

JEE Main (2024)

MEMORY BASED PAPER SOLUTION

30 JAN 2024 (S-01)




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CHEMISTRY



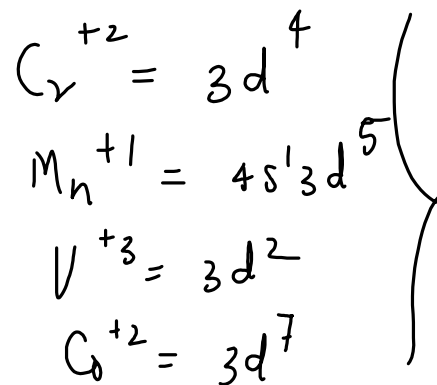
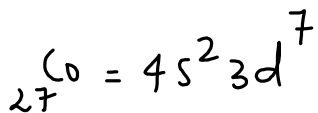
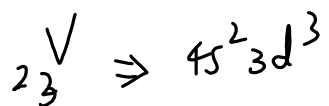
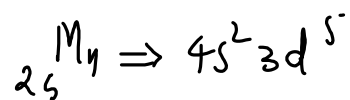
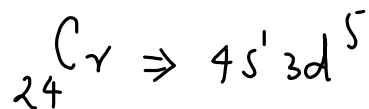
Q.

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

Select the correct matching

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

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





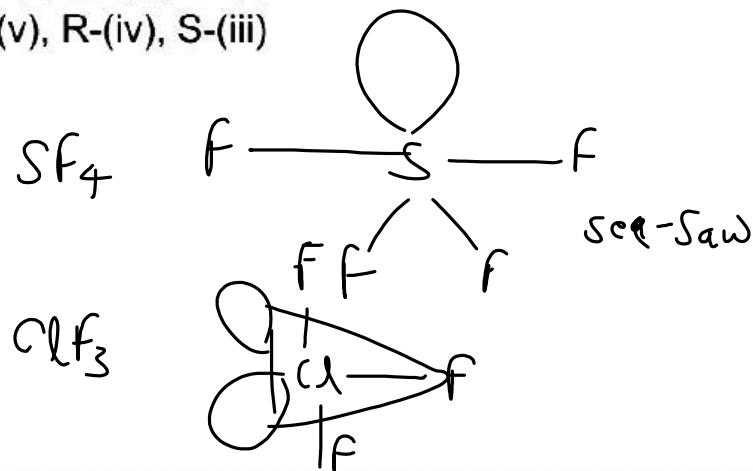
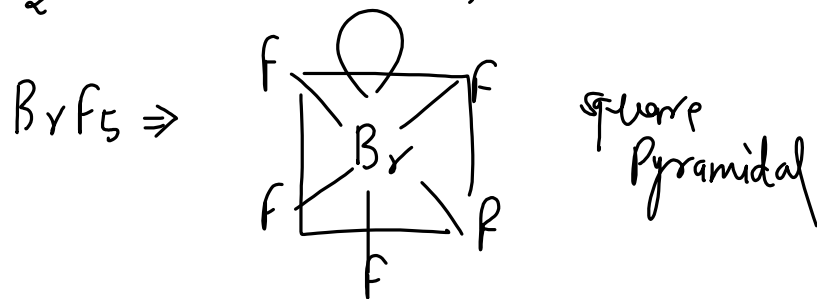
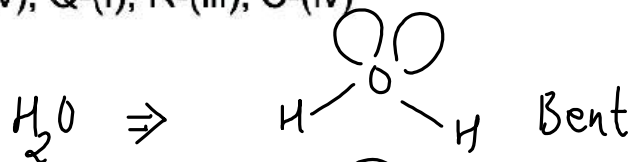
Q.

	List-I		List-II
(P)	H ₂ O	→	(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)
(3) P-(v), Q-(i), R-(iii), S-(iv)

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

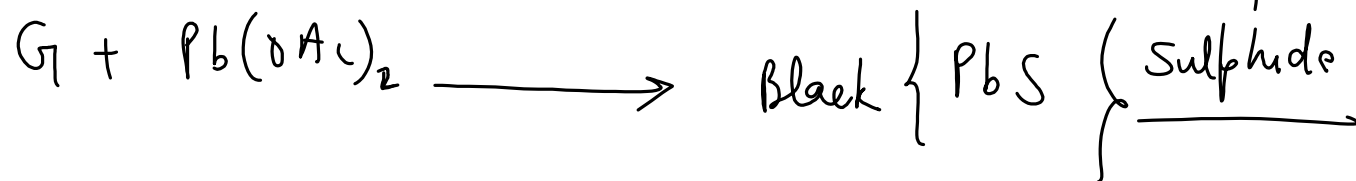
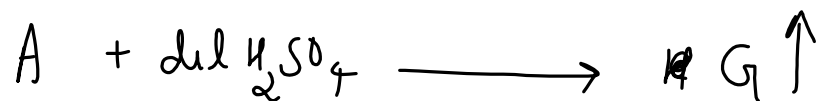
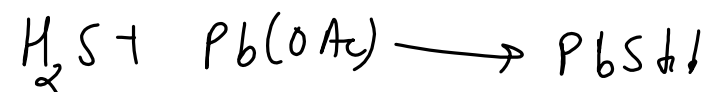
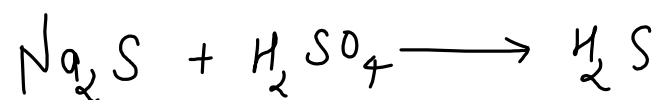




Q. **Statement-I** : Reaction of a compound on treatment with dil. H_2SO_4 produces a gas which on passing through lead acetate filter paper turns paper black . It is confirmatory test for S^{2-} acid radical.

