

FACULTY SELECTION TEST

CHEMISTRY

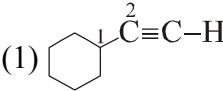
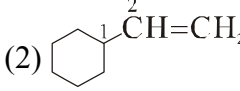
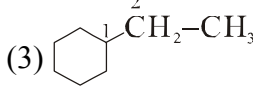
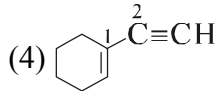
Time: 90 Min.

Max. Marks: 200

GENERAL INSTRUCTIONS

1. Write your Name in the Space Provided in the Bottom of this Booklet.
2. The question paper consists of '50' objective type questions.
3. Each question has four choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.
4. Each correct answer carries **4 marks** and each wrong answer **(- 1) Mark**.
5. Use **Black or Blue Ball Point Pen** only for filling particulars.
6. Use of Blank Papers, Clip Boards, Calculator, Log Table, Slide Rule and Mobile or any electronic gadgets in any form is not allowed.
7. In case of any dispute, the answer filled in the OMR sheet available with the institute shall be final.
8. After completion submit the Question Paper back along with the Answer Sheet.

Name: _____

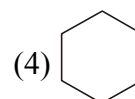
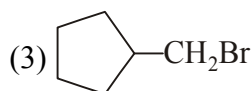
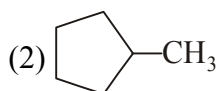
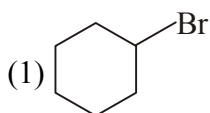
- Q.1 An electron, a proton and an alpha particle have kinetic energies of 16E, 4E and E respectively. What is the qualitative order of their de Broglie wavelengths?
 (1) $\lambda_e > \lambda_p = \lambda_\alpha$ (2) $\lambda_p = \lambda_\alpha > \lambda_e$ (3) $\lambda_p > \lambda_e > \lambda_\alpha$ (4) $\lambda_\alpha < \lambda_e \gg \lambda_p$
- Q.2 C₁-C₂ bond is shortest in :
- (1)  (2)  (3)  (4) 
- Q.3 The species present in solution when CO₂ is dissolved in water are
 (1) CO₂, H₂CO₃, HCO₃⁻, CO₃²⁻ (2) H₂CO₃, CO₃²⁻
 (3) CO₃²⁻, HCO₃⁻ (4) CO₂, H₂CO₃
- Q.4 What is the equilibrium constant for the reaction

$$P_{4(s)} + 5O_{2(g)} \rightleftharpoons P_4O_{10(s)}$$
- (1) $K_c = \frac{1}{[O_2]^5}$ (2) $K_c = \frac{[P_4O_{10}]}{5[P_4][O_2]^5}$ (3) $K_c = [O_2]^5$ (4) $K_c = \frac{[P_4O_{10}]}{[P_4][O_2]^5}$
- Q.5 Which can undergo haloform reaction?
 (1) (CH₃)₃C-OH (2) (C₂H₅)₂C = O (3) Acetophenone (4) Benzophenone
- Q.6 (NH₄)₂Cr₂O₇ on heating gives a gas which is also given by:
 (1) heating NH₄NO₂ (2) heating NH₄NO₃
 (3) Mg₃N₂ + H₂O (4) Na(comp.) + H₂O₂
- Q.7 The rate law for a reaction between the substances A and B is given by

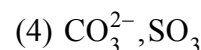
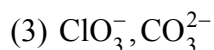
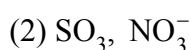
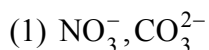
$$\text{rate} = k [A]^n [B]^m$$

 On doubling the concentration of A and halving the concentration of B, the ratio of the new rate to the earlier rate of the reaction will be as
 (1) 2^(n-m) (2) 1 / 2^(m+n) (3) (m + n) (4) (n - m)

