

# JEE-Main-01-02-2024 (Memory Based)

## [MORNING SHIFT]

### Chemistry

**Question:** Find out total possible optical isomers of 2-chlorobutane.

**Options:**

- (a) 2  
(b) 3  
(c) 4  
(d) 6

**Answer: (a)**

**Solution:** The number of optical isomers possible for a compound is  $r$  where  $n =$  number of asymmetric carbon atoms.

As  $2^n = 1$  for 2-chlorobutane,

$$2^n = 2^1 = 2.$$

Hence, it has two optical isomers.

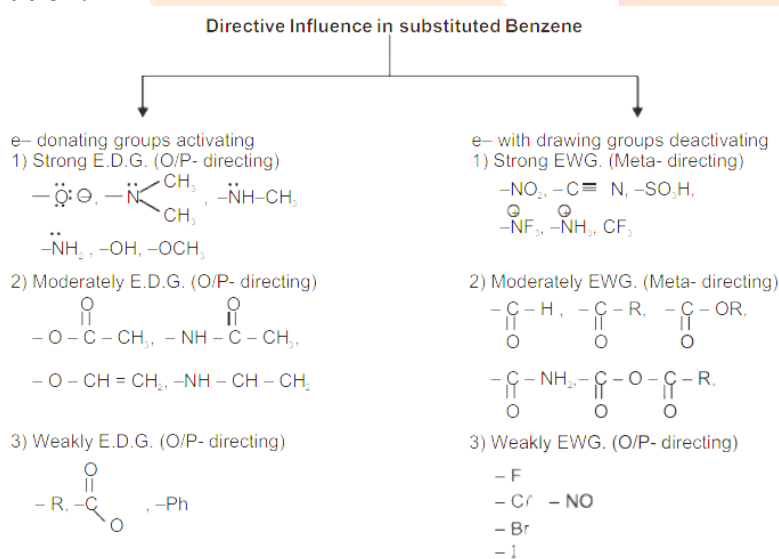
**Question:** The total number of deactivating groups among the following is :  $-\text{CN}$ ,  $-\text{NH}-\text{CO}-\text{CH}_3$ ,  $-\text{CO}-\text{CH}_3$ ,  $-\text{NH}-\text{CH}_3$

**Options:**

- (a) 1  
(b) 2  
(c) 3  
(d) 4

**Answer: (b)**

**Solution:**



**Question:** In Kjeldahl's estimation of nitrogen,  $\text{CuSO}_4$  acts as :

**Options:**

- (a) Oxidising agent

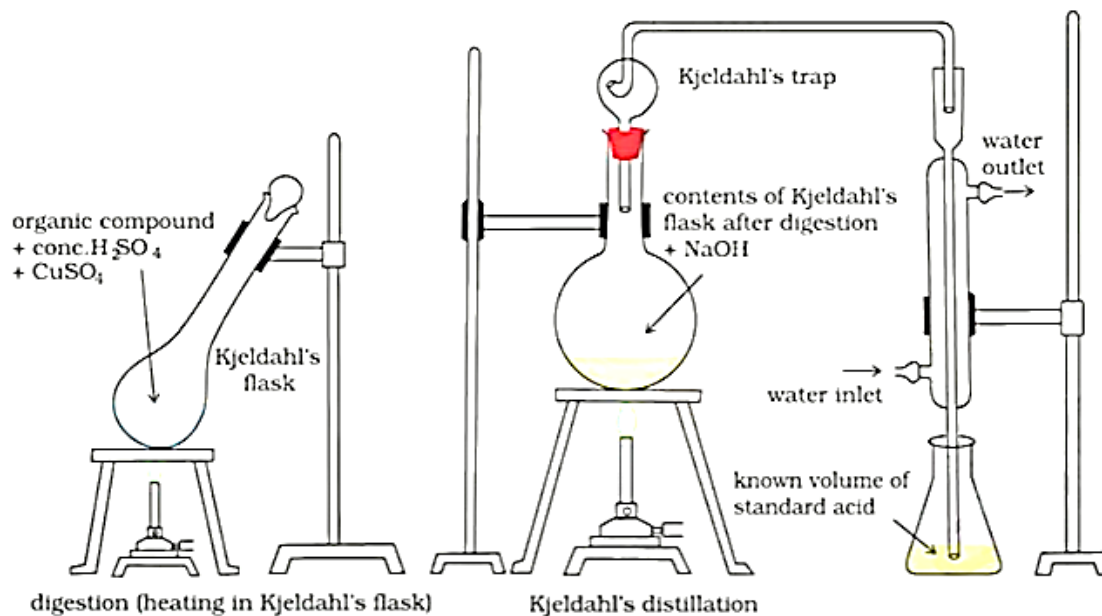
(b) Reducing agent

(c) Catalyst

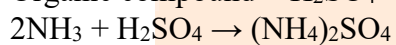
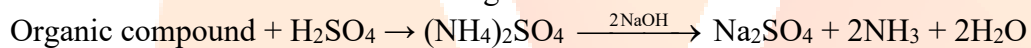
(d) Reagent

**Answer: (c)**

**Solution:**



Taken and that left after the reaction gives the amount of acid reacted with ammonia.



