CHEMISTRY

1. Name of the polymer which is named as orlon is

(1) Polyamide (2) Polycarbonate (3) Polyacrylonitrile (4) Polyethene

Ans. (3)

2. If radius of hydrogen in ground state is 51 pm, find out the radius of fifth orbit of Li^{2+} ions

Ans. 425

Sol. $R_0 = 0.059 \times \frac{n^2}{Z}$ $\begin{pmatrix} n=1 \\ z=1 \end{pmatrix}$

$[r_0 = 0.059 \times]$

$\left(r_n \propto \frac{n^2}{Z}\right)$ $r_n = k\,\frac{n^2}{Z}$ $\begin{pmatrix} n=1 \\ Z=1 \end{pmatrix}$

$\phi 51 = \frac{k \times (1)^2}{(4)}$

$k = 51$

$\left(r_n\right)_{li^{2t}} = k\left(\frac{(5)^2}{3}\right)$ $\begin{bmatrix} n=5 \\ Z=3 \end{bmatrix}$

$= 51 \times \frac{25}{3}$

$= 17 \times 25$

$\left(r_{5^{th}}\right)_{li^{2t}} = 425$ pm

3. In a compound, atoms of element Y form ccp lattice and those of element X occupy 1/3rd of tetrahedral voids. The formula of the compound will be :

Ans. X_2Y_3

Sol. $y = 4\left(8 \times \frac{1}{8} + \frac{6 \times 1}{2}\right) = 4$

$x = \frac{8}{3}$

4. **Assertion :** In a complex, $[Fe(H_2O)_6]^{+2}$ the magnetic moment is 5.92 BM and in $[Fe(CN)_6]^{3-}$ magnetic moment is 1.73 BM

Reason : In both the complex compound iron is in +3 oxidation state

In the light of the above statements. Choose the correct answer from the options given below

(1) Both A and R are true and R is the correct explanation of A

(2) Both A and R are true but R is NOT the correct explanation of A

(3) A is true but R is false

(4) A is false but R is true

Ans. (2)

5. **Match the column:**

Column-I	**Column-II**
(A) Vitamin A	(P) Xerophthalmia
(B) Riboflavin	(Q) Beri-Beri
(C) Ascorbic Acid	(R) Scurvy
(D) Thiamine	(S) Cheilosis

(1) (A)-(P); (B)-(S); (C)-(R); (D)-(Q) (2) (A)-(Q); (B)-(P); (C)-(P); (D)-(S)
(3) (A)-(R); (B)-(Q); (C)-(S); (D)-(P) (4) (A)-(P); (B)-(Q); (C)-(R); (D)-(S)

Ans. (1)

6. Photochemical smog found mainly in
(1) Industrial area (2) Marshy place
(3) Hilly area of Himachal (4) Cold humid climate

Ans. (1)

7. $A_2B_3 \rightleftharpoons 2A^{3+} + 3B^{2-}$

If equilibrium constant is K, then find the degree of dissociation α.

Ans. $\left[\frac{K}{(108C^4)}\right]^{1/5}$

Sol. $A_2B_3 \rightleftharpoons 2A(g) + 3B(g)$

C

$C-C\alpha \quad 2C\alpha \quad 3C\alpha$

$$K_{eq} = \frac{(2C\alpha)^2(3\alpha)^3}{C - C\alpha} \Rightarrow \frac{4C^2\alpha^2 \times 27C^3\alpha^3}{C(1-\alpha)}$$

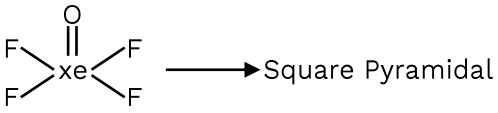
$1 - \alpha = 1$

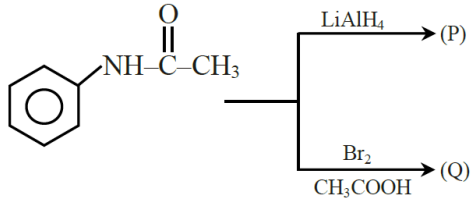
$$k = \frac{108C^4\alpha^5}{1}$$

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

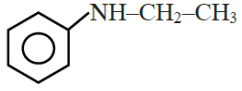
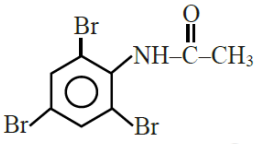
8. Which of the following has square pyramidal shape :
(1) $XeOF_4$ (2) BrF_3 (3) XeF_4 (4) XeO_3

