

## PART II : CHEMISTRY

### SECTION I : Single Correct Answer Type

This section contains **8 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

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21.  $\text{NiCl}_2\{\text{P}(\text{C}_2\text{H}_5)_2(\text{C}_6\text{H}_5)\}_2$  exhibits temperature dependent magnetic behaviour (paramagnetic / diamagnetic). The coordination geometries of  $\text{Ni}^{2+}$  in the paramagnetic and diamagnetic states are respectively
- (A) tetrahedral and tetrahedral                      (B) square planar and square planar  
(C) tetrahedral and square planar                    (D) square planar and tetrahedral

**ANSWER : C**

22. In the cyanide extraction process of silver from argentite ore, the oxidizing and reducing agents used are
- (A)  $\text{O}_2$  and CO respectively.                      (B)  $\text{O}_2$  and Zn dust respectively.  
(C)  $\text{HNO}_3$  and Zn dust respectively.            (D)  $\text{HNO}_3$  and CO respectively.

**ANSWER : B**

23. The reaction of white phosphorus with aqueous NaOH gives phosphine along with another phosphorus containing compound. The reaction type; the oxidation states of phosphorus in phosphine and the other product are respectively
- (A) redox reaction;  $-3$  and  $-5$   
(B) redox reaction;  $+3$  and  $+5$   
(C) disproportionation reaction;  $-3$  and  $+5$   
(D) disproportionation reaction;  $-3$  and  $+3$

**Zero Marks to all**

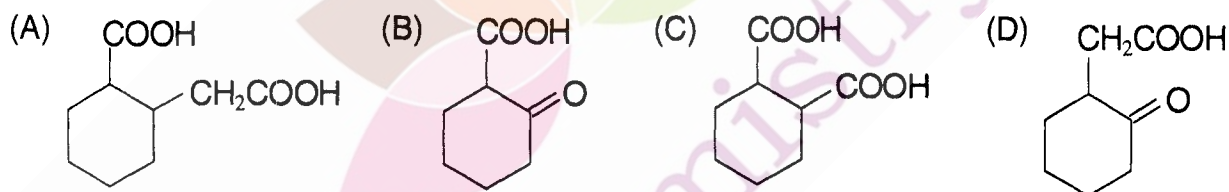
24. The shape of  $\text{XeO}_2\text{F}_2$  molecule is
- (A) trigonal bipyramidal (B) square planar  
(C) tetrahedral (D) see-saw

ANSWER : D

25. For a dilute solution containing 2.5 g of a non-volatile non-electrolyte solute in 100 g of water, the elevation in boiling point at 1 atm pressure is  $2^\circ\text{C}$ . Assuming concentration of solute is much lower than the concentration of solvent, the vapour pressure (mm of Hg) of the solution is (take  $K_b = 0.76 \text{ K kg mol}^{-1}$ )
- (A) 724 (B) 740 (C) 736 (D) 718

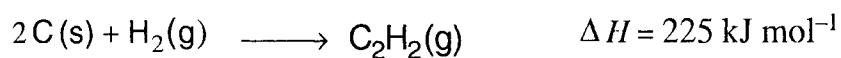
ANSWER : A

26. The compound that undergoes decarboxylation most readily under mild condition is



ANSWER : B

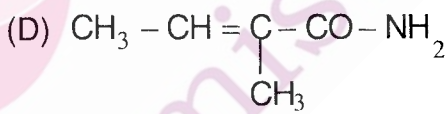
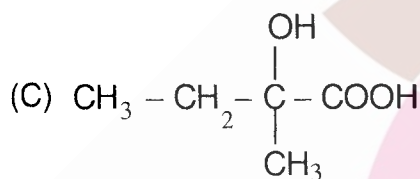
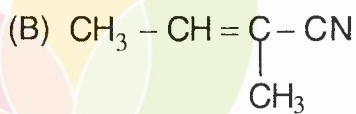
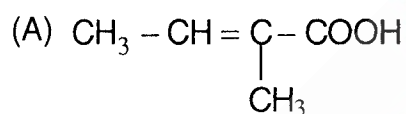
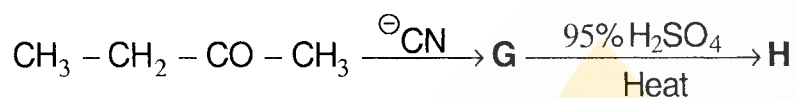
27. Using the data provided, calculate the multiple bond energy ( $\text{kJ mol}^{-1}$ ) of a  $\text{C}\equiv\text{C}$  bond in  $\text{C}_2\text{H}_2$ . That energy is (take the bond energy of a  $\text{C-H}$  bond as  $350 \text{ kJ mol}^{-1}$ .)



