JEE MAIN-2012

CHEMISTRY

[Time: 3 hours] [Maximum Marks: 198]

GENERAL INSTRUCTIONS

A. General:

1. This booklet is your Question paper. Do not break the seats of his booklet before being instructed to do so by the invigilators.

2. The question paper CODE is printed on the right hand top corner of this page and on the back page of this booklet.

3. Blank spaces and blank pages are provided in this booklet for your rough work. No additional sheets will be provided for rough work.

4. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers, and electronic gadgets are NOT allowed inside the examination hall.

5. Answers to the questions and personal details arc to be filled on a two part carbon less paper, which is provided separately. You should not separate these parts. The invigilator will separate them at the end of examination. The upper sheet is machine-gradablc Objective Response Sheet (ORS) which will be taken back by the invigilator. You will be allowed to take away the bottom sheet at the end of the examination.

6. **Using a black ball point pen, darken the bubbles on the upper original sheet**. Apply sufficient pressure so that the impression is created on the bottom sheet.

7. DO NOT TAMPER WITH /MUTILATE THE ORS OR THE BOOKLET.

8. On breaking the seals of the booklet check that it contains 36 pages and all 60 questions and corresponding answer choices are legible. Read carefully the instructions printed at the beginning of each section.

B. Filling the Right Part of the ORS:

9. The ORS also has a CODES printed on its left and right parts.

10. Check that the same CODE is printed on the ORS and on this booklet. **IF IT IS NOT THEN ASK FOR A CHANGE OF THE BOOKLET.** Sign at the place provided on the ORS affirming that you have verified that all the code are same.

11. Write your Name, Registration Number and the name of examination centre and sign with pen in the boxes provided on the right part of the ORS. **Do not write any of this information anywhere else.** Darken the appropriate bubble UNDER each digit of your Registration Number in such a way that the impression is created on the bottom sheet. Also darken the paper CODE given on the right side of **ORS(R4).**

C. Question paper format:

The question paper consists of 3 Section. Each part consists of three sections.

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

13. **Section II** contains **3 paragraphs** each describing theory, experiment, data etc. There are **6 multiple choice questions** relating to three paragraphs with **2 questions on each paragraph**. Each question of a particular paragraph has four choices (A),(B). (C) and (D) out of which ONLY ONE is correct.

14. Section III contains 6 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE or MORE are correct.
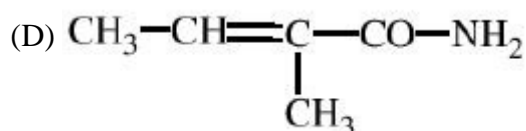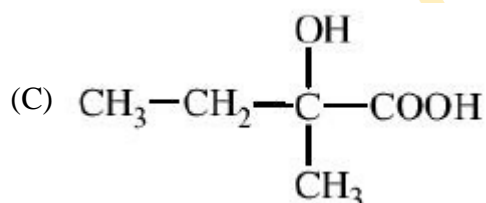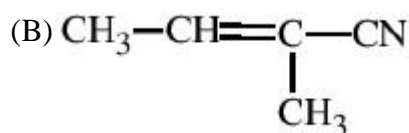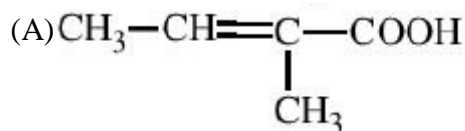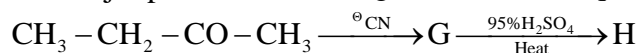
D. Marking Scheme

15. For each question in Section I and Section IT, you will he awarded 3 marks if you darken the bubble corresponding to the correct answer ONLY and zero (0) marks if no bubbles are darkened. In all other cases, minus one (-1) mark will be awarded in these sections.

16. For each question in **Section III**. you will be awarded **4 marks** if you darken **ALL** the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answer(s) in this section.

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SECTION I

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

21. The major product H of the given reaction sequence is

$$CH_3 - CH_2 - CO - CH_3 \xrightarrow{\ominus CN} G \xrightarrow[\text{Heat}]{95\% H_2SO_4} H$$

(A) CH₃—CH=C—COOH
        |
        CH₃

(B) CH₃—CH=C—CN
        |
        CH₃

(C) CH₃—CH₂—C—COOH
              |
              OH (above)
              |
              CH₃

(D) CH₃—CH=C—CO—NH₂
        |
        CH₃

22. $NiCl_2\{P(C_2H_5)(C_6H_5)\}_2$ exhibits temperature dependent magnetic behaviour (paramagnetic/diamagnetic). The coordination geometries of 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

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23. In the cyanide extraction process of silver from argentite ore, the oxidising and reducing agents used are

