INDIAN ASSOCIATION OF PHYSICS TEACHERS

NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2018 -19

Date of Examination: 25TH November, 2018

Time: 1100 to 1300 Hrs

Q. Paper Code: C321

Write the question paper code mentioned above on YOUR answer sheet (in the space provided), otherwise your answer sheet will NOT be assessed. Note that the same Q. P. Code appears on each page of the question paper.

Instructions to Candidates –

1. Use of mobile phones, smartphones, ipads during examination is **STRICTLY PROHIBITED**.
2. In addition to this question paper, you are given answer sheet along with Candidate's copy.
3. On the answer sheet, make all the entries carefully in the space provided **ONLY** in **BLOCK CAPITALS** as well as by properly darkening the appropriate bubbles.
   Incomplete/ incorrect/carelessly filled information may disqualify your candidature.
4. On the answer sheet, use only **BLUE or BLACK BALL POINT PEN** for making entries and filling the bubbles.
5. The email ID and date of birth entered in the answer sheet will be your login credentials for accessing performance report. Please take care while entering.
6. Question paper has 80 multiple choice questions. Each question has four alternatives, out of which **only one** is correct. Choose the correct alternative and fill the appropriate bubble, as shown.

Q. No. 22 

7. A correct answer carries 3 marks whereas 1 mark will be deducted for each wrong answer.
8. Any rough work should be done only in the space provided.
9. Use of **non-programmable** calculator is allowed.
10. No candidate should leave the examination hall before the completion of the examination.
11. After submitting your answer paper, take away the Candidate's copy for your reference.

Please DO NOT make any mark other than filling the appropriate bubbles properly in the space provided on the answer sheet.

Answer sheets are evaluated using machine, hence CHANGE OF ENTRY IS NOT ALLOWED.

Scratching or overwriting may result in a wrong score.

DO NOT WRITE ON THE BACK SIDE OF THE ANSWER SHEET.

Instructions to Candidates (continued) –

Read the following instructions after submitting the answer sheet.

12. **Comments regarding this question paper, if any, can be shared only on Google forms,** https://goo.gl/forms/Lxb1l8Bqov3Cl9FQ2 **till 27th November, 2018.**
13. **The answers/solutions to this question paper will be available on our website – www.iapt.org.in by 2nd December, 2018.**
14. **CERTIFICATES and AWARDS –**
Following certificates are awarded by the IAPT to students successful in NSEs

(i) "Centre Top 10%" that will be sent to NSE centre by post.

(ii) "Statewise Top 1%" that can be downloaded after Feb -15th, 2019 from iapt.org.in

(iii) "National Top 1%". Certificates can be downloaded after Feb -15th, 2019 from iapt.org.in

15. Result sheets can be downloaded from our website in the month of February. The "Centre Top 10%" certificates will be dispatched to the Prof-in-charge of the centre by February, 2019.
16. List of students (with centre number and roll number only) having score above MAS will be displayed on our website (**www.iapt.org.in**) by **22nd December, 2018.** See the **Eligibility Clause** in the Student's brochure on our website.
17. Students eligible for the INO Examination on the basis of selection criteria mentioned in Student's brochure will be informed accordingly.
18. Students qualified for OCSC (Chemistry) – 2019 will be awarded gold medals.

Useful Constants:

Charge of electron, $e = 1.602 \times 10^{-19}$ C

Mass of electron, $m_e = 9.1 \times 10^{-31}$ kg

Planck's constant, $h = 6.626 \times 10^{-34}$ J s

Speed of light, $c = 3.0 \times 10^{8}$ m s^{-1}

Avogadro constant, $N_A = 6.022 \times 10^{23}$ mol^{-1}

Molar gas constant, $R = 0.082$ L atm mol^{-1} K^{-1}

$= 8.314$ J mol^{-1} K^{-1}

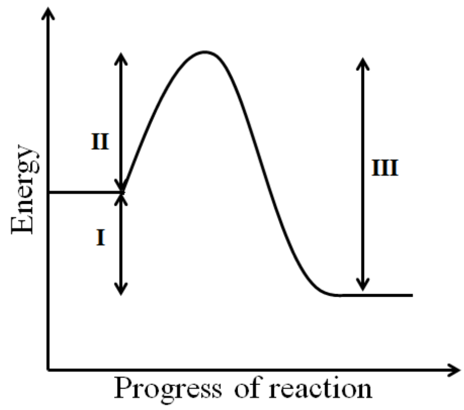
INDIAN ASSOCIATION OF PHYSICS TEACHERS

NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2018-19

Total Time: 120 minutes **Marks: 240**

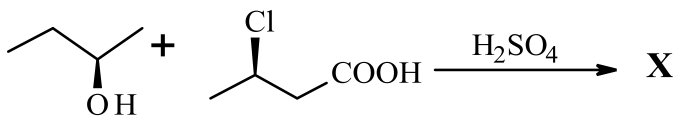
Only one out of four options is correct

(1) Which of the energy values marked as I,II and III in the following diagram, will change by the addition of a suitable catalyst?



(A) II only (B) I and II (C) II and III (D) III only

(2) The product '**X**' in the following reaction is



(A) a racemic mixture of ester (B) an optically inactive ester

(C) an optically active ester (D) a meso ester

(3) At 298 K, change in internal energy for the complete combustion of fullerene, C_{60}(s), an allotrope of carbon, and the enthalpy of formation of CO_2 (g) are -25970 kJ mol^{-1} and -393 kJ mol^{-1} respectively. The enthalpy of formation of C_{60} (s) at 298 K is

(A) – 2390 kJ (B) 4.95 $\times 10^4$ kJ (C) 2.60 $\times 10^4$ kJ (D) 2390 kJ

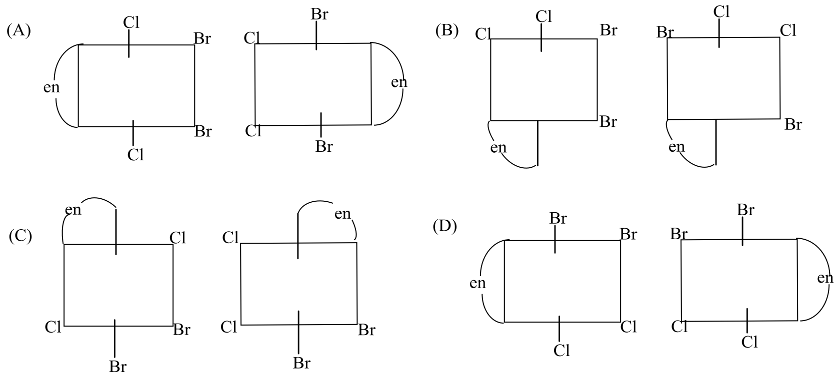
(4) Which of the following is *not* paramagnetic?

