



Choose the correct answer (two marks for each question).

- An aqueous solution of aluminum sulfide contains 0.6mol of sulfide ions, what is the total number of moles ion produced? **A.** 0.4 **B.** 0.8 **C.** 1.0 **D.** 1.2
- Which of the following ions form precipitate with chlorate ion?
A. Mg^{2+} **B.** Ba^{2+} **C.** Al^{3+} **D.** none of them
- The weak acid is a weak electrolyte because:
A. it ionizes only slightly in aqueous solution.
B. it forms H_3O^+ and OH^- ions in aqueous solution.
C. it lowers the freezing point of water.
D. it is miscible with water.
- The osmosis is the movement of.....through a semipermeable from the side of lower concentration to the side of higher concentration.
A. solute particles **B.** ions in aqueous solution
C. solute particles in solvent **D.** solvent molecules
- The boiling points of solutions of three nonvolatile solutes X ,Y and Z in water with 1*m* concentration is equal to (100.51 ,101.53 ,101.02) $^{\circ}C$ respectively ,which solutions has the lowest freezing point? ($K_b=0.51^{\circ}C/m$) ($K_f=-1.86^{\circ}C/m$)
A. Y **B.** X **C.** Z **D.** cannot be determined
- The following reaction: $H_3O^+(aq)+OH^-(aq) \rightarrow 2H_2O(l)$, represents the net ionic equation of a reaction:
A. $NaCl(aq)$ with $AgNO_3(aq)$ **B.** $H_2SO_4(aq)$ with $Ba(OH)_2(aq)$
C. $HNO_3(aq)$ with $NaOH(aq)$ **D.** both(B and C)
- Ammonia in aqueous solution acts as Arrhenius base because it:
A. donates an electron pair **B.** a proton acceptor
C. increases hydroxide ion concentration **D.** a proton donor
- In the ionization process of phosphoric acid, which of the following ion has the highest concentration?
A. HPO_4^{2-} **B.** $H_2PO_4^-$ **C.** PO_4^{3-} **D.** cannot be determined
- If water reacts with a stronger acid than water, water acts as:
A. Bronsted- Lowry base **B.** Bronsted- Lowry acid **C.** Arrhenius acid **D.** Arrhenius base
- When chloric acid ($HClO_3$) reacts with conjugate base of H_2CO_3 , then one of the product is:
A. H_3O^+ **B.** H_2CO_3 **C.** CO_3^{2-} **D.** HCO_3^-
- Which of the following is used as an antacid in the stomach?
A. $NaOH$ **B.** $Mg(OH)_2$ **C.** NH_3 **D.** HCl
- If 1000L of an aqueous solution contains 2.0×10^{-5} mol of H_3O^+ ions, then the solution is:
A. a base **B.** an acid **C.** a neutral **D.** an amphoteric
- Which of the following is correct for the $Ca(OH)_2$ solution with $2.0 \times 10^{-3}M$ concentration?
A. $[OH^-]= 2.0 \times 10^{-3}M$ **B.** $pOH=2.7$ **C.** $[H_3O^+]=5 \times 10^{-12}M$ **D.** $pH=11.6$
- The indicators that change their color at pH less than 7 are used to determine the equivalence point of titration:
A. a strong acid and weak base **B.** a weak acid and strong base
C. a strong acid and strong base **D.** a weak acid and weak base
- Suppose that 15mL of 0.025M H_2SO_4 solution required to neutralized 0.075M KOH solution, the volume of the base is equal to:
A. 15mL **B.** 5mL **C.** 10mL **D.** 0.015L
- Which of the following solutions with the same concentration has the highest pH?
A. HCl **B.** H_2SO_4 **C.** CH_3COOH **D.** KNO_3
- If a process in nature occurs towards the least enthalpy and towards the largest entropy, then it is:
A. spontaneous at high temperature **B.** always spontaneous
C. spontaneous at low temperature **D.** always non spontaneous
- The standard enthalpy of formation for liquid water is equal to $-286kJ/mol$, then the enthalpy of reaction for combustion 2 mol of hydrogen is equal to:
A. $-572 kJ$ **B.** $-286kJ$ **C.** $-858kJ$ **D.** $-57.2kJ$
- The quantity of energy that a material absorbs when heated depends on the:
A. nature of material **B.** mass of material
C. change of temperature **D.** all of them
- In a reaction, the free- energy change is equal to $-101.1kJ/mol$ and released $136.9 kJ/mol$ of energy, what is the entropy change at room temperature?