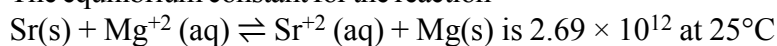
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Q.9 Which of the following are isoelectronic and isostructural? NO_3^- , CO_3^{2-} , ClO_3^- , SO_3



Q.10 The equilibrium constant for the reaction



is 2.69×10^{12} at 25°C

The E° for a cell made up of the Sr/Sr^{+2} and Mg^{+2}/Mg half cells

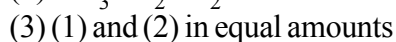
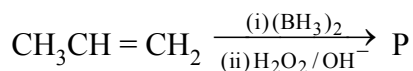
(1) 0.3667 V

(2) 0.7346 V

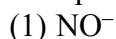
(3) 0.1836 V

(4) 0.1349 V

Q.11 Predict the product P



Q.12 The species having bond order different from that in CO is



Q.13 Correct option regarding a container containing 1 mol of a gas in 22.4 litre container at 273 K is

(1) If compressibility factor (z) > 1 then 'P' will be less than 1 atm.

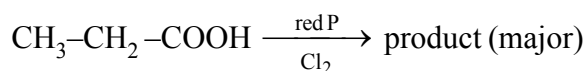
(2) If compressibility factor (z) > 1 then 'P' will be greater than 1 atm.

(3) If 'b' dominates, pressure will be less than 1 atm.

(4) If 'a' dominates, pressure will be greater than 1 atm.

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Q.14 Select the correct product for the following reaction.



- (1) $\begin{array}{c} \text{CH}_2\text{-CH}_2\text{-COOH} \\ | \\ \text{Cl} \end{array}$ (2) $\begin{array}{c} \text{Cl} \\ | \\ \text{CH}_3\text{-CH-COOH} \end{array}$
- (3) $\begin{array}{c} \text{Cl} \qquad \qquad \text{O} \\ | \qquad \qquad \parallel \\ \text{CH}_2\text{-CH}_2\text{-C-Cl} \end{array}$ (4) $\begin{array}{c} \qquad \qquad \qquad \text{O} \\ \qquad \qquad \qquad \parallel \\ \text{CH}_3\text{-CH}_2\text{-C-Cl} \end{array}$

Q.15 $\text{Y} \xleftarrow{\Delta, 205^\circ\text{C}} \text{CaSO}_4 \cdot 2\text{H}_2\text{O} \xrightarrow{\Delta, 120^\circ\text{C}} \text{X}$. X and Y are respectively

- (1) plaster of paris, dead burnt plaster
(2) dead burnt plaster, plaster of paris
(3) CaO and plaster of paris
(4) plaster of paris, mixture of gases

Q.16 Which one of the following schemes of ordering closed packed sheets of equal sized spheres do not generate close packed lattice.

- (1) ABCABC (2) ABACABAC
(3) ABBAABBA (4) ABCBCABCBC

Q.17 Which of the following compounds can undergo Canizzaro reaction?

- (1) CH_3CHO (2) $\text{CH}_3\text{CH}_2\text{CHO}$
(3) $(\text{CH}_3)_2\text{CHCHO}$ (4) None of these

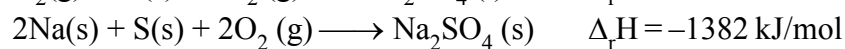
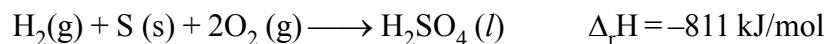
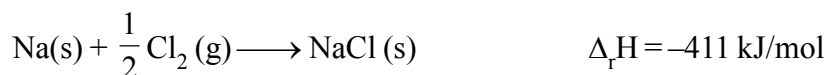
Q.18 The compound(s) formed upon combustion of sodium metal in excess air is (are)

- (1) Na_2O_3 (2) Na_2O (3) NaO_2 (4) NaOH

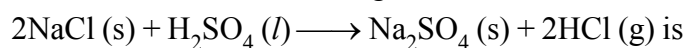
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Q.19 The enthalpy changes of the following reactions at 27°C are

