CHEMISTRY

1. Predict expression for α in terms of K_{eq} and concentration C :

$A_2B_3\ (aq) \rightleftharpoons 2A^{3+}(aq) + 3B^{2-}\ (aq)$

(1*) $\left(\frac{K_{eq}}{108C^4}\right)^{1/5}$ (2) $\left(\frac{K_{eq}}{5C^4}\right)^{1/5}$ (3) $\left(\frac{4K_{eq}}{5C^4}\right)^{1/5}$ (4) $\left(\frac{9K_{eq}}{5C^4}\right)^{1/5}$

Sol. $A_2B_3\ (aq) \rightleftharpoons 2A^{3+}(aq) + 3B^{2-}\ (aq)$

C

$C(1-\alpha)$ $2C\alpha$ $3C\alpha$

$$K_{eq} = \frac{(2C\alpha)^2(3C\alpha)^3}{C}$$

$$K_{eq} = 108C^4\alpha^5$$

$$\alpha = \left(\frac{K_{eq}}{108C^4}\right)^{1/5}$$

2. Radius of first orbit of hydrogen atom is 51 pm. Determine the radius of 5^{th} orbit of Li^{2+}

Ans. 425 pm

Sol. $r_H = 51$ pm

$$(r_{H^{2+}})_5 = (r_H)_1 \times \frac{n^2}{Z} = 51 \times \frac{5^2}{3} = 425 \text{ pm}$$

3. How many moles of $Ba_3(PO_4)_2$ will be formed by the reaction of 5 moles of $BaCl_2$ and 3 moles of $Na_3(PO_4)$.

Ans. $\frac{5}{3}$

Sol. $3\ BaCl_2 + 2Na_3\ PO_4 \longrightarrow Ba_3(PO_4)_2 + 6NaCl$

5 mole 3 mole

Moles of $Ba_3(PO_4)_2 = \frac{5}{3}$

4. In which of the following pairs of elements electron gain enthalpy difference is highest ?

(1) Cl, Ar (2) Cl, Ne (3) F, Ar (4) F, Ne

Ans. **(2)**

Sol. Chlorine has most negative ΔH_{eg} (–349 kJ/mole) whereas Neon has most positive ΔH_{eg} (116 kJ/mole)

5. In an ionic solid element Y crystallises in ccp lattice and element X occupy $\frac{1}{3}^{rd}$ of tetrahedral void.

Find formula of ionic solid.

Ans. X_2Y_3

Sol. For 1 unit cell,

No. of particles

X $\frac{1}{3} \times 8$

Y 4

$\therefore$ Formula of Ionic solid = $X_{8/3}Y_4 = X_2Y_3$

6. The value of $\log_{10}K$ for a reaction $A \rightleftharpoons B$ is

(Given $\Delta H^\circ_{298K} = -54.67\ kJmol^{-1}$

$\Delta S^\circ_{298K} = 10\ kJmol^{-1}$

and $R = 8.314\ JK^{-1}mol^{-1}$

$2.303 \times 8.314 \times 298 = 5705$)

Ans. **10**

Sol. $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$

$= -54.07 \times 1000 - 298 \times 10$

$= -57050$

$\Delta G^\circ = -2.303\ RT\log_{10}K$

$\log K = 10$

7. Determine the amount of urea (NH_2CONH_2) to be added in 1000 g of water to decrease its vapour presssure by 25%.

Sol. $\frac{P^\circ - P_S}{P^\circ} = \frac{n}{N+n} = \frac{1}{4}$

$\Rightarrow$ $4n = N + n$

$$n = \frac{N}{3} = \left(\frac{1000}{18}\right) \times \frac{1}{3}$$

$\therefore$ Amount of urea is $\frac{(1000)}{18 \times 3} \times 60 = \frac{10000}{9}$ gm

$\approx$ 1111.1 gram

8. Which of the following slows down the process of setting of the cement ?

Ans. **Gypsum**

9. Number of ambidentate ligands in given complex $[M(en)(SCN)_4]$:

Ans. **4**

Sol. SCN^- is an ambidentate ligand S & N both are donor atom.

10. $2[Au(CN)_2]^- + Zn \longrightarrow [Zn(CN)_4]^{2-} + 2Au\downarrow$

(A) Redox reaction (C) Displacement reaction

(B) Combination reaction (D) Decomposition reaction

(1*) A & B (2) B only (3) A & D (4) B & D

Sol. $2[Au(CN)_2]^- + Zn \longrightarrow [Zn(CN)_4]^{2-} + 2Au\downarrow$

It is a redox, displacement reaction.