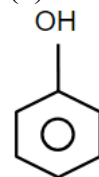
**Question:** Which of the following is most likely attacked by electroph

**Options:**

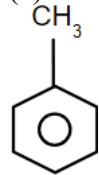
(a)



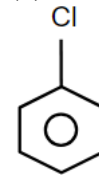
(b)



(c)



(d)



**Answer: (c)**

**Question:** Statement I :  $S_8$  disproportionates into  $H_2S_2O_3$  and  $S_2^-$  in alkaline medium  
Statement II :  $ClO_4^-$  undergoes disproportionation in acidic medium

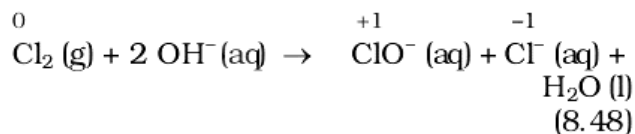
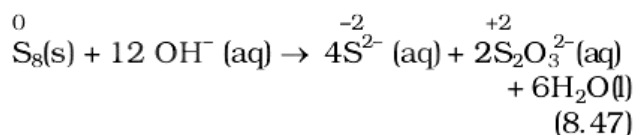
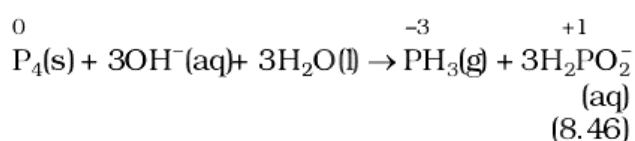
**Options:**

- (a) Statement I is correct but Statement II is incorrect
- (b) Statement I is incorrect but Statement II is correct
- (c) Both Statement I and Statement II are correct
- (d) Both Statement I and Statement II are incorrect

**Answer: (c)**

**Solution:**

Phosphorous, sulphur and chlorine undergo disproportionation in the alkaline medium as shown below :



**Question:** Match the following and select the correct option.

List I	List II
(a) $[Cr(H_2O)_6]^{3+}$	(i) $t_{2g}^2 e_g^0$
(b) $[Fe(H_2O)_6]^{3+}$	(ii) $t_{2g}^3 e_g^0$
(c) $[Ni(H_2O)_6]^{2+}$	(iii) $t_{2g}^3 e_g^2$
(d) $[V(H_2O)_6]^{3+}$	(iv) $t_{2g}^6 e_g^2$

**Options:**

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

**Answer: (a)**

**Question: Statement I:**  $PH_3$  will have lower boiling point than  $NH_3$ .

**Statement II:** There are strong van der Waals forces in  $NH_3$  and strong hydrogen bonding in  $PH_3$

**Options:**

- (a) Both Statement I and Statement II are correct
- (b) Both Statement I and Statement II are incorrect
- (c) Statement I is correct, but Statement II is incorrect
- (d) Statement I is incorrect, but Statement II is correct

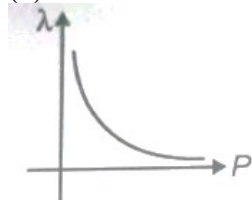
**Answer: (c)**

**Solution:**  $\text{NH}_3$  intermolecular hydrogen bonding leads to molecular association so large amount of energy is required to break these hydrogen bonds whereas in  $\text{PH}_3$  there is no hydrogen bonding. Hence  $\text{NH}_3$  has high boiling point than  $\text{PH}_3$

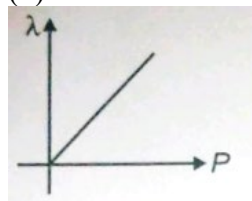
**Question:** Which of the following is the correct plot between  $\lambda$  (de-Broglie wavelength) and  $p$  (momentum) ?