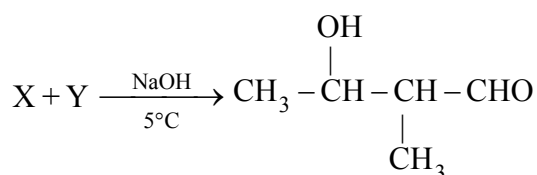


from these data, the heat change of reaction at constant volume (in kJ/mol) at 27°C for the process



- (1) 67 (2) 62.02 (3) 71.98 (4) None

Q.20 In the given reaction



(X) and (Y) will respectively be:

- (1) $\text{CH}_3\text{-CH}_2\text{-CHO}$ and $\text{CH}_3\text{-CH}_2\text{-CHO}$ (2) $\text{CH}_3\text{-CHO}$ and $\text{CH}_3\text{-CH}_2\text{-CHO}$

- (3) $\text{CH}_3\text{-CHO}$ and $\text{CH}_3\text{-CHO}$ (4) $\text{CH}_3\text{-CHO}$ and $\text{CH}_3 - \overset{\text{CH}_3}{\underset{\underset{\text{CH}_3}{|}}{\text{C}}} - \text{CHO}$

Q.21 The reaction of P_4 with X leads selectively to P_4O_6 . The X is

- (1) Dry O_2 (2) A mixture of O_2 and N_2
 (3) Moist O_2 (4) O_2 in the presence of aqueous NaOH

Q.22 The vapour pressure of an aqueous solution is found to be 750 torr at certain temperature 'T'. If 'T' is the temperature at which pure water boils under atmospheric pressure and same solution show elevation in boiling point $\Delta T_b = 1.04 \text{ K}$, find the atmospheric pressure ($K_b = 0.52 \text{ K kg mol}^{-1}$)

- (1) 777 (2) 779 (3) 782 (4) 746

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- Q.23 Elimination of HBr from 2-bromobutane results in the formation of :
 (1) Equimolar mixture of 1–and 2–butene (2) Predominantly 2–butene
 (3) Predominantly 1–butene (4) Predominantly 2–butyne
- Q.24 In the equation : $M + 8CN^- + 2H_2O + O_2 \longrightarrow 4[M(CN)_2]^- + 4OH^-$
 Metal M is:
 (1) Cu (2) Ag (3) Fe (4) Al
- Q.25 **Statement-1** : pH of 10^{-7} M NaOH solution exists between 7 to 7.3 at 25°C .
Statement-2 : Due to common ion effect ionization of water is reduced.
 (1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (3) Statement-1 is true, statement-2 is false.
 (4) Statement-1 is false, statement-2 is true.
- Q.26 **Statement-1**: 2–methylbutan–2–ol on heating with H_2SO_4 given 2–methyl but–2–ene
Statement-2: The dehydration of 3° alcohol occurs through carbocation function followed by E^1 mechanism
 (1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (3) Statement-1 is true, statement-2 is false.
 (4) Statement-1 is false, statement-2 is true.
- Q.27 **Statement-1** : The highest oxidation state of chromium in its compounds is $6+$.
Statement-2 : Chromium atom has only six electrons in ns and $(n-1)$ d orbitals.
 (1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (3) Statement-1 is true, statement-2 is false.
 (4) Statement-1 is false, statement-2 is true.