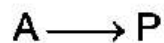
Statement-II : Lead sulphite is formed

- (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





Q. For a first order reaction



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 : $\log 2 = 0.3$, $\log 3 = 0.48$)

$$t_{1/2} = \frac{0.693}{k}$$

$$k = \frac{2.303}{t} \log \frac{[A_0]}{[A_t]}$$

$$\textcircled{1} - \frac{0.693}{t_{1/2}} = \frac{2.303}{10} \log \frac{[A_0]}{[0.04]}$$

$$\textcircled{2} - \frac{0.693}{t_{1/2}} = \frac{2.303}{20} \log \frac{[A_0]}{[0.03]}$$

$$\frac{2.303}{10} \log \frac{[A_0]}{0.04} = \frac{2.303}{20} \log \frac{[A_0]}{0.03}$$

$$\log \left(\frac{[A_0]}{0.04} \right) = \frac{1}{2} \log \frac{[A_0]}{0.03}$$

$$\left(\frac{[A_0]}{0.04} \right)^2 = \frac{[A_0]}{0.03}$$

$$\frac{[A_0]}{(0.04)^2} = \frac{1}{0.03}$$

$$[A_0] = \frac{(0.04)^2}{0.03}$$

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

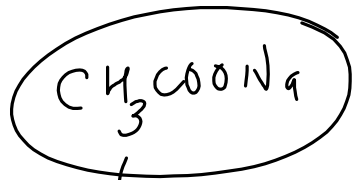
$$\frac{0.693 \times 10}{2.303} = t_{1/2} \log \frac{4}{3}$$

$$\frac{0.693 \times 10}{2.303 \times (2 \times 0.3010 - 48)} = t_{1/2} [2 \log 2 - \log 3]$$

$$t_{1/2} = 24.49 \text{ min}$$



Q. 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 $\text{CH}_3\text{COONa} = 82.08 \text{ g/mol}$]



1000 mL of solⁿ \longrightarrow 0.35 moles

250 mL of solⁿ \longrightarrow $\left(\frac{0.35}{1000} \times 250 \right)$ moles of CH_3COONa

hence mass of solute
In 250 mL solⁿ = $\left(\frac{0.35 \times 250}{1000} \times 82.08 \right)$ gm



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

$$\text{Area} = 0.05 \text{ cm}^2$$

$$t = 0.05 \text{ cm}$$

$$\begin{aligned} \text{Vol} &= \text{Area} \times \text{thickness} \\ &= (0.05 \times 0.05) \text{ cm}^3 \end{aligned}$$

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\begin{aligned} \text{Mass} &= \text{Vol} \times \text{density} \\ &= (0.05)^2 \times 7.9 \end{aligned}$$

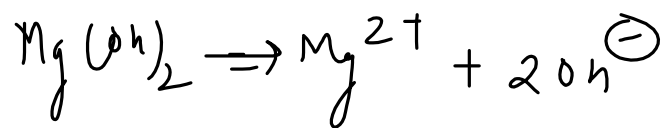
$$\text{moles of Ag} = \frac{(0.05)^2 \times 7.9}{108}$$

$$\text{Tot. no of atom} = \frac{(0.05)^2 \times 7.9}{108} \times N_A$$



Q. 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?

$$\text{Solubility} = [\text{conc}^n \text{ of Ions}]$$
$$\text{Prd}$$



$$K_{sp} = [Mg^{2+}][OH^-]^2$$

$$10^{-11} = 10^{-1} \times [OH^-]^2$$
$$[OH^-]^2 = 10^{-10}$$

$$[OH^-] = 10^{-5}$$

$$-\log[OH^-] = pOH = -\log 10^{-5}$$

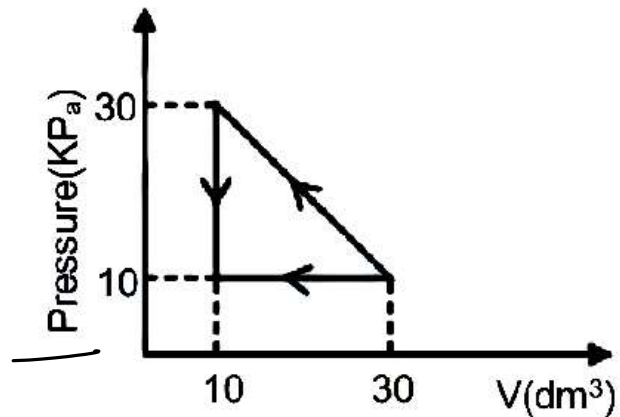
$$pOH = 5 \log 10 \rightarrow 1$$

$$pOH = 5$$

$$pH = 9$$



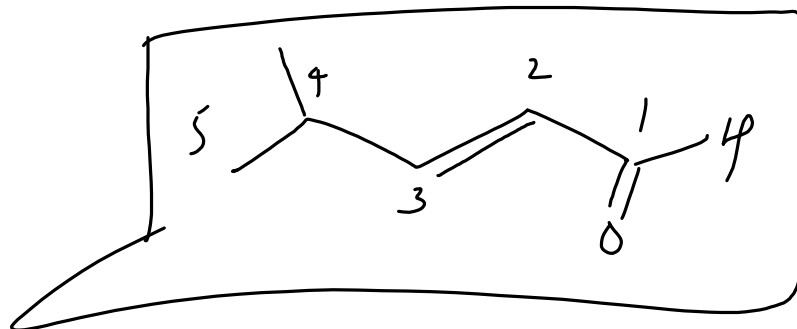
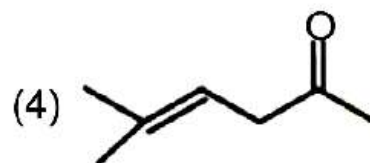
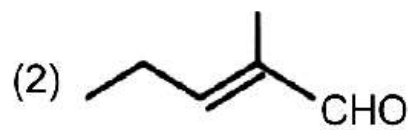
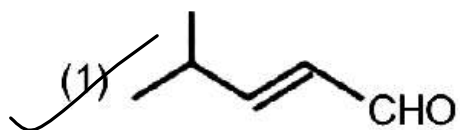
Q. Find work done in the following cyclic process (in J)



$$\begin{aligned} W &= \frac{1}{2} \times \text{base} \times \text{height} \\ &= \frac{1}{2} \times 20 \times (10^{-1})^3 \times 20 \times 10^3 \\ &= \frac{1}{2} \times 20 \times 20 = 200 \text{ J} \end{aligned}$$

