaction: $HNO_2(aq) + H_2O(l) \rightleftharpoons NO_2^-(aq) + H_3O^+(aq)$, the conjugate acid of NO₂⁻ is:-

- A. H₃O⁺ B. HNO₂ C. H₂O D. none of them

20. The.....compounds contribute to the destruction of ozone in the upper atmosphere.

- A. C₂F₄ B. CFCs C. MTBE D. PVA

21. If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p = 0.07J/(g.K)$)

- A. 25°C B. 298K C. 40K D. 40°C

22. By using the information in the adjacent table, which of the following is catalyst?

- A. MnO₂

- B. H₂O₂

- C. H₂O

- D. O₂

Substance	H ₂ O ₂	H ₂ O	O ₂	MnO ₂
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

23. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?

- A. 5M B. 1M C. 0.001M D. all of them

24. According to IUPAC system the compound: (CH₃-CH₂-CH₂-COH), is called:-

- A. 1-butanol B. propanal C. butanone D. butanal

25. A chemical formula that shows the type of covalent bond in organic compound:-

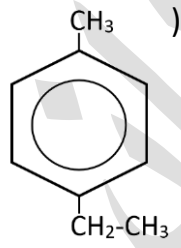
- A. molecular formula B. empirical formula C. structural formula D. ionic formula

26. In the following reaction: $CaCO_3(s) + 179.2kJ \rightarrow CaO(s) + CO_2(g)$, what is the ΔH_f^0 value for CaO? If the ΔH_f^0 value for each of CO₂ and CaCO₃ equal to (-393.5, -1207.6) kJ/mol respectively

- A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol

27. By decreasing pressure on the following equilibrium system: $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

- A. the quantity of N₂ decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change

28. What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
29. A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. NH_3
30. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4} \text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4} \text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5} \text{mol/L}$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
31. In the following gaseous equilibrium system: $2\text{CO}_2 + 167 \text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
 C. the value of K at 500°C is less than the value of K at 700°C
 D. none of them
32. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
 A. substitution B. addition C. condensation D. elimination
33. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
 A. NaCN B. KCl C. KNO_2 D. NH_4Br
34. The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
 A. $\text{Ba}(\text{OH})_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow$ B. $\text{Sr}(\text{OH})_2(\text{aq}) + \text{HCl}(\text{aq}) \longrightarrow$
 C. $\text{Zn}(\text{s}) + \text{HCl}(\text{aq}) \longrightarrow$ D. both (A and B)
35. At which of the following situation the pH do not change?
 A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
36. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?
 A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyze D. none of them
37. All of the following pair compounds are structural isomers to each ether **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
38. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
39. The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
40. A molecular compound which dissolves in water and it does **not** ionize:-
 A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF
41. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 B. 10 C. 8 D. 12

42. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. 0.24 B. 0.12 C. 0.36 D. 0.72
43. The correct order according the pOH value for the following solution is:-
 A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
44. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
45. Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}] = 0.02 \text{M}$ B. $[\text{HCl}] = 0.04 \text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)
46. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant
47. At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues D. both the forward and reverse reactions continue.
48. Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a = K_b$ B. $K_a > K_b$ C. $K_b > K_a$ D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
49. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
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50. The entropy increases by:-
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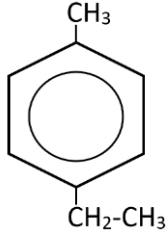


Answer the following questions: (two marks for each right choice)

- Suppose that 20mL of 0.01M Ca(OH)_2 is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}]=0.02\text{M}$ B. $[\text{HCl}]=0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. **both (B and C)**
 - The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq})+\text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
 A. $\text{Ba(OH)}_2(\text{aq})+\text{H}_2\text{SO}_4(\text{aq}) \longrightarrow$ B. **$\text{Sr(OH)}_2(\text{aq})+\text{HCl}(\text{aq}) \longrightarrow$**
 C. $\text{Zn(s)}+\text{HCl}(\text{aq}) \longrightarrow$ D. **both (A and B)**
 - In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3+\text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. **0.005** B. 0.05 C. 20 D. 200
 - The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is:
 if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)
 A. 102.04°C B. 1.02°C C. **101.02°C** D. 100.51°C
 - A chemical formula that shows the type of covalent bond in organic compound:-
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 - Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a=K_b$ B. $K_a>K_b$ C. **$K_b>K_a$** D. $[\text{H}_3\text{O}^+]>[\text{OH}^-]$
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 A. both have the same a functional group B. both have the same boiling point
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 - The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
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 - When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 B. **KF** C. NaF D. both (B and C)
 - By using the information in the adjacent table, which of the following is catalyst?
 A. **MnO_2**
 B. H_2O_2
 C. H_2O
 D. O_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|------------------------|----------------------|--------------|----------------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
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- The following reaction: $\text{NH}_4\text{Cl(s)} + 176\text{kJ} \longrightarrow \text{NH}_3(\text{g}) + \text{HCl}(\text{g})$, occurs spontaneously:-
 A. if ΔS value = 176kJ B. **if ΔS value > 176kJ** C. if ΔS value < 176kJ D. at all temperature
 - By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. **the quantities do not change**

- At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. **all of them**
- An acid is used as a fungicide:-
 A. **CH_3COOH** B. HCl C. HNO_3 D. H_3PO_4
- In the following reaction: $\text{HNO}_2(\text{aq})+\text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq})+\text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. **HNO_2** C. H_2O D. none of them
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- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$
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- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. **changing concentration of product**
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- A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. **NH_3**
- In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a^- is:-(place the reactants at energy level zero).
 A. **65kJ/mol** B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
- In the following reaction: $2\text{NO}+\text{O}_2 \longrightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3+\text{NO} \longrightarrow 2\text{NO}_2$, which of following is **correct**?
 A. NO is intermediate B. NO_3 is intermediate C. $R=k[\text{NO}][\text{O}_2]$ D. **both(B and C)**
- Which of the following is **incorrect**?
 A. **the reaction type of methane gas with chlorine gas is addition**
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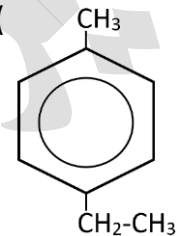
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 A. 1-butanol B. propanal C. butanone **D. butanal**
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 B. the value of K at both temperatures are equal
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 D. none of them
43. The correct order according the pOH value for the following solution is:-
 A. $NaCl > CH_3COOK > NH_4NO_3$ **B. $NH_4NO_3 > NaCl > CH_3COOK$**
 C. $CH_3COOK > NaCl > NH_4NO_3$ D. $NH_4NO_3 > CH_3COOK > NaCl$
44. In this reaction: $CN^-(aq) + H_2O(l) \rightleftharpoons HCN(aq) + OH^-(aq)$, which of the following is **incorrect**?
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Answer the following questions: (two marks for each right choice)

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 A. if ΔS value = 176kJ B. if ΔS value > 176kJ C. if ΔS value < 176kJ D. at all temperature
- In the following gaseous equilibrium reaction: $PCl_5 \rightleftharpoons PCl_3+Cl_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005 B. 0.05 C. 20 D. 200

- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}M$, which of the following is **correct**? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5}mol/L$
 A. ionic product > K_{sp} B. ionic product < K_{sp} C. ionic product = K_{sp} D. precipitate isn't form
- The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
- If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
 A. $[OH^-]=2.0 \times 10^{-6}M$ B. the sea water is basic C. $[OH^-]=5.0 \times 10^{-9}M$ D. both (A and B)
- The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
- The rate law for the following hypothetical reaction: $A+B \rightarrow C$, is $R=k[A]^2[B]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
- All of the following pair compounds are structural isomers to each ether **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
- When compared dimethyl ether and ethanol, which of the following is **correct**?
 A. both have the same a functional group B. both have the same boiling point
 C. both dissolved in water. D. all of them
- Which of the following is **correct** at all temperature in pure water?
 A. $K_w=[H_3O^+][OH^-]$ B. $[H_3O^+][OH^-]=1 \times 10^{-14}$
 C. $[H_3O^+]= [OH^-]=1 \times 10^{-7}M$ D. all of them.
- Increasing the percentage of branched-chain alkanes in gasoline causes to:-
 A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)
- Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. both (A and C)
- According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
- The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 B. 10 C. 8 D. 12
- The net ionic equation for which of the following reaction is: $H_3O^+(aq)+OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq)+H_2SO_4(aq) \rightarrow$ B. $Sr(OH)_2(aq)+HCl(aq) \rightarrow$
 C. $Zn(s)+HCl(aq) \rightarrow$ D. both (A and B)
- In this reaction: $CN^-(aq)+ H_2O(l) \rightleftharpoons HCN(aq)+ OH^-(aq)$, which of the following is **incorrect**?
 A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyze D. none of them

