



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

- A chemical compound which dissolves in water that ionizes and increases $[H_3O^+]$ is:-
 A. ammonium chloride B. ethane C. hydrogen fluoride D. ammonia
- An ion forms precipitate with SO_4^{2-} ion :-
 A. Ca^{2+} B. NH_4^+ C. Mg^{2+} D. Al^{3+}
- How many moles of magnesium chloride ($MgCl_2$) is required per 500 g of water so that its expected boiling point equals to $103.06^\circ C$. ($K_b = 0.51^\circ C/m$)
 A. 0.5 B. 1 C. 2 D. 1.5
- The expected value of freezing point depression of KCl solution compared with sucrose solution with the same concentration is:-
 A. exactly the same B. greater twice exactly C. slightly lower D. greater twice almost
- The number of moles of ions are produced by dissociation 0.5 mol of NH_4Br is:-
 A. 0.5 B. 1 C. 2 D. 3
- Which of the following is the spectator ion, when an aqueous solution of sodium carbonate and calcium chloride are mixed?
 A. Cl^- , Na^+ B. Ca^{2+} , Cl^- C. Na^+ , CO_3^{2-} D. Ca^{2+} , CO_3^{2-}
- The strength of an acid depends on the:-
 A. number of hydrogen atoms in the chemical formula of acid B. concentration of acid
 C. polarity and energy of bond D. all of them
- In which of the following reactions the water acts as Bronsted-Lowry acid and base?
 A. $HCN(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + CN^-(aq)$ B. $NH_3(aq) + H_2O(l) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$
 C. $H_2O(l) + H_2O(l) \rightleftharpoons H_3O^+(aq) + OH^-(aq)$ D. none of them
- When hydrochloric acid (HCl) reacts with barium metal:-
 A. the hydronium ion concentration increases B. precipitate is formed
 C. hydrogen gas is produced D. chlorine gas is produced
- The conjugate base of chloric acid is:-
 A. chlorate B. chlorite C. chloride D. perchlorate
- Which of the following acts as acid when reacts with ammonia solution?
 A. CN^- B. $H_2PO_4^-$ C. $HCOO^-$ D. both (B and C)
- Which of the following is Lewis base?
 A. an electron pair acceptor B. an electron pair donor
 C. a proton donor D. a proton acceptor
- Phosphoric acid is used in:-
 A. the manufacture of detergents and ceramics B. the recovery of magnesium from sea water
 C. a fungicide D. the manufacture of rubber and plastics

