

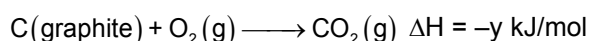
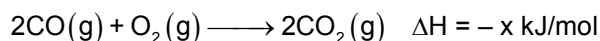
## CHEMISTRY

### SECTION - A

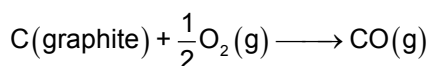
**Multiple Choice Questions:** This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

**Choose the correct answer:**

1. Select the correct option



Then  $\Delta H$  for



- |                       |                      |
|-----------------------|----------------------|
| (1) $x - \frac{y}{2}$ | (2) $\frac{x-2y}{2}$ |
| (3) $\frac{x+2y}{2}$  | (4) $\frac{x-y}{2}$  |

**Answer (2)**

**Sol.**  $\Delta H$  for  $\text{C(graphite)} + \frac{1}{2}\text{O}_2\text{(g)} \longrightarrow \text{CO(g)}$  will be

$$-y + \frac{1}{2}x \text{ or } \frac{x-2y}{2} \text{ kJ/mol}$$

2. Stabiliser used for concentration of sulphide ore is

- |                 |               |
|-----------------|---------------|
| (1) Fatty acids | (2) Pine oil  |
| (3) Cresol      | (4) Xanthates |

**Answer (3)**

**Sol.** • Cresol and aniline is used as stabiliser.

- Pine oils, fatty acids, xanthates are used as collectors.

3. That one which does not stabilise secondary and tertiary protein?

- (1) H-H linkage
- (2) S-S linkage
- (3) Van Der Waal's Force
- (4) Hydrogen bonding

**Answer (1)**

**Sol.** The secondary and tertiary protein are stabilised by hydrogen bonds, disulphide linkages, Van Der Waal's and electrostatic forces of attraction.

4. Which of the following is diamagnetic with low spin?

- |                                       |  |
|---------------------------------------|--|
| (1) $[\text{Co}(\text{NH}_3)_6]^{3+}$ | (2) $[\text{CoF}_6]^{3-}$                    |
| (3) $[\text{CoCl}_6]^{3-}$            | (4) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ |

**Answer (1)**

**Sol.**  $\text{Co}^{3+}$  with  $\text{NH}_3$  will form low spin complex  
 $n = 0$  for  $[\text{Co}(\text{NH}_3)_6]^{3+}$

5. The compound which does not exist

- |                     |                                   |
|---------------------|-----------------------------------|
| (1) $\text{BeH}_2$  | (2) $\text{NaO}_2$                |
| (3) $\text{PbEt}_4$ | (4) $(\text{NH}_4)_2\text{BeF}_4$ |

**Answer (2)**

**Sol.** Lithium forms oxide, sodium forms peroxide and the K, Rb, Cs forms superoxide.

6. Number of molecules & moles in 2.8375 litre of  $\text{O}_2$  in STP

- (1)  $1.505 \times 10^{23}$  & 0.250
- (2)  $7.625 \times 10^{23}$  and 0.250
- (3)  $7.625 \times 10^{22}$  and 0.126
- (4)  $7.527 \times 10^{22}$  and 0.125

**Answer (3)**

$$\text{Sol. No. of moles} = \frac{2.8375}{22.4}$$

$$= 0.1266 \text{ moles}$$

$$\begin{aligned} \text{No. of molecules} &= 0.1266 \times 6.023 \times 10^{23} \\ &= 0.7625 \times 10^{23} \end{aligned}$$

7. Enthalpy of adsorption and enthalpy of micelle formation is respectively

- |         |         |
|---------|---------|
| (1) ++  | (2) + - |
| (3) - + | (4) --  |

**Answer (3)**

**Sol.** Enthalpy of adsorption is (-ve) and Enthalpy of micelle formation is (+ve)

8. Prolonged heating of Ferrous ammonium sulphate is avoided to prevent?

- |                |               |
|----------------|---------------|
| (1) Oxidation  | (2) Reduction |
| (3) Hydrolysis | (4) Breaking  |

**Answer (1)**

**Sol.** Prolonged heating results in oxidation of  $\text{Fe}^{+2}$  to  $\text{Fe}^{+3}$  ions.

9. Read the following two statements

**Statement I:** Potassium dichromate is used in volumetric analysis.

**Statement II:**  $\text{K}_2\text{Cr}_2\text{O}_7$  is more soluble in water than  $\text{Na}_2\text{Cr}_2\text{O}_7$ .