(A) S^{2-} (B) N^{2-} (C) O^{2-} (D) NO

(5) Solubility product of AgCl is 1.8×10^{-10}. The minimum volume (in L) of water required to dissolve 1 mg of AgCl is close to

(A) 0.5 (B) 7.5 (C) 50 (D) 0.75

(6) The complex $[M(en)(Br)_2(Cl)_2]$ has two optical isomers. Their configurations can be represented as



(7) A sample of water from a river was analyzed for the presence of metal ions and the observations were recorded as given below

Reagent added	Observation
dil. HCl	No change
aq. Na_2CO_3	White precipitate
aq. Na_2SO_4	No change

The water sample is likely to contain

(A) Ba^{2+} (B) Cu^{2+} (C) Li^{+} (D) Mg^{2+}

(8) The lattice enthalpy and enthalpy of solution in water for solid NaCl are 753 kJ mol^{-1} and 5 kJ mol^{-1} respectively(Fig above). If the solution enthalpies of Na^+ and Cl^- are in the ratio 6:5, the enthalpy of hydration of Na^+ ion is

(A) 408 kJ mol^{-1} (B) -412 kJ mol^{-1} (C) $-$408 kJ mol^{-1} (D) – 412 kJ mol^{-1}

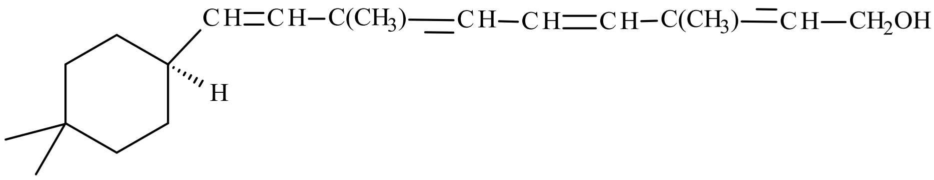
(9) The gaseous product obtained on reaction of BF_3 with LiH is

(A) HF (B) H_2 (C) B_2H_6 (D) F_2

(10) The equilibrium constant K for the reversible reaction A=B is 2 x10^3 at 350K. The rate constants of the forward reaction in the presence and absence of a suitable catalyst at the same temperature are 5x10^4 s^{-1} and 4x10^{-6} s^{-1} respectively. The rate constant of the reverse reaction in the absence of the catalyst is

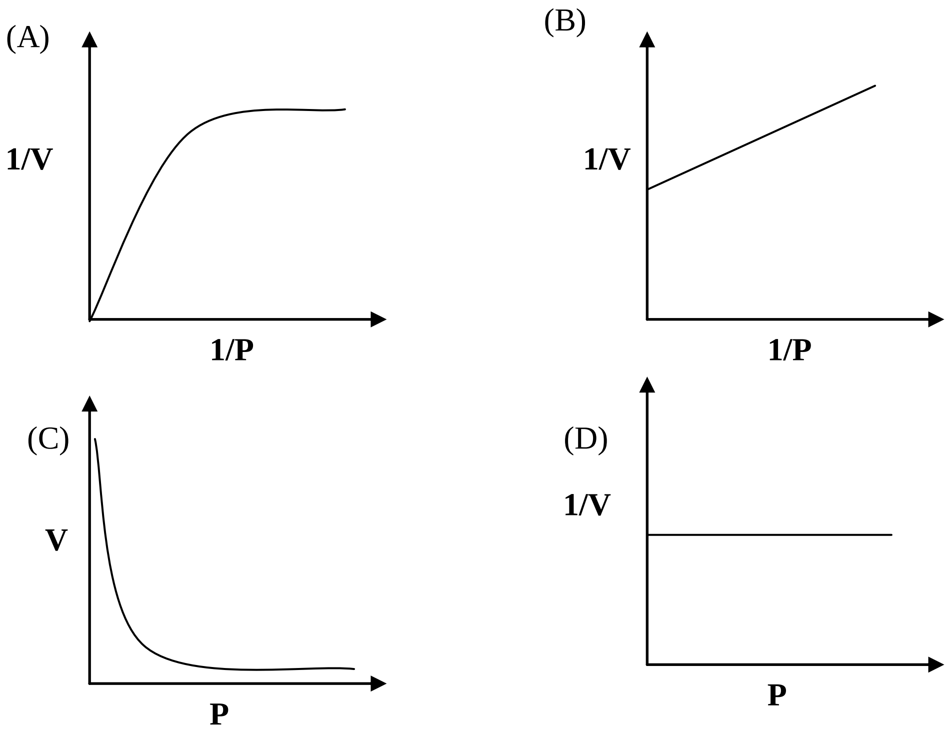
(A) 2 x 10^{-3} s^{-1} (B) 2.5 x 10^{-1} s^{-1} (C) 1.6 x10^{-7} s^{-1} (D) 1.25 x10^{-2} s^{-1}