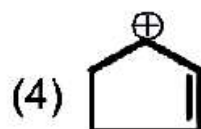
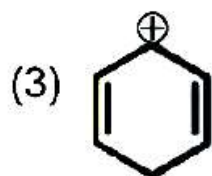
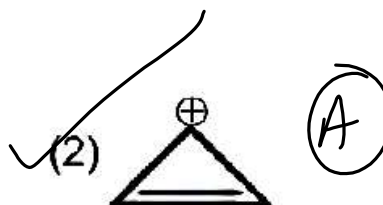


Q. Correct structure of 4-Methyl-pent-2-enal is.



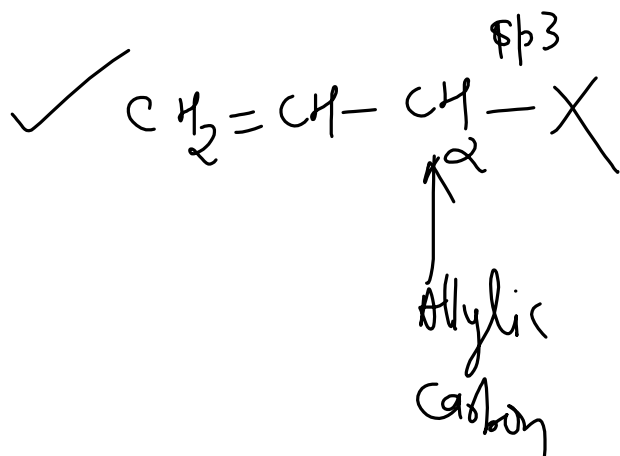


Q. Which of the following is most stable.



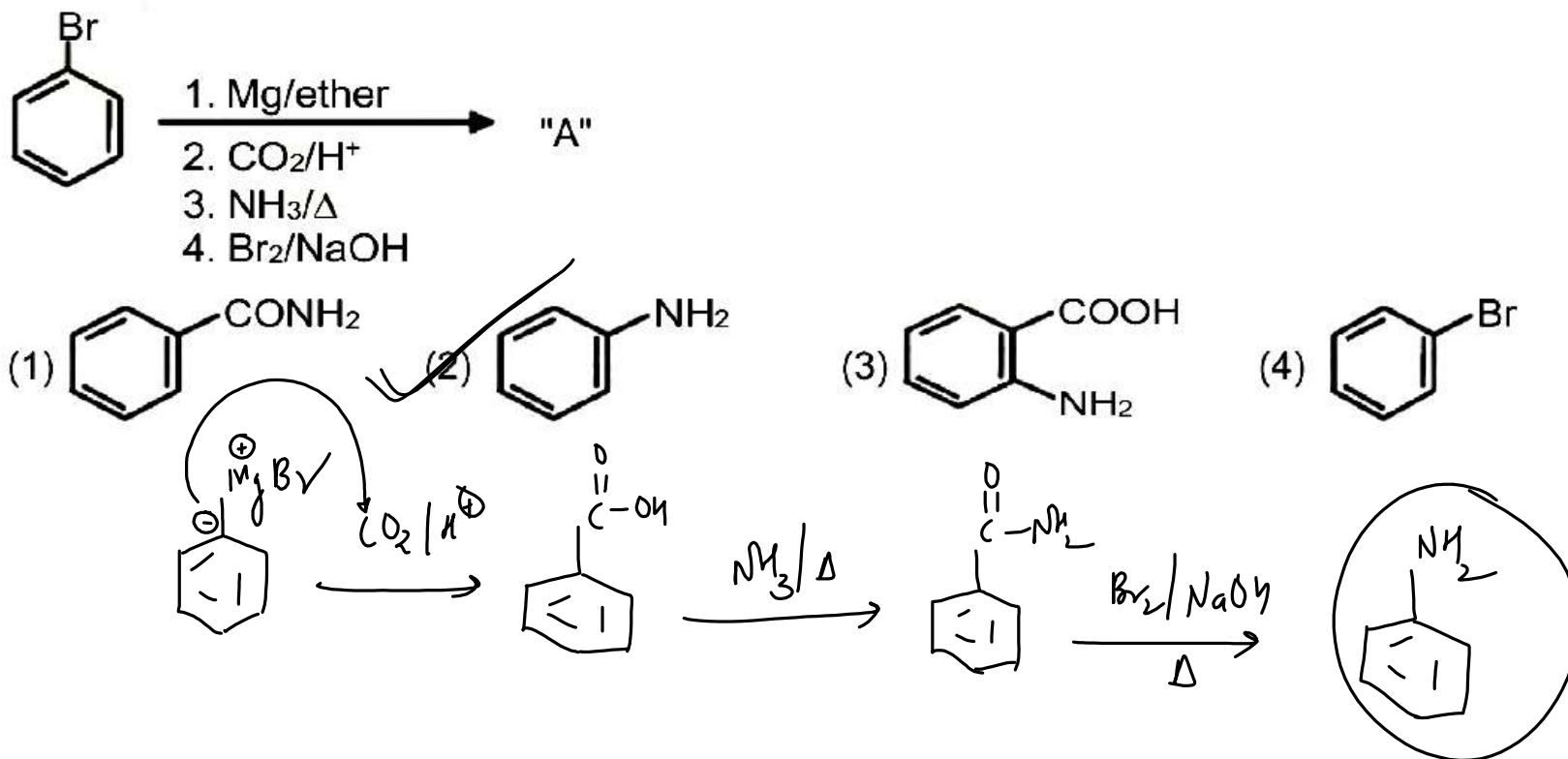


- Q. Statement-I : Structure of allylic halide is $\text{CH}_2=\text{CH}-\text{CH}_2-\text{X}$.
Statement-II : In allylic halide, halide atom is attached to sp^2 hybrid carbon
- (1) Both Statement-I & Statement-II are correct.
 - (2) Both Statement-I & Statement-II are incorrect.
 - ✓ (3) Statement-I is correct whereas Statement-II is incorrect.
 - (4) Both Statement-I and Statement-II are incorrect.



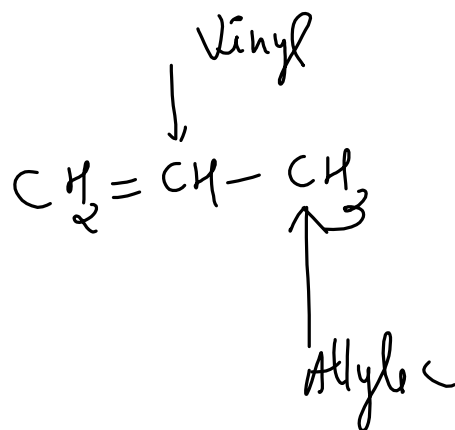
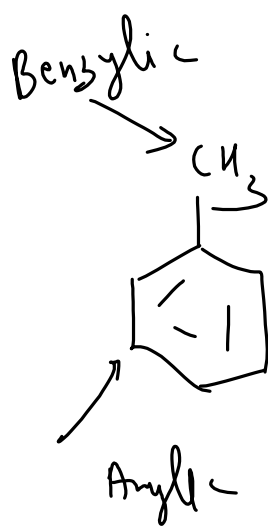
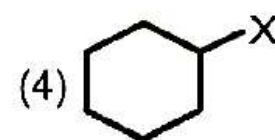