- 14.** How many moles of Ba(OH)₂ in terms of quantity that would be the chemically equivalent of the 0.20 mol HF? A. 0.20 B. 0.40 C. 0.12 D. 0.10
- 15.** When compared the equal volume of both aqueous solutions of HCl and HCN with the same concentration at 25°C, which of the following is correct?
A. the pH value for both solutions are equal B. the pOH value for HCl is lower than HCN
C. the mole number for both solutions are equal D. [OH⁻] in both solutions are equal.
- 16.** All of the following solutions are acids except:-
A. [H₃O⁺]=1.0x10⁻⁵M B. [OH⁻]=1.0x10⁻¹⁰M C. pH<7 D. [H₃O⁺]=1.0x10⁻⁷M
- 17.** In aqueous solution of 1.0x10⁻³M Ca(OH)₂, the [H₃O⁺] at 25°C is equal to:-
A. 5.0x10⁻³M B. 0.002M C. 1.0x10⁻¹¹M D. 5.0x10⁻¹²M
- 18.** In a titration process 36mL of 0.02M KOH solution is neutralized 12mL aqueous solution of H₂SO₄, which of the following is correct?
A. the pH of equivalence point higher than 7 B. [H₂SO₄]=0.03M
C. the pH of equivalence point lower than 7 D. none of them
- 19.** A 4.0 g of a glass absorbed 32J of energy as heat if it is heated from 274K to 314K, how much energy gain when it is heated from 314K to 344K?
A. 32J B. 0.2J C. 24J D. cannot determine from information given
- 20.** In the following reaction: NO(g)+ ½O₂(g) → NO₂(g), calculate the enthalpy of reaction for the combustion of 2 mol of nitrogen monoxide gas, if ΔH⁰_f NO = +90.3kJ/mol and ΔH⁰_f NO₂ = +33.2kJ/mol
A. -57.1kJ B. +114.2kJ C. -114.2kJ D. +57.1kJ
- 21.** The ΔG value is always negative if:-
A. (ΔH= -, ΔS= -) B. (ΔH= +, ΔS= +) C. (ΔH= -, ΔS= +) D. (ΔH= +, ΔS= -)
- 22.** In a reaction ΔH value is equal to 98.112kJ/mol and ΔS is equal to 292J/(mol.K), at what temperature in kelvins the reaction is spontaneous?
A. T=336K B. T>336K C. T<336K D. cannot determine
- 23.** In the following exothermic reaction: NH₃(g)+HCl(g) → NH₄Cl(s), which of the following is correct?
A. the reaction has a negative ΔS B. the reaction is always spontaneous
C. the reaction is always nonspontaneous D. the reaction is spontaneous at high temperature
- 24.** The NO₂ gas reacts with CO gas according to the following mechanism:-
step 1: NO₂+ NO₂ → NO₃ + NO
step 2: CO+ NO₃ → CO₂ + NO₂, by what factor does the rate of reaction increase if [CO] doubled?
A. 2 B. 4 C. 8 D. the rate of reaction is not changed
- 25.** In the following hypothetical reaction: 2B+80kJ → C, if the activation energy for forward reaction is equal to 100kJ/mol and the products energy level is equal to 60kJ/mol, then the energy of activated complex is:
A. 100kJ/mol B. 90kJ/mol C. 120kJ/mol D. 80kJ/mol
- 26.** The value of specific rate constant increases by:-
A. increasing reactant concentration B. rising temperature
C. increasing surface area of reaction D. all of them

- 27.** For the following reaction: $3A \longrightarrow C$, the initial concentration of A was 0.2M and the reaction rate was 1.0M/s, when [A] was doubled, the reaction rate increased to 4.0M/s which of the following is the rate law for the reaction?
- A. $R=k[A]$ B. $R=k[A]^2$ C. $R=k[A]^3$ D. none of them
- 28.** Changes temperature effects on the rate of reaction because it effect on the:-
- A. activated complex energy B. enthalpy of reaction
C. activation energy D. number of effective collision
- 29.** The minimum energy required to transform the reactants into an activated complex is called:-
- A. activation energy B. free energy C. enthalpy of reaction D. kinetic energy
- 30.** A polyatomic ion that hydrolyses is:-
- A. SO_4^{2-} B. CO_3^{2-} C. F^- D. both(B and C)
- 31.** In which of the following reactions rising temperature and decreasing pressure would favor forward reaction?
- A. $2HI(g)+12.2kJ \rightleftharpoons H_2(g)+I_2(g)$ B. $2CO(g)+O_2(g) \rightleftharpoons 2CO_2(g)+167kJ$
C. $PCl_5(g) +88kJ \rightleftharpoons PCl_3(g)+ Cl_2(g)$ D. $Cu^{2+}(aq)+4NH_3(aq) \rightleftharpoons [Cu(NH_3)_4]^{2+}(aq)+42kJ$
- 32.** In the following gaseous equilibrium reaction: $2SO_2+O_2 \rightleftharpoons 2SO_3 +energy$, at equilibrium is found $[SO_2]=1.5M$, $[O_2]=1.25M$ and $K=4.36$, which of the following is correct by decreasing temperature?
- A. $[SO_3] >3.5M$ B. $K >4.36$ C. $[SO_2] >1.5M$. D. both(A and B)
- 33.** After mixing both aqueous solution of $Pb(NO_3)_2$ and KCl found $[Pb^{2+}] = 1.6 \times 10^{-3}M$ and $[Cl^-] = 1.2 \times 10^{-3}M$, calculate ionic product, does precipitate form? (if $K_{sp} PbCl_2 = 1.6 \times 10^{-5}$)
- A. 2.3×10^{-9} no B. 2.3×10^{-9} yes C. 3.1×10^{-9} no D. 1.9×10^{-5} yes
- 34.** This reaction: $HCl(aq)+NaOH(aq) \longrightarrow \dots\dots\dots + \dots\dots\dots$, going to completion because $\dots\dots\dots$ is formed .
- A. precipitate B. gas C. slightly ionized product D. all of them
- 35.** In the equilibrium system if equilibrium constant (K) value is very high at specified temperature which of the following is correct?
- A. forward reaction rate greater than reverse reaction rate
B. reverse reaction rate greater than forward reaction rate
C. forward reaction rate is equal to reverse reaction rate
D. none of them
- 36.** Adding $NaCH_3COO$ to aqueous solution of acetic acid causes:-
- A. forming more molecules of acetic acid B. shifting equilibrium to right direction
C. increasing the ionization of acid D. decreasing pH
- 37.** In the following reaction: $2H_2(g)+CO(g) \longrightarrow CH_3OH(g)+90.7kJ$, the value -90.7kJ represents:-
- A. enthalpy of reaction B. enthalpy of combustion of hydrogen
C. enthalpy of formation of methanol D. both (A and C)
- 38.** What can be observed about the rate of a change of the pH of solution near the end point of a titration?
- A. the pH does not change B. the pH value is changed rapidly
C. the pH becomes zero D. the pH value is changed slowly
- 39.** Which of the following properties of a diamond is incorrect?
- A. is a good conductor for electricity B. is a good conductor for heat
C. it has high density D. it has high melting point