(11) The number of stereoisomers possible for the following compound



(A) 4 (B) 2 (C) 16 (D) 32

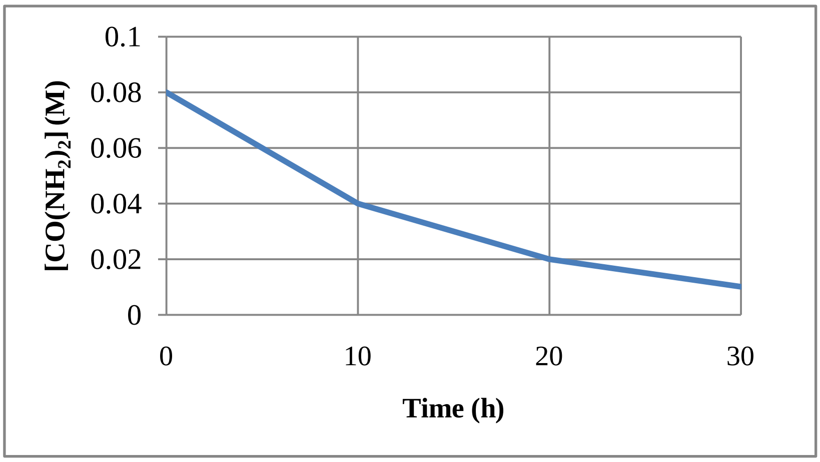
(12) An adsorption isotherm equation proposed by Langmuir is of the form $V = \dfrac{V_0 bP}{(1+bP)}$ where V is the volume of gas adsorbed at pressure P. For a given adsorbate/adsorbent system, V_0 and b are constants. The dependence of V on P can be depicted as



(13) For the reaction $4NO_2\,(g) + O_2\,(g) \rightarrow 2N_2O_5(g)$, $\Delta H_{reaction} = -112$ kJ. If the N_2O_5 is assumed to be formed in the reaction as a solid, $\Delta H_{reaction}$ will be ($\Delta H_{sublimation}$ of N_2O_5 is 54 kJ mol^{-1})

(A) – 220 kJ (B) – 4 kJ (C) – 166 kJ (D) –332 kJ

(14) Urea, $CO(NH_2)_2$, decomposes at 90°C as $CO(NH_2)_2\,(aq) \rightarrow NH_4^+\,(aq) + OCN^-\,(aq)$ Experimental data obtained for the reaction is given in the following plot



From the graph it can be inferred that

(A) Average rate of the reaction is the same for successive time intervals of 10 h

(B) unit of rate constant of the reaction is h^{-1}

(C) rate constant of the reaction is the lowest at 30 h

(D) the reaction is of zero order

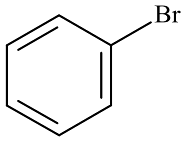
(15) If for an aqueous solution of a weak acid, pH= $pK_a + 2$ at 25°C, the approximate fraction of the acid in the dissociated form is

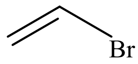
(A) 1.1% (B) 0.99 % (C) 99.0 % (D) 9.9%

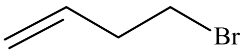
(16) 2.0 L of N_2 gas kept at 25^o C and 5 atm pressure were expanded isothermally against a constant pressure of 1 atm until the pressure of the gas reaches 1 atm. Assuming ideal behaviour, reversible work of expansion in this process (in J) is close to

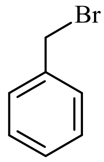
(A) 810 J (B) –194 kJ (C) – 810 kJ (D) 3390 kJ

(17) The compound which would undergo a reaction with ammonia by S_N1 mechanism is

(A) 

(B) 

(C) 

(D) 

(18) The daily energy requirement of a teenager is 7800 kJ. As calculated from the data given in the table below, the amount of glucose he has to consume (g) per day assuming that the entire energy he requires comes from the combustion of glucose is

Molecule	ΔH_f (kJ mol^{-1})
$C_6H_{12}O_6$	-1273
CO_2 (g)	-394
H_2O	-286

(A) 262 (B) 500 (C) 131 (D) 250

(19) The pressure inside two gas cylinders of volume 25 m^3 and 50 m^3 are 10 kPa and 20 kPa respectively. The cylinders are kept at the same temperature and sepearted by a valve. What is the pressure in the combined system when the valve is opened?

(A) 30 kPa (B) 15 kPa (C) 16.7 kPa (D) 2.5 kPa

(20) Aluminium and copper are extracted from their oxide and sulphide ores respectively. Which of the following is correct?

I. Copper is extracted by the auto reduction of copper oxide by copper sulphide

II. Aluminium cannot be obtained by chemical reduction due to its strong affinity for oxygen

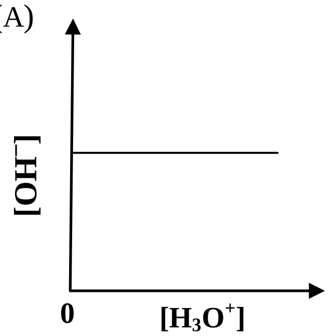
III. In electrometallurgy of Al, graphite is used as cathode to avoid reoxidation of Al into Al_2O_3 by preventing formation of O_2.

IV. Sulphide ores of copper are difficult to be reduced than the oxide ores

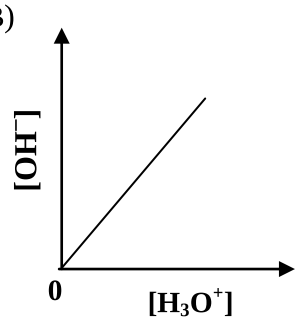
(A) I, II, IV (B) II and III (C) II and III (D) II and IV

(21) Which of the following graphs describes the relationship between $[H_3O^+]$ and $[OH^-]$ in an aqueous solution at a constant temperature?