- (1) Both statements I and II are correct
- (2) Both statements I and II are incorrect
- (3) Statement I is correct and II is incorrect
- (4) Statement I is incorrect and II is correct

**Answer (3)**

**Sol.** Sodium dichromate is more soluble than  $\text{K}_2\text{Cr}_2\text{O}_7$ .

10. Match the column

	Column-I		Column-II
(A)	Dacron	(P)	Thermosetting
(B)	Urea formaldehyde resin	(Q)	Biodegradable
(C)	Nylon-2, Nylon-6	(R)	Polyester
(D)	Nylon-6, 6	(S)	Used for making bristles of brushes

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

**Answer (3)**

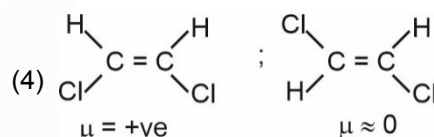
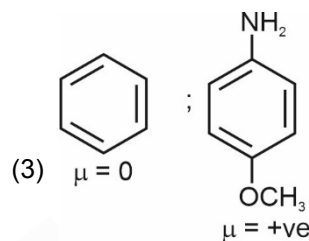
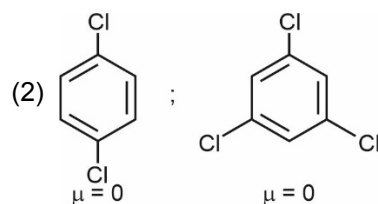
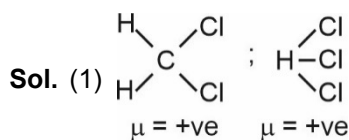
**Sol.** • Dacron is polyester.

- Urea formaldehyde resin is thermosetting.
- Nylon-2, Nylon-6 is biodegradable.
- Nylon-6, 6 is used in making bristles for brushes.

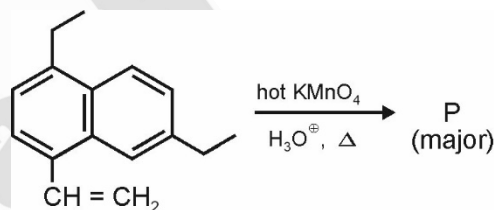
11. The pair of compounds from the following pairs having both the compounds with net zero dipole moment is

- (1)  $\text{CH}_2\text{Cl}_2$ ;  $\text{CHCl}_3$
- (2) 1,4-dichlorobenzene; 1,3,5-trichlorobenzene
- (3) Benzene; p-Anisidine
- (4) Cis-dichloroethene; trans-dichloroethene

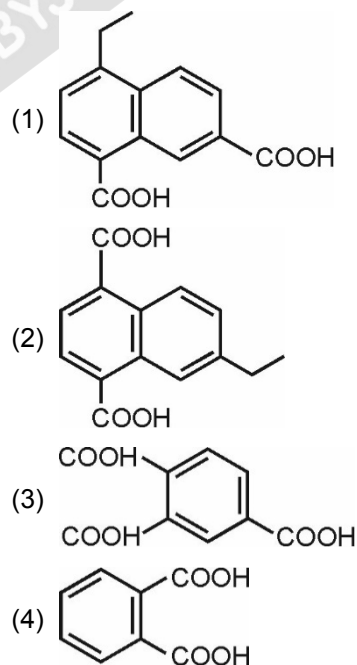
**Answer (2)**



12. Consider the following reaction

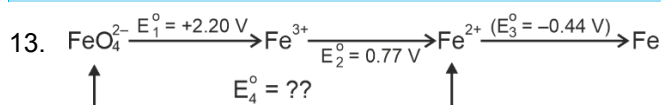


The product P is



**Answer (3)**

**Sol.** Oxidation of benzene ring towards left takes place.



Value of  $E_4^\circ$  is close to

- (1) 1.00 V                      (2) 2.00 V  
(3) 2.50 V                      (4) 0.50 V

**Answer (2)**

**Sol.**  $E_4^\circ = \frac{(2.20 \times 3) + (0.77 \times 1)}{4}$

$1.84 \approx 2.0 \text{ V}$

14. Mixture of A, B and C is added to column containing adsorbent for separation. Using solvent, A is eluted first and B eluted last, then B has