- 27.** Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
- 28.** At which of the following situation the pH do not change?
A. adding NH_4NO_3 solution to the NH_3 solution **B.** adding KCN solution to the HCN solution
C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
- 29.** An acid is used as a fungicide:-
A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
- 30.** Salts of weak acids and weak bases can produce basic aqueous solution if:-
A. $K_a = K_b$ **B.** $K_a > K_b$ **C. $K_b > K_a$** D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
- 31.** At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
A. 5M **B.** 1M **C.** 0.001M **D. all of them**
- 32.** A molecular compound which dissolves in water and it does **not** ionize:-
A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF
- 33.** At equilibrium :-
A. all reaction have ceased **B.** only the forward reaction continues
C. only the reverse reaction continues **D. both the forward and reverse reactions continue.**
- 34.** By using the information in the adjacent table, which of the following is catalyst?
A. MnO_2
B. H_2O_2
C. H_2O
D. O_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|------------------------|----------------------|--------------|----------------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
- 35.** In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2\text{kJ} \longrightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO ?
 If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively
A. -814.1kJ/mol **B.** +814.1kJ/mol **C. -634.9kJ/mol** **D.** +634.9kJ/mol
- 36.** By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
A. the quantity of N_2 decreases **B.** the quantity of NO decreases
C. the quantity of NO increases **D. the quantities do not change**
- 37.** The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is:
 if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)
A. 102.04°C **B.** 1.02°C **C. 101.02°C** **D.** 100.51°C
- 38.** The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
A. substitution **B.** addition **C. condensation** **D.** elimination
- 39.** The molecular formula for the ethyl ethanoate compound is :-
A. $\text{C}_4\text{H}_{10}\text{O}_2$ **B. $\text{C}_4\text{H}_8\text{O}_2$** **C.** $\text{C}_4\text{H}_{10}\text{O}$ **D.** $\text{C}_4\text{H}_8\text{O}$
- 40.** In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a^- is:-(place the reactants at energy level zero).
A. 65kJ/mol **B.** -65kJ/mol **C.** 35kJ/mol **D.** 135kJ/mol

- 41.** A molecule that donates one electron pair to form a covalent bond is:-
A. BF_3 **B.** NH_4^+ **C.** CH_4 **D. NH_3**
- 42.** What colligative properties are displayed when antifreeze is added to a car's cooling system?
A. vapor-pressure elevation **B.** boiling point elevation
C. freezing-point depression **D. both (B and C)**
- 43.** The correct order according the pOH value for the following solution is:-
A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ **B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$**
C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ **D.** $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
- 44.** Which of the following is **incorrect**?
A. the reaction type of methane gas with chlorine gas is addition
B. the alkynes don't have geometric formula
C. the graphite is a good electrical conductor
D. none of them
- 45.** Which of the following is heated with sulfur atoms in vulcanization process?
A. isoprene **B.** neoprene **C. poly isoprene** **D.** 2-methyl-1,3 butadiene
- 46.** In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
A. presence of catalyst **B. changing concentration of product**
C. changing temperature **D.** changing concentration of reactant
- 47.** At which of the following situation the reaction solid zinc with solution of HCl is faster?
A. 0.1M HCl at 25°C **B.** 0.1M HCl at 50°C **C. 1M HCl at 50°C** **D.** 1M HCl at 25°C
- 48.** A chemical formula that shows the type of covalent bond in organic compound:-
A. molecular formula **B.** empirical formula **C. structural formula** **D.** ionic formula
- 49.** An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
A. Mg^{2+} **B. Ca^{2+}** **C.** Pb^{2+} **D.** Al^{3+}
- 50.** The.....compounds contribute to the destruction of ozone in the upper atmosphere.
A. C_2F_4 **B. CFCs** **C.** MTBE **D.** PVA



Answer the following questions: (two marks for each right choice)

- The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 B. 10 C. 8 D. 12
- At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
- All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
 A. NaCN B. KCl C. KNO_2 D. NH_4Br
- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}M$, which of the following is **correct**? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5}mol/L$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
- In the following reaction: $CaCO_3(s) + 179.2kJ \rightarrow CaO(s) + CO_2(g)$, what is the ΔH_f^0 value for CaO? If the ΔH_f^0 value for each of CO_2 and $CaCO_3$ equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol
- In the following gaseous equilibrium reaction: $PCl_5 \rightleftharpoons PCl_3 + Cl_2$,the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005 B. 0.05 C. 20 D. 200
- Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree ($1^\circ C$) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
- The correct order according the pOH value for the following solution is:-
 A. $NaCl > CH_3COOK > NH_4NO_3$ B. $NH_4NO_3 > NaCl > CH_3COOK$
 C. $CH_3COOK > NaCl > NH_4NO_3$ D. $NH_4NO_3 > CH_3COOK > NaCl$
- The following reaction: $NH_4Cl(s) + 176kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-
 A. if ΔS value = 176kJ B. if ΔS value $> 176kJ$ C. if ΔS value $< 176kJ$ D. at all temperature
- In this reaction: $CN^-(aq) + H_2O(l) \rightleftharpoons HCN(aq) + OH^-(aq)$,which of the following is **incorrect**?
 A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyzed D. none of them
- Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. both (A and C)
- The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
- According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
- In the following reaction: $HNO_2(aq) + H_2O(l) \rightleftharpoons NO_2^-(aq) + H_3O^+(aq)$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. HNO_2 C. H_2O D. none of them

15. The net ionic equation for which of the following reaction is: $H_3O^+(aq) + OH^-(aq) \rightleftharpoons 2H_2O(l)$?

- A. $Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow$ B. $Sr(OH)_2(aq) + HCl(aq) \rightarrow$
 C. $Zn(s) + HCl(aq) \rightarrow$ D. both (A and B)
 SN: 000019

16. By using the information in the adjacent table, which of the following is catalyst?

A. MnO_2

B. H_2O_2

C. H_2O

D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

17. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.

- A. specific heat B. nature C. temperature D. all of them

18. Which theories of acids and bases belong to acids and bases conjugate?

- A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them

19. In the following gaseous equilibrium system: $2CO_2 + 167kJ \rightleftharpoons 2CO + O_2$, which of the following is **true**?

- A. the value of K at $500^\circ C$ is greater than the value of K at $700^\circ C$
 B. the value of K at both temperatures are equal
 C. the value of K at $500^\circ C$ is less than the value of K at $700^\circ C$
 D. none of them

20. In the following reaction: $2NO + O_2 \rightarrow 2NO_2$,the reaction for the fast step is: $NO_3 + NO \rightarrow 2NO_2$, which of following is **correct**?

- A. NO is intermediate B. NO_3 is intermediate C. $R = k[NO][O_2]$ D. both(B and C)

21. If 49J of energy are added to 35g of a material at $20^\circ C$, what will the final temperature of the material be? ($C_p = 0.07J/(g.K)$)

- A. $25^\circ C$ B. 298K C. 40K D. $40^\circ C$

22. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?

- A. 0.24 B. 0.12 C. 0.36 D. 0.72

23. In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol , the value of E_a^- is:-(place the reactants at energy level zero).

- A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol

24. Which of the following is heated with sulfur atoms in vulcanization process?

- A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene

25. At equilibrium :-

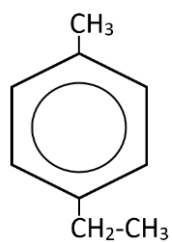
- A. all reaction have ceased B. only the forward reaction continues
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26. What colligative properties are displayed when antifreeze is added to a car's cooling system?

- A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)

27. The.....compounds contribute to the destruction of ozone in the upper atmosphere.

- A. C_2F_4 B. CFCs C. MTBE D. PVA

28. All of the following pair compounds are structural isomers to each other **except**:-
 A. pentane and 2,2-dimethyl propane
 B. hexene and cyclohexane
 C. pentane and cyclopentane
 D. 1,1-dichloro ethane and 1,2-dichloro ethane
29. The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
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 C. 1-methyl-4-ethyl benzene
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30. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO₃
 B. KF
 C. NaF
 D. both (B and C)
31. At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C
 B. 0.1M HCl at 50°C
 C. 1M HCl at 50°C
 D. 1M HCl at 25°C
32. The rate law for the following hypothetical reaction: $A + B \rightarrow C$, is $R = k[A]^2[B]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27
 B. 16
 C. 18
 D. 8
33. The molecular formula for the ethyl ethanoate compound is :-
 A. C₄H₁₀O₂
 B. C₄H₈O₂
 C. C₄H₁₀O
 D. C₄H₈O
34. Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a = K_b$
 B. $K_a > K_b$
 C. $K_b > K_a$
 D. $[H_3O^+] > [OH^-]$
35. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
 A. $[OH^-] = 2.0 \times 10^{-6} M$
 B. the sea water is basic
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 A. Mg²⁺
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 D. Al³⁺
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 B. both have the same boiling point
 C. both dissolved in water.
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 B. decrease octane rating
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 B. NH₄⁺
 C. CH₄
 D. NH₃
40. Which of the following is **incorrect**?
 A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them