   (A) O_2 and CO respectively

   (B) O_2 and Zn dust respectively

   (C) HNO_3 and Zn dust respectively

   (D) HNO_3 and CO respectively

24. The reaction of white phosphorous with aqueous $NaOH$ gives phosphine along with another phosphorous 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) disproportionarion reaction; -3 and $+5$

   (D) disproportionation reaction; -3 and $+3$

25. The shape of XeO_2F_2 molecule is

   (A) trigonal bipyramidal

   (B) square planar

   (C) tetrahedral

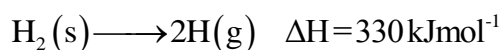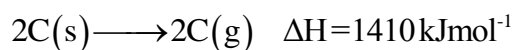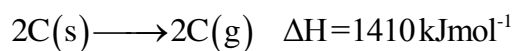   (D) see–saw

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

   (A) 724

   (B) 740

   (C) 736

   (D) 718

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

   (A)

   (B)

   (C)

   (D)

5
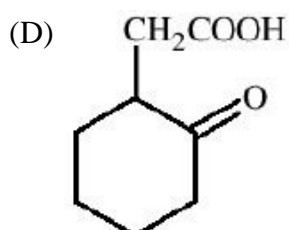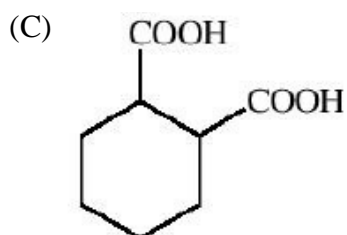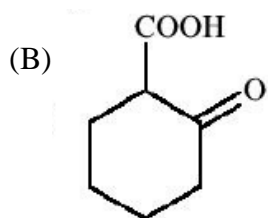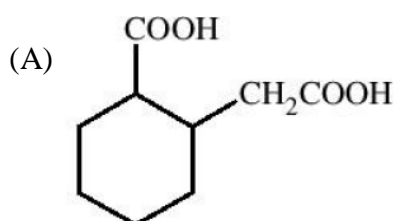
28. Using the data provided, calculate the multiple bond energy $(kJmol^{-1})$ of a $C\equiv C$ bond in C_2H_2. That energy is (take the bond energy of a $C-H$ bond as $350\,kJ\,mol^{-1}$)

$$2C(s)\longrightarrow 2C(g) \quad \Delta H=1410\,kJmol^{-1}$$

$$2C(s)\longrightarrow 2C(g) \quad \Delta H=1410\,kJmol^{-1}$$

$$H_2(s)\longrightarrow 2H(g) \quad \Delta H=330\,kJmol^{-1}$$

(A) 1165

(B) 837

(C) 865

(D) 815

SECTION II

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**.
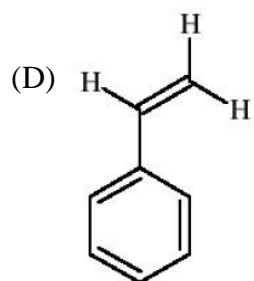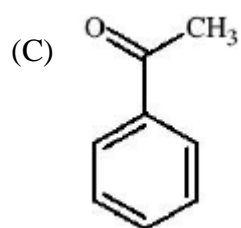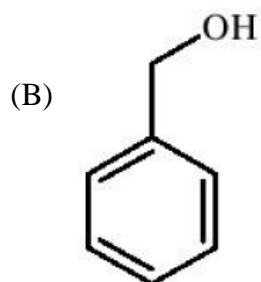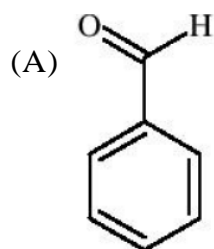
Paragraph for Questions 29 and 30

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

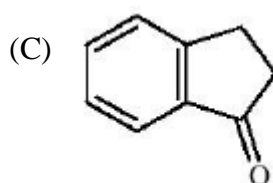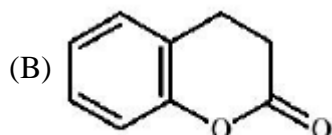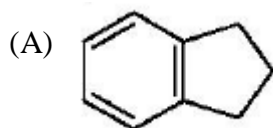$$I\xrightarrow[CH_3COONa]{(CH_3CO)_2O}J\xrightarrow[\substack{(ii)SOCl_2\\(iii)anhyd.AlCL_3}]{(i)H_2,Pd/C}K$$
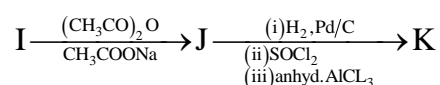
$J(C_9H_8O_2)$ gives effervescence on treatment with $NaHCO_3$ and a positive Baeyer's test.