- (A) 1165                      (B) 837                      (C) 865                      (D) 815

**ANSWER : D**

28. The major product **H** of the given reaction sequence is



**ANSWER : A**

## SECTION II : Paragraph Type

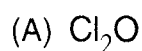
This section contains 6 multiple choice questions relating to three paragraphs with two questions on each paragraph. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

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## Paragraph for Questions 29 and 30

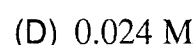
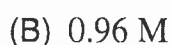
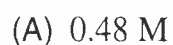
Bleaching powder and bleach solution are produced on a large scale and used in several household products. The effectiveness of bleach solution is often measured by iodometry.

29. Bleaching powder contains a salt of an oxoacid as one of its components. The anhydride of that oxoacid is



ANSWER : A

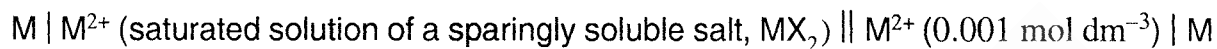
30. 25 mL of household bleach solution was mixed with 30 mL of 0.50 M KI and 10 mL of 4 N acetic acid. In the titration of the liberated iodine, 48 mL of 0.25 N  $\text{Na}_2\text{S}_2\text{O}_3$  was used to reach the end point. The molarity of the household bleach solution is



ANSWER : C

## Paragraph for Questions 31 and 32

The electrochemical cell shown below is a concentration cell.



The emf of the cell depends on the difference in concentrations of  $M^{2+}$  ions at the two electrodes.

The emf of the cell at 298 K is 0.059 V.

31. The solubility product ( $K_{sp}$ ;  $\text{mol}^3 \text{ dm}^{-9}$ ) of  $MX_2$  at 298 K based on the information available for the given concentration cell is (take  $2.303 \times R \times 298/F = 0.059 \text{ V}$ )

- (A)  $1 \times 10^{-15}$       (B)  $4 \times 10^{-15}$       (C)  $1 \times 10^{-12}$       (D)  $4 \times 10^{-12}$

**ANSWER : B**

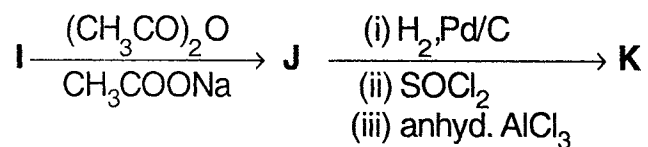
32. The value of  $\Delta G$  ( $\text{kJ mol}^{-1}$ ) for the given cell is (take  $1F = 96500 \text{ C mol}^{-1}$ )

- (A)  $-5.7$       (B)  $5.7$       (C)  $11.4$       (D)  $-11.4$

**ANSWER : D**

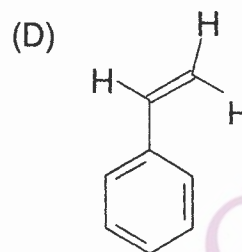
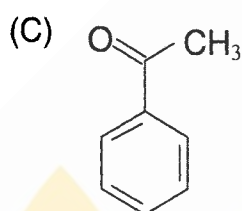
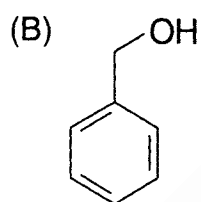
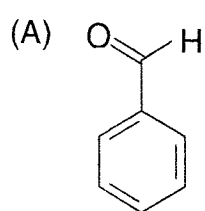
## Paragraph for Questions 33 and 34

In the following reaction sequence, the compound **J** is an intermediate.