- 40.** All compounds of homologous series of alkanes:-
- A. have the same molecular formula
B. are in the same physical state
C. have the same general molecular formula
D. doesn't have structural isomers
- 41.** The combustion of..... when it is mixed with pure oxygen produces the intense heat of welding torches.
A. C_2H_6
B. C_2H_4
C. C_6H_6
D. C_2H_2
- 42.** The correct name for this compound: ($\begin{array}{c} CH_3 \\ | \\ CH_2=C-CH-CH_3 \\ | \\ CH_2-CH_3 \end{array}$) according to IUPAC system is:
- A. 3-ethyl-2-methyl-3-butene
B. 2-ethyl-3-methyl-1-butene
C. 3-methyl-2-ethyl-1-butene
D. 2-propyl-1-butene
- 43.** The second compound of alkenes series is :-
A. C_2H_4
B. C_3H_4
C. C_3H_6
D. C_2H_6
- 44.** Which of the following unsaturated hydrocarbons has the least chemical reactivity?
A. aromatic
B. alkene
C. alkyne
D. alkane
- 45.** The monomer of natural rubber is:-
A. neoprene
B. isoprene
C. 2-chloro-1,3-butadiene.
D. ethylene
- 46.** Which of the following organic compounds is used as octane enhancers in fuel for automobiles?
A. ethanol
B. glycerol
C. MTBE
D. both (A and C)
- 47.** In which of the following compounds two alkyl groups are bonded with carbonyl group directly?
A. ester
B. aldehyde
C. ketone
D. ether
- 48.** What type of chemical reaction would you expect to occur between 2-butene and hydrogen bromide, (HBr)?
A. substitution
B. addition
C. condensation
D. elimination
- 49.** The molecular formula for which of the following organic compounds is C_3H_9N ?
A. tri methyl amine
B. ethyl methyl amine
C. propyl amine
D. all of them
- 50.** Which of the following is named incorrectly according to IUPAC system?
A. 2,2-dichloro-1,1-difluoropropane
B. 3-butanol
C. 1-methyl-2-ethyl cyclopropane
D. both (B and C)