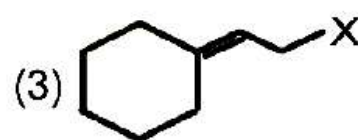
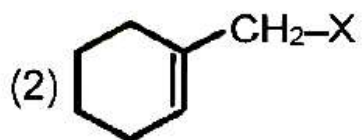
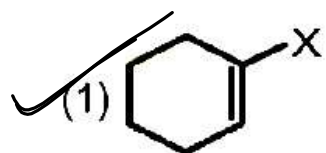


Q. The final product "A" formed in the following reaction sequence ;



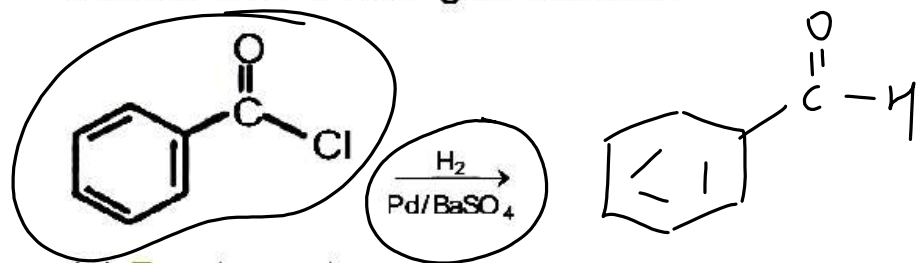


Q. Structure of vinylic halide is :





Q. What is the name of given reaction



(1) Etard reaction

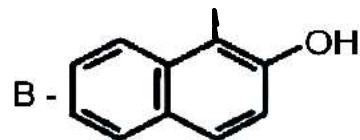
(3) Wolf kishner reduction

(2) Stephen's reduction

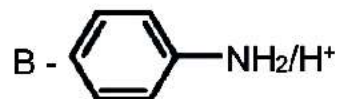
(4) Rosenmund reaction

Q. c1ccc(N)cc1 \xrightarrow{A} c1ccc([N+]#N)cc1 \xrightarrow{B} Scarlet red, A and B are respectively

(1) A - NaNO_2/HCl (0-5°C) ;



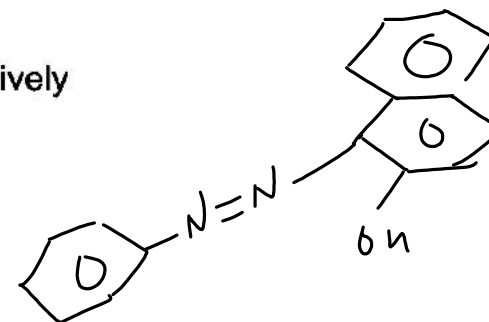
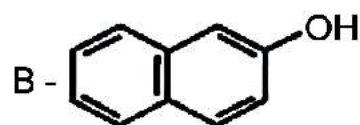
(2) A - NaNO_2/HCl (0-5°C) ;



(3) A - NaNO_2/HCl (0-5°C) ;



(4) A - HNO_3 ;