**Options:**

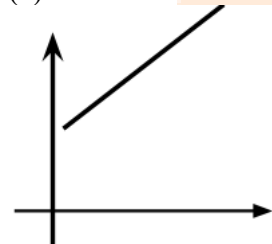
(a)



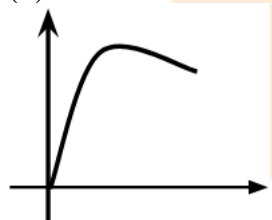
(b)



(c)



(d)



**Answer: (a)**

**Solution:** Graph between  $\lambda$  and  $p$  is a rectangular hyperbola

**Question:** What is the pH of  $\text{CH}_3\text{COO}^- \text{NH}_4^+$  ? (At  $25^\circ\text{C}$ )

**Given:**  $K_a$  of  $\text{CH}_3\text{COOH} = 1.8 \times 10^{-5}$ ,  $K_b$  of  $\text{NH}_4\text{OH} = 1.8 \times 10^{-5}$

**Options:**

(a) 7

(b) 9

(c) 8.9

(d) 7.8

**Answer: (a)**

**Solution:**  $\text{pH} = 7 + \frac{1}{2}(\text{p}K_a - \text{p}K_b)$

**Question:** Which of the following is correct for adiabatic free expansion against vacuum ?

**Options:**

- (a)  $q = 0, \Delta U = 0, w = 0$
- (b)  $q \neq 0, w = 0, \Delta U = 0$
- (c)  $q = 0, \Delta U \neq 0, w = 0$
- (d)  $q = 0, \Delta U \neq 0, w \neq 0,$

**Answer: (a)**

**Solution:** Free expansion of an ideal gases under adiabatic condition is  $q = 0, \Delta T = 0$  and  $w = 0$ .

**Question:** Which of the following have trigonal bipyramidal shape ?

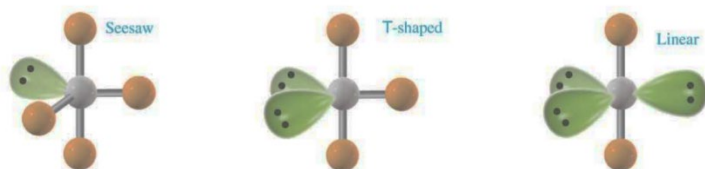
$PF_5, PBr_5, [PtCl_4]^{-}, SF_6, BF_3, BrF_5, PCl_5, [Fe(CO)_5]$

**Options:**

- (a)  $PF_5, PBr_5, PCl_5, [Fe(CO)_5]$  only
- (b)  $PF_5, PBr_5, PCl_5, BrF_5$  only
- (c)  $PF_5, PCl_5, [Fe(CO)_5]$  only
- (d)  $PF_5, PBr_5, BrF_5, PCl_5, [Fe(CO)_5]$  only

**Answer: (a)**

**Solution:**



**Question:** Complementary stand of DNA ATGCTTCA is :

**Options:**

- (a) TACGAAGA
- (b) TACGAAGT
- (c) TAGCAACA
- (d) TAGCTACT

**Answer: (b)**

**Solution:** A always pairs with T with two hydrogen bonds and G always pairs with C with three hydrogen bonds.

**Question:** We are given with 3 NaCl samples and their Van't Hoff factors

Sample	Van't Hoff factor
Sample - 1 (0.1 M)	$i_1$
Sample - 2 (0.01 M)	$i_2$
Sample - 3 (0.001 M)	$i_3$

**Options:**

- (a)  $I_1 = i_2 = i_3$
- (b)  $I_1 > i_2 > i_3$
- (c)  $I_3 > i_2 > i_1$
- (d)  $I_1 > i_3 > i_2$

**Answer: (a)**

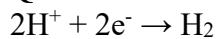
**Solution:**  $I_1 = i_2 = i_3$

**Question:** How many oxides are amphoteric in nature ?

$\text{SnO}_2, \text{PbO}_2, \text{SiO}_2, \text{P}_2\text{O}_5, \text{Al}_2\text{O}_3, \text{CO}_2, \text{CO}, \text{NO}, \text{N}_2\text{O}$

**Answer: 3**

**Question:** We are given with following cell reaction :



$P_{\text{H}_2} = 2 \text{ atm}$

$[\text{H}^+] = 1 \text{ M}$

$(2.30RT/F=0.06)$

If  $E_{\text{cell}}$  of the reaction is given by  $-x \times 10^{-3} \text{ V}$ . Find out x.

**Answer: 9**

**Solution:**

Anode:  $\text{H}_2 (1 \text{ atm}) \rightarrow 2\text{H}^{\oplus} (x \text{ M}) + 2\text{e}^-$

Cathode:  $2\text{H}^{\oplus} (1 \text{ M}) + 2\text{e}^- \rightarrow \text{H}_2, (1 \text{ atm})$

$$= E^{\circ}_{\text{H}^+/\frac{1}{2}\text{H}_2} + \frac{0.059}{n} \log \frac{[\text{H}^+]}{(P_{\text{H}_2})^{1/2}}$$