41. Which of the following is **correct** at all temperature in pure water?
 A. $K_w = [H_3O^+][OH^-]$
 B. $[H_3O^+][OH^-] = 1 \times 10^{-14}$
 C. $[H_3O^+] = [OH^-] = 1 \times 10^{-7} M$
 D. all of them.
42. A molecular compound which dissolves in water and it does **not** ionize:-
 A. C₂H₅OH
 B. C₆H₆
 C. NH₄Cl
 D. HF
43. At which of the following situation the pH do not change?
 A. adding NH₄NO₃ solution to the NH₃ solution
 B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH₃ and NH₄Cl solution
 D. all of them
44. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst
 B. changing concentration of product
 C. changing temperature
 D. changing concentration of reactant
45. By decreasing pressure on the following equilibrium system: $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
 A. the quantity of N₂ decreases
 B. the quantity of NO decreases
 C. the quantity of NO increases
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46. An acid is used as a fungicide:-
 A. CH₃COOH
 B. HCl
 C. HNO₃
 D. H₃PO₄
47. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C, is: if ($K_f = -1.86^\circ C/m$) ($K_b = 0.51^\circ C/m$)
 A. 102.04°C
 B. 1.02°C
 C. 101.02°C
 D. 100.51°C
48. A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula
 B. empirical formula
 C. structural formula
 D. ionic formula
49. Suppose that 20mL of 0.01M Ca(OH)₂ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[HCl] = 0.02M$
 B. $[HCl] = 0.04M$
 C. the spectator ions are Ca²⁺ and Cl⁻
 D. both (B and C)
50. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
 A. substitution
 B. addition
 C. condensation
 D. elimination



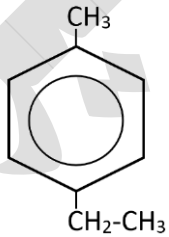
Answer the following questions: (two marks for each right choice)

- A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula **C. structural formula** D. ionic formula
- Which of the following oxides when reacted with water forms acid solution?
 A. CO₂ B. CaO C. SO₃ **D. both (A and C)**
- By using the information in the adjacent table, which of the following is catalyst?
A. MnO₂

Substance	H ₂ O ₂	H ₂ O	O ₂	MnO ₂
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

 B. H₂O₂
 C. H₂O
 D. O₂
- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene **C. poly isoprene** D. 2-methyl-1,3 butadiene
- At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C **C. 1M HCl at 50°C** D. 1M HCl at 25°C
- The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C₂F₄ **B. CFCs** C. MTBE D. PVA
- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg²⁺ **B. Ca²⁺** C. Pb²⁺ D. Al³⁺
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 A. [HCl]=0.02M B. [HCl]=0.04M C. the spectator ions are Ca²⁺ and Cl⁻ **D. both (B and C)**
- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis **C. Bronsted-Lowry** D. none of them
- The molecular formula for the ethyl ethanoate compound is :-
 A. C₄H₁₀O₂ **B. C₄H₈O₂** C. C₄H₁₀O D. C₄H₈O
- Which of the following is **correct** at all temperature in pure water?
A. K_w=[H₃O⁺][OH⁻] B. [H₃O⁺][OH⁻]=1x10⁻¹⁴
 C. [H₃O⁺]= [OH⁻]=1x10⁻⁷M D. all of them.
- When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO₃ **B. KF** C. NaF D. both (B and C)
- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature **C. temperature** D. all of them

- When compared dimethyl ether and ethanol, which of the following is **correct**?
 A. both have the same a functional group B. both have the same boiling point
C. both dissolved in water. D. all of them
- Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. K_a=K_b B. K_a>K_b **C. K_b>K_a** D. [H₃O⁺]>[OH⁻]
 SN: 000020
- The net ionic equation for which of the following reaction is: H₃O⁺(aq)+OH⁻(aq) ⇌ 2H₂O(l)?
 A. Ba(OH)₂(aq)+H₂SO₄(aq) → **B. Sr(OH)₂(aq)+HCl(aq) →**
 C. Zn(s)+HCl(aq) → D. both (A and B)
- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst **B. changing concentration of product**
 C. changing temperature D. changing concentration of reactant
- In the following gaseous equilibrium system: 2CO₂+167kJ ⇌ 2CO+O₂ , which of the following is **true**?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
C. the value of K at 500°C is less than the value of K at 700°C
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- A molecule that donates one electron pair to form a covalent bond is:-
 A. BF₃ B. NH₄⁺ C. CH₄ **D. NH₃**
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- In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol , the value of E_a⁻ is:-(place the reactants at energy level zero). **A. 65kJ/mol** B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
- By decreasing pressure on the following equilibrium system: N₂(g)+ O₂(g) ⇌ 2NO(g)
 A. the quantity of N₂ decreases B. the quantity of NO decreases
 C. the quantity of NO increases **D. the quantities do not change**
- In the following reaction: HNO₂(aq)+H₂O(l) ⇌ NO₂⁻(aq)+H₃O⁺(aq), the conjugate acid of NO₂⁻ is:-
 A. H₃O⁺ **B. HNO₂** C. H₂O D. none of them
- In the following gaseous equilibrium reaction: PCl₅ ⇌ PCl₃+Cl₂ ,the mole number for each of PCl₅ ,PCl₃ and Cl₂ at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
A. 0.005 B. 0.05 C. 20 D. 200
- The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C, is:
 if (K_f= -1.86°C/m) (K_b= 0.51°C/m)
 A. 102.04°C B. 1.02°C **C. 101.02°C** D. 100.51°C
- At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M **D. all of them**

27. Which of the following is **incorrect**?
- A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them
28. A molecular compound which dissolves in water and it does **not** ionize:-
- A. C_2H_5OH B. C_6H_6 C. NH_4Cl D. HF
29. If 49J of energy are added to 35g of a material at $20^\circ C$, what will the final temperature of the material be? ($C_p = 0.07 J/(g.K)$)
- A. $25^\circ C$ B. 298K C. 40K D. $40^\circ C$
30. An acid is used as a fungicide:-
- A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
31. In the following reaction: $CaCO_3(s) + 179.2 kJ \rightarrow CaO(s) + CO_2(g)$, what is the ΔH_f° value for CaO ? If the ΔH_f° value for each of CO_2 and $CaCO_3$ equal to (-393.5, -1207.6) kJ/mol respectively
- A. -814.1 kJ/mol B. +814.1 kJ/mol C. -634.9 kJ/mol D. +634.9 kJ/mol
32. All of the following pair compounds are structural isomers to each ether **except**:-
- A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
33. At equilibrium :-
- A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues D. both the forward and reverse reactions continue.
34. The entropy increases by:-
- A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
35. If the pH of sea water at $25^\circ C$ is equal to 8.3, which of the following is **correct**?
- A. $[OH^-] = 2.0 \times 10^{-6} M$ B. the sea water is basic C. $[OH^-] = 5.0 \times 10^{-9} M$ D. both (A and B)
36. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
- A. 0.24 B. 0.12 C. 0.36 D. 0.72
37. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree ($1^\circ C$) or one kelvin (1K) is:-
- A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
38. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4} M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4} M$, which of the following is **correct**? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5} mol/L$
- A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
39. In the following reaction: $2NO + O_2 \rightarrow 2NO_2$, the reaction for the fast step is: $NO_3 + NO \rightarrow 2NO_2$, which of following is **correct**?
- A. NO is intermediate B. NO_3 is intermediate C. $R = k[NO][O_2]$ D. both (B and C)
40. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
- A. substitution B. addition C. condensation D. elimination
41. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
- A. 6 B. 10 C. 8 D. 12
42. The following reaction: $NH_4Cl(s) + 176 kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-
- A. if $T\Delta S$ value = 176kJ B. if $T\Delta S$ value $> 176 kJ$ C. if $T\Delta S$ value $< 176 kJ$ D. at all temperature
43. In this reaction: $CN^-(aq) + H_2O(l) \rightleftharpoons HCN(aq) + OH^-(aq)$, which of the following is **incorrect**?
- A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyze D. none of them
44. The correct name for this compound: () according to IUPAC system is:
- A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4-ethyl cyclohexane
45. The correct order according the pOH value for the following solution is:-
- A. $NaCl > CH_3COOK > NH_4NO_3$ B. $NH_4NO_3 > NaCl > CH_3COOK$
 C. $CH_3COOK > NaCl > NH_4NO_3$ D. $NH_4NO_3 > CH_3COOK > NaCl$
46. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
- A. $NaCN$ B. KCl C. KNO_2 D. NH_4Br
47. What colligative properties are displayed when antifreeze is added to a car's cooling system?
- A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
48. According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
- A. 1-butanol B. propanal C. butanone D. butanal
49. At which of the following situation the pH do not change?
- A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
50. The rate law for the following hypothetical reaction: $A + B \rightarrow C$, is $R = k[A]^2[B]$, by what factor does the rate increase if the concentration of each A and B is tripled?
- A. 27 B. 16 C. 18 D. 8