HNO_2
or
 $\text{NaNO}_2 + \text{HNO}_3$



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

(1) Lactose

β -D-Galactose

+
 β -D-Glucose

-OH

(2) Maltose

-OH α -D-Glucose

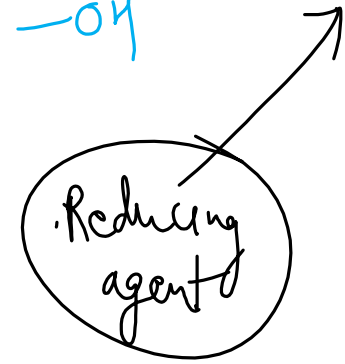
+
 α -D-Glucose

(3) Sucrose

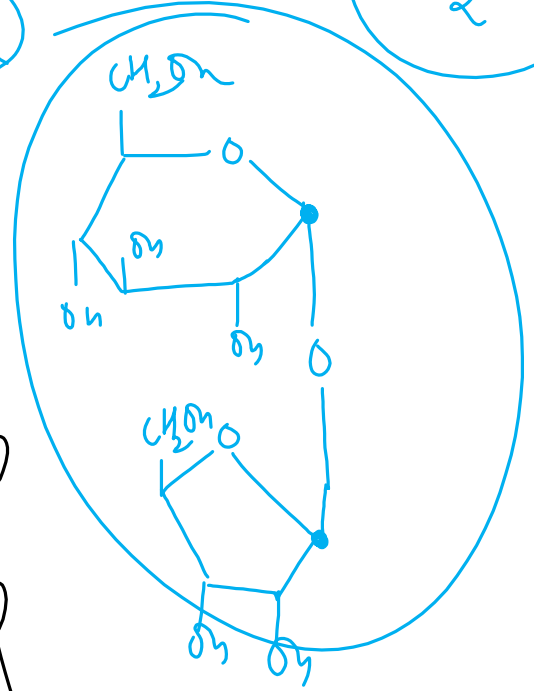
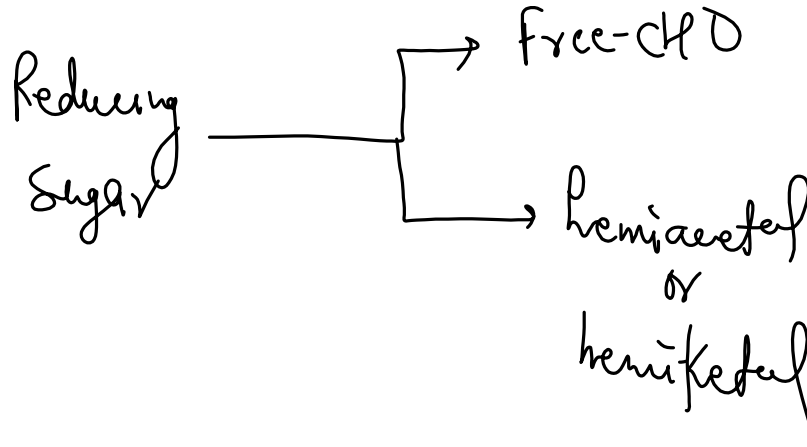
β -D-Glucose

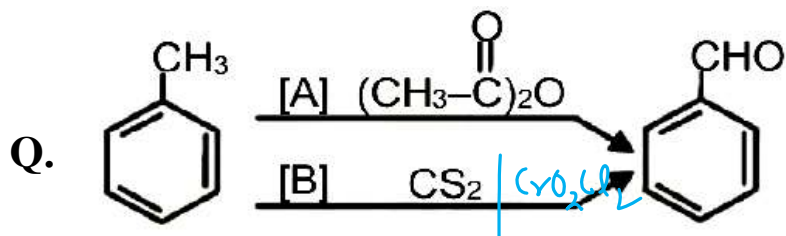
+
 α -D-Fructose

(4) Glucose



Fehling's solⁿ \Rightarrow Oxidising agent

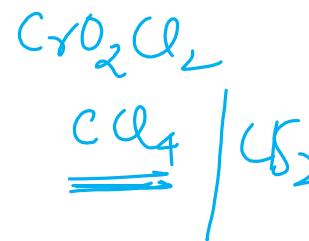


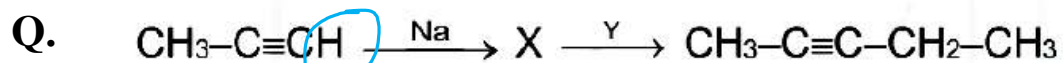


A and B are

- (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

Etard
reaction \Rightarrow





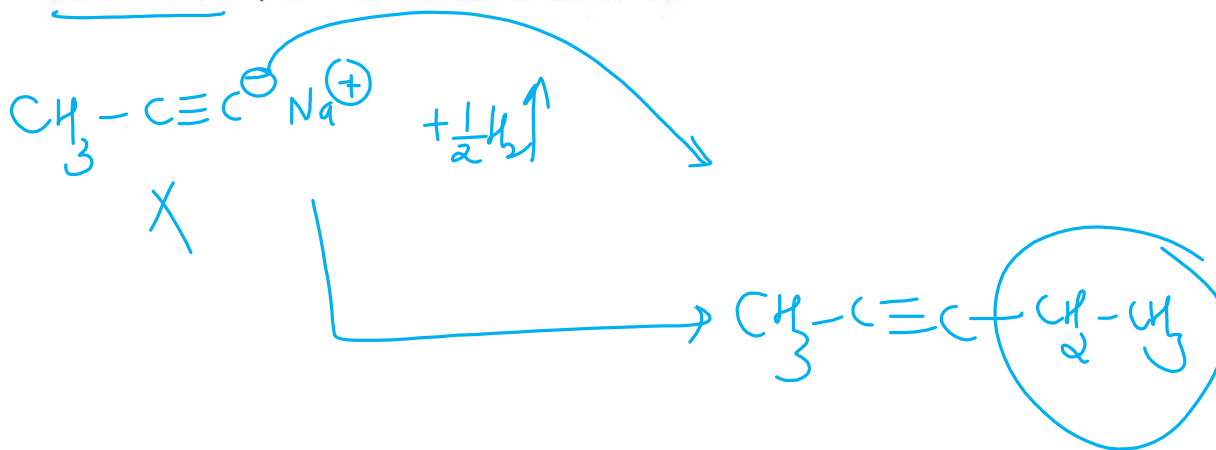
Correct set of X and Y is :