11. A $\Rightarrow$ Spin only magnetic moment of $[Fe(CN)_6]^{-3}$ is 1.73 B.M. and $[Fe(H_2O)_6]^{+3}$ is 5.92 B.M.

R $\Rightarrow$ In both cases Fe have +3 oxidation state

Ans. Both A & R are correct but R is not the correct explanation

Sol. $[Fe(CN)_6]^{-3}$: Fe^{+3} : $3d^5$ with S.F.L

$\Rightarrow$ n = 1

Magnetic moment = 1.73 B.M

$[Fe(H_2O)_6]^{+3}$ Fe^{+3} : $3d^5$ with W.F.L

$\Rightarrow$ n = 5

Magnetic moment = 5.92 B.M

12. Assertion: Radius of H^+ is 1.5×10^{-3} pm

Reason: H^+ cannot exist independently

Sol. Both assertion and reason are correct but reason is not a correct explanation of assertion.

13. Oxidation number of Mo in Ammonophosphomolybdate

Ans. **6**

Sol. $(NH_4)_3PMo_{12}O_{40}$ or $(NH_4)_3PO_4.12MoO_3$

$+3 + 5 + 12x - 80 = 0$

$12x = 80 - 8$

$12x = 72$

$x = 6$

14. Which of following are reducing and oxidising agent respectively.

(1) Eu^{+2}, Ce^{+4} (2) Ce^{+3}, Ce^{+4}

(3) Eu^{+4}, Eu^{+2} (4) Tb^{+2}, Ce^{2+}

Ans. **(1)**

Sol. $Eu^{2+} \longrightarrow Eu^{3+} + e^-$

$Eu^{2+} \longrightarrow$ Good reducing agent

$e^- + Ce^{4+} \longrightarrow Ce^{3+}$

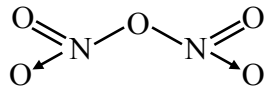
Ce^{4+} is a good oxidising agent

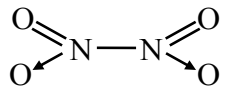
15.

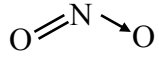
Column-I	**Column-II**
(P) N_2O_5	(i) N–N bond
(Q) N_2O	(ii) N–O–N bond
(R) N_2O_4	(iii) N=N / N≡N bond
(S) NO_2	(iv) N=O bond

Ans. P – (ii), Q – (iii), R – (i), S – (iv)

Sol.





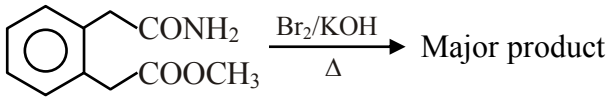


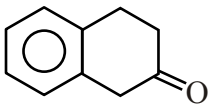
16. Polymer which is named as orlon

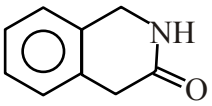
(1) Polyamide (2) Polyacrylonitrile

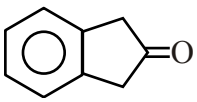
(3) Polycarbamate (4) Polyethene

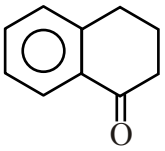
Ans. **(2)**

17. 

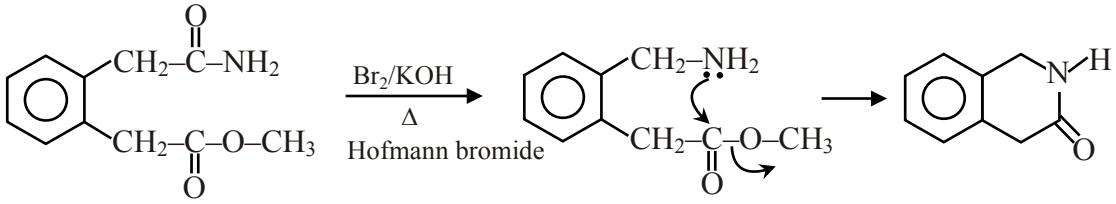
(1) 

(2) 

(3) 

(4) 

Ans. **(2)**

Sol. 

18.

Column I	**Column II**
(i) Vitamin A	(a) Beri-beri
(ii) Vitamin C (Ascorbic acid)	(b) Cheilosis
(iii) Riboflavin	(c) Xerophthalmia
(iv) Thiamine	(d) Scurvy

