INDIAN ASSOCIATION OF PHYSICS TEACHERS
NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2016-17
Date of Examination: 27th November, 2016
Time: 11:00 to 13:00 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.

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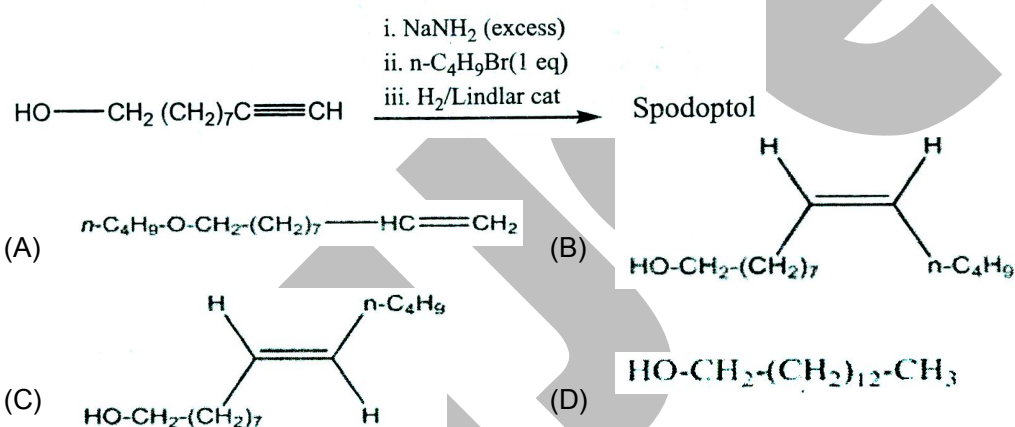
Speed of light, $c = 3.0 \times 10^8$ m s^{-1}

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

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

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

NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2016-17

Total Time: 120 minutes   Marks: 240

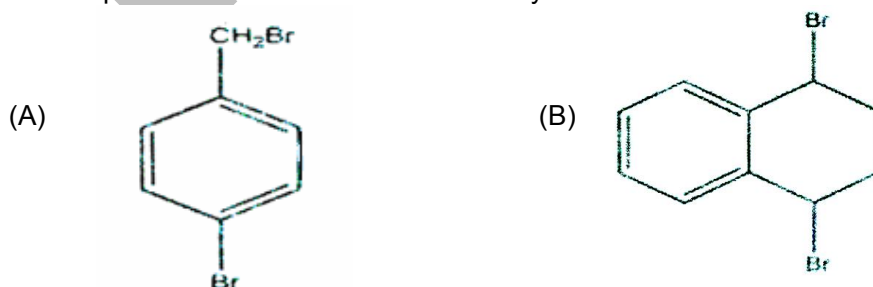## *Only one out of four options is correct*

1.   The electrons identified by quantum numbers n and ℓ, (i) n = 4, ℓ = 1, (ii) n = 4, ℓ = 0, (iii) n = 3, ℓ = 2, (iv) n = 3, ℓ = 1 can be placed in order of increasing energy from lowest to highest as
      (A) (iv) < (ii) < (iii) < (i)   (B) (ii) < (iv) < (i) < (iii)
      (C) (i) < (iii) < (ii) < (iv)   (D) (iii) < (i) < (iv) < (ii)
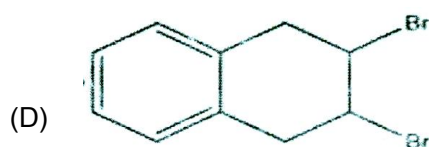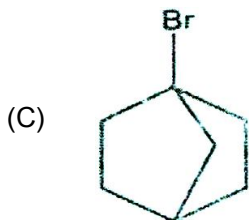
2.   Spodoptol, a sex attractant, produced by a female fall armyworm moth, can be prepared as follows. The structure of Spodoptol is (p^{Ka}: terminal alkynes ~ 25, alcohol ~ 17)

$$HO-CH_2(CH_2)_7C \equiv CH \xrightarrow[\text{iii. } H_2/\text{Lindlar cat}]{\substack{\text{i. NaNH}_2 \text{ (excess)} \\ \text{ii. } n\text{-C}_4\text{H}_9\text{Br(1 eq)}}} \text{Spodoptol}$$

      (A) $n\text{-C}_4\text{H}_9\text{-O-CH}_2\text{-(CH}_2)_7\text{---HC}=\text{CH}_2$

      (B) [alkene structure: HO-CH$_2$-(CH$_2$)$_7$ and n-C$_4$H$_9$ with H, H cis]