29. The compound I is

(A)

(B)

(C)

(D)

30. The compound K is

(A)

(B)

(C)

(D)
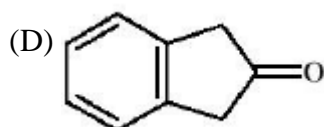
Paragraph for Questions 31 and 32

The electrochemical cell shown below is a concentration cell.

$$M|M^{2+}\left(\text{saturated solution of a sparingly soluble salt, } MX_2\right)\;||\;M^{2+}\left(0.001\,\text{mol}\,\text{dm}^{-3}\right)|M$$

The emf of the cell depends on the difference in concentration of M^{2+} ion at the two electrodes. The emf of the cell at $298\,\text{K}$ is $0.059\,\text{V}$.

31. The value of $\Delta G\;\left(\text{k J mol}^{-1}\right)$ for the given cell is (take $1F = 96500\,\text{C}\,\text{mol}^{-1}$)

(A) -5.7

(B) 5.7

(C) 11.4

(D) -11.4

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

(A) 1×10^{-15}

(B) 4×10^{-15}

(C) 1×10^{-12}

(D) 4×10^{-12}

Paragraph for Questions 33 and 34

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

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

(A) Cl_2O

(B) Cl_2O_7

(C) ClO_2

(D) Cl_2O_6

34. $25\,mL$ of household solution was mixed with $30\,mL$ of $0.50\,M$ KI and $10\,mL$ of $4N$ acetic acid. In the titration of the liberated iodine, $48\,mL$ of $0.25\,N$ $Na_2S_2O_3$ was used to reach the end point. The molarity of the household bleach solution is

(A) $0.48\,M$

(B) $0.96\,M$
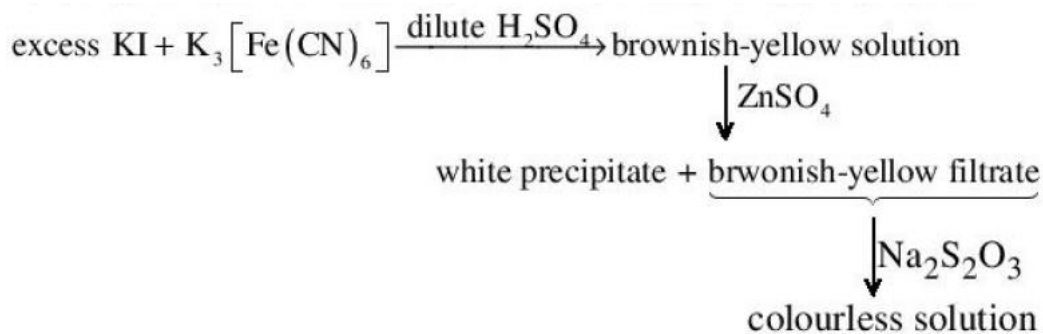
(C) $0.24\,M$

(D) $0.024\,M$

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SECTION III

This section contains **6 multiple choice questions**. Each question has four choices (A), (R), (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?
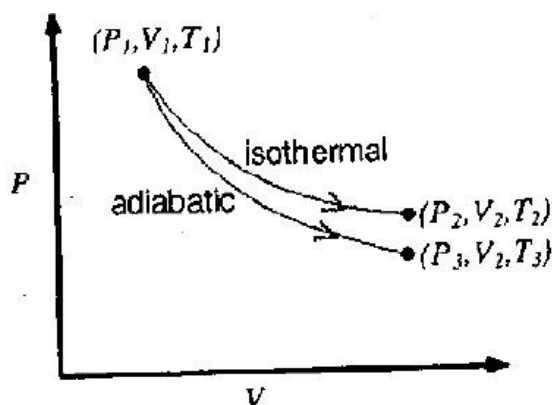

(A) $T_1 = T_2$

(B) $T_3 > T_1$

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

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

36.   For the given aqueous reactions, which of the statement(s) is (are) true?

$$\text{excess KI} + \text{K}_3\left[\text{Fe}\left(\text{CN}\right)_6\right] \xrightarrow{\text{dilute H}_2\text{SO}_4} \text{brownish-yellow solution}$$

$$\downarrow \text{ZnSO}_4$$

$$\text{white precipitate} + \underbrace{\text{brwonish-yellow filtrate}}$$

$$\downarrow \text{Na}_2\text{S}_2\text{O}_3$$

$$\text{colourless solution}$$

(A) The first reaction is a redox reaction.

(B) White precipitate is $Zn_3[Fe(CN)_6]_2$.

(C) Addition of filtrate to starch solution gives blue colour.

(D) White precipitate is soluble in NaOH solution.