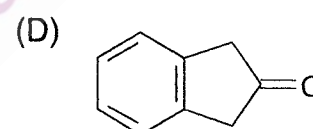
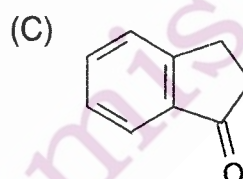
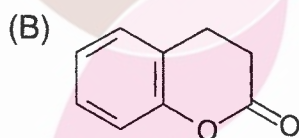
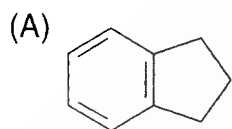
**J** ( $\text{C}_9\text{H}_8\text{O}_2$ ) gives effervescence on treatment with  $\text{NaHCO}_3$  and a positive Baeyer's test.

33. The compound **I** is



ANSWER : A

34. The compound **K** is

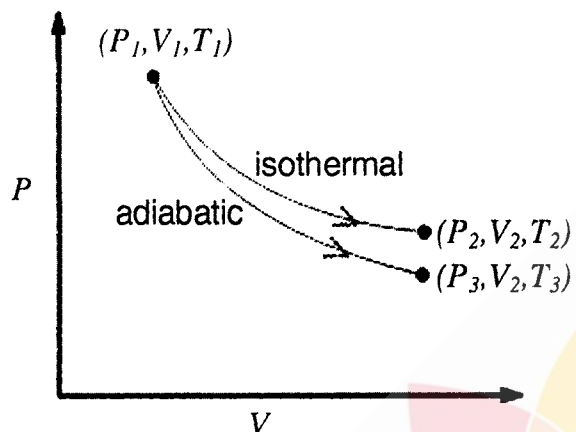


ANSWER : C

## SECTION III : Multiple Correct Answer(s) Type

This section contains 6 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** are correct.

35. The reversible expansion of an ideal gas under adiabatic and isothermal conditions is shown in the figure. Which of the following statement(s) is (are) correct?



