(2) Both A and R are true and R is the correct explanation of A
(3) Both A and R are true but R is not the correct explanation of A
(4) A is true but R is false

Ans. **(3)**

Sol. Due to the presence of completely filled d and/ or f orbitals in heavier members.

2. On mixing benzene and naphthalene freezing point :

(1) Decreases (2) Increases

(3) Firstly decreases then increases (4) Remains unchanged

Ans. **(4)**

Sol. Benzene and naphthalene forms ideal solution.

3.

	Column-I		**Column-II**
(a)	$_{24}Cr^{+2}$	**(i)**	$3d^7$
(b)	$_{25}Mn^{+1}$	**(ii)**	$3d^2$
(c)	$_{23}V^{+3}$	**(iii)**	$3d^4$
(d)	$_{27}Co^{+2}$	**(iv)**	$3d^5, 4s^1$

Select the correct matching

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

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

Ans. **(1)**

Sol. $_{24}Cr^{+2}$ = [Ar] $3d^4$

$_{25}Mn^{+1}$ = [Ar] $3d^5, 4s^1$

$_{23}V^{+3}$ = [Ar] $3d^3$

$_{27}Co^{+2}$ = [Ar] $3d^7$

4. **Statement-I :** Orbitals of same energy are degenerate orbitals.

Statement-II : 3p and 3d orbitals in H atom are not degenerate.

(1) Statement I and Statement II are correct.

(2) Statement I is correct and Statement II is incorrect

(3) Statement I is incorrect and Statement II is correct

(4) Statement I and Statement II are incorrect

Ans. **(2)**

Sol. Same energy orbitals are degenerate orbital

In hydrogen atom 3p and 3d orbital have same energy because for H-atom $E_n = -13.6 \times \frac{z^2}{n^2}$ eV , energy depends on only n.

5.

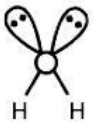
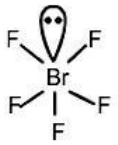
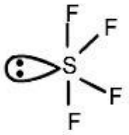
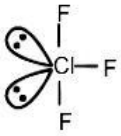
	List-I		List-II
(P)	H_2O	**(i)**	Bent
(Q)	BrF_5	**(ii)**	See-Saw
(R)	SF_4	**(iii)**	T-shape
(S)	ClF_3	**(iv)**	Square pyramidal
		(v)	Linear

Select the correct matching

(1) P-(i), Q-(iv), R-(ii), S-(iii)
(2) P-(iv), Q-(v), R-(iii), S-(i)
(3) P-(v), Q-(i), R-(iii), S-(iv)
(4) P-(i), Q-(v), R-(iv), S-(iii)

Ans. **(1)**

Sol.

	Molecule	**Shape**		**Molecule**	**Shape**
(1)		Bent	(2)		Square pyramidal
(3)		See-Saw	(4)		T-Shape

6. Which of the following set of ions is diamagnetic?

(1) La^{+3}, Ce^{+4} (2) Nd^{+3}, Ce^{+4} (3) Lu^{+3}, Eu^{+2} (4) Nd^{+3}, Gd^{+3}

Ans. **(1)**

Sol. $_{57}La : [_{54}Xe]\ 5d^1\ 6s^2$
$_{58}Ce : [_{54}Xe]\ 4f^1\ 5d^1\ 6s^2$
$_{60}Nd : [_{54}Xe]\ 4f^4\ 6s^2$
$_{63}Eu : [_{54}Xe]\ 4f^7\ 6s^2$
$_{64}Gd : [_{54}Xe]\ 4f^7\ 5d^1\ 6s^2$
$_{71}Lu : [_{54}Xe]\ 4f^{14}\ 5d^1\ 6s^2$

7. **Statement-I :** Reaction of a compound on treatment with dil. H_2SO_4 produces a gas which on passing through lead acetate filter paper turns paper black . It is confirmatory test for S^{-2} acid radical.
Statement-II : Lead sulphite is formed

(1) Statement I and Statement II are correct.
(2) Statement I is correct and Statement II is incorrect
(3) Statement I is incorrect and Statement II is correct
(4) Statement I and Statement II are incorrect

Ans. **(2)**

Sol. $Na_2S(aq) + H_2SO_4\ (dil) \longrightarrow Na_2SO_4(aq) + H_2S\uparrow$

$(CH_3COO)_2\ Pb + H_2S \longrightarrow \underset{\text{(Black)}}{PbS\downarrow} + CH_3COOH$

8. Aluminium chloride in acidified aqueous solution forms an ion with the shape_____.

(1) Tetrahedral (2) Octahedral

(3) Square planar (4) Trigonal bipyramidal

Ans. **(2)**

Sol. $AlCl_3$ in acidifed aqueous solution froms octahedral $[Al(H_2O)_6]^{3+}$ ion.