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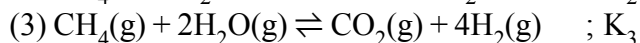
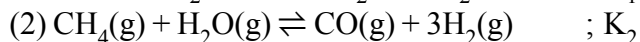
- Q.28 **Statement-1** : For every chemical reaction at equilibrium, standard Gibbs energy of reaction is zero
- Statement-2** : At constant temperature and pressure, chemical reactions are spontaneous in the direction of decreasing Gibbs energy.
- (1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (3) Statement-1 is true, statement-2 is false.
 (4) Statement-1 is false, statement-2 is true.
- Q.29 **Statement-1**: Propane on photochlorination gives 2-chloro propane as major product.
Statement-2: 2° carbocation is more stable than 1° carbocation.
- (1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (3) Statement-1 is true, statement-2 is false.
 (4) Statement-1 is false, statement-2 is true.
- Q.30 **Statement-1** : NH_3 and CH_3^- both have pyramidal shape.
- Statement-2** : N in NH_3 and C in CH_3^- both have sp^3 -hybridisation with one lone pair of electron on each.
- (1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (3) Statement-1 is true, statement-2 is false.
 (4) Statement-1 is false, statement-2 is true.
- Q.31 The value of $(n_2 + n_1)$ and $(n_2^2 - n_1^2)$ for He^+ ion in atomic spectrum are 4 and 8 respectively. The wavelength of emitted photon when electron jump from n_2 to n_1 is
- (1) $\frac{32}{9} R_H$ (2) $\frac{9}{32} R_H$ (3) $\frac{9}{32 R_H}$ (4) $\frac{32}{9 R_H}$
- Q.32 The reduction in atomic size with increase in atomic number is a characteristic of elements of -
 (1) d-block (2) f-block (3) Radioactive series (4) High atomic masses

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- Q.33 Bottles containing C_6H_5I and $C_6H_5CH_2I$ lost their original labels. They were labelled A and B for testing. A and B were separately taken in test tubes and boiled with NaOH solution. The end solution in each tube was made acidic with dilute HNO_3 and some $AgNO_3$ solution added. Solution A gave yellow precipitate. Which one of the following statements is true for the experiment ?
- (1) Addition of HNO_3 was unnecessary (2) A was C_6H_5I
 (3) A was $C_6H_5CH_2I$ (4) B was C_6H_5I

- Q.34 For the following three reactions 1, 2 and 3, equilibrium constants are given :



Which of the following relations is correct ?

- (1) $K_1 \sqrt{K_2} = K_3$ (2) $K_2 K_3 = K_1$ (3) $K_3 = K_1 K_2$ (4) $K_3 \cdot K_2^3 K_1^2$

- Q.35 If the ionic radii of each K^+ and F^- are 1.34\AA , then the atomic radii of K and F will be respectively :

- (1) 1.34\AA , 1.34\AA (2) 0.72\AA , 1.96\AA (3) 1.96\AA , 0.72\AA (4) 1.96\AA , 1.34\AA

- Q.36 Meso tartaric acid is optically inactive due to :

- (1) two chiral C-atoms (2) absence of element of symmetry
 (3) external compensation (4) plane of symmetry

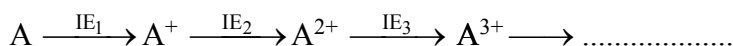
- Q.37 Rate of a reaction can be expressed by Arrhenius equation as :

$$k = Ae^{-E/RT}$$

In this equation, E represents

- (1) The fraction of molecules with energy greater than the activation energy of the reaction
 (2) The energy above which all the colliding molecules will react
 (3) The energy below which colliding molecules will not react
 (4) The total energy of the reacting molecules at a temperature, T

- Q.38 For an element 'A'.



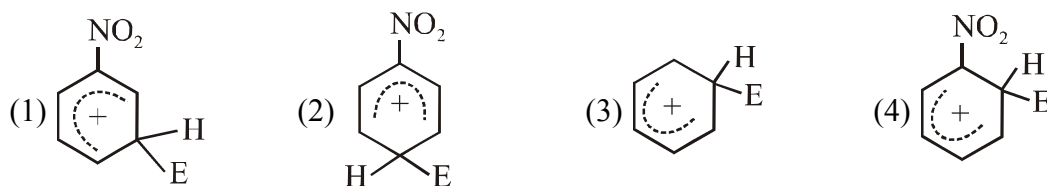
The IE_1 and IE_3 values are 27 kJ/mole and 51 kJ/mole respectively. Then the value of IE_2 is _____ kJ/mole.