A. $-1.20kJ/(mol.K)$ **B.** $+0.120kJ/(mol.K)$ **C.** $-0.120kJ/(mol.K)$ **D.** $+0.8kJ/(mol.K)$
- Which of the following process has a negative ΔS ?
A. mixing two liquids **B.** evaporating one mole of water
C. dissociation sodium chloride in water **D.** increasing the pressure on the gas
- In a reaction, $E_a=50kJ/mol$ and $\Delta H= -10kJ/mol$, which of the following is correct?
A. the reactant is more stable in the reverse reaction **B.** $E_a^- = 60kJ/mol$
C. the product is more stable in the forward reaction **D.** all of them are correct
- Presence of catalyst effects all of the following **except**:
A. enthalpy of reaction **B.** activated complex energy level
C. rate of reaction **D.** specific rate constant
- which of the following does not affect the rate of reaction in the homogeneous gaseous reaction?
A. temperature **B.** concentration of reactant
C. nature of reactant **D.** surface area of reaction
- In the following reaction: $2H_2+2NO \rightarrow N_2+2H_2O$, the reaction for one of the steps of reaction mechanism is: $H_2+N_2O \rightarrow H_2O + N_2$,which of the following is correct?
A. N_2O is intermediate **B.** $R=k[NO][H_2]^2$ **C.** $R=k[NO]^2$ **D.** both (A and B) are correct

26. The following reaction: $X+2Y \longrightarrow XY_2$, is occurred by a one-step mechanism, by what factor does the rate increase if the concentration of each X and Y tripled?
A. 9 **B.** 18 **C.** 27 **D.** 3
27. Adding aqueous solution of KCN to aqueous solution of HCN leads to:
A. precipitate KCN **B.** increase $[OH^-]$ **C.** increase HCN ionization **D.** both (B and C)
28. By combine 9.0×10^{-3} mol of Na_2CO_3 and 6.7×10^{-4} mol of $BaBr_2$ in a 10.0L of water, which of the following is correct? ($K_{sp}=2.8 \times 10^{-9}$)
A. ionic product $> K_{sp}$ **B.** ionic product $< K_{sp}$
C. forms precipitate **D.** both (A and C) are correct
29. In the following equilibrium reaction: $2NO_2(g) \rightleftharpoons N_2O_4(g) + \text{energy}$, in which of the following temperature the amount of N_2O_4 is the highest?
A. $100^\circ C$ **B.** $25^\circ C$ **C.** $0^\circ C$ **D.** cannot be determined
30. Which of the following equation represents the anion hydrolysis?
A. $CO_3^{2-}(aq) + H_3O^+(aq) \rightleftharpoons HCO_3^-(aq) + H_2O(l)$ **B.** $F^-(aq) + H_2O(l) \rightleftharpoons HF(aq) + OH^-(aq)$
C. $NH_4^+(aq) + H_2O(l) \rightleftharpoons NH_3(aq) + H_3O^+(aq)$ **D.** all of them
31. If the solubility product constant of a salt is: $K_{sp} = [Ca^{2+}]^3 [PO_4^{3-}]^2$, then the chemical formula for the salt is:
A. $Ca_3(PO_4)_2$ **B.** $Ca_2(PO_4)_3$ **C.** Ca_3PO_4 **D.** $3Ca(PO_4)_2$
32. In the following reaction: $PbS(s) + 4H_2O_2(l) \longrightarrow PbSO_4(s) + 4H_2O(l)$, the.....ion is reduced.
A. hydrogen **B.** peroxide **C.** sulfide **D.** lead
33. After balancing the following equation: $MnO_4^- + I_2 \longrightarrow Mn^{2+} + IO_3^-$, in an acidic solution, the number of water molecules are equal to:
A. 2 molecule in product **B.** 10 molecule in reactant
C. 2 molecule in reactant **D.** 8 molecule in product
34. The oxidation number of oxygen in the compound.....is +2.
A. OF_2 **B.** BaO_2 **C.** $XeOF_2$ **D.** MgO
35. Which of the following reaction is not a redox reaction?
A. $Cl_2 + H_2O \longrightarrow HCl + HOCl$ **B.** $CrCl_3 + 3KOH \longrightarrow Cr(OH)_3 + 3KCl$
C. $2Na + Br_2 \longrightarrow 2NaBr$ **D.** $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$
36. If the highest oxidation number of nitrogen in its compound is equal to +5, then nitrogen is expected to act as:
A. a reducing agent **B.** an oxidation agent
C. a reducing and oxidation agent **D.** a precipitating agent
37. Which of the following metal is more active? if E° reduce for each of ($Cd^{2+}, Ni^{2+}, Cu^{2+}, Cr^{3+}$) is equal to (-0.40, -0.23, 0.34, -0.74) volt respectively.
A. cadmium **B.** copper **C.** Nickel **D.** chromium
38. The following half-reaction: $2MnO_2 + H_2O + 2e^- \longrightarrow Mn_2O_3 + 2OH^-$, occurs at cathode of which the following cells?
A. fuel cell **B.** alkaline batteries **C.** mercury batteries **D.** both (A and B)
39. In the electrolyte cells, which of the following is correct?
A. reduction reaction is occurred at anode **B.** oxidation reaction is occurred at cathode
C. electrical energy is converted to chemical energy **D.** all of them
40. What happens if an aluminum spoon were used to stir a solution of $Zn(NO_3)_2$?
If E° reduce for each of Zn^{2+} and Al^{3+} is equal to (-0.76, -1.66) volt respectively.
A. the spoon is corroded **B.** Zn is corroded **C.** precipitate Al **D.** both (C and B)
41. A substans that is produced at cathode of electrolysis of water cell is.....
A. hydrogen gas **B.** hydronium ions **C.** oxygen gas **D.** hydrogen peroxide
42. The released energy in a redox reaction, if electron transferred indirectly is called:
A. electrical energy **B.** heat energy **C.** kinetic energy **D.** all of them
43. Carbon atoms form double bond through.....hybridization.
A. sp **B.** sp^2 **C.** sp^3 **D.** both (B and C)
44. All of the following names are incorrect according to IUPAC system **except**:
A. 1,1,1-trimethyl propane **B.** 3,3-dimethyl butane
C. 2,2-dimethyl butane **D.** 2-ethyl-2-methyl propane
45. The hydrocarbon branches of alkanes are called.....which are groups of atoms that are formed when one hydrogen atoms removed from an alkane molecule.
A. alkene **B.** alkyl **C.** aromatic **D.** alkyne
46. Which of the following compound is nonpolar?
A. methyl benzene **B.** cyclopropane **C.** butene **D.** all of them
47. Which of the following formula is suitable with alkyne?
A. C_6H_{12} **B.** C_8H_{14} **C.** C_6H_{14} **D.** C_7H_{15}
48. Which of the following compound with the same molecular mass has the lowest boiling point?
A. pentane **B.** 2-methyl butane
C. 2,2-dimethyl propane **D.** all of them have the same boiling point
49. When ammonia is reacted with....., acidic aqueous solution is produced, If $K_b(NH_3) = 1.8 \times 10^{-5}$
A. $K_a(CH_3COOH) = 1.8 \times 10^{-5}$ **B.** $K_a(HCN) = 2 \times 10^{-9}$ **C.** $K_a(HF) = 6.9 \times 10^{-4}$ **D.** cannot be determined
50. In which of the following equilibrium gaseous system the concentration of products and reactants remain unchanged, at specified temperature?
A. $N_2 + 3H_2 \rightleftharpoons 2NH_3$ $K=0.286$ **B.** $H_2 + I_2 \rightleftharpoons 2HI$ $K=54.3$
C. $A + 2B \rightleftharpoons 2C$ $K=1$ **D.** all of them