PART : CHEMISTRY

1. If the radius of hydrogen atom is 51 pm then what will be the radius of 5th orbit of Li^{2+} (in pm) ? (Report your answer to the nearest integer).

Ans. **(425)**

Sol. $r_H = 51$ pm

$$r_{Li^{+2}} = \frac{r_H \times n^2}{Z} = \frac{51 \times 5^2}{3} = 17 \times 25 = 425 \text{ pm}$$

2. If X forms CCP and Y occupy $\frac{1}{3}$ of octahedral voids then what will be the formula of the compound ?

(1) XY_3 (2) X_2Y_3 (3) X_3Y (4) X_3Y_2

Ans. **(3)**

Sol. Number of X atom = 4

Number of Y atom = $4 \times \frac{1}{3} = \frac{4}{3}$

Formula of compound $(X_4Y_{4/3}) \times \frac{3}{4} = X_3Y$

3. What is the Oxidation state of Mo in ammonium phosphomolybdate ?

Ans. **(6)**

Sol. the Oxidation state of Mo in ammonium phosphomolybdate = + 6

$(NH_4)_3PO_4.12MoO_3$

4. Find log K_{eq} value for a reaction for which $\Delta H^\circ = -54.07$ KJ/mol and $\Delta S^\circ = 10$ J/K at T = 293K

Given : 2.303 RT = 5610 (Report your answer in to nearest integer)

Ans. 10

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

$\Delta G^\circ = -54070 - 293 \times 10 = -57000$ J

$\Delta G^\circ = -2.303\ RT \log K_{eq}$

$-57000\ J = -5610 \log K_{eq}$

$\log K_{eq} = 10.16 = 10$

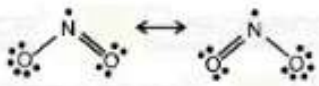
5. Match the following

	List-I (species)		List-II (type of bond)
(A)	NO_2	(P)	N – N
(B)	N_2O	(Q)	N = O
(C)	N_2O_4	(R)	N – O – N
(D)	N_2O_5	(S)	N = O / N = N

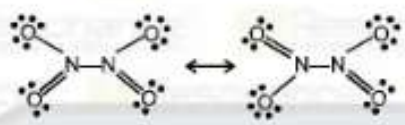
	(A)	(B)	(C)	(D)
(1)	Q	S	P	R
(2)	P	R	Q	S
(3)	Q	S	R	P
(4)	S	P	Q	R

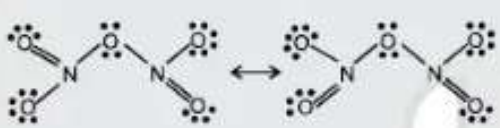
Ans. **(1)**

Sol.

NO_2 

N_2O 

N_2O_4 

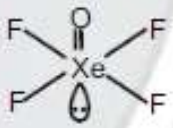
N_2O_5 

6. Which of the following have square pyramidal structure :

(1) $XeOF_4$ (2) BrF_3 (3) XeF_4 (4) XeO_3

Ans. **(1)**

Sol.

(1) $XeOF_4$  (Square pyramidal)

(2) BrF_3  (T-shape)

(3) XeF_4  (Square planner)

(4) XeO_3  (Pyramidal)

7. For a reversible reaction

$A_2B_3\,(g) \rightleftharpoons 2A\,(g) + 3B\,(g)$ the initial concentration of A_2B_3 is C mol/L and equilibrium constant of the reaction is K, then degree of dissociation (α) is :

(1) $\alpha = \left[\frac{K}{108\,C^4}\right]^{1/5}$ (2) $\alpha = \left[\frac{108\,C^4}{K}\right]^{1/5}$

(3) $\alpha = \left[\frac{K}{27\,C^4}\right]^{1/5}$ (4) $\alpha = \left[\frac{4\,C^2}{K}\right]^{1/3}$

Ans. **(1)**

Sol.

	A_2B_3	$\rightleftharpoons$	$2A$	+	$3B$
Initial conc.	C		0		0
	$C - C\alpha$		$2C\alpha$		$3C\alpha$

$$K = \frac{(2C\alpha)^2(3C\alpha)^3}{(C - C\alpha)}$$

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

$$\alpha = \left[\frac{K}{108C^4}\right]^{1/5}$$

8. Total number of ambidentate ligand in the complex $[Co(en)(SCN)_4]^{-1}$ is

Ans. **(4)**

Sol. SCN^- is an ambidentate ligand.

9. Amongst the following select the best oxidising & reducing agent respectively :

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

Ans. **(3)**

Sol. $(E^0_{Ce^{+4}/Ce^{+3}})_{RP} = 1.74$ V

Eu^{+2} is a strong reducing agent changing to common oxidation state + 3.