(1) X = 2-Butene ; Y = $\text{C}_2\text{H}_5\text{Br}$

(2) X = $\text{CH}_3\text{-C}\equiv\text{C}^-$; Y = $\text{C}_2\text{H}_5\text{-Br}$

(3) X = $\text{C}_2\text{H}_5\text{Br}$; Y = $\text{CH}_3\text{-C}\equiv\text{C}^-$

(4) X = $\text{CH}_3\text{-C}\equiv\text{C}^-$; Y = $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-Br}$





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

$$R_f = \frac{\text{Distance travelled by solute}}{\text{Distance travelled by solvent}}$$

$$R_f = \frac{3.5}{0.5} = 7$$



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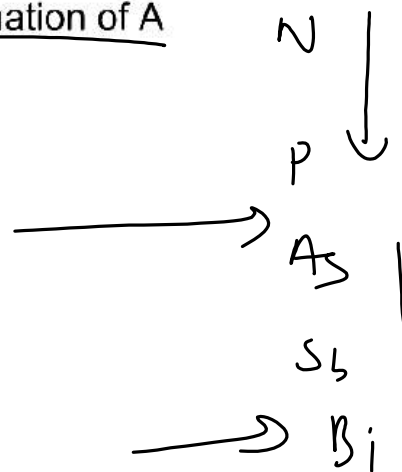
Q. **Assertion** : There is considerable increase in covalent radius from N to P but not so from As to Bi.
Reason : Covalent and ionic radii in particular oxidation state increase down the group.

(1) A is false but R is true

(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

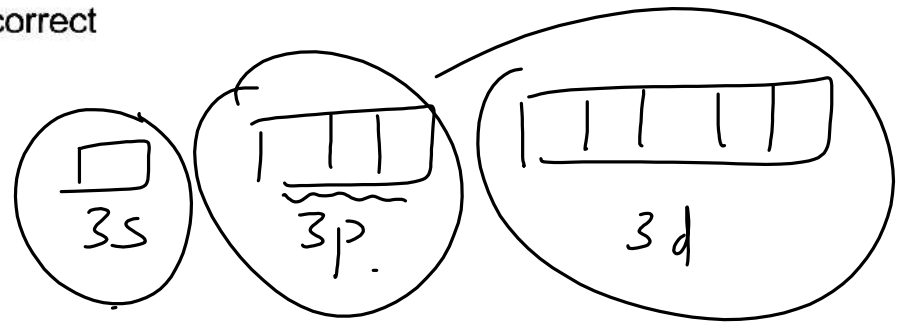




Q. On mixing benzene and naphthalene freezing point :
(1) Decreases ^{is p} ^{is p} (2) Increases
(3) Firstly decreases then increases (4) Remains unchanged

Q. **Statement-I** : Orbitals of same energy are degenerate orbitals. $\rightarrow T$
Statement-II : 3p and 3d orbitals in H atom are not degenerate. F

- (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



Single e⁻ system

$$3s = 3p = 3d$$





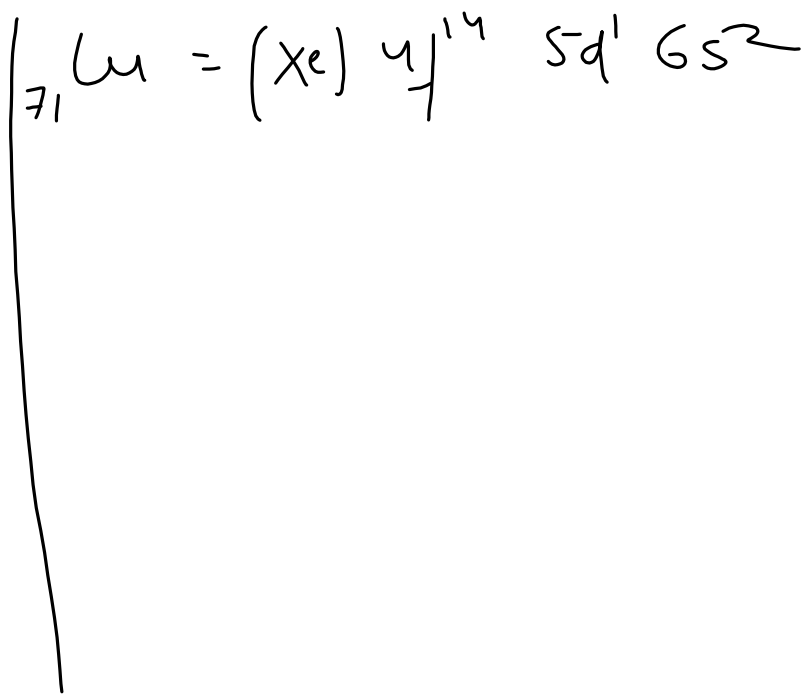
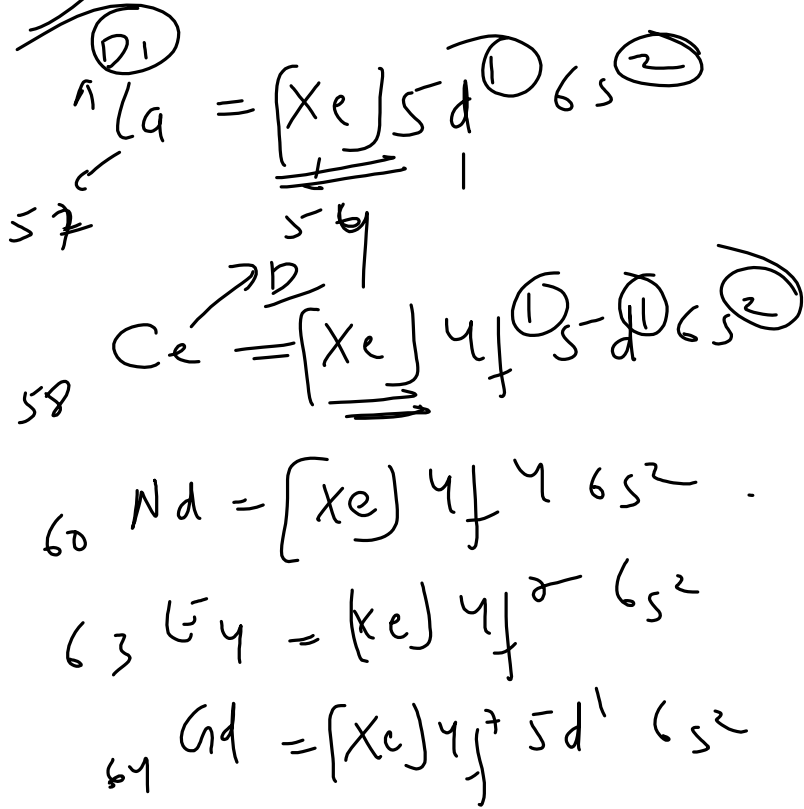
Q. Which of the following set of ions is diamagnetic?