- (1) 21 (2) 33 (3) 59 (4) 63

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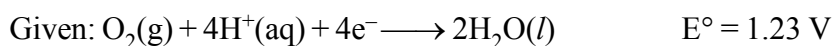


Q.39 The electrophile, E^+ attacks the benzene ring to generate the intermediate σ -complex. Of the following which σ -complex is of lowest energy ?



Q.40 For the fuel cell reaction $2H_2(g) + O_2(g) \longrightarrow 2H_2O(l)$; $\Delta_f H_{298}^\circ(H_2O, l) = -285.5 \text{ kJ/mol}$

What is ΔS_{298}° for the given fuel cell reaction?



- (1) -0.322 J/K (2) -0.635 kJ/K (3) 3.51 kJ/K (4) -0.322 kJ/K

Q.41 Match List-I with List-II and select the correct answer using codes given below the lists –

List-I

Metal ions

(A) Cr^{3+}

(B) Fe^{2+}

(C) Ni^{2+}

(D) Mn^{2+}

List-II

Magnetic moment(B.M.)

i. $\sqrt{35}$

ii. $\sqrt{30}$

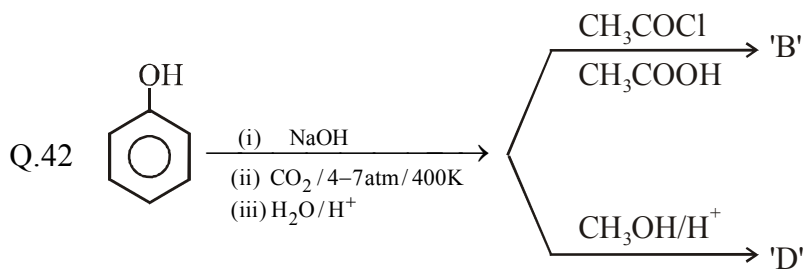
iii. $\sqrt{24}$

iv. $\sqrt{15}$

v. $\sqrt{8}$

code :		(A)	(B)	(C)	(D)
(1)	i	iii	v	iv	iv
(2)	i	iii	v	v	i
(3)	iv	iii	v	v	i
(4)	iv	v	iii	iii	i

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B and D respectively are :

- (1) aspirin, oil of winter green (2) oil of winter green, aspirin
 (3) salicylic acid (4) none

Q.43 A gas mixture contains equal number of molecules of N_2 and SF_6 , some of it is passed through a gaseous effusion apparatus. Calculate how many molecules of N_2 are present in the product gas for every 100 molecules of SF_6 .

- (1) 228 (2) 114 (3) 116 (4) 456

Q.44 From the stability constant (hypothetical values) given below, predict which is the strongest ligand—

- (1) $Cu^{2+} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}$, ($K = 4.5 \times 10^{11}$)
 (2) $Cu^{2+} + 4CN^- \rightleftharpoons [Cu(CN)_4]^{2-}$, ($K = 2.0 \times 10^{27}$)
 (3) $Cu^{2+} + 2en \rightleftharpoons [Cu(en)_2]^{2+}$, ($K = 3.0 \times 10^{15}$)
 (4) $Cu^{2+} + 4H_2O \rightleftharpoons [Cu(H_2O)_4]^{2+}$, ($K = 9.5 \times 10^8$)

Q.45 $CH_3-COOH \xrightarrow[\text{Red P}]{Br_2(1 Eq.)} \xrightarrow{KCN} \xrightarrow{H_2O/H^+} \xrightarrow{\Delta} \dots\dots$ The final product is :