Answer the following questions: (two marks for each right choice)

- In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
 C. the value of K at 500°C is less than the value of K at 700°C
 D. none of them
- The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
- At which of the following situation the pH do not change?
 A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
- A molecular compound which dissolves in water and it does **not** ionize:-
 A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF
- The rate law for the following hypothetical reaction: $\text{A} + \text{B} \rightarrow \text{C}$, is $R = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. temperature D. all of them
- According to IUPAC system the compound: $(\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COH})$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
- Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)
- In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol , the value of E_a is:-(place the reactants at energy level zero).
 A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
- If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p = 0.07\text{J}/(\text{g}\cdot\text{K})$)
 A. 25°C B. 298K C. 40K D. 40°C
- Which of the following is **correct** at all temperature in pure water?
 A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$ B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
 C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7}\text{M}$ D. all of them.
- An acid is used as a fungicide:-
 A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4

13. Which of the following is **incorrect**?

- the reaction type of methane gas with chlorine gas is addition
- the alkynes don't have geometric formula
- the graphite is a good electrical conductor
- none of them

14. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is: if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)

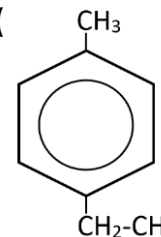
- 102.04°C
- 1.02°C
- 101.02°C
- 100.51°C

15. In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-

- H_3O^+
- HNO_2
- H_2O
- none of them

16. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-

- Mg^{2+}
- Ca^{2+}
- Pb^{2+}
- Al^{3+}

17. The correct name for this compound: () according to IUPAC system is:

- 1-ethyl-4-methyl cyclohexane
- 1-ethyl-4-methyl benzene
- 1-methyl-4-ethyl benzene
- 1-methyl-4- ethyl cyclohexane

18. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?

- presence of catalyst
- changing concentration of product
- changing temperature
- changing concentration of reactant

19. Which of the following oxides when reacted with water forms acid solution?

- CO_2
- CaO
- SO_3
- both (A and C)

20. What colligative properties are displayed when antifreeze is added to a car's cooling system?

- vapor-pressure elevation
- boiling point elevation
- freezing-point depression
- both (B and C)

21. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-

- substitution
- addition
- condensation
- elimination

22. At equilibrium :-

- all reaction have ceased
- only the forward reaction continues
- only the reverse reaction continues
- both the forward and reverse reactions continue.

23. The.....compounds contribute to the destruction of ozone in the upper atmosphere.

- C_2F_4
- CFCs
- MTBE
- PVA

24. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?

- KNO_3
- KF
- NaF
- both (B and C)

25. By using the information in the adjacent table, which of the following is catalyst?

- A. MnO_2
B. H_2O_2
C. H_2O
D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

26. When compared dimethyl ether and ethanol, which of the following is **correct**?

- A. both have the same a functional group
B. both have the same boiling point
C. both dissolved in water.
D. all of them

27. In the following reaction: $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \longrightarrow 2\text{NO}_2$, which of following is **correct**?

- A. NO is intermediate
B. NO_3 is intermediate
C. $R=k[\text{NO}][\text{O}_2]$
D. both(B and C)

28. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$

- A. ionic product $> K_{sp}$
B. ionic product $< K_{sp}$
C. ionic product $= K_{sp}$
D. precipitate isn't form

29. The correct order according the pOH value for the following solution is:-

- A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$
B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$
D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$

30. At which of the following situation the reaction solid zinc with solution of HCl is faster?

- A. 0.1M HCl at 25°C
B. 0.1M HCl at 50°C
C. 1M HCl at 50°C
D. 1M HCl at 25°C

31. A chemical formula that shows the type of covalent bond in organic compound:-

- A. molecular formula
B. empirical formula
C. structural formula
D. ionic formula

32. The following reaction: $\text{NH}_4\text{Cl(s)} + 176\text{kJ} \longrightarrow \text{NH}_3(\text{g}) + \text{HCl(g)}$, occurs spontaneously:-

- A. if ΔS value = 176kJ
B. if ΔS value $> 176\text{kJ}$
C. if ΔS value $< 176\text{kJ}$
D. at all temperature

33. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?

- A. 0.24
B. 0.12
C. 0.36
D. 0.72

34. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?

- A. 5M
B. 1M
C. 0.001M
D. all of them

35. Salts of weak acids and weak bases can produce basic aqueous solution if:-

- A. $K_a = K_b$
B. $K_a > K_b$
C. $K_b > K_a$
D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$

36. The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \longleftrightarrow 2\text{H}_2\text{O(l)}$?

- A. $\text{Ba(OH)}_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow$
B. $\text{Sr(OH)}_2(\text{aq}) + \text{HCl(aq)} \longrightarrow$
C. $\text{Zn(s)} + \text{HCl(aq)} \longrightarrow$
D. both (A and B)

37. A molecule that donates one electron pair to form a covalent bond is:-

- A. BF_3
B. NH_4^+
C. CH_4
D. NH_3

38. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?

- A. $[\text{OH}^-] = 2.0 \times 10^{-6}\text{M}$
B. the sea water is basic
C. $[\text{OH}^-] = 5.0 \times 10^{-9}\text{M}$
D. both (A and B)

39. Which of the following is heated with sulfur atoms in vulcanization process?

- A. isoprene
B. neoprene
C. poly isoprene
D. 2-methyl-1,3 butadiene

40. In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2\text{kJ} \longrightarrow \text{CaO(s)} + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO?

If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively

- A. -814.1kJ/mol
B. +814.1kJ/mol
C. -634.9kJ/mol
D. +634.9kJ/mol

41. All of the following pair compounds are structural isomers to each ether **except**:-

- A. pentane and 2,2-dimethyl propane
B. hexene and cyclohexane
C. pentane and cyclopentane
D. 1,1-dichloro ethane and 1,2-dichloro ethane

42. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-

- A. NaCN
B. KCl
C. KNO_2
D. NH_4Br

43. In the following gaseous equilibrium reaction: $\text{PCl}_5 \longleftrightarrow \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-

- A. 0.005
B. 0.05
C. 20
D. 200

44. Increasing the percentage of branched-chain alkanes in gasoline causes to:-

- A. increase octane rating
B. decrease octane rating
C. increase boiling point
D. both (A and C)

45. Which theories of acids and bases belong to acids and bases conjugate?

- A. Arrhenius
B. Lewis
C. Bronsted-Lowry
D. none of them

46. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \longleftrightarrow 2\text{NO(g)}$

- A. the quantity of N_2 decreases
B. the quantity of NO decreases
C. the quantity of NO increases
D. the quantities do not change

47. The molecular formula for the ethyl ethanoate compound is :-

- A. $\text{C}_4\text{H}_{10}\text{O}_2$
B. $\text{C}_4\text{H}_8\text{O}_2$
C. $\text{C}_4\text{H}_{10}\text{O}$
D. $\text{C}_4\text{H}_8\text{O}$

48. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O(l)} \longleftrightarrow \text{HCN(aq)} + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?

- A. OH^- is conjugate base
B. H_2O is amphoteric
C. CN^- ion is hydrolyzez
D. none of them

49. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-

- A. specific heat
B. enthalpy of reaction
C. enthalpy of formation
D. enthalpy of combustion

50. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-

- A. 6
B. 10
C. 8
D. 12



Answer the following questions: (two marks for each right choice)

- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. temperature D. all of them
 - By using the information in the adjacent table, which of the following is catalyst?
 A. MnO_2
 B. H_2O_2
 C. H_2O
 D. O_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|----------|--------|-------|---------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
- If 49J of energy are added to 35g of a material at $20^\circ C$, what will the final temperature of the material be? ($C_p=0.07J/(g.K)$)
 A. $25^\circ C$ B. 298K C. 40K D. $40^\circ C$
 - Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a=K_b$ B. $K_a>K_b$ C. $K_b>K_a$ D. $[H_3O^+]>[OH^-]$
 - Which of the following is incorrect?
 A. the reaction type of methane gas with chlorine gas is addition
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 C. the graphite is a good electrical conductor
 D. none of them
 - An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
 - In the following gaseous equilibrium system: $2CO_2+167kJ \rightleftharpoons 2CO+O_2$, which of the following is true?
 A. the value of K at $500^\circ C$ is greater than the value of K at $700^\circ C$
 B. the value of K at both temperatures are equal
 C. the value of K at $500^\circ C$ is less than the value of K at $700^\circ C$
 D. none of them
 - In the following reaction: $HNO_2(aq)+H_2O(l) \rightleftharpoons NO_2^-(aq)+H_3O^+(aq)$, the conjugate acid of NO_2^- is:-
 A. H_3O^+ B. HNO_2 C. H_2O D. none of them
 - Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree ($1^\circ C$) or one kelvin (1K) is:-
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 - The net ionic equation for which of the following reaction is: $H_3O^+(aq)+OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq)+H_2SO_4(aq) \rightarrow$
 C. $Zn(s)+HCl(aq) \rightarrow$
 B. $Sr(OH)_2(aq)+HCl(aq) \rightarrow$
 D. both (A and B)
 - The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 B. CFCs C. MTBE D. PVA