(1) La^{+3} , Ce^{+4}

(2) Nd^{+3} , Ce^{+4}

(3) Lu^{+3} , Eu^{+2}

(4) Nd^{+3} , Gd^{+3}

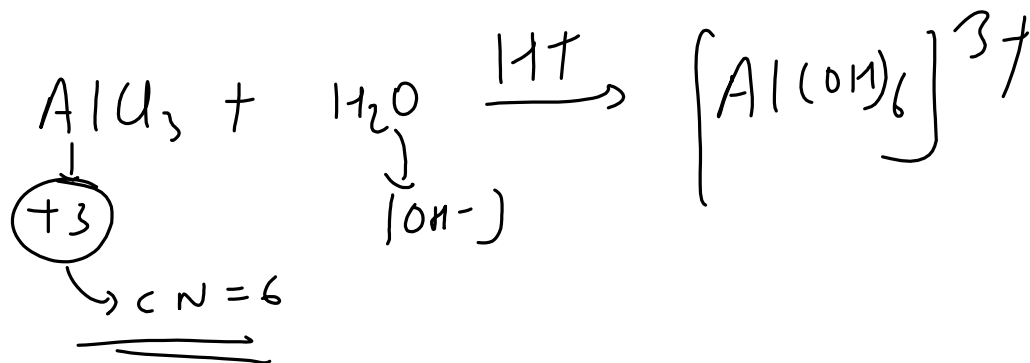




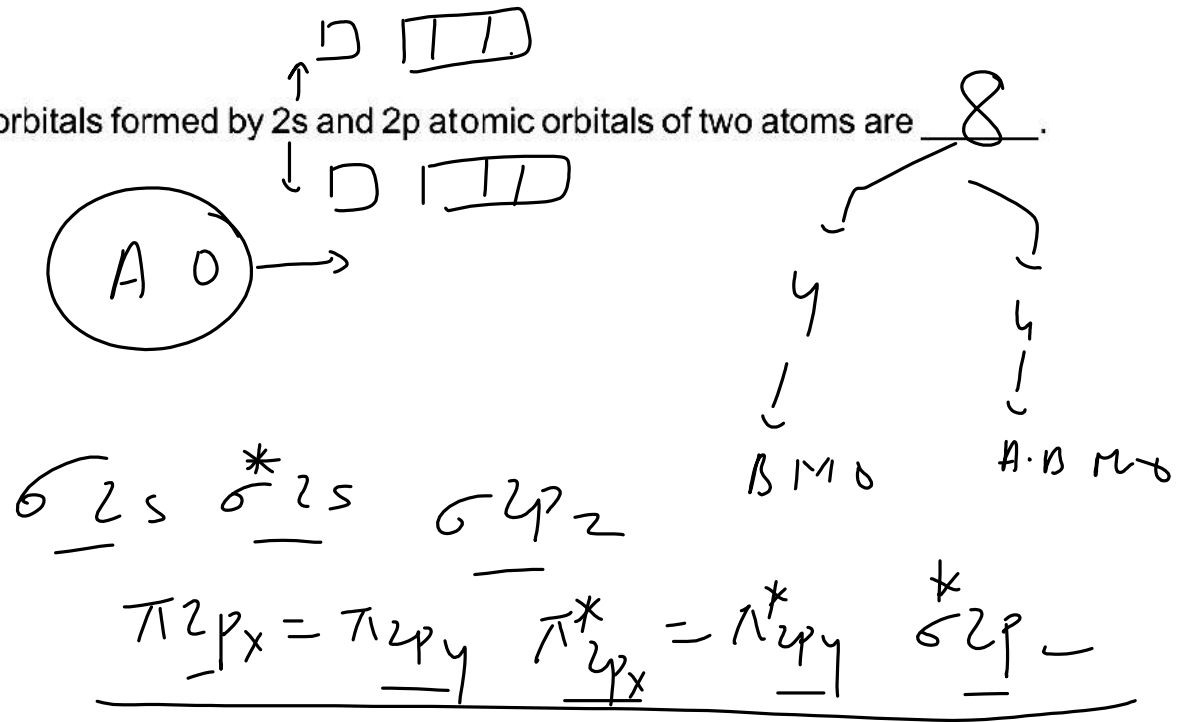
Q. Aluminium chloride in acidified aqueous solution forms an ion with the shape _____.