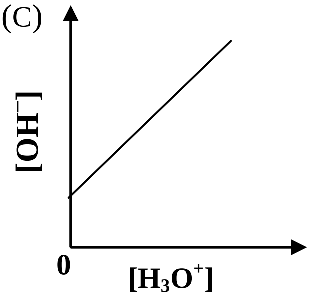
(A)



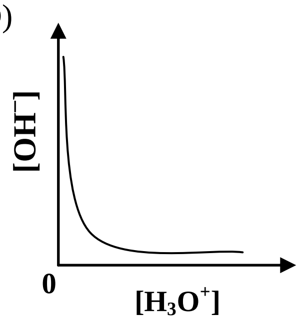
(B)



(C)



(D)



(22) From the given standard electrode potentials

$Sn^{4+}(aq) + 2e^- \rightarrow Sn^{2+}(aq)$ $E^0 = 0.15$ V

$Br_2(l) + 2e^- \rightarrow 2Br^-(aq)$ $E^0 = 1.07$ V

The approximate free energy change for the process

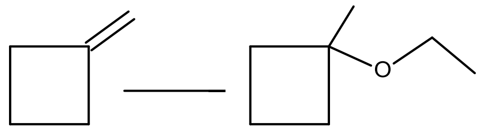
$2Br^-(aq) + Sn^{4+}(aq) \rightarrow Br_2(l) + Sn^{2+}(aq)$ is

(A) 177.6 kJ (B) 355 kJ (C) –177.6 kJ (D) –355 kJ

(23) Number of moles of $KClO_3$ that have to be heated to produce 1.0 L of O_2 (g) at STP can be expressed as

(A) 1/3 (1/22.4) (B) ½ (1/22.4) (C) 2/3 (1/22.4) (D) 3/2 (22.4)

(24) The sequence of reagents required for the following conversion is



(A) (i) B_2H_6/H_2O_2 /OH^- (ii) Na (iii) C_2H_5I

(B) (i) HCl (ii) C_2H_5ONa

(C) (i) H_3O^+ (ii) Na (iii) C_2H_5OH

(D) (i) H_3O^+ (ii) Na (iii) C_2H_5Cl

(25) Among the following, number of oxygen atoms present is the *maximum* in

(A) 1.0 g of O_2 molecules

(B) 4.0 g of O atoms

(C) 1.0 g of O_3

(D) 1.7g of H_2O

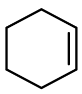
(26) Which of the following elements will exhibit photoelectric effect with light of the longest wavelength?

(A) K (B) Rb (C) Mg (D) Ca

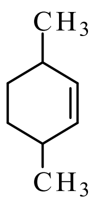
(27) Compound '**X**' in the following reaction is

$$X \xrightarrow[\text{(iii) } Cl_2 / NaOH \quad \text{(iv) } H_3O^+]{\text{(i) } O_3 \quad \text{(ii) } Zn / H_2O} COOH—((CH_2)_4)—COOH$$

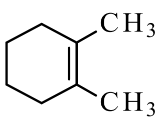
Adipic Acid



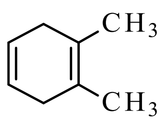
(A)



(B)



(C)



(D)

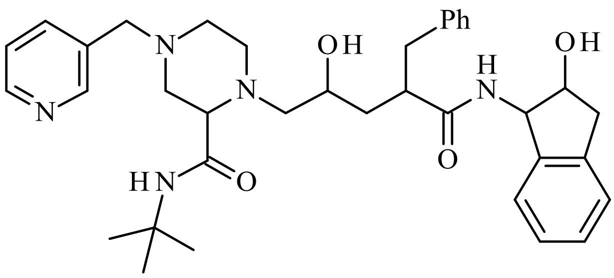
(28) The standard molar entropies of H_2 (g), N_2 (g) and NH_3 (g) are 130, 190 and 193 J mol^{-1} K^{-1} respectively. For the reaction ½ N_2 (g) + 3/2H_2 (g) $\rightleftharpoons$ NH_3 (g) ($\Delta H_{reaction}$ = −45 kJ) to be in equilibrium, the temperature must be equal to

(A) 464 K (B) 928 K (C) 737 K (D) 354 K

(29) Density of CO_2 gas at 0 °C and 2.00 atm pressure can be expressed as

(A) 2 g m^{-3} (B) 4 g m^{-3} (C) 4×10^3 kg m^{-3} (D) 8 g L^{-1}

(30) The maximum number of moles of CH_3I consumed by one mole of crixivan, a drug used against AIDS is



Crixivan

(A) 2 (B) 3 (C) 5 (D) 7

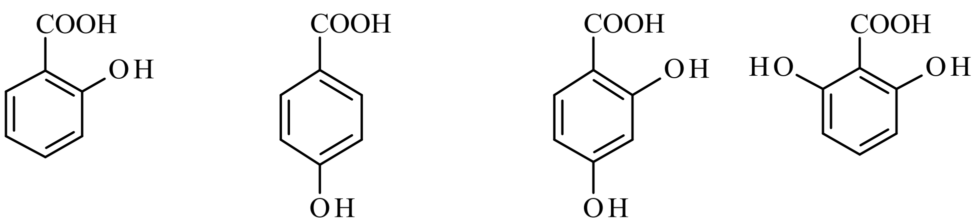
(31) Concentration of K^+ ions inside a biological cell was found to be 25 times higher than that outside. The magnitude of the potential difference between the two sides of the cell is close to (2.303 RT/F can be taken as 59 mV; difference in concentrations of other ions can be taken as negligible.)

(A) 4.2 mV (B) 195 mV (C) 82 mV (D) -82 mV

(32) The standard redox potential for the reaction $2H_2O \rightarrow O_2 + 4H^+ + 4\ e^-$ is –1.23V. If the same reaction is carried out at 25^0C and at pH =7, the potential will be

(A) –0.82 V (B) –3.28 V (C) 0.82 V (D) –1.18 V

(33) The order of pK_a values of the following acids is



I II III IV

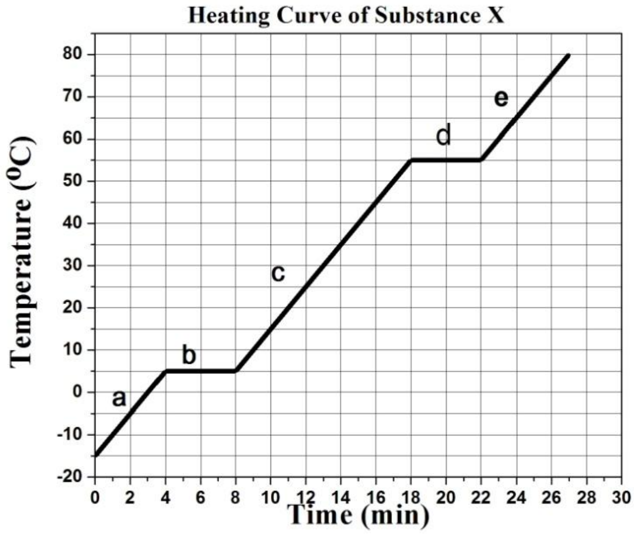
(A) IV > I > III > II (B) III > IV > I > II

(C) II > I > III > IV (D) II > III > I > IV

(34) If the radius of the hydrogen atom is 53 pm, the radius of the He^+ ion is close to

(A) 75 pm (B) 38 pm (C) 106 pm (D) 27 pm

(35) A substance **X** was heated at constant pressure and the temperature observed at various times of heating was plotted as given below



Which of the following is/are correct?