12. The molecular formula for the ethyl ethanoate compound is :-

- A. $C_4H_{10}O_2$ B. $C_4H_8O_2$ C. $C_4H_{10}O$ D. C_4H_8O

13. The correct order according the pOH value for the following solution is:-

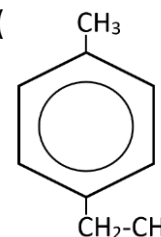
- A. $NaCl>CH_3COOK>NH_4NO_3$ B. $NH_4NO_3>NaCl>CH_3COOK$
 C. $CH_3COOK>NaCl>NH_4NO_3$ D. $NH_4NO_3>CH_3COOK>NaCl$

14. Which of the following is heated with sulfur atoms in vulcanization process?

- A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene

15. After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}M$, which of the following is correct? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5}mol/L$

- A. ionic product $>K_{sp}$ B. ionic product $<K_{sp}$ C. ionic product $=K_{sp}$ D. precipitate isn't form

16. The correct name for this compound: () according to IUPAC system is:

- A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
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17. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?

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22. In the following reaction: $2NO+O_2 \rightarrow 2NO_2$, the reaction for the fast step is: $NO_3+NO \rightarrow 2NO_2$, which of following is correct?

- A. NO is intermediate B. NO_3 is intermediate C. $R=k[NO][O_2]$ D. both(B and C)

23. In this reaction: $CN^-(aq)+H_2O(l) \rightleftharpoons HCN(aq)+OH^-(aq)$, which of the following is incorrect?

- A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyzed D. none of them

24. A chemical formula that shows the type of covalent bond in organic compound:-

- A. molecular formula B. empirical formula C. structural formula D. ionic formula

25. In the following gaseous equilibrium reaction: $PCl_5 \rightleftharpoons PCl_3+Cl_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-

- A. 0.005 B. 0.05 C. 20 D. 200

26. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
 A. substitution B. addition C. condensation D. elimination
27. A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. NH_3
28. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
 A. NaCN B. KCl C. KNO_2 D. NH_4Br
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 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
30. Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}]=0.02\text{M}$ B. $[\text{HCl}]=0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)
31. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. 0.24 B. 0.12 C. 0.36 D. 0.72
32. An acid is used as a fungicide:-
 A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
33. The rate law for the following hypothetical reaction: $\text{A} + \text{B} \longrightarrow \text{C}$, is $\text{R} = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. 27 B. 16 C. 18 D. 8
34. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
35. At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
36. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
 A. $[\text{OH}^-]=2.0 \times 10^{-6}\text{M}$ B. the sea water is basic C. $[\text{OH}^-]=5.0 \times 10^{-9}\text{M}$ D. both (A and B)
37. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change
38. When compared dimethyl ether and ethanol, which of the following is **correct**?
 A. both have the same a functional group B. both have the same boiling point
 C. both dissolved in water. D. all of them
39. The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
40. In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a^- is:-(place the reactants at energy level zero).
 A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol

41. A molecular compound which dissolves in water and it does **not** ionize:-
 A. $\text{C}_2\text{H}_5\text{OH}$ B. C_6H_6 C. NH_4Cl D. HF
42. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant
43. Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them
44. Which of the following is **correct** at all temperature in pure water?
 A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$ B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
 C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7}\text{M}$ D. all of them.
45. In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2\text{kJ} \longrightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO? If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol
46. Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. both (A and C)
47. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is: if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)
 A. 102.04°C B. 1.02°C C. 101.02°C D. 100.51°C
48. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
 A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)
49. At which of the following situation the pH do not change?
 A. adding NH_4NO_3 solution to the NH_3 solution B. adding KCN solution to the HCN solution
 C. adding a small amount of HCl to NH_3 and NH_4Cl solution D. all of them
50. All of the following pair compounds are structural isomers to each ether **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane

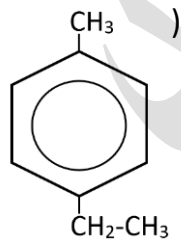


Answer the following questions: (two marks for each right choice)

- At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
- According to IUPAC system the compound:(CH₃-CH₂-CH₂-COH), is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
- In the following gaseous equilibrium system: 2CO₂+167kJ $\rightleftharpoons$ 2CO+O₂ , which of the following is true?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
 C. the value of K at 500°C is less than the value of K at 700°C
 D. none of them
- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant
- The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C, is:
 if (K_f= -1.86°C/m) (K_b= 0.51°C/m)
 A. 102.04°C B. 1.02°C C. 101.02°C D. 100.51°C
- By using the information in the adjacent table, which of the following is catalyst?
 A. MnO₂
 B. H₂O₂
 C. H₂O
 D. O₂
- Suppose that 20mL of 0.01M Ca(OH)₂ is required to neutralize 10mL of HCl solution, which of the following is correct?
 A. [HCl]=0.02M B. [HCl]=0.04M C. the spectator ions are Ca²⁺and Cl⁻ D. both (B and C)

Substance	H ₂ O ₂	H ₂ O	O ₂	MnO ₂
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them
- All of the following salts effect on the H₃O⁺ and OH⁻ concentration when added to water except:-
 A. NaCN B. KCl C. KNO₂ D. NH₄Br

- The correct name for this compound: () according to IUPAC system is:

- 1-ethyl-4-methyl cyclohexane
- 1-ethyl-4-methyl benzene
- 1-methyl-4-ethyl benzene
- 1-methyl-4- ethyl cyclohexane

- In the following reaction: CaCO₃(s)+ 179.2kJ $\rightarrow$ CaO (s)+ CO₂(g), what is the ΔH_f° value for CaO?
 If the ΔH_f° value for each of CO₂ and CaCO₃ equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol
 SN: 000023
- Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
- Which of the following is incorrect?
 A. the reaction type of methane gas with chlorine gas is addition
 B. the alkynes don't have geometric formula
 C. the graphite is a good electrical conductor
 D. none of them
- In the following reaction: HNO₂(aq)+H₂O(l) $\rightleftharpoons$ NO₂⁻(aq)+H₃O⁺(aq), the conjugate acid of NO₂⁻ is:-
 A. H₃O⁺ B. HNO₂ C. H₂O D. none of them
- By decreasing pressure on the following equilibrium system: N₂(g)+ O₂(g) $\rightleftharpoons$ 2NO(g)
 A. the quantity of N₂ decreases B. the quantity of NO decreases
 C. the quantity of NO increases D. the quantities do not change
- If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? (C_p=0.07J/(g.K))
 A. 25°C B. 298K C. 40K D. 40°C
- In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol , the value of E_a⁻ is:-(place the reactants at energy level zero).
 A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
- In the following gaseous equilibrium reaction: PCl₅ $\rightleftharpoons$ PCl₃+Cl₂ ,the mole number for each of PCl₅ ,PCl₃ and Cl₂ at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005 B. 0.05 C. 20 D. 200
- When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO₃ B. KF C. NaF D. both (B and C)
- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. poly isoprene D. 2-methyl-1,3 butadiene
- At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
- What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
 C. freezing-point depression D. both (B and C)
- A molecule that donates one electron pair to form a covalent bond is:-
 A. BF₃ B. NH₄⁺ C. CH₄ D. NH₃
- Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. K_a=K_b B. K_a>K_b C. K_b>K_a D. [H₃O⁺]>[OH⁻]