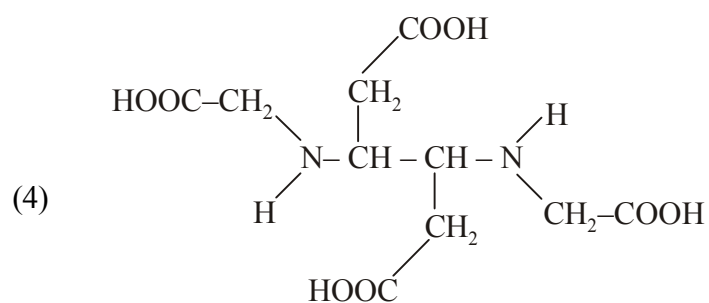
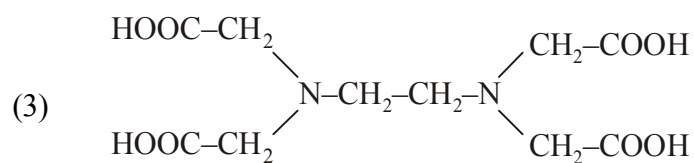
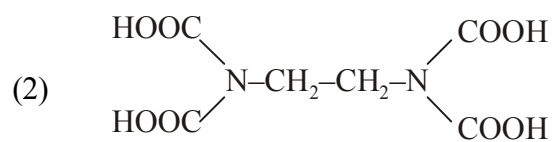
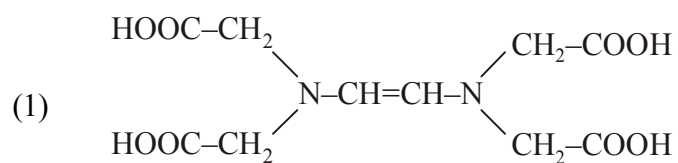
- (1) $CH_2 \begin{cases} \nearrow COOH \\ \searrow COOH \end{cases}$ (2) $H_3C - \overset{O}{\parallel} C - COOH$
 (3) CH_3COOH (4) CH_4

Q.46 Which of the following is most soluble in water?

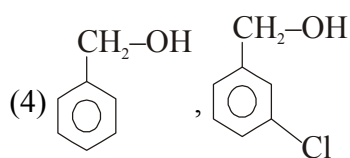
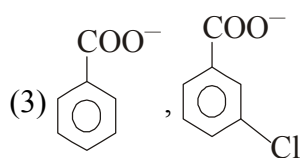
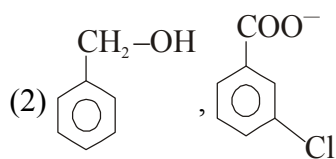
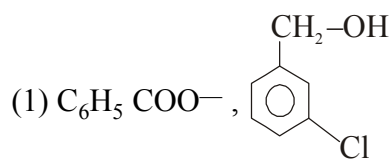
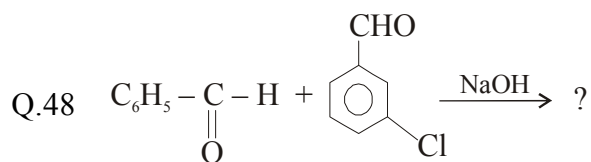
- (1) MnS ($K_{sp} = 8 \times 10^{-37}$)
 (2) ZnS ($K_{sp} = 7 \times 10^{-16}$)
 (3) Bi_2S_3 ($K_{sp} = 1 \times 10^{-72}$)
 (4) $Ag_3(PO_4)$ ($K_{sp} = 1.8 \times 10^{-18}$)

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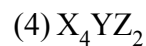
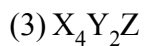
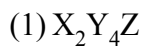
Q.47 The correct structure of ethylenediaminetetraacetic acid (EDTA) is



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Q.49 A solid is formed and it has three types of atoms X, Y, Z. X forms a FCC lattice with Y atoms occupying all the tetrahedral voids and Z atoms occupying half the octrahedral voids. The formula of the solid is:



Q.50 Polling process is used for –



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