9. The maximum number of molecular orbitals formed by 2s and 2p atomic orbitals of two atoms are _____.

Ans. **(8)**

Sol. From 2s & 2p atomic orbtials of two atoms following MO are formed.

ABMO : σ^*2s, σ^*2p_z, π^*2p_x, π^*2p_y.

BMO : $\sigma2s$, $\sigma2p_z$, $\pi2p_x$, $\pi2p_y$.

10. $aI^- + 2MnO_4^- + bH_2O \longrightarrow xMnO_2 + yI_2 + zOH^-$

Determine value of z.

Ans. **(8)**

Sol. $6I^- + 2MnO_4^- + 4H_2O \longrightarrow 2MnO_2 + 3I_2 + 8OH^-$

11. For a first order reaction

$$A \longrightarrow P$$

concentration of A at 10 min. and 20 min is 0.04 M and 0.03 M respectively calculate $t_{1/2}$ in minute.

(Given : log 2 = 0.3, log 3 = 0.48)

Ans. **(24)**

Sol. $K = \frac{2.303}{t}\log\frac{[A_0]}{[A_t]}$

$$\frac{0.693}{t_{1/2}} = \frac{2.303}{10}\log\frac{[A_0]}{0.04} \quad \text{..... (1)}$$

$$\frac{0.693}{t_{1/2}} = \frac{2.303}{20}\log\frac{[A_0]}{0.03} \quad \text{..... (2)}$$

on solving

$$\frac{0.693}{t_{1/2}} = \frac{2.303}{10}\log\frac{0.04}{0.03}$$

$t_{1/2}$ = 24 min

12. 250 mL solution of CH_3COONa of molarity 0.35 M is prepared. What is mass of CH_3COONa required in gram (nearest integer) ? [Molar mass of CH_3COONa = 82.08 g/mol]

Ans. **(7)**

Sol. $\text{Molarity} = \frac{\text{moles of solute}}{\text{Volume (lit) of solution}}$

$$0.35 = \frac{\text{moles}}{250/1000}$$

$$\text{moles} = 0.35 \times \frac{1}{4} = 0.0875$$

mass of CH_3COONa = 0.0875 × 82.08 = 7.18 g

13. The number of atom in silver plate having area 0.05 cm^2 and thickness 0.05 cm is _____ × 10^{19}.
[Given density of Ag = 7.9 gram/cm^3 and atomic mass of Ag = 108]

Ans. **(11)**

Sol. Density = $\frac{\text{mass}}{\text{volume}}$

mass of Ag deposited = density × volume
= 7.9 × [0.05 × 0.05] gram
= 0.01975 gram

No. of mole of Ag deposited = $\left(\frac{197.5\times10^{-4}}{108}\right)$ = 1.83×10^{-4}

No. of Ag atom = $[1.83 \times 10^{-4}] \times 6.02 \times 10^{23}$
= 11.01×10^{19} atom

14. The element with IUPAC name 'unununnium' belongs to ____group of the periodic table.

Ans. **(11)**

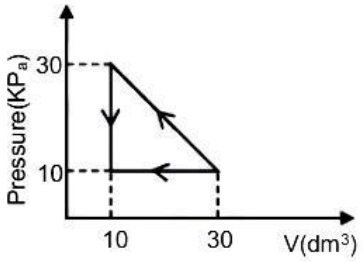
Sol. Unununnium—111 (Uuu)
Electronic configuration : $[_{86}Rn]$ $5f^{14}, 6d^{10}\ 7s^1$
This element belongs to d-block, 7th period and 11th group

15. Given K_{sp} of $Mg(OH)_2$ is 10^{-11} and $[Mg^{+2}]$ is 0.1 M, then find pH at which precipitation will start?

Ans. **(9)**

Sol. $K_{sp} = 10^{-11} = [Mg^{+2}] [OH^-]^2$
or $10^{-11} = [0.1] [OH^-]^2$
or $[OH^-] = 10^{-5}$
or pOH = 5 or pH = 9

16. Find work done in the following cyclic process (in J)



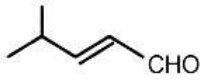
Ans. **(200)**

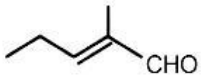
Sol. W = $\frac{1}{2}$ × base × height

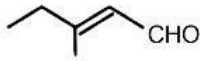
= $\frac{1}{2} \times 20 \times 10^3 \times 20 \times (10^{-1}\ m)^3$

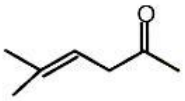
= 200 J.

17. Correct structure of 4-Methyl-pent-2-enal is.

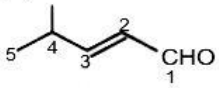
(1) 

(2) 

(3) 

(4) 

Ans. **(1)**

Sol. 

18. Which of the following is most stable.

(1) 

(2) 

(3) 

(4) 

Ans. **(2)**

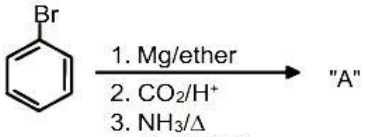
Sol.  is aromatic species.