- (1) High  $R_f$ , less adsorption  
(2) Low  $R_f$ , strongly adsorbed  
(3) High  $R_f$ , strong adsorption  
(4) Low  $R_f$ , weakly adsorbed

**Answer (2)**

**Sol.** Those substances which are strongly adsorbed more slowly will be eluted late.

15. Solution of 0.1 Molal Weak Acid HA is present.

$T_1$  : Freezing point of solution assuming no dissociation of acid.

$T_2$  : Freezing point of solution assuming degree of dissociation ( $\alpha$ ) = 0.3

Find out  $|T_1 - T_2|$  if  $K_f$  of water = 1.86 K kg/mole.

- (1) 0.0324                      (2) 0.0558  
(3) 0.0257                      (4) 0.8742

**Answer (2)**

**Sol.**  $\Delta T_1 = (1) (1.86) (0.1) = 0.186$

$\Delta T_2 = (1.3) (1.86) (0.1) = 0.2418$

$(T_1 - T_2) = 0.0558$

16. Statement-1: Reduction potential  $M^{3+}/M^{2+}$  is more for Fe than Mn

Statement-2:  $V^{2+}$  has magnetic moment between 4.4 – 5.2 B.M.

Select the correct option

- (1) Statement 1 and 2, both are correct  
(2) Statement 1 and 2, both are incorrect  
(3) Statement 1 is correct but statement 2 is incorrect  
(4) Statement 1 is incorrect but statement 2 is correct

**Answer (2)**

**Sol.**  $E_{\text{Mn}^{3+}/\text{Mn}^{2+}}^\circ = 1.57 \text{ V}$

$E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^\circ = 0.77 \text{ V}$

Therefore statement 1 is incorrect

$V^{3+} = d^2 \Rightarrow \mu = \sqrt{2(2+2)} \text{ B.M.}$

$= \sqrt{8}$

$= 2.83 \text{ B.M.}$

Therefore statement 2 is incorrect

Hence option (2) is the correct answer.

17. Match column-I with Column-II.

Industry	Waste/pollution
(i) Cotton mills	(a) Biodegradable waste
(ii) Paper mills	(b) Gypsum
(iii) Fertilizer	(c) Non biodegradable waste
(iv) Thermal power plant	(d) Fly ash

- (1) i  $\rightarrow$  c; ii  $\rightarrow$  a, b; iii  $\rightarrow$  c, iv  $\rightarrow$  b  
(2) i  $\rightarrow$  a; ii  $\rightarrow$  a; iii  $\rightarrow$  b; iv  $\rightarrow$  d  
(3) i  $\rightarrow$  a, c; ii  $\rightarrow$  b; iii  $\rightarrow$  b, iv  $\rightarrow$  a  
(4) i  $\rightarrow$  c; ii  $\rightarrow$  b, c; iii  $\rightarrow$  b, c; iv  $\rightarrow$  a

**Answer (2)**

**Sol.** Cotton mills  $\rightarrow$  Biodegradable waste

Paper mills  $\rightarrow$  Biodegradable waste

Fertilizer  $\rightarrow$  Gypsum

Thermal power plants  $\rightarrow$  Fly ash

18.

19.

20.