25. The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C₂F₄ **B. CFCs** C. MTBE D. PVA
26. If the pH of sea water at 25°C is equal to 8.3, which of the following is **correct**?
 A. [OH⁻]=2.0x10⁻⁶M B. the sea water is basic C. [OH⁻]=5.0x10⁻⁹M **D. both (A and B)**
27. Which of the following oxides when reacted with water forms acid solution?
 A. CO₂ B. CaO C. SO₃ **D. both (A and C)**
28. All of the following pair compounds are structural isomers to each other **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
29. The correct order according the pOH value for the following solution is:-
 A. NaCl>CH₃COOK>NH₄NO₃ **B. NH₄NO₃>NaCl>CH₃COOK**
 C. CH₃COOK>NaCl>NH₄NO₃ D. NH₄NO₃>CH₃COOK>NaCl
30. A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula **C. structural formula** D. ionic formula
31. A molecular compound which dissolves in water and it does **not ionize**:-
A. C₂H₅OH B. C₆H₆ C. NH₄Cl D. HF
32. The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na₂SO₄) is 0.36mol, what is the molarity of solution?
A. 0.24 B. 0.12 C. 0.36 D. 0.72
33. In this reaction: CN⁻(aq)+ H₂O(l) $\rightleftharpoons$ HCN(aq)+ OH⁻(aq) ,which of the following is **incorrect**?
 A. OH⁻ is conjugate base **B. H₂O is amphoteric** C. CN⁻ ion is hydrolyze D. none of them
34. Which of the following is **correct** at all temperature in pure water?
A. K_w=[H₃O⁺][OH⁻] B. [H₃O⁺][OH⁻]=1x10⁻¹⁴
 C. [H₃O⁺]= [OH⁻]=1x10⁻⁷M D. all of them.
35. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 **B. 10** C. 8 D. 12
36. The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases **D. all of them**
37. The molecular formula for the ethyl ethanoate compound is :-
 A. C₄H₁₀O₂ **B. C₄H₈O₂** C. C₄H₁₀O D. C₄H₈O
38. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg²⁺ **B. Ca²⁺** C. Pb²⁺ D. Al³⁺
39. At which of the following situation the pH do not change?
 A. adding NH₄NO₃ solution to the NH₃ solution B. adding KCN solution to the HCN solution
C. adding a small amount of HCl to NH₃ and NH₄Cl solution D. all of them
40. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
A. increase octane rating B. decrease octane rating
 C. increase boiling point D. both (A and C)

41. The net ionic equation for which of the following reaction is: H₃O⁺(aq)+OH⁻(aq) $\rightleftharpoons$ 2H₂O(l)?
 A. Ba(OH)₂(aq)+H₂SO₄(aq) $\longrightarrow$ **B. Sr(OH)₂(aq)+HCl(aq) $\longrightarrow$**
 C. Zn(s)+HCl(aq) $\longrightarrow$ D. both (A and B)
42. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-
 A. substitution B. addition **C. condensation** D. elimination
43. The rate law for the following hypothetical reaction: A +B $\longrightarrow$ C, is R=k[A]²[B], by what factor does the rate increase if the concentration of each A and B is tripled?
A. 27 B. 16 C. 18 D. 8
44. In the following reaction: 2NO+O₂ $\longrightarrow$ 2NO₂ ,the reaction for the fast step is: NO₃+NO $\longrightarrow$ 2NO₂ , which of following is **correct**?
 A. NO is intermediate B. NO₃ is intermediate C. R=k[NO][O₂] **D. both(B and C)**
45. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature **C. temperature** D. all of them
46. An acid is used as a fungicide:-
A. CH₃COOH B. HCl C. HNO₃ D. H₃PO₄
47. After mixing Ca²⁺ ions with concentration 2.4x10⁻⁴M and CO₃²⁻ ions with concentration 1.2x10⁻⁴M , which of the following is **correct**? If the solubility of CaCO₃ in its saturated solution is 5.3x10⁻⁵mol/L
A. ionic product>K_{sp} B. ionic product<K_{sp} C. ionic product=K_{sp} D. precipitate isn't form
48. When compared dimethyl ether and ethanol, which of the following is **correct**?
 A. both have the same a functional group B. both have the same boiling point
C. both dissolved in water. D. all of them
49. The following reaction: NH₄Cl(s) +176kJ $\longrightarrow$ NH₃(g)+HCl(g) , occurs spontaneously:-
 A. if TΔS value = 176kJ **B. if TΔS value > 176kJ** C. if TΔS value < 176kJ D. at all temperature
50. At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues **D. both the forward and reverse reactions continue.**

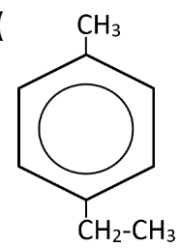


Answer the following questions: (two marks for each right choice)

- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. temperature D. all of them
- By using the information in the adjacent table, which of the following is catalyst?
 A. MnO_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

 B. H_2O_2
 C. H_2O
 D. O_2
- A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 D. NH_3
- In the following reaction: $CaCO_3(s) + 179.2kJ \rightarrow CaO(s) + CO_2(g)$, what is the ΔH_f^0 value for CaO ?
 If the ΔH_f^0 value for each of CO_2 and $CaCO_3$ equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol C. -634.9kJ/mol D. +634.9kJ/mol
- At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
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 A. both have the same a functional group B. both have the same boiling point
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- All of the following pair compounds are structural isomers to each ether except:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}M$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}M$, which of the following is correct? If the solubility of $CaCO_3$ in its saturated solution is $5.3 \times 10^{-5}mol/L$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
- In the following gaseous equilibrium reaction: $PCl_5 \rightleftharpoons PCl_3 + Cl_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005 B. 0.05 C. 20 D. 200
- The net ionic equation for which of the following reaction is: $H_3O^+(aq) + OH^-(aq) \rightleftharpoons 2H_2O(l)$?
 A. $Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow$ B. $Sr(OH)_2(aq) + HCl(aq) \rightarrow$
 C. $Zn(s) + HCl(aq) \rightarrow$ D. both (A and B)
- Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree ($1^\circ C$) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion

- The following reaction: $NH_4Cl(s) + 176kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-
 A. if $T\Delta S$ value = 176kJ B. if $T\Delta S$ value $> 176kJ$ C. if $T\Delta S$ value $< 176kJ$ D. at all temperature
- According to IUPAC system the compound: $(CH_3-CH_2-CH_2-COH)$, is called:-
 A. 1-butanol B. propanal C. butanone D. butanal
- Which of the following is incorrect?
 A. the reaction type of methane gas with chlorine gas is addition
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 A. Arrhenius B. Lewis C. Bronsted-Lowry D. none of them
- If the pH of sea water at $25^\circ C$ is equal to 8.3, which of the following is correct?
 A. $[OH^-] = 2.0 \times 10^{-6}M$ B. the sea water is basic C. $[OH^-] = 5.0 \times 10^{-9}M$ D. both (A and B)
- The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
 B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4- ethyl cyclohexane
- In the following gaseous equilibrium system: $2CO_2 + 167kJ \rightleftharpoons 2CO + O_2$, which of the following is true?
 A. the value of K at $500^\circ C$ is greater than the value of K at $700^\circ C$
 B. the value of K at both temperatures are equal
 C. the value of K at $500^\circ C$ is less than the value of K at $700^\circ C$
 D. none of them
- The correct order according the pOH value for the following solution is:-
 A. $NaCl > CH_3COOK > NH_4NO_3$ B. $NH_4NO_3 > NaCl > CH_3COOK$
 C. $CH_3COOK > NaCl > NH_4NO_3$ D. $NH_4NO_3 > CH_3COOK > NaCl$
- The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 B. CFCs C. MTBE D. PVA

25. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
- A. the quantity of N_2 decreases B. the quantity of NO decreases
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- A. Mg^{2+} B. Ca^{2+} C. Pb^{2+} D. Al^{3+}
31. If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p = 0.07\text{J}/(\text{g}\cdot\text{K})$)
- A. 25°C B. 298K C. 40K D. 40°C
32. The molecular formula for the ethyl ethanoate compound is :-
- A. $\text{C}_4\text{H}_{10}\text{O}_2$ B. $\text{C}_4\text{H}_8\text{O}_2$ C. $\text{C}_4\text{H}_{10}\text{O}$ D. $\text{C}_4\text{H}_8\text{O}$
33. A chemical formula that shows the type of covalent bond in organic compound:-
- A. molecular formula B. empirical formula C. structural formula D. ionic formula
34. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
- A. 5M B. 1M C. 0.001M D. all of them
35. In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
- A. presence of catalyst B. changing concentration of product
C. changing temperature D. changing concentration of reactant
36. Which of the following is **correct** at all temperature in pure water?
- A. $K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$ B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7}\text{M}$ D. all of them.
37. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
- A. KNO_3 B. KF C. NaF D. both (B and C)
38. In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-
- A. H_3O^+ B. HNO_2 C. H_2O D. none of them
39. Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
- A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. both (B and C)

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42. At which of the following situation the reaction solid zinc with solution of HCl is faster?
- A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
43. In the following reaction: $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \rightarrow 2\text{NO}_2$, which of following is **correct**?
- A. NO is intermediate B. NO_3 is intermediate C. $\text{R} = k[\text{NO}][\text{O}_2]$ D. both(B and C)
44. An acid is used as a fungicide:-
- A. CH_3COOH B. HCl C. HNO_3 D. H_3PO_4
45. Salts of weak acids and weak bases can produce basic aqueous solution if:-
- A. $K_a = K_b$ B. $K_a > K_b$ C. $K_b > K_a$ D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
46. The entropy increases by:-
- A. decreasing the pressure B. increasing the temperature C. mixing gases D. all of them
47. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is **incorrect**?
- A. OH^- is conjugate base B. H_2O is amphoteric C. CN^- ion is hydrolyzed D. none of them
48. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is: if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)
- A. 102.04°C B. 1.02°C C. 101.02°C D. 100.51°C
49. Increasing the percentage of branched-chain alkanes in gasoline causes to:-
- A. increase octane rating B. decrease octane rating
C. increase boiling point D. both (A and C)
50. All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
- A. NaCN B. KCl C. KNO_2 D. NH_4Br