I. Melting point of **X** is -5°C

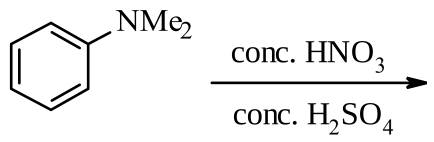
II. Solid and liquid forms of **X** coexist in the region b

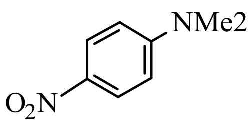
III. Boiling point of **X** is 55°C

IV. Solid and liquid forms of **X** coexist in the region d

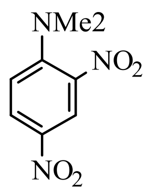
(A) I and IV (B) II and III (C) III only (D) I , II and III

(36) The *major* product of the following reaction is

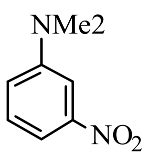




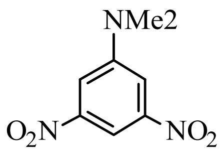
(A)



(B)



(C)



(D)

(37) In which of the following, all the bond lengths are *not* the same?

I. IF_4^+ II. BF_4^- III. SF_4 IV. $TeCl_4$

(A) I, II , IV (B) II, III, IV (C) I, III, IV (D) I, II, III

(38) Among the following, the reaction/s that can be classified as oxidation- reduction is /are

I. $Cr_2O_7^{2-}$ (aq) + 2 OH^- (aq) → 2 CrO_4^{2-} + H_2O (l)

II. $SiCl_4$ (l) + 2Mg (s) → 2$MgCl_2$ (l) + Si (s)

III. 6Cl_2 (l) + 12KOH (l) → 2$KClO_3$ (s) + 10 KCl + 6H_2O (l)

IV. 2 H_2O_2 → 2H_2O (l) + O_2 (g)

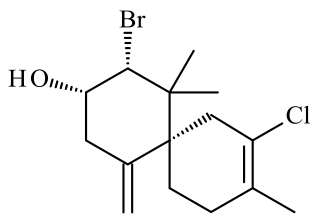
(A) I and IV (B) I, II and III (C) II, III and IV (D) IV only

(39) Among the following pairs, the one in which both the compounds as pure liquids can show significant auto ionization is

(A) H_2O and H_2S (B) BrF_3 and ICl_3

(C) PF_5 and PCl_5 (D) HF and HCl

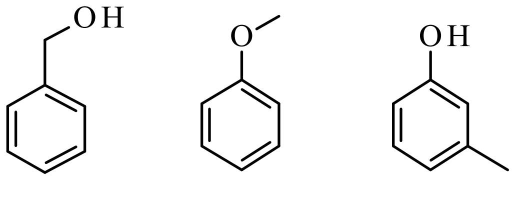
(40) The number of quaternary and chiral carbon atoms present in elatol, isolated from an algae are respectively



Elatol

(A) 2, 3 (B) 4, 2 (C) 3, 2 (D) 1, 3

(41) Compounds **X** (pK_a ~ 15) and **Y** (pK_a ~ 10), both produce H_2 on treatment with sodium metal and both yield a mixture of isomers on mononitration. **X** and **Y** respectively are



I II III IV

(A) IV, I (B) III, II (C) III, I (D) I, III

(42) A crystal of KCl containing a small amount of $CaCl_2$ will have

(A) vacant Cl^- sites

(B) vacant K^+ sites and a higher density as compared to pure KCl

(C) vacant K^+ sites and a lower density as compared to pure KCl

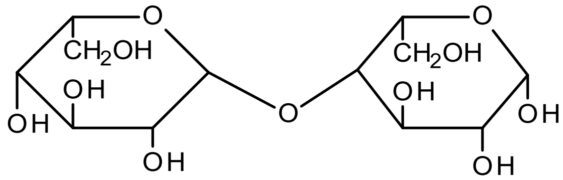
(D) K^+ ions in the interstitial sites

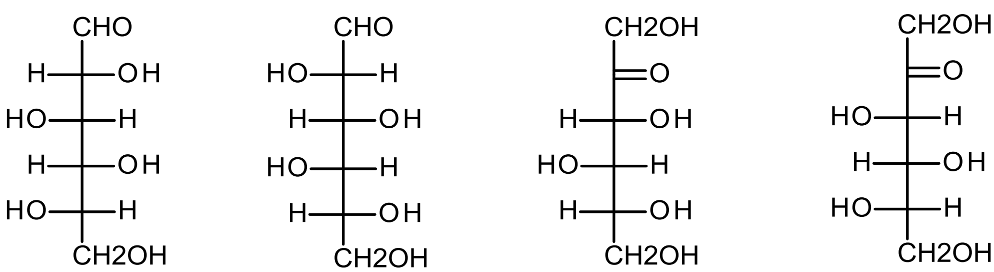
(43) In the following reaction, the values of **a**, **b** and **c**, respectively are

a $F_2(g)$ + **b** $OH^-(aq)$ → **c** $F^-(aq)$ + **d** $OF_2(g)$ + **e** $H_2O(l)$

(A) 3, 2, 4 (B) 3, 4, 2 (C) 2, 2, 4 (D) 2, 2, 2

(44) The monosaccharide present in the following disaccharide is





(A) (B) (C) (D)

