B. Choose the correct alternatives: 2 marks

1. The equilibrium constant for the reaction

$NH_4NO_2(s) \rightleftharpoons N_2(g) + 2H_2O(g)$, is given by –

(a) $\frac{[NH_4NO_2]}{[N_2][H_2O]^2}$ (b) $[N_2][H_2O]^2$

(c) $\frac{[N_2][H_2O]}{[NH_4NO_2]}$ (d) $\frac{[N_2][2H_2O]^2}{[NH_4NO_2]^2}$

2. In which of the following reactions the equilibrium constant will have no units of concentration?

(a) $NO(g) \rightleftharpoons \frac{1}{2}N_2(g) + \frac{1}{2}O_2(g)$

(b) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

(c) $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$

(d) In all the above reaction

3. The equilibrium constant for a reaction $A + 2B \rightleftharpoons 2C$ is 40. The equilibrium constant for reaction $C \rightleftharpoons B + 1/2\ A$ is –

(a) $\frac{1}{40}$ (b) $\left(\frac{1}{40}\right)^{\frac{1}{2}}$

(c) $\left(\frac{1}{40}\right)^2$ (d) 40

4. The equilibrium constant. K for the reaction : $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$ at room temperature is 2.85 and that of 698 K is 1.4×10^{-2}. This implies that the forward reaction is –

(a) Exothermic (b) Endothermic

(c) Exergonic (d) Unpredictable

5. For reaction

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

The value of K_p changes with –

(a) Catalyst

(b) Temperature

(c) Amounts of H_2 and I_2

(d) All the above factors

6. The equilirium constant for a reaction $A + B \rightleftharpoons C + D$ is 1×10^{-2} at 298 K and is 2 at 373 K.

The chemical process resulting in the formation of C and D is –

(a) exotermic

(b) endothermic

(c) unpredictable

(d) there is no relationship between K and ΔH.

7. In which of the following reaction K_p and K_c are equal –

(a) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

(b) $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

(c) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

(d) $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$

8. For the reaction

$2SH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$

the units of K_p will be –

(a) atm (b) $(atm)^3$

(c) $(atm)^{-2}$ (d) $(atm)^2$

9. For a gaseous reaction

$xA + yB \rightleftharpoons lC + mD$

(a) $K_p = K_c$

(b) $K_p = (K_c)^{l+m}$

(c) $K_p = (K_c)^{(l+m)-(x+y)}$

(d) $K_p = \frac{1}{K_c}$

10. For an hypothetical reaction of the kind
$AB_2(g) + \frac{1}{2}B_2(g) \rightleftharpoons AB_3(g)$;
$\Delta H = -xkJ$
More AB_3 could be produced at equilibrium by–
(a) using a catalyst
(b) removing some of B_2
(c) increasing the temperature
(d) increasing the pressure

11. Le-Chatellier principle is not applicable to–
(a) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
(b) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(c) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
(d) $Fe(s) + S(s) \rightleftharpoons FeS(s)$

12. The solubility of CO_2 in water increases with–
(a) increase in temperature
(b) reduction of gas pressure
(c) increase in gas pressure
(d) increase in volume

13. XY_2 dissociates as
$XY_2(g) \rightleftharpoons XY(g) + Y(g)$
when the initial pressure of XY_2 is 600 mm per square the total equilibrium pressure is 800 mm per square. Calculate K for the reaction assuming that the volume of the system remains unchanged–
(a) 50 (b) 100
(c) 166.6 (d) 400

14. For the equilibrium system
$2HX(g) \rightleftharpoons H_2(g) + X_2(g)$
the equilibrium constant is 1.0×10^{-3}. What is the equilibrium concentration of HX if the equilibrium concentrations of H_2 and X_2 and 1.2×10^{-3} M and 1.2×10^{-4} respectively?
(a) 12×10^{-4} M (b) 12×10^{-3} M
(c) 12×10^{-2} M (d) 12×10^{-3} M

15. For the reactions
$A \rightleftharpoons B$; $K_c = 1$
$B \rightleftharpoons C$; $K_c = 2$
$C \rightleftharpoons D$; $K_c = 3$
K_c for the reaction $A \rightleftharpoons D$ is–
(a) 5 (b) 6
(c) 15 (d) 1

16. Vapour density of PCl_5 is 104.16 but when heated to 230°C its vapour density is reduced to 62. The degree of dissociation of PCl_5 at this temperature will be–
(a) 6.8% (b) 68%
(c) 46% (d) 64%

17. In the following euilibria
I. $A + 2B \rightleftharpoons C$; $K_{eq} = K_1$
II. $C + D \rightleftharpoons 3A$; $K_{eq} = K_2$
III. $6B + D \rightleftharpoons 2C$; $K_{eq} = K_3$
Hence–
(a) $3K_1 + K_2 = K_3$
(b) $K_1^3 \cdot K_2^2 = K_3$
(c) $3K_1 + K_2^2 = K_3$
(d) $K_1^2 \cdot K_2 = K_3$