Answer the following questions: (two marks for each right choice)

- The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
 A. $\text{Ba}(\text{OH})_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow$ B. $\text{Sr}(\text{OH})_2(\text{aq}) + \text{HCl}(\text{aq}) \longrightarrow$
 C. $\text{Zn}(\text{s}) + \text{HCl}(\text{aq}) \longrightarrow$ D. both (A and B)
- Suppose that 20mL of 0.01M $\text{Ca}(\text{OH})_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[\text{HCl}] = 0.02\text{M}$ B. $[\text{HCl}] = 0.04\text{M}$ C. the spectator ions are Ca^{2+} and Cl^- D. **both (B and C)**
- When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 B. **KF** C. NaF D. both (B and C)
- In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. **0.005** B. 0.05 C. 20 D. 200
- If 49J of energy are added to 35g of a material at 20°C , what will the final temperature of the material be? ($C_p = 0.07\text{J}/(\text{g}\cdot\text{K})$)
 A. 25°C B. 298K C. 40K D. **40°C**
- The following reaction: $\text{NH}_4\text{Cl}(\text{s}) + 176\text{kJ} \longrightarrow \text{NH}_3(\text{g}) + \text{HCl}(\text{g})$, occurs spontaneously:-
 A. if ΔS value = 176kJ B. **if ΔS value > 176kJ** C. if ΔS value < 176kJ D. at all temperature
- Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis C. **Bronsted-Lowry** D. none of them
- The rate law for the following hypothetical reaction: $\text{A} + \text{B} \longrightarrow \text{C}$, is $R = k[\text{A}]^2[\text{B}]$, by what factor does the rate increase if the concentration of each A and B is tripled?
 A. **27** B. 16 C. 18 D. 8
- Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a = K_b$ B. $K_a > K_b$ C. **$K_b > K_a$** D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
- Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene C. **poly isoprene** D. 2-methyl-1,3 butadiene
- An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} B. **Ca^{2+}** C. Pb^{2+} D. Al^{3+}
- The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases D. **all of them**
- All of the following salts effect on the H_3O^+ and OH^- concentration when added to water **except**:-
 A. NaCN B. **KCl** C. KNO_2 D. NH_4Br

- In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. **changing concentration of product**
 C. changing temperature SN: 000025 D. changing concentration of reactant
- In the following gaseous equilibrium system: $2\text{CO}_2 + 167\text{kJ} \rightleftharpoons 2\text{CO} + \text{O}_2$, which of the following is **true**?
 A. the value of K at 500°C is greater than the value of K at 700°C
 B. the value of K at both temperatures are equal
 C. **the value of K at 500°C is less than the value of K at 700°C**
 D. none of them
- After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is **correct**? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$
 A. **ionic product > K_{sp}** B. ionic product < K_{sp} C. ionic product = K_{sp} D. precipitate isn't form
- All of the following pair compounds are structural isomers to each ether **except**:-
 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
 C. **pentane and cyclopentane** D. 1,1-dichloro ethane and 1,2-dichloro ethane
- Which of the following oxides when reacted with water forms acid solution?
 A. CO_2 B. CaO C. SO_3 D. **both (A and C)**
- In a reaction, the value of the forward activation energy equals 100kJ/mol and the enthalpy change for reverse reaction equals -35kJ/mol, the value of E_a is:-(place the reactants at energy level zero).
 A. **65kJ/mol** B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
- The correct order according the pOH value for the following solution is:-
 A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ B. **$\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$**
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
- Which of the following is **correct** at all temperature in pure water?
 A. **$K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$** B. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$
 C. $[\text{H}_3\text{O}^+] = [\text{OH}^-] = 1 \times 10^{-7}\text{M}$ D. all of them.
- The.....compounds contribute to the destruction of ozone in the upper atmosphere.
 A. C_2F_4 B. **CFCs** C. MTBE D. PVA
- At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. **1M HCl at 50°C** D. 1M HCl at 25°C
- The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
 A. **0.24** B. 0.12 C. 0.36 D. 0.72
- If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature C. **temperature** D. all of them
- In the following reaction: $\text{CaCO}_3(\text{s}) + 179.2\text{kJ} \longrightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, what is the ΔH_f° value for CaO ?
 If the ΔH_f° value for each of CO_2 and CaCO_3 equal to (-393.5, -1207.6) kJ/mol respectively
 A. -814.1kJ/mol B. +814.1kJ/mol C. **-634.9kJ/mol** D. +634.9kJ/mol

27. By using the information in the adjacent table, which of the following is catalyst?

A. MnO_2

B. H_2O_2

C. H_2O

D. O_2

Substance	H_2O_2	H_2O	O_2	MnO_2
mass at the start of the reaction (g)	68	0	0	5
mass at the end of the reaction (g)	0	36	32	5

28. An acid is used as a fungicide:-

A. CH_3COOH

B. HCl

C. HNO_3

D. H_3PO_4

29. At which of the following situation the pH do not change?

A. adding NH_4NO_3 solution to the NH_3 solution

B. adding KCN solution to the HCN solution

C. adding a small amount of HCl to NH_3 and NH_4Cl solution

D. all of them

30. At which of the following concentrations the hydrochloric acid considered a strong electrolyte?

A. 5M

B. 1M

C. 0.001M

D. all of them

31. A molecular compound which dissolves in water and it does not ionize:-

A. $\text{C}_2\text{H}_5\text{OH}$

B. C_6H_6

C. NH_4Cl

D. HF

32. The reaction that occurs when aqueous solutions of carboxylic acids and amines are mixed is called:-

A. substitution

B. addition

C. condensation

D. elimination

33. In this reaction: $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, which of the following is incorrect?

A. OH^- is conjugate base

B. H_2O is amphoteric

C. CN^- ion is hydrolyzed

D. none of them

34. The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is:
if ($K_f = -1.86^\circ\text{C}/m$) ($K_b = 0.51^\circ\text{C}/m$)

A. 102.04°C

B. 1.02°C

C. 101.02°C

D. 100.51°C

35. According to IUPAC system the compound: $(\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{COH})$, is called:-

A. 1-butanol

B. propanal

C. butanone

D. butanal

36. At equilibrium :-

A. all reaction have ceased

B. only the forward reaction continues

C. only the reverse reaction continues

D. both the forward and reverse reactions continue.

37. The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-

A. 6

B. 10

C. 8

D. 12

38. The molecular formula for the ethyl ethanoate compound is :-

A. $\text{C}_4\text{H}_{10}\text{O}_2$

B. $\text{C}_4\text{H}_8\text{O}_2$

C. $\text{C}_4\text{H}_{10}\text{O}$

D. $\text{C}_4\text{H}_8\text{O}$

39. A chemical formula that shows the type of covalent bond in organic compound:-

A. molecular formula

B. empirical formula

C. structural formula

D. ionic formula

40. In the following reaction: $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$, the reaction for the fast step is: $\text{NO}_3 + \text{NO} \longrightarrow 2\text{NO}_2$, which of following is correct?

A. NO is intermediate

B. NO_3 is intermediate

C. $R = k[\text{NO}][\text{O}_2]$

D. both (B and C)

41. Increasing the percentage of branched-chain alkanes in gasoline causes to:-

A. increase octane rating

B. decrease octane rating

C. increase boiling point

D. both (A and C)

42. When compared dimethyl ether and ethanol, which of the following is correct?

A. both have the same a functional group

B. both have the same boiling point

C. both dissolved in water.

D. all of them

43. By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$

A. the quantity of N_2 decreases

B. the quantity of NO decreases

C. the quantity of NO increases

D. the quantities do not change

44. A molecule that donates one electron pair to form a covalent bond is:-

A. BF_3

B. NH_4^+

C. CH_4

D. NH_3

45. What colligative properties are displayed when antifreeze is added to a car's cooling system?

A. vapor-pressure elevation

B. boiling point elevation

C. freezing-point depression

D. both (B and C)

46. Which of the following is incorrect?

A. the reaction type of methane gas with chlorine gas is addition

B. the alkynes don't have geometric formula

C. the graphite is a good electrical conductor

D. none of them

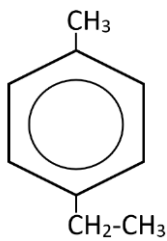
47. In the following reaction: $\text{HNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NO}_2^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$, the conjugate acid of NO_2^- is:-