(45) The IUPAC name of the complex $[Pt(en)(NH_3)(Cl)_2(ONO)][Ag(CN)_2]$is

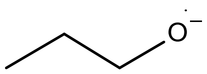
(A) monoamminedichlorido(ethane-1,2-diammine)nitritoplatinum(IV) dicyanoargentate(I)

(B) monoaminebischlorido(ethane-1,2-diamine)nitroplatinate(IV) dicyanosilver(I)

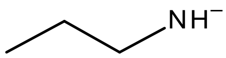
(C) monoaminebischlorido(ethane-1,2-diammine)nitritoplatinate(IV) dicyanoargentate(I)

(D) monoamminedichlorido(ethane-1,2-diamine)nitritoplatinum(IV) dicyanoargentate(I)

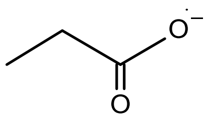
(46) The correct order of basicity of the following species is



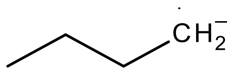
I



II



III



IV

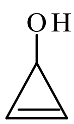
(A) III < IV < II < I (B) III < I < II < IV

(C) III < II < I < IV (D) IV < I < II < III

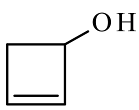
(47) Which among the following is nonlinear?

(A) N_3^- (B) ClF_2^- (C) Br_3^- (D) $BrCl_2^+$

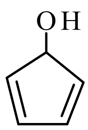
(48) The compound most likely to lose water on protonation is



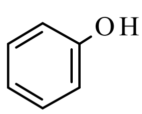
(A)



(B)

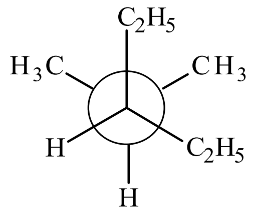


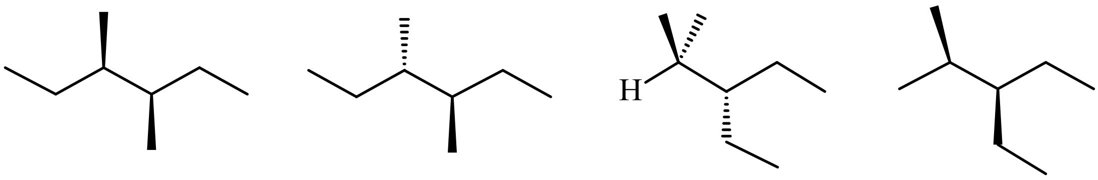
(C)



(D)

(49) The Newman projection shown is the same as





I II III IV

(A) I and IV (B) II and III (C) III and IV (D) I and II

(50) Which one of the following is *not* used as a monomer for the synthesis of a high molecular weight silicone polymer?

(A) $MeSiCl_3$ (B) Me_2SiCl_2 (C) Me_3SiCl (D) $PbSiCl_3$

(51) In $YBa_2Cu_3O_{7-x}$, a superconducting oxide that got George Bednorz and Karl Muller the Nobel prize in 1986, Cu can exist in both +2 and +3 oxidation states and their proportion depends on the value of 'x'. In $YBa_2Cu_3O_{7-0.5.}$

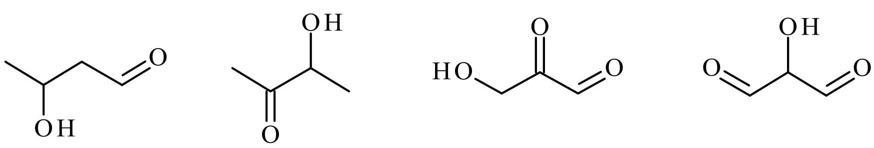
(A) 0.5 moles of Cu are in +3 oxidation state

(B) 5% of Cu is in +3 oxidation state

(C) All the Cu is in +3 oxidation state

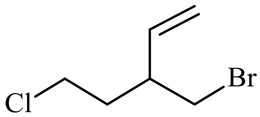
(D) All Cu is in +2 oxidation state

(52) Compound '**Y**' (molar mass = 88.12 g mol^{-1}) containing 54.52 % carbon, 9.17 % hydrogen and 36.31% oxygen gives a reddish-brown precipitate in Fehling's test. '**Y**' is



(A) (B) (C) (D)

(53) The IUPAC name of the following compound is



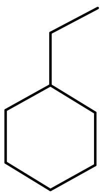
(A) 1-Bromo-4-chloro-3-ethenylbutane

(B) 4-Bromo-1-chloro-3-ethenylbutane

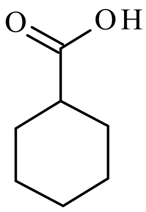
(C) 3-(Bromomethyl)-5-chloropent-1-ene

(D) 3-(Bromomethyl)-1-chloropent-4-ene

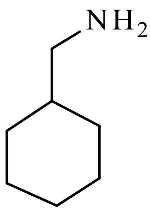
(54) The correct order of boiling points of the following compounds is



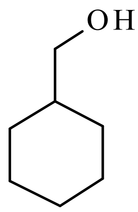
I



II



III



IV

(A) III < IV < II < I

(B) I < III < IV < II

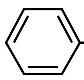
(C) I < II < III < IV

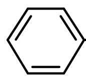
(D) IV < III < I < II

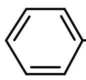
(55) Which of the following is a strong oxidising agent?