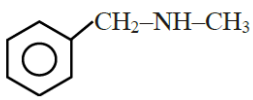
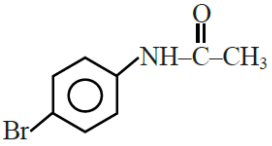
Ans. (1)

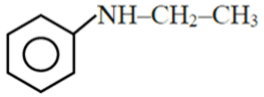
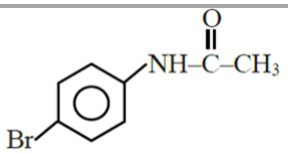
Sol.  → Square Pyramidal

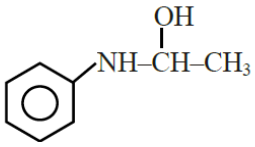
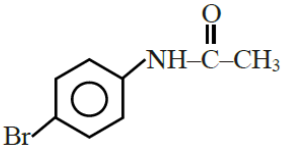
9. 

Product (P) and (Q) are respectively

(1)  and 

(2)  and 

(3)  and 

(4)  and 

Ans. (3)

10. Among Ne, F, Cl, Ar which element have highest difference between electron gain enthalpy

(1) Ne–Cl (2) Ne–Ar (3) Ne–F (4) F–Cl

Ans. (1)

11. The correct set of strong oxidising and reducing agent

Ce^{4+}, Yb^{2+}, Tb^{4+}, Eu^{2+}

(1) Ce^{4+} & Eu^{+2} (2) Yb^{+2} & Tb^{4+} (3) Ce^{4+} & Yb^{+2} (4) Tb^{4+} & Eu^{+2}

Ans. (1)

12.

Column-I **Name Reaction**	**Column-II** **Reagents**
(A) Etard Reaction	(P) NaOCl
(B) Iodoform Reaction	(Q) CO/ HCl, Anhy. $AlCl_3$
(C) Gatterman Reaction	(R) CrO_2Cl_2, CS_2, H_3O^+
(D) HVZ Reaction	(S) X_2/Red P, H_2O

(1) (A)-(R); (B)-(P); (C)-(Q); (D)-(S) (2) (A)-(P); (B)-(S); (C)-(Q); (D)-(R)

(3) (A)-(Q); (B)-(R); (C)-(S); (D)-(P) (4) (A)-(P); (B)-(Q); (C)-(S); (D)-(R)

Ans. **(1)**

13.

Column-I **Compound**	**Column-II** **Type of Bond**
(A) N_2O	(P) N—N Bond
(B) N_2O_4	(Q) N—O—N Bond
(C) N_2O_5	(R) N=O Bond
(D) NO_2	(S) N=N or N≡N Bond

(1) (A)-(S); (B)-(P); (C)-(Q); (D)-(R) (2) (A)-(S); (B)-(R); (C)-(Q); (D)-(P)

(3) (A)-(Q); (B)-(R); (C)-(P); (D)-(S) (4) (A)-(R); (B)-(S); (C)-(P); (D)-(Q)

Ans. (1)

14. Which of the following is used for setting of cement

(1) Gypsum (2) Clay (3) Lime Stone (4) Sillica

Ans. (1)

15. We are given with the reaction

$R—CH_2—Br + NaI \xrightarrow{Acetone} RI + NaBr$

(1) This reaction is called Swarts reaction.

(2) This reaction can also take place in acetic acid

(3) This reaction will take place even if Br is replaced with F

(4) This reaction shifts in forward direction using the principle of Le – Chatelier's principle

Ans. (4)

16. Which of the reaction is correct among the following with appropriate enzyme?

(1) Sucrose $\longrightarrow$ Glucose + Fructose : Enzyme – Invertase

(2) Glucose $\longrightarrow$ CO_2 + Ethanol : Enzyme – Maltase

(3) Protein $\longrightarrow$ Aminoacid : Enzyme – Zymase

(4) Starch $\longrightarrow$ Maltose : Enzyme – Pepsin

Ans. (1)

17. Compound "P" with molecular formula $C_{14}H_{13}ON$ is hydrolysed to give 'Q' and 'R'. Compound 'Q' gives effervescence with $NaHCO_3$ while compound R react with Hinsberg reagent to give oily liquid which react with NaOH.