37. With reference to the scheme given, which of the given statement(s) about T, U, V and W is (are) correct?
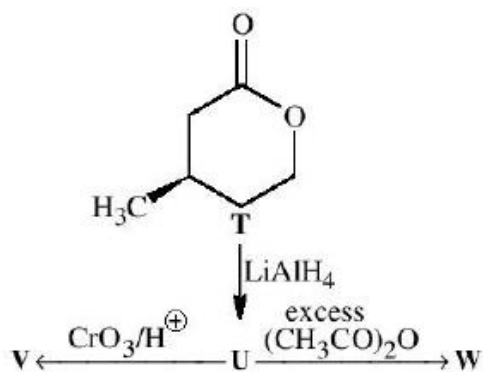
(A) T is soluble in hot aqueous NaOH

(B) U is optically active

(C) Molecular formula of W is $C_{10}H_{18}O_4$

(D) V gives effervescence on treatment with aqueous $NaHCO_3$

38. Which of the given statement(s) about N,O,P and Q with respect to M is (are) correct?
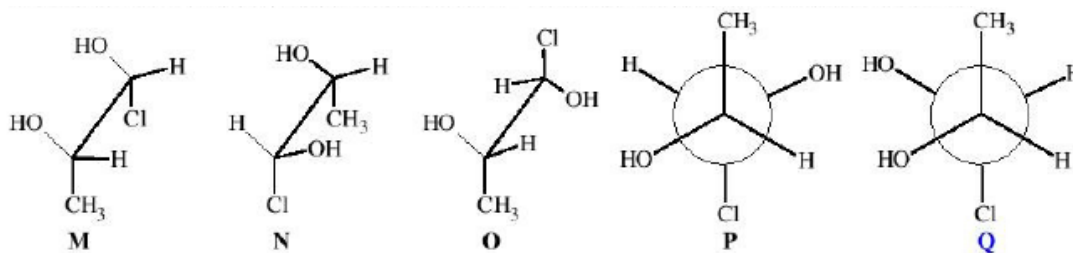
(A) M and N are non-mirror image stereoisomers

(B) M and O are identical

(C) M and P are identical

(D) M and Q are identical

39. 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.

40. 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?
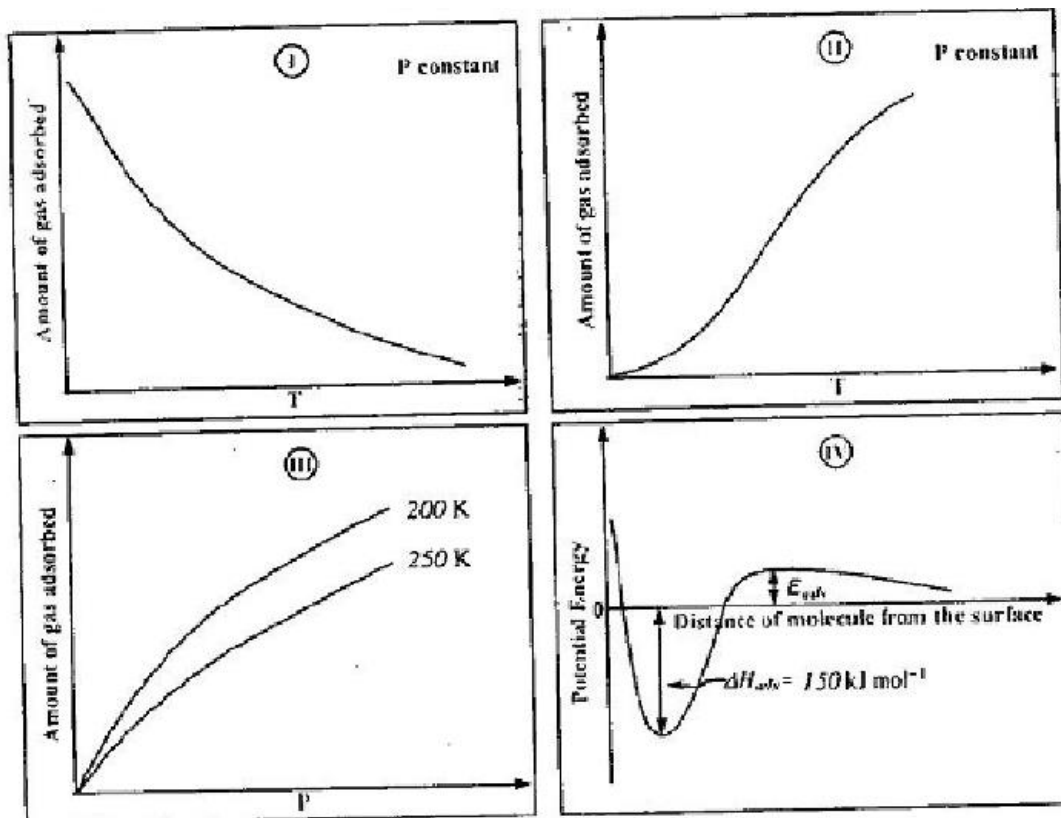
(A) I is physisorption and **II** is chemisorption

(B) **I** is physisorption and III is chemisorption

(C) IV is chemisorption and II is chemisorption

(D) IV is chemisorption and III is chemisorption

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