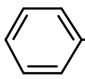
(A) $AlCl_3$ (B) $TlCl_3$ (C) NF_3 (D) PCl_3

(56) The molecule in which all atoms are *not* coplanar is

(A)  $-CH=C=C=CH_2$

(B)  $-CH=C\equiv CH$

(C)  $-CH=C=CH_2$

(D)  $-CH=CH-CH=CH_2$

(57) The most stable radical among the following is

(A) (B) (C) (D)

(58) During World War II, soldiers posted at high altitudes experienced crumbling of the tin buttons of their uniforms into a grey powder. This can be attributed to

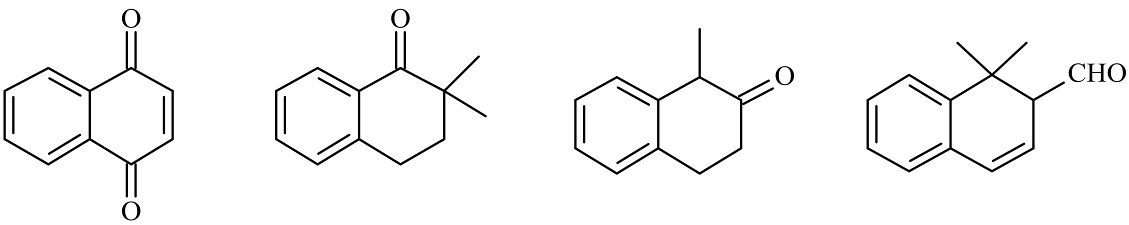
(A) oxidation of tin

(B) interaction with nitrogen in the air at low pressure

(C) change in the crystal structure of tin

(D) reaction of tin with water vapour in the air

(59) The molecules that can exhibit tautomerism are



I **II** **III** **IV**

(A) I, IV (B) II, III (C) III, IV (D) I, II

(60) A scientist attempts to replace a few carbon atoms in 1.0 g of diamond with boron atoms or nitrogen atoms in separate experiments. Which of the following is correct?

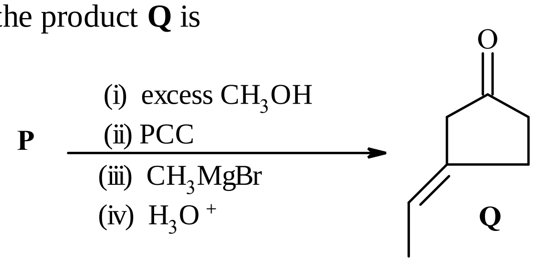
(A) The resulting material with B doping will be an n-type semiconductor

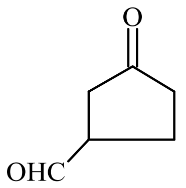
(B) The resulting material with B doping will be a p-type semiconductor

(C) B doping is NOT possible as B cannot form multiple bonds

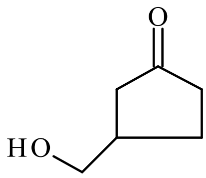
(D) The resulting material with N doping will be a p-type semiconductor

(61) Compound '**P**' that undergoes the sequence of reactions given below to give the product **Q** is

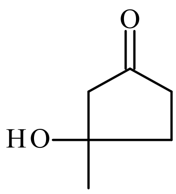




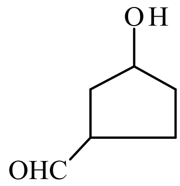
(A)



(B)



(C)



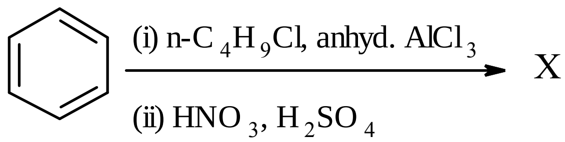
(D)

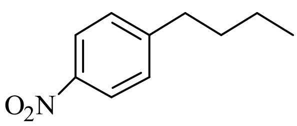
(62) The most stable Lewis structure of N_2O is

(A) $:\ddot{O}=N=\ddot{N}:$ (B) $:N=O=\ddot{N}:$

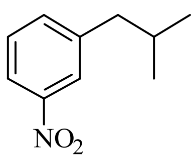
(C) $:\underset{\cdot\cdot}{\ddot{N}}-N\equiv O:$ (D) $:\underset{\cdot\cdot}{\ddot{O}}-N\equiv N:$

(63) The *major* product '**X**' formed in the following reaction is

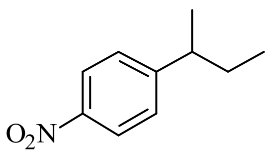




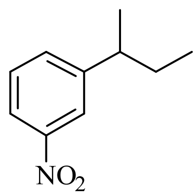
(A)



(B)



(C)



(D)

(64) Which of the following accounts best for the fact that F^- is smaller than O^{2-}?

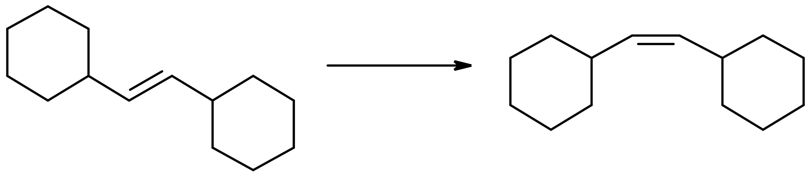
(A) F^- has a larger nuclear mass than O^{2-}

(B) F^- has a larger nuclear charge than O^{2-}

(C) F^- is more polarizable than O^{2-}

(D) F is more electronegative than O

(65) The correct sequence of reagents from those listed below for the following conversion is



I. $NaNH_2$ II. Br_2 III. H_2 /Pd-C, quinoline IV. H_3O^+

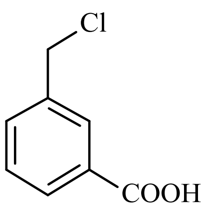
(A) IV – I – III (B) III – IV – I (C) II – I – III (D) I – II – III

(66) An orbital among the following that has two radial nodes and two angular nodes is

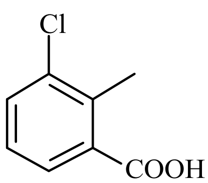
(A) 3d (B) 4p (C) 4f (D) 5d

(67) The compound '**X**' undergoing the following reaction is

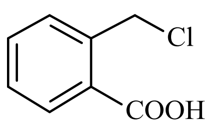
$$\mathbf{X} \xrightarrow[\text{(iii) acid } K_2Cr_2O_7 \text{ (iv) Heat}]{\text{(i) dil aq NaOH (ii) } H^+} \mathbf{C_8H_4O_3}$$



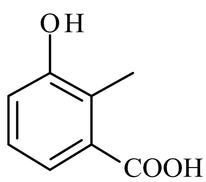
(A)



(B)



(C)



(D)