P $\longrightarrow$	Q	+	R
	Give Effervescence With $NaHCO_3$		React with Hinsberg reagent

Find the products Q and R respectively;

(1) C_6H_5COOH and $C_6H_{13}NH_2$

(2) C_6H_5COOH and $C_6H_5CH_2NH_2$

(2) $CH_3(CH_2)_4COOH$ and $CH_3(CH_2)_6NH_2$

(4) $CH_3(CH_2)_4CONH_2$ and $CH_3(CH_2)_5COOH$

Ans. (2)

18. According to Bohr's atomic theory:

(A) Kinetic energy of electron is $\propto \frac{z^2}{n^2}$

(B) The product of velocity (v) of electron and principle quantum number of 'vn' $\propto Z^2$

(C) Frequency of revolution of electron in an orbit is $\propto \frac{z^3}{n^3}$

(D) Coulombic force of attraction of on the electron is $\propto \frac{z^3}{n^4}$

Choose the most appropriate answer from the options give below.

(1) (A), (C) and (D) only

(2) (A) only

(3) (C) only

(4) (A) and (D) only

Ans. (4)

Sol. $K.E = -T.E = 13.6 \frac{z^2}{42}$

$n \times v = v_0 \times \frac{z}{n} \times n$

$nv \propto \alpha z$

$f = k\frac{q_1q_2}{r^2}$

$= k\frac{(Ze)(e)}{\left(r_0\frac{n^2}{z}\right)}$

$$\text{if} = \frac{v}{2\pi R} = \frac{v_0 \frac{Z}{n}}{2\pi v_0 \times \frac{n^2}{z}}$$

$$\text{force} \propto \frac{z^3}{n^4} \; ; f \propto \frac{z^2}{n^3}$$

19. An ideal gas is allowed to expand form 1 L to 10 L against a constant external pressure of 1 bar. The work done in kJ is:

(1) +10.0 (2) −0.9 (3) −2.0 (4) −9.0

Ans. (2)

Sol. w = −(9) × 0.1 = − 0.9 kJ

20. The number of radial and angular nodes in 4d-orbital are respectively

(1) 1 and 2 (2) 3 and 2 (3) 1 and 0 (4) 2 and 1

Ans. (1)

Sol. 4d

(n − l − 1) = radial node

4 − 2 − 1 = 1

l = 2

21. Some amount of urea is added to 1000 gm of H_2O due to which the vapour pressure decreases by 25% of the original vapour pressure. Find out the mass of urea added (Round off 2 decimal places)

Ans. **1111.11**

Sol. $\frac{P^o - P}{P^o} = X_{solute}$

$\frac{P^o - P}{P^o} = \frac{n}{n+N}$ (n = mole of solute, N = mole of solvent)

$$\frac{100-75}{100} = \frac{\frac{W}{60}}{\frac{W}{60} + \frac{1000}{18}}$$

$$\frac{1}{4} = \frac{W}{60\left(\frac{W}{60} + \frac{1000}{18}\right)}$$

$$W + \frac{1000 \times 60}{18} = 4W$$

$$\frac{1000 \times 60}{18} = 3W$$

W = 1111.11 gm

22. Match column-I (Compound) with column-II final product obtained during their qualitative analysis)

Column-I		Column-II	
(A)	Nitrogen	(P)	AgX
(B)	Sulphur	(Q)	$(NH_4)_3PO_4.12\ MoO_3$
(C)	Phosphorous	(R)	$Fe(SCN)_3$
(D)	Halogens	(S)	$Fe_4[Fe(CN)_6]_3$

(1) A → P; B → R; C → Q, D → S (2) A → R; B → P; C → Q, D → S

(3) A → S; B → R; C → Q, D → P (4) A → Q; B → R; C → P, D → S

Ans. **(3)**

23. Find log k, if $\Delta H^\circ = -54.07$ kJ/mol & T = 298 K, ΔS° = 10 J/mol K.

Also given 2.303 × 298 = 5705.

Ans. **1.2**

Sol. $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$ .....(1)

$\Delta G^\circ = -RT \ln k$

$\Delta G^\circ = -2.303\ RT \log K$.....(2)

From eq. (1) & (2)

$-2.303\ RT \log K = \Delta H^\circ - T\Delta S^\circ$

$$-2.303 \times 8.314 \times 298 \log K = \frac{-54.07 - 2.98 \times 10}{1000}$$

Log K = 1.2

24. Oxidation state of Mo in Ammonium Phosphomolybdate is:

Ans. **6**

Sol. $(NH_4)_3PO_4.12MoO_3$

3(+1) + (−3) + 12x + 36 (−2) = 0

x = +6