A. H_3O^+

B. HNO_2

C. H_2O

D. none of them

48. The correct name for this compound: () according to IUPAC system is:

A. 1-ethyl-4-methyl cyclohexane

B. 1-ethyl-4-methyl benzene

C. 1-methyl-4-ethyl benzene

D. 1-methyl-4- ethyl cyclohexane

49. Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-

A. specific heat

B. enthalpy of reaction

C. enthalpy of formation

D. enthalpy of combustion

50. If the pH of sea water at 25°C is equal to 8.3, which of the following is correct?

A. $[\text{OH}^-] = 2.0 \times 10^{-6}\text{M}$

B. the sea water is basic

C. $[\text{OH}^-] = 5.0 \times 10^{-9}\text{M}$

D. both (A and B)

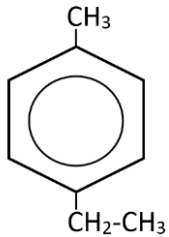


Answer the following questions: (two marks for each right choice)

- At which of the following concentrations the hydrochloric acid considered a strong electrolyte?
 A. 5M B. 1M C. 0.001M D. all of them
- The correct order according the pOH value for the following solution is:-
 A. $\text{NaCl} > \text{CH}_3\text{COOK} > \text{NH}_4\text{NO}_3$ B. $\text{NH}_4\text{NO}_3 > \text{NaCl} > \text{CH}_3\text{COOK}$
 C. $\text{CH}_3\text{COOK} > \text{NaCl} > \text{NH}_4\text{NO}_3$ D. $\text{NH}_4\text{NO}_3 > \text{CH}_3\text{COOK} > \text{NaCl}$
- The net ionic equation for which of the following reaction is: $\text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l})$?
 A. $\text{Ba}(\text{OH})_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow$ B. $\text{Sr}(\text{OH})_2(\text{aq}) + \text{HCl}(\text{aq}) \longrightarrow$
 C. $\text{Zn}(\text{s}) + \text{HCl}(\text{aq}) \longrightarrow$ D. both (A and B)
- The total number of ions moles which are produced by dissociation 500mL an aqueous solution of sodium sulfate (Na_2SO_4) is 0.36mol, what is the molarity of solution?
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 A. 65kJ/mol B. -65kJ/mol C. 35kJ/mol D. 135kJ/mol
- The number of hydrogen atoms in the 1,1-dimethyl cyclopropane compound is equal to:-
 A. 6 B. 10 C. 8 D. 12

- Amount of energy required to raise the temperature of one gram of a substance by one Celsius degree (1°C) or one kelvin (1K) is:-
 A. specific heat B. enthalpy of reaction C. enthalpy of formation D. enthalpy of combustion
 SN: 000026
 - At which of the following situation the reaction solid zinc with solution of HCl is faster?
 A. 0.1M HCl at 25°C B. 0.1M HCl at 50°C C. 1M HCl at 50°C D. 1M HCl at 25°C
 - After mixing Ca^{2+} ions with concentration $2.4 \times 10^{-4}\text{M}$ and CO_3^{2-} ions with concentration $1.2 \times 10^{-4}\text{M}$, which of the following is correct? If the solubility of CaCO_3 in its saturated solution is $5.3 \times 10^{-5}\text{mol/L}$
 A. ionic product $> K_{sp}$ B. ionic product $< K_{sp}$ C. ionic product $= K_{sp}$ D. precipitate isn't form
 - What colligative properties are displayed when antifreeze is added to a car's cooling system?
 A. vapor-pressure elevation B. boiling point elevation
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 - The boiling point of an aqueous solution containing a nonelectrolyte that freezes at -3.72°C , is:
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 - By decreasing pressure on the following equilibrium system: $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
 A. the quantity of N_2 decreases B. the quantity of NO decreases
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 A. H_3O^+ B. HNO_2 C. H_2O D. none of them
 - By using the information in the adjacent table, which of the following is catalyst?
 A. MnO_2
- | Substance | H_2O_2 | H_2O | O_2 | MnO_2 |
|---------------------------------------|------------------------|----------------------|--------------|----------------|
| mass at the start of the reaction (g) | 68 | 0 | 0 | 5 |
| mass at the end of the reaction (g) | 0 | 36 | 32 | 5 |
- Salts of weak acids and weak bases can produce basic aqueous solution if:-
 A. $K_a = K_b$ B. $K_a > K_b$ C. $K_b > K_a$ D. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
 - In the following gaseous equilibrium reaction: $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, the mole number for each of PCl_5 , PCl_3 and Cl_2 at equilibrium is (0.084, 0.035, 0.06) respectively in 5L vessel, the value of equilibrium constant is:-
 A. 0.005 B. 0.05 C. 20 D. 200
 - In the reaction that occurs by one direction(forward), which of the following doesn't effect on the rate of reaction?
 A. presence of catalyst B. changing concentration of product
 C. changing temperature D. changing concentration of reactant

27. A chemical formula that shows the type of covalent bond in organic compound:-
 A. molecular formula B. empirical formula **C. structural formula** D. ionic formula
28. The.....compounds contribute to the destruction of ozone in the upper atmosphere.
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 A. pentane and 2,2-dimethyl propane B. hexene and cyclohexane
C. pentane and cyclopentane D. 1,1-dichloro ethane and 1,2-dichloro ethane
34. A molecular compound which dissolves in water and it does **not ionize**:-
 A. C_2H_5OH B. C_6H_6 C. NH_4Cl D. HF
35. The molecular formula for the ethyl ethanoate compound is :-
 A. $C_4H_{10}O_2$ **B. $C_4H_8O_2$** C. $C_4H_{10}O$ D. C_4H_8O
36. Which of the following is **correct** at all temperature in pure water?
 A. $K_w = [H_3O^+][OH^-]$ B. $[H_3O^+][OH^-] = 1 \times 10^{-14}$
 C. $[H_3O^+] = [OH^-] = 1 \times 10^{-7} M$ D. all of them.
37. Which theories of acids and bases belong to acids and bases conjugate?
 A. Arrhenius B. Lewis **C. Bronsted-Lowry** D. none of them
38. In the following gaseous equilibrium system: $2CO_2 + 167kJ \rightleftharpoons 2CO + O_2$, which of the following is **true**?
 A. the value of K at $500^\circ C$ is greater than the value of K at $700^\circ C$
 B. the value of K at both temperatures are equal
C. the value of K at $500^\circ C$ is less than the value of K at $700^\circ C$
 D. none of them
39. At equilibrium :-
 A. all reaction have ceased B. only the forward reaction continues
 C. only the reverse reaction continues **D. both the forward and reverse reactions continue.**
40. When 50mL of 0.1M monoprotic weak acid titrated with 50mL of 0.1M potassium hydroxide, which of the following salts may be formed?
 A. KNO_3 **B. KF** C. NaF D. both (B and C)

41. If a piece of hot copper metal is dipped in cool water, the energy is transferred as heat, the direction of energy transfer is determined by the.....differences between the objects within system.
 A. specific heat B. nature **C. temperature** D. all of them
42. The following reaction: $NH_4Cl(s) + 176kJ \rightarrow NH_3(g) + HCl(g)$, occurs spontaneously:-
 A. if $T\Delta S$ value = 176kJ **B. if $T\Delta S$ value > 176kJ** C. if $T\Delta S$ value < 176kJ D. at all temperature
43. In this reaction: $CN^-(aq) + H_2O(l) \rightleftharpoons HCN(aq) + OH^-(aq)$, which of the following is **incorrect**?
 A. OH^- is conjugate base **B. H_2O is amphoteric** C. CN^- ion is hydrolyzed D. none of them
44. An ion that forms precipitate with sulfate ion, but doesn't form precipitate with sulfide ion :-
 A. Mg^{2+} **B. Ca^{2+}** C. Pb^{2+} D. Al^{3+}
45. If the pH of sea water at $25^\circ C$ is equal to 8.3, which of the following is **correct**?
 A. $[OH^-] = 2.0 \times 10^{-6} M$ B. the sea water is basic C. $[OH^-] = 5.0 \times 10^{-9} M$ **D. both (A and B)**
46. The entropy increases by:-
 A. decreasing the pressure B. increasing the temperature C. mixing gases **D. all of them**
47. The correct name for this compound: () according to IUPAC system is:
 A. 1-ethyl-4-methyl cyclohexane
B. 1-ethyl-4-methyl benzene
 C. 1-methyl-4-ethyl benzene
 D. 1-methyl-4-ethyl cyclohexane
48. Suppose that 20mL of 0.01M $Ca(OH)_2$ is required to neutralize 10mL of HCl solution, which of the following is **correct**?
 A. $[HCl] = 0.02M$ B. $[HCl] = 0.04M$ C. the spectator ions are Ca^{2+} and Cl^- **D. both (B and C)**
49. Which of the following is heated with sulfur atoms in vulcanization process?
 A. isoprene B. neoprene **C. poly isoprene** D. 2-methyl-1,3 butadiene
50. A molecule that donates one electron pair to form a covalent bond is:-
 A. BF_3 B. NH_4^+ C. CH_4 **D. NH_3**