      (C) [alkene structure: HO-CH$_2$-(CH$_2$)$_7$ and n-C$_4$H$_9$ with H, H]

      (D) $HO\text{-}CH_2\text{-}(CH_2)_{12}\text{-}CH_3$

3.   Passing H_2S gas into a mixture of Mn^{2+}, Ni^{2+}, Cu^{2+}, and Hg^{2+} in an acidified aqueous solution precipitates
      (A) CuS and HgS   (B) MnS and CuS
      (C) MnS and NiS   (D) NiS and HgS

4.   Battery acid (H_2SO_4) has density 1.285 g cm^{-3}. 10.0 cm^3 of this acid is diluted to 1 L. 25.0 cm^3 of this diluted solution requires 25.0 cm^3 of 0.1 N sodium hydroxide solution for neutralization. The percentage of sulphuric acid by mass in the battery acid is
      (A) 98   (B) 38
   (C) 19   (D) 49

5.   The compound that reacts fastest with methylamine is

      (A) [structure: benzene ring with CH$_2$Br at top and Br at bottom]

      (B) [structure: tetralin ring system with Br at two positions]

(C)

(D)

6. HgO is prepared by two different methods: one shows yellow colour while the other shows red colour. The difference in colour is due to difference in
(A) electronic d-d transitions
(B) particle size
(C) Frenkel defect
(D) Schottkey defect

7. The pH of a 1.0×10^{-3} mol L^{-1} solution of a weak acid HA is 3.60. The dissociation constant of the acid is
(A) 8.4×10^{-8}
(B) 8.4×10^{-6}
(C) 8.4×10^{-5}
(D) 8.4×10^{-2}

8. The best sequence of reactions for preparation of the following compound from benzene is
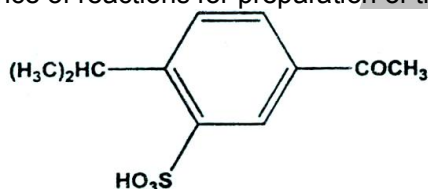
(A) (i) $CH_3COCl / AlCl_3$ (ii) Oleum (iii) $(CH_3)_2 CH - Cl$ (1 mole) / $AlCl_3$
(B) (i) $(CH_3)_2 CH - Cl$ (1 mole) / $AlCl_3$ (ii) $CH_3COCl / AlCl_3$ (iii) Oleum
(C) (i) Oleum (ii) $CH_3COCl / AlCl_3$ (iii) $(CH_3)_2 CH - Cl$ (1 mole) / $AlCl_3$
(D) $(CH_3)_2 CH - Cl$ (1 mole) / $AlCl_3$ (ii) Oleum (iii) $CH_3COCl / AlCl_3$

9. Which reaction is spontaneous at all temperatures at standard pressure and concentration?
(A) exothermic reaction with a decrease in entropy
(B) exothermic reaction with an increase in entropy
(C) endothermic reaction with a decrease in entropy
(D) endothermic reaction with an increase in entropy

10. The IUPAC name of the following compound is
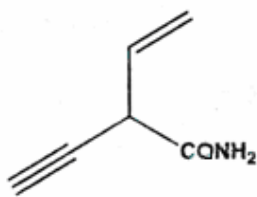
(A) 3- Aminocarbonylpent-1-en-4-yne
(B) 2-Ethenylbut-3-yn-1-amide
(C) 2-Ethynylbut-3-en-1-amide
(D) 3-Aminocarbonylpent-4-en-1-yne

11. NaOH solution is added dropwise to HCl solution and the conductance of the mixture is measured after addition of each drop. The variation of conductance with volume of NaOH added is as shown in adjacent graph
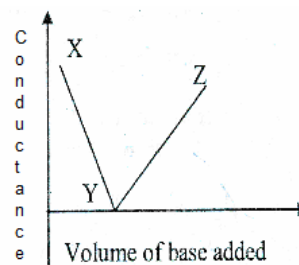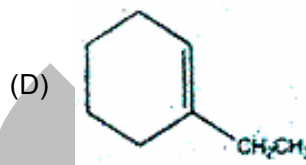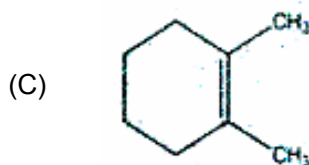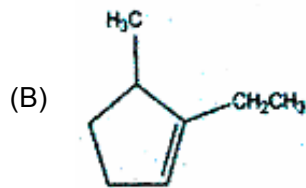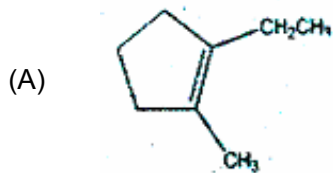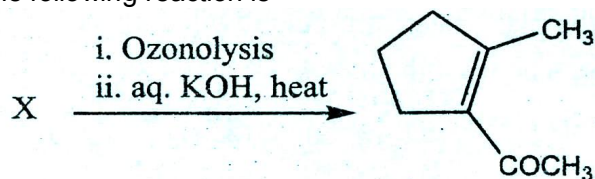