(A)  $T_1 = T_2$

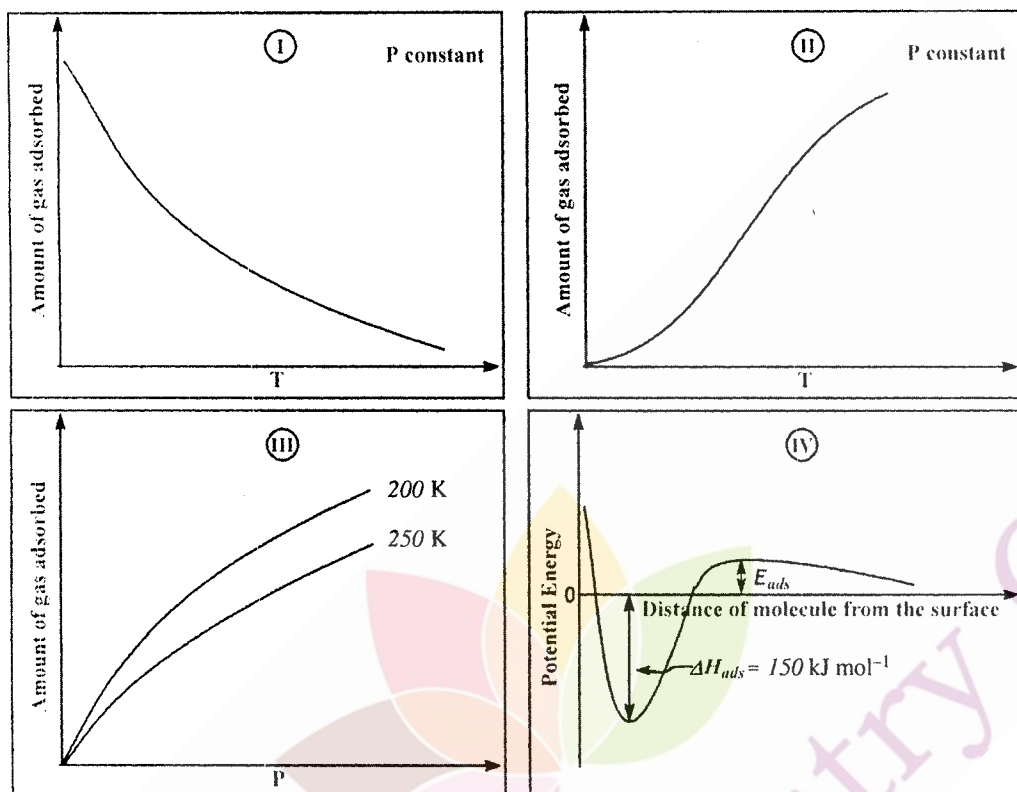
(B)  $T_3 > T_1$

(C)  $w_{\text{isothermal}} > w_{\text{adiabatic}}$

(D)  $\Delta U_{\text{isothermal}} > \Delta U_{\text{adiabatic}}$

**ANSWER : ACD or AD**

36. The given graphs / data I, II, III and IV represent general trends observed for different physisorption and chemisorption processes under mild conditions of temperature and pressure. Which of the following choice(s) about I, II, III and IV is (are) correct?



- (A) I is physisorption and II is chemisorption  
 (B) I is physisorption and III is chemisorption  
 (C) IV is chemisorption and II is chemisorption  
 (D) IV is chemisorption and III is chemisorption

ANSWER : AC



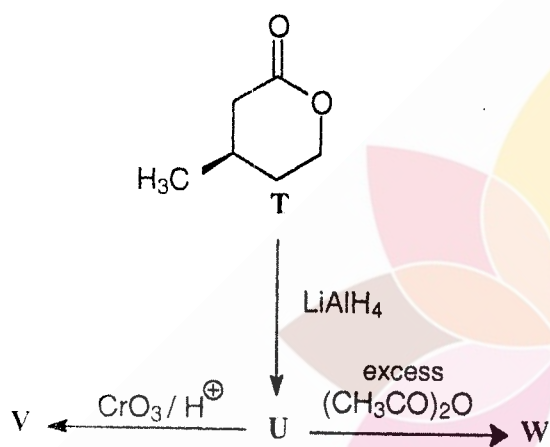


38. With respect to graphite and diamond, which of the statement(s) given below is (are) correct ?

- (A) Graphite is harder than diamond.
- (B) Graphite has higher electrical conductivity than diamond.
- (C) Graphite has higher thermal conductivity than diamond.
- (D) Graphite has higher C-C bond order than diamond.

**ANSWER : BD**

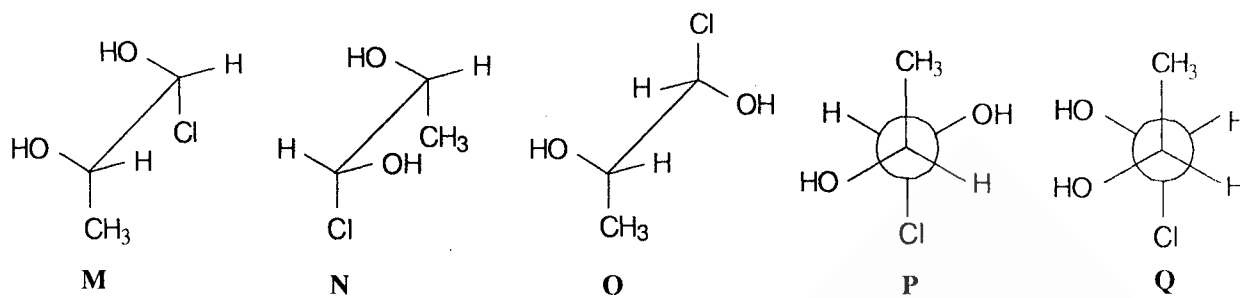
39. With reference to the scheme given, which of the given statment(s) about **T**, **U**, **V** and **W** is (are) correct ?



- (A) **T** is soluble in hot aqueous NaOH
- (B) **U** is optically active
- (C) Molecular formula of **W** is  $\text{C}_{10}\text{H}_{18}\text{O}_4$
- (D) **V** gives effervescence on treatment with aqueous  $\text{NaHCO}_3$

**ANSWER : ACD**

40. Which of the given statement(s) about N, O, P and Q with respect to M is (are) correct ?



- (A) M and N are non-mirror image stereoisomers  
 (B) M and O are identical  
 (C) M and P are enantiomers  
 (D) M and Q are identical

ANSWER : ABC

The Chemistry Guru