10. **Assertion** : Magnetic moment of $[Fe(H_2O)_6]^{+3}$ is 5.92 BM and that of $[Fe(CN)_6]^{-3}$ is 1.73 BM

Reason : Oxidation state of Fe in both the complexes is +3

(1) Both **Assertion** and **Reason** are correct and **Reason** is the correct explanation of **Assertion**.

(2) Both **Assertion** and **Reason** are not correct and **Reason** is the correct explanation of **Assertion**.

(3) **Reason** is correct and **Assertion** is not correct

(4) **Assertion** is correct and **Reason** is not correct

Ans. **(2)**

Sol. In $[Fe(H_2O)_6]^{+3}$, H_2O is a weak field ligend so configuration of Fe^{+3} is $t_{2g}^{1,1,1}$, $e_g^{1,1}$

so number of unpaired electron are 5 and magenetic momentum is 5.92 BM

In $[Fe(CN)_6]^{-3}$, CN^- is a weak field ligend so configuration of Fe^{+3} is $t_{2g}^{2,2,1}$, $e_g^{0,0}$

so number of unpaired electron are 1 and magenetic momentum is 1.73 BM

11. Which substance is added in cement for increase in setting time of cement

(1) silica (2) clay (3) gypsum (4) lime stone

Ans. **(3)**

Sol. The purpose of adding gypsum is only to slow down the process of setting of the cement so that it gets sufficiently hardened.

12. For which of the following pair of elements have maximum difference in value of electron gain enthalpy (ΔHeg)

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

Ans. **(1)**

Sol. Cl has maximum –ve ΔHeg and Ne has most +ive ΔHeg hence difference will be maximum for Ne and Cl.

Element	ΔHeg (KJ/mole)
F	–333
Cl	–349
Ne	+48
Ar	+116

13. When 5 mole of $BaCl_2$ mixed with 2 mole of Na_3PO_4 then Maximum Number of mole of $Ba_3(PO_4)_2$ are formed.

Ans. **1.00**

Sol. $3BaCl_2 + 2Na_3PO_4 \longrightarrow Ba_3(PO_4)_2 + 6NaCl$

inicial mole 5 2

L.R. $\frac{5}{3} = 1.67$ $\frac{2}{2} = 1$ (L.R. = Na_3PO_4)

$$\frac{\text{mole}\,Na_3PO_4}{2} = \frac{\text{mole}\,Ba_3(PO_4)_2}{1}$$

maximum number of mole of $Ba_3(PO_4)_2 = \frac{2}{2} = 1$ mole

14. $2Na[Ag(CN)_2]_{aq} + Zn(s) \longrightarrow Na_2[Zn(CN)_4]_{aq} + 2Ag(s)$ the given reaction is an example of

(I) Redox reaction
(II) Displacement reaction
(III) Combination reaction
(IV) Decomposition reaction

correct answer is

(1) I, II (2) I, III (3) I, IV (4) II, IV

Ans. **(1)**

Sol. Theory based

15. Standard electrode potential M^{2+}/M does not depends upon :

(1) Sublimation enthalpy (2) Hydration enthalpy
(3) Ionisation enthalpy (4) Concentration of metal ion

Ans. **(4)**

Sol. Theory based

16. Polymer which is named as orlon is

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

Ans. **(2)**

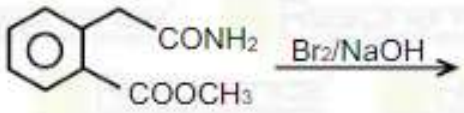
Sol. $CH_2{=}CH(CN) \longrightarrow \left(-CH_2-CH(CN)-\right)_n$

17. Photochemical smog occurs in which area?

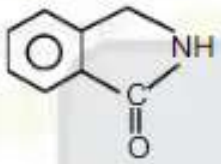
(1) Himalaya village area (2) Industrial area

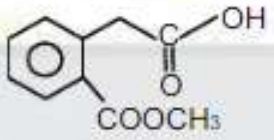
(3) Plain area (4) Muddy area

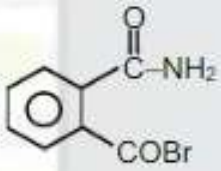
Ans. **(2)**

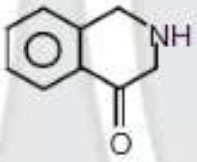
18. 