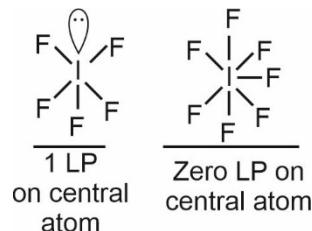
**SECTION - B**

**Numerical Value Type Questions:** This section contains 10 questions. In Section B, attempt any five questions out of 10. The answer to each question is a **NUMERICAL VALUE**. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the second decimal place; e.g., 06.25, 07.00, -00.33, -00.30, 30.27, -27.30) using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

21. Sum of number of lone pairs in central atom in  $\text{IF}_5$  and  $\text{IF}_7$  is

**Answer (01.00)**

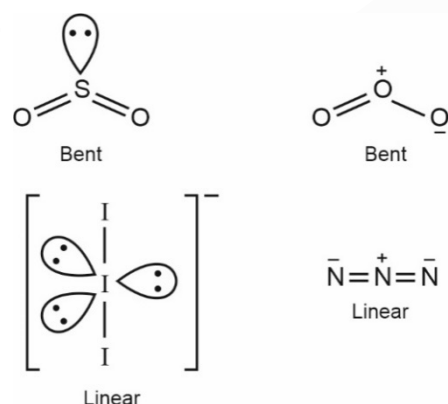
**Sol.**



22. How many of the following are bent in shape  
 $\text{SO}_2$ ,  $\text{O}_3$ ,  $\text{I}_3^\ominus$ ,  $\text{N}_3^\ominus$ ?

**Answer (02)**

**Sol.**



23. The pressure value of a gas is 930.2 mm Hg. The volume is then reduced to 40% of its initial value at constant temperature then what is the final pressure (in mm Hg)?

**Answer (2325.5)**

**Sol.**  $P_1V_1 = P_2V_2$

$$\frac{(930.2)}{760} \times V_1 = P_2 \times (0.4)V_1$$

$$P_2 = \frac{930.2}{0.4} = 2325.5 \text{ mm Hg.}$$

24. The degree of dissociation of a monobasic acid is 0.3. By what percent is the observed depression in freezing point greater than the calculated depression in freezing point?

**Answer (30.00)**

**Sol.**  $\text{HA} \rightleftharpoons \text{H}^+ + \text{A}^-$

$$1-\alpha \quad \alpha \quad \alpha$$

$$i = 1 + \alpha$$

$$\alpha = 0.3$$

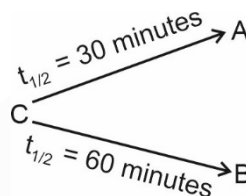
$$i = 1.3$$

$$(\Delta T_f)_{\text{obs}} = 1.3 \times K_f \times m$$

$$(\Delta T_f)_{\text{cal}} = 1 \times K_f \times m$$

$$\frac{(\Delta T_f)_{\text{obs}} - (\Delta T_f)_{\text{cal}}}{(\Delta T_f)_{\text{cal}}} \times 100 = \frac{0.3}{1} \times 100 = 30\%$$

25. Consider a reaction



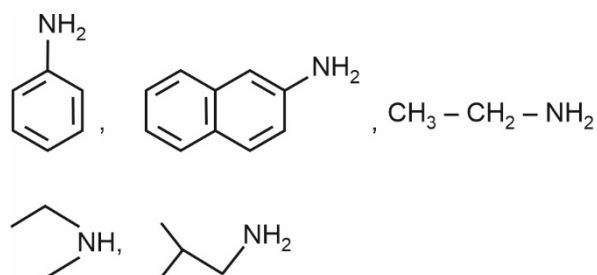
Overall half-life of C is (in minutes):

**Answer (20)**

$$\text{Sol. } \frac{1}{(t_{1/2})_C} = \frac{1}{(t_{1/2})_A} + \frac{1}{(t_{1/2})_B} = \frac{1}{30} + \frac{1}{60} = \frac{90}{1800}$$

$$\frac{1}{(t_{1/2})_C} = \frac{1}{20} \Rightarrow (t_{1/2})_C = 20 \text{ minutes}$$

26. How many compounds can be easily prepared by Gabriel phthalamide synthesis, which on reaction with Hinsberg reagent produces a compound which is soluble in KOH



**Answer (02)**

**Sol.**  $1^\circ$  aliphatic amines can be easily prepared by Gabriel phthalamide synthesis and produce soluble adducts in KOH

27.  
28.  
29.  
30.