(1) i→c, ii→d, iii→a, iv→b (2) i→c, ii→d, iii→b, iv→a

(3) i→d, ii→c, iii→b, iv→a (4) i→c, ii→b, iii→d, iv→a

Ans. **(2)**

19. Photochemical smog found mainly in

(1) Industrial area (2) Marshy place

(3) Hilly area of Himachal (4) Cold humid climate

Ans. **(1)**

20. **Column I (Chemical reactions)** **Column II (Enzymes used)**

(i) Glucose $\rightarrow CO_2$ + Ethanol (a) Pepsin

(ii) Sucrose $\rightarrow$ Glucose + Fructose (b) Diastase

(iii) Starch $\rightarrow$ Maltose (c) Zymase

(iv) Protein $\rightarrow$ Amino acids (d) Invertase

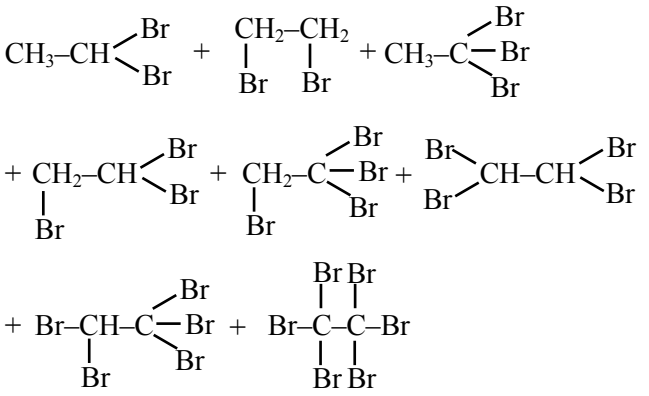
(1) i$\rightarrow$c, ii$\rightarrow$d, iii$\rightarrow$b, iv$\rightarrow$a (2) i$\rightarrow$d, ii$\rightarrow$c, iii$\rightarrow$b, iv$\rightarrow$a

(3) i$\rightarrow$c, ii$\rightarrow$d, iii$\rightarrow$a, iv$\rightarrow$b (4) i$\rightarrow$c, ii$\rightarrow$b, iii$\rightarrow$d, iv$\rightarrow$a

Ans. **(1)**

21. How many bromo products are formed when ethane is reacted with excess of Br_2 on heating?

Ans. **(9)**

Sol. $CH_3–CH_3 \xrightarrow{Br_2/h\nu} CH_3–CH_2–Br +$ 

22. Match the following with the correct name of reaction

(I) $CH_3–COOH \xrightarrow{\text{Red-P} + Br_2}$ (P) Gattermann Koch reaction

(II) $CH_3–\underset{\underset{O}{\|}}{C}–CH_3 \xrightarrow{NaOI}$ (Q) Hell Volhard Zelinsky

(III)  $\xrightarrow{CO + HCl + AlCl_3}$ (R) Iodoform reaction

(1) (I) $\rightarrow$ (Q), (II) $\rightarrow$ (R), (III) $\rightarrow$ (P)

(2) (I) $\rightarrow$ (R), (II) $\rightarrow$ (Q), (III) $\rightarrow$ (P)

(3) (I) $\rightarrow$ (Q), (II) $\rightarrow$ (P), (III) $\rightarrow$ (R)

(4) (I) $\rightarrow$ (P), (II) $\rightarrow$ (Q), (III) $\rightarrow$ (R)

Ans. **(1)**

23. $CH_3CH_2–Br \xrightarrow[\text{Acetone}]{NaI} CH_3–CH_2–I + NaBr$

Which of the following statement is correct ?

(1) Acetic acid solvent can take in above reaction.

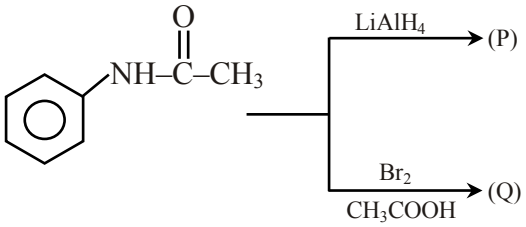
(2) NaI is soluble in acetone but NaBr is precipitate in acetone

(3) NaI is precipitated in acetone but NaBr is soluble in acetone

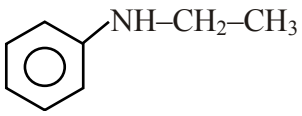
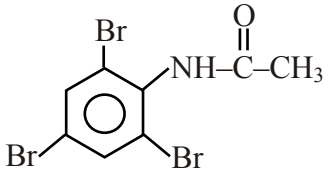
(4) When acetone is taken in solvent transition state is highly polar

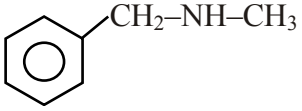
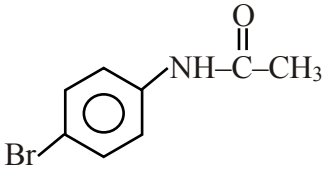
Ans. (2)

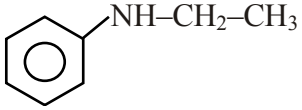
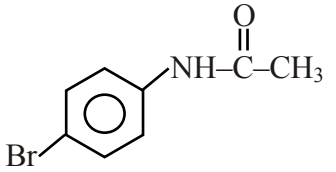
24.

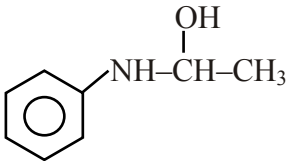
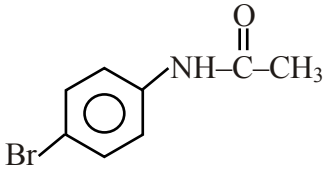


Product (P) and (Q) are respectively

(1)  and 

(2)  and 

(3)  and 

(4)  and 

Ans. (3)