18. Naphthalene, a white solid used to make mothballs, has a vapour pressure of 0.10 mmHg at 27°C. Hence, K_p and K for the equilibrium are:
$C_{10}H_8(s) \rightleftharpoons 2NO_2(g)$
K_p is found to be equal to K_c. This is attained when–
(a) T = 1 K (b) T = 12.8 K
(c) T = 27.3 K (d) T = 273 K

19. For the following gaseous equilibrium X, Y and Z at 300 K
X : $2SO_2 + O_2 \rightleftharpoons 2SO_3$
Y : $PCl_5 \rightleftharpoons PCl_3 + Cl_2$
Z : $2BI \rightleftharpoons H_2 + I_2$
ratio of K_p and K_c in the increasing order is–
(a) X = Y = Z (b) X < Y < Z
(c) X < Z < Y (d) Z < Y < X

Multiple Choice Questions

A. Choose the correct alternative : 1 mark

1. Which of the following statements is correct?
   (a) All ores are minerals.
   (b) All minerals are ores.
   (c) A mineral cannot be an ore.
   (d) An ore is always obtained in pure form.
2. The impurities present in a mineral are called–
   (a) gangue (b) flux
   (c) froth (d) nuggets
3. Nuggets are–
   (a) sulphide ores
   (b) oxide ores
   (c) lumps of pure metal
   (d) silicates
4. Which of the following is sulphide ore?
   (a) Argentite
   (b) Cuprite
   (c) Azurite
   (d) Cerussite
5. Which of the following is a carbonate ore?
   (a) Copper pyrite
   (b) Anglesite
   (c) Cerussite
   (d) Mica
6. Calamine is an ore of–
   (a) magnesium (b) calcium
   (c) lead (d) zinc
7. Which of the following is a fluoride ore?
   (a) Cryolite (b) Carnallite
   (c) Feldspar (d) Ilmenite
8. The ore of calcium which contains phosphorus is–
   (a) gypsum
   (b) talc
   (c) fluorapatite
   (d) asbestos
9. Which of the following ores is a silicate one?
   (a) Mica (b) Beryl
   (c) Willemite (d) All of these
10. In the aluminothermic process, aluminium acts as–
    (a) an oxidizing agent
    (b) a reducing agent
    (c) a flux
    (d) a solder
11. Which of the following metals is refined by the Van Arkel process?
    (a) Au (b) Cu
    (c) Ni (d) Ti
12. Which of the following represents the thermite reaction?
    (a) $Mn_3O_4 + Al \rightarrow Mn + Al_2O_3$
    (b) $MgCO_3 + SiO_2 \rightarrow MgSiO_3 + CO_2$
    (c) $Cu_2S + Cu_2O \rightarrow Cu + SO_2$
    (d) $Fe_2O_3 + CO \rightarrow Fe + CO_2$
13. Which of the following ligands is used to form the complex from which silver is extracted?
    (a) NaCNS (b) NH_3
    (c) NaCN (d) NaCNO
14. Roasting is carried out in–
    (a) a muffle furnace
    (b) an electroic furnace
    (c) a reverberatory furnace
    (d) a blast furnace

15. The liquation process is used for the purification of—
(a) Sn (b) Al
(c) Zn (d) Hg

16. The distillation process (under reduced pressure) is used for the purificaiton of—
(a) Pb (b) Hg
(c) Sn (d) Cs

17. Which of the following minerals contains calcium as well as magnesium?
(a) Tridymite (b) Argonite
(c) Dolomite (d) Carnallite

18. Silicon is the main constituent of—
(a) rocks (b) alloys
(c) animals (d) plants

19. Which of the following mixtures is called matter?
(a) $CuO + Cu_2S$ (b) $PbS + PbSO_4$
(c) $Cu_2S + FeO$ (d) $Cu_2S + FeS$

20. Blister copper is obtained in—
(a) Bessemer converter
(b) Blast furnace
(c) muffle furnace
(d) reverberatory furnace

B. Choose the correct alternatives: 2 marks

1. Which of the following statements is incorrect in the context of minerals?
(a) Naturally occurring crystal bodies consisting of compounds of metals which are formed as a result of physical and chemical processes are called minerals.
(b) Minerals are always a single compound and have a definite composition.
(c) Minerals from which metals can be conveniently & economically extracted are known as ores.
(d) All ores are minerals but all minerals are not ores.

2. Concentration of ores is not done by the—
(a) gravity separation process
(b) electromagnetic separation process
(c) froth-floatation process
(d) roasting process

3. Sulphide ores are generally concentrated by the—
(a) gravity separation process
(b) calcination process
(c) froth-floatation process
(d) carbon-reduction process

4. In the froth-floatation process, the ore particles float because—
(a) they are light
(b) their surface is not easily wetted by water
(c) they bear electrostatic charge
(d) they are insoluble

5. Of the following metals, the one which cannot be obtained by the electrolysis of the aqueous solution of its salt is—
(a) Ag (b) Mg
(c) Cu (d) Hg

6. The electrometallurgical process (electrolysis of fused salts) is employed to extract—
(a) lead (b) silver
(c) sodium (d) copper

7. In the forth-flotation process, the sulphide ores are concentrated by mixing the ore with—
(a) water, pine oil and sodium ethylxanthate
(b) water, wax and benzene
(c) water, benzene and sodium ethyl xanthate
(d) water, matrix and air