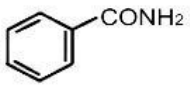
19. Statement-I : Structure of allylic halide is $CH_2=CH-CH_2-X$.
Statement-II : In allylic halide, halide atom is attached to sp^2 hybrid carbon
(1) Both Statement-I & Statement-II are correct.
(2) Both Statement-I & Statement-II are incorrect.
(3) Statement-I is correct whereas Statement-II is incorrect.
(4) Both Statement-I and Statement-II are incorrect.

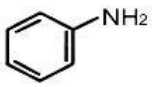
Ans. **(3)**

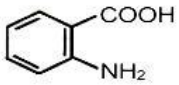
Sol. (3) Statement-I is correct whereas Statement-II is incorrect.

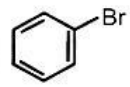
20. The final product "A" formed in the following reaction sequence ;



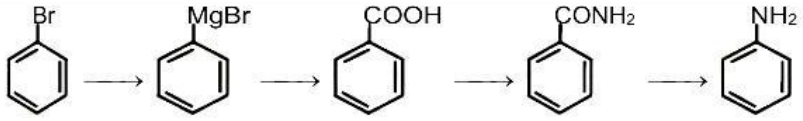
(1) 

(2) 

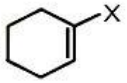
(3) 

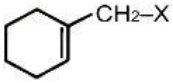
(4) 

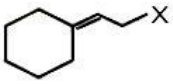
Ans. **(2)**

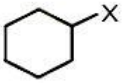
Sol. 

21. Structure of vinylic halide is :

(1) 

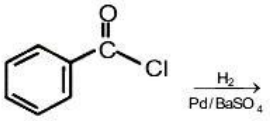
(2) 

(3) 

(4) 

Ans. **(1)**

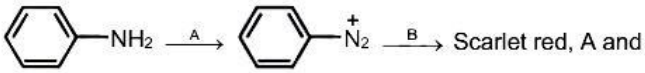
22. What is the name of given reaction



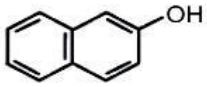
(1) Etard reaction (2) Stephen's reduction

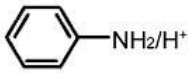
(3) Wolf kishner reduction (4) Rosenmund reaction

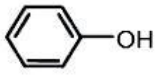
Ans. **(4)**

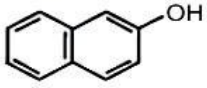
23. 

Scarlet red, A and B are respectively

(1) A - $NaNO_2/HCl$ (0-5°C) ; B - 

(2) A - $NaNO_2/HCl$ (0-5°C) ; B - 

(3) A - $NaNO_2/HCl$ (0-5°C) ; B - 

(4) A – HNO_3 ; B - 

Ans. **(1)**

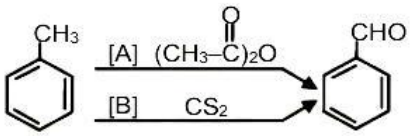
24. Which sugar does not give reddish brown precipitate with Fehling solution

(1) Lactose (2) Maltose (3) Sucrose (4) Glucose

Ans. **(3)**

Sol. Sucrose do not have hemiacetal group, therefore it will not produce aldehyde group in solution, hence no precipitate with Fehling solution.

25.



A and B are

(1) A = CrO_3 ; B = CrO_2Cl_2

(2) A = CrO_2Cl_2 ; B = CrO_2Cl_2

(3) A = CrO_3 ; B = CrO_3

(4) A = CrO_2Cl_2 ; B = CrO_3

Ans. **(1)**

26. $CH_3–C\equiv CH \xrightarrow{Na} X \xrightarrow{Y} CH_3–C\equiv C–CH_2–CH_3$

Correct set of X and Y is :

(1) X = 2-Butene ; Y = C_2H_5Br

(2) X = $CH_3–C\equiv C^-$; Y = $C_2H_5–Br$

(3) X = C_2H_5Br ; Y = $CH_3–C\equiv C^-$

(4) X = $CH_3–C\equiv C^-$; Y = $CH_3–CH_2–CH_2–Br$

Ans. **(2)**

Sol. $CH_3–C\equiv CH \xrightarrow{Na} CH_3–C\equiv C^- \xrightarrow{C_2H_5\text{-}Br} CH_3–C\equiv C–CH_2–CH_3$

27. Calculate R_f value, if solute travelled by 3.5 cm and solvent travelled by 0.5 cm.

Ans. 7

Sol. R_f i.e. retention factor is the ratio of the distance travelled by the compound as compared to the distance moved by the solvent

$$R_f = \frac{\text{Distance by solute}}{\text{Distance by solvent}} = \frac{3.5}{0.5} = 7$$