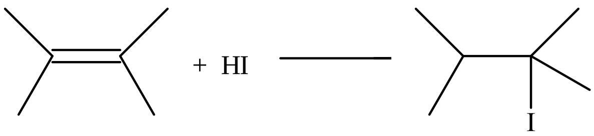
(68) A dilute solution of an alkali metal in liquid ammonia is

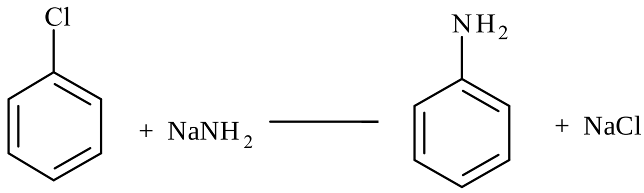
I. blue in colour II. conducts electricity

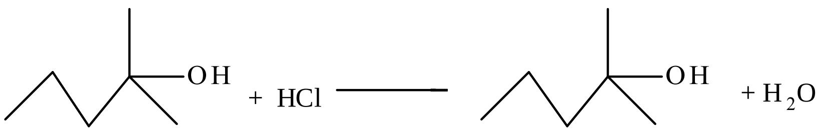
III. paramagnetic IV. an oxidising agent

(A) I and III (B) II and IV (C) I,II and III (D) I and III

(69) The reactions from those given below that involve a carbocation intermediate are

(i) 

(ii) 

(iii) 

(A) i, ii and iii (B) i and ii (C) i and iii (D) ii and iii

(70) The C-O bond length is the *shortest* in

(A) $[Cr(CO)_6]$ (B) $[Mo(CO)_6]$ (C) $[Mn(CO)_6]^+$ (D)$[V(CO)_6]^-$

(71) The rate of the reaction between two reactants X and Y can be expressed as $R = k\,[X]^2\,[Y]$. In an experiment, the initial rate of the reaction was found to be R_1 when the initial concentrations of X and Y are $[X_0]$ and $[Y_0]$. Another experiment was performed in which $[X_0]$ was taken as ½ $[X_0]$. What should be $[Y_0]$ in this experiment to get the initial rate as $0.5R_1$?

(A) 4 $[Y_0]$ (B) ½ $[Y_0]$ (C) 2 $[Y_0]$ (D) $[Y_0]$

(72) Among the following, the compound that has the highest dipole moment is

(A) CH_3COOCH_3 (B) CH_3CONH_2

(C) $CH_3COC_2H_5$ (D) CH_3COCl

(73) A common method to clean acid spills is to use Na_2CO_3 (Molar mass 106 g). If 50.0 mL of 0.75 M HCl is spilt on a wooden surface, the amount of Na_2CO_3 required is

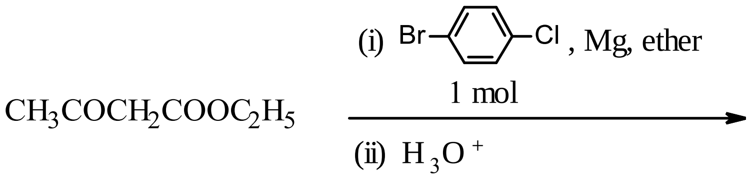
(A) 3.75 g (B) 7.5 g (C) 2.0 g (D) 4.0 g

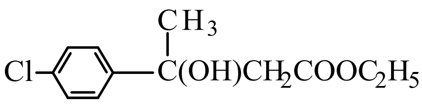
(74) The spin-only magnetic moments of $[Fe(NH_3)_6]^{3+}$ and $[FeF_6]^{3-}$ (in units of BM) respectively are

(A) 1.73 and 1.73 (B) 5.92 and 1.73

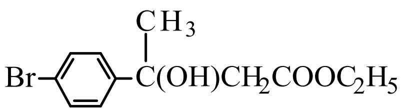
(C) 1.73 and 5.92 (D) 5.92 and 5.92

(75) The *major* product of the following reaction is



(A) 

(B) 

(C) 

(D) 

(76) The standard electrode potential (E^0) of the Daniel cell is 1.1 V and the overall cell reaction can be represented as $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$.

Under which of the following conditions will the cell potential be higher than 1.1V?

(A) 1.0M Zn^{2+}, 1.0M Cu^{2+} (B) 1.2 M Zn^{2+}, 1.2 M Cu^{2+}

(C) 0.1 M Zn^{2+}, 1.0M Cu^{2+} (D) 1.0 M Zn^{2+}, 0.01M Cu^{2+}

(77) Penicillamine is used in the treatment of arthritis. One molecule of penicillamine contains a single sulphur atom and the weight percentage of sulphur in penicillamine is 21.49%. Molecular weight of penicillamine in g mol^{-1} is

(A) 85.40 (B) 68.76 (C) 125.2 (D) 149.2

(78) An ion exchange resin, RH_2, can replace Ca^{2+} in hard water as

$RH_2 + Ca^{2+} \rightarrow RCa^{2+} + 2\ H^+$

When a 1.0 L hard water sample was passed through the resin, all H^+ ions were replaced by Ca^{2+} ions and the pH of eluted water was found to be 2.0. The hardness of water (as ppm of Ca^{2+}) in the sample of water treated is

(A) 50 (B) 100 (C) 125 (D) 200

(79) The analysis of three different binary oxides of bromine (Br) and oxygen (O) gives the following results:

Compound	Mass of O combined with 1.0 g of Br
X	0.101 g
Y	0.303 g
Z	0.503 g

Which of the following statements is *not* correct?

I Compound **Y** is Br_2O_3 II Compound **Z** is Br_2O_5

III Compound **Z** is Br_2O_7 IV Compound **Y** is Br_2O_5

(A) I and III (B) II and IV (C) III and IV (D) I and II

(80) Which of the following statement/s is/are correct?

I. Number of significant figures in 2345.100 is three

II. 0.00787 rounded to two significant figures is written as 0.787×10^{-2}

III. 340 rounded to two significant figures is written as 0.34×10^{3}

IV. The number of significant figures in 0.020 is two

(A) II and III (B) III and IV (C) I, II and IV (D) III only