Product is

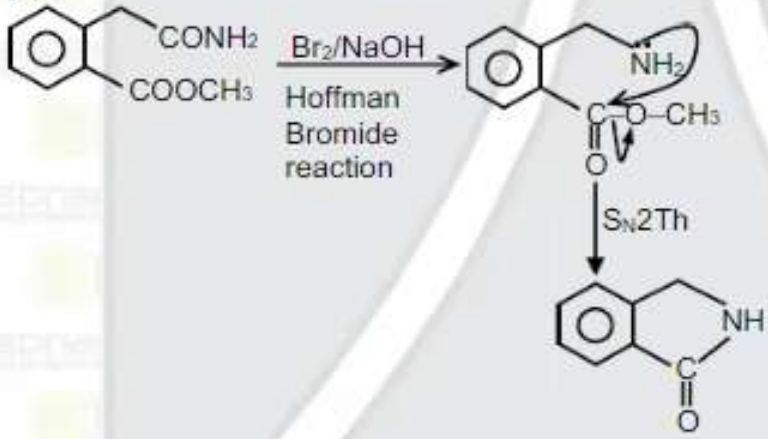
(1) 

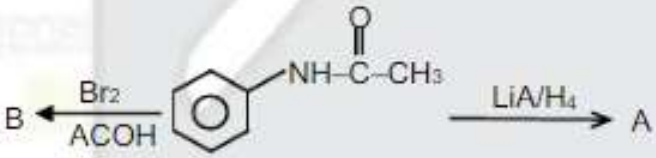
(2) 

(3) 

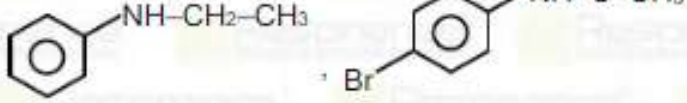
(4) 

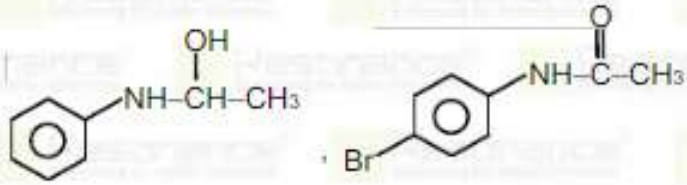
Ans. **(1)**

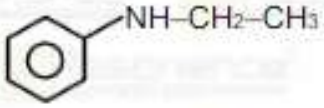
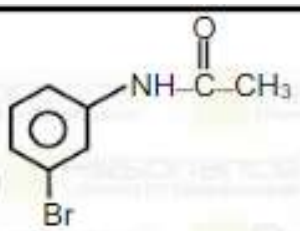
Sol. 

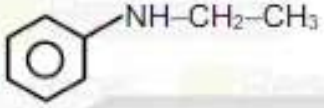
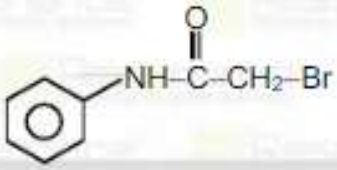
19. 

Identify A and B

(1) 

(2) 

(3)  , 

(4)  , 

Ans. **(1)**

20. Match the following :

	List-I (Element)		List-II (Reagent use to identify)
(A)	Halogen	(I)	$Fe(CN)_6$
(B)	Sulphur	(II)	$AgNO_3$
(C)	Nitrogen	(III)	$[Fe(CN)_5NO]^{-2}$
(D)	Phosphorous	(IV)	$(NH_4)_2MoO_4$

(1) A – II ; B – III ; C – I ; D – IV (2) A – III ; B – I ; C – II ; D – IV
(3) A – I ; B – II ; C – III ; D – IV (4) A – II ; B – I ; C – IV ; D – III

Ans. **(1)**

Sol. (1) Halogen + $AgNO_3 \rightarrow$ AgX ppt
(2) 'S' + Sodium nitro prusside $\rightarrow$ Violet colour
(3) 'N' + $[Fe(CN)_6]^{4-} \rightarrow$ Blue colour
(4) 'P' + $(NH_4)_2 MoO_4 \rightarrow (NH_4)_3 PO_4.12MoO_3 \rightarrow$ Yellow colour

21. Match the following :

	List-I		List-II
(A)	Vitamin A	(I)	Beri-Beri
(B)	Thiamine	(II)	Scurvery
(C)	Ascorbic acid	(III)	Chelosis
(D)	Riboflavin	(IV)	Xeropthalmia

(1) A – IV ; B – I ; C – II ; D – III (2) A – I ; B – II ; C – III ; D – IV
(3) A – III ; B – IV ; C – II ; D – I (4) A – II ; B – I ; C – III ; D – IV

Ans. **(1)**

Sol. Vitamin A $\rightarrow$ Xeropthalmia
Thiamine $\rightarrow$ Beri-Beri
Ascorbic acid $\rightarrow$ Chelosis
Riboflavin $\rightarrow$ Xeropthalmia

22. Match the following :

	List-I		List-II
(A)	Etard	(I)	CO + HCl
(B)	Gatterman-koach	(II)	$CrO_2Cl_2 + CS_2$
(C)	H.V.Z.	(III)	Red P + X_2
(D)	Haloform reaction	(IV)	I_2/NaOH

(1) A – II ; B – I ; C – IV ; D – III (2) A – IV ; B – III ; C – I ; D – II
(3) A – I ; B – II ; C – IV ; D – III (4) A – III ; B – II ; C – I ; D – IV

Ans. **(1)**