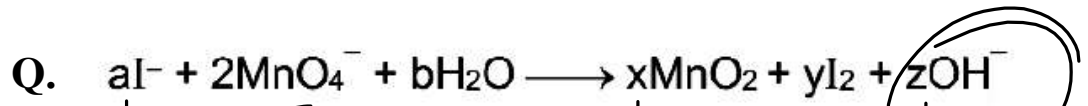
(1) Tetrahedral $\rightarrow 4$
(3) Square planar $\rightarrow 5$ | $+1$ | LP

~~(2) Octahedral $\rightarrow 6$~~
(4) Trigonal bipyramidal $\rightarrow 5$



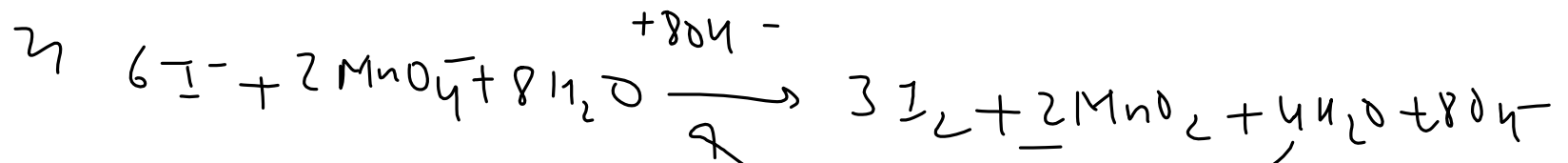
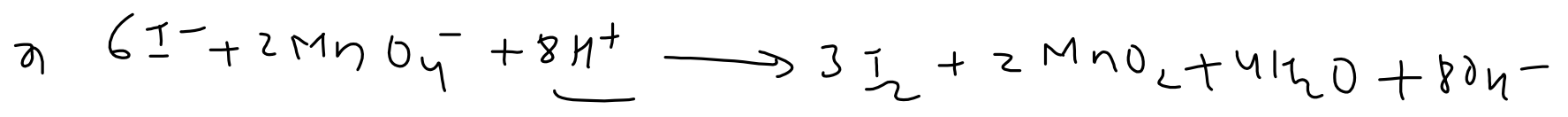
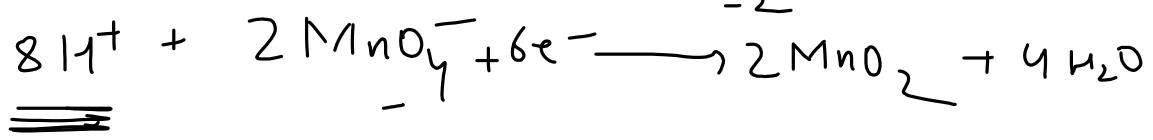
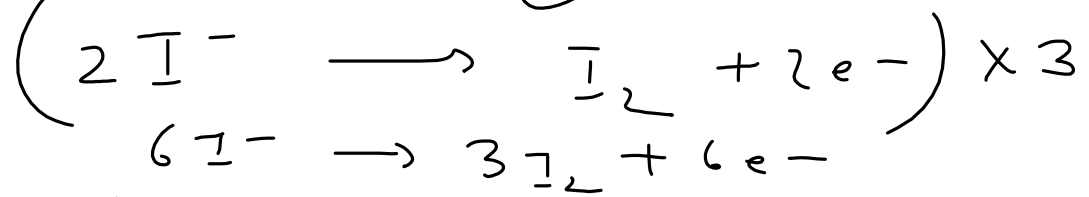
Q. The maximum number of molecular orbitals formed by 2s and 2p atomic orbitals of two atoms are 8.





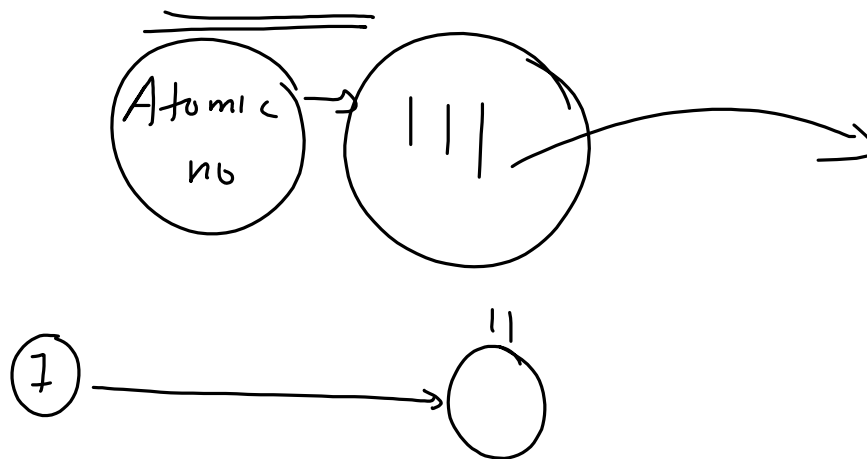
Determine value of z $\rightarrow 8$

\downarrow \downarrow \downarrow \downarrow \downarrow \downarrow
 6 2 8 2 3 8





Q. The element with IUPAC name 'unununium' belongs to ____ group of the periodic table.





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