The statement is that is **not true** for the above is

(A) decrease in conductance from X $\rightarrow$ Y is due to decrease in $[H^+]$
(B) point Y represents the equivalence point of titration
(C) Na^+ has the higher equivalence conductance than H_3O^+
(D) segment YZ represents the conductance due to ions from NaCi and NaOH in solution

12. A colorless water – soluble compound on strong heating liberates a brown coloured gas and leaves a yellow residue that turns white on cooling. An aqueous solution of the original solid gives a white precipitate with $(NH_4)_2S$. The original solid is
(A) $Zn(NO_3)_2$ (B) $Ca(NO_3)_2$
(C) $Al(NO_3)_3$ (D) $NaNO_3$

13. The following compounds are heated (i) KNO_3, (ii) $Cu(NO_3)_2$, (iii) $Pb(NO_3)_2$, (iv) NH_4NO_3 which of the following statement is/are correct
(A) (ii) and (iii) liberate NO_2 (B) (iv) liberate N_2O
(C) (i), (ii) and (iii) liberate O_2 (D) All statements are correct

14. The diastereoisomer (stereoisomer that is not a mirror image) of 'X' is
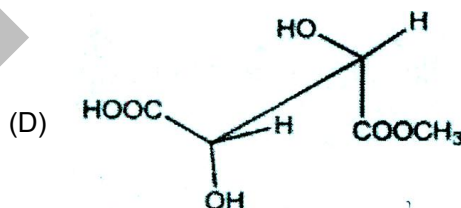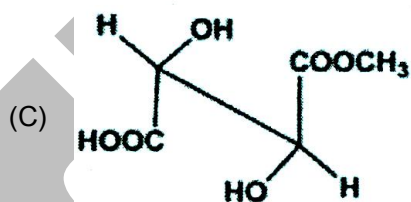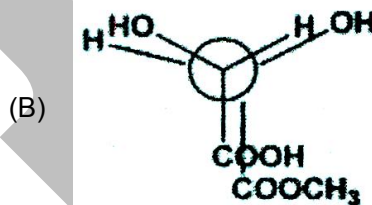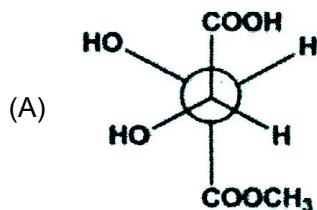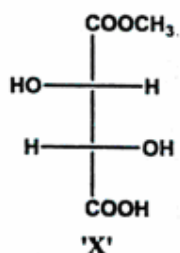
15. Given $\Delta_r H^\circ = -54.08 \, kJ \, mol^{-1}$ and $\Delta_r S^\circ = 10.0 \, J \, mol^{-1}$ at $25^\circ C$, the value of $\log_{10}K$ for the reaction $A \rightleftharpoons B$ is
(A) 3.4   (B) 10
(C) 0.53   (D) 113

16. Which of the complexes has the magnetic moment of 3.87 B.M.?
(A) $\left[Co(NH_3)_6 \right]^{3+}$

(B) $\left[CoF_6 \right]^{3-}$

(C) $\left[CoCl_4 \right]^{2-}$

(D) [Co (dmg)$_2$] square planar complex (dmg = dimethyl glyoxime)

17. Compound 'X' in the following reaction is

$$X \xrightarrow[\text{ii. aq. KOH, heat}]{\text{i. Ozonolysis}} \text{(cyclopentene with } CH_3 \text{ and } COCH_3\text{)}$$

(A)

(B)

(C)

(D)

18. A toxic element is to be removed from drinking water by adsorption on activated charcoal. At low concentrations, the rate constant for adsorption is 1.8×10^{-5} s^{-1}. The time required to reduce the concentration of the toxic element is 10% of its initial concentration is
(A) 1.28×10^5 s
(B) 5.85×10^3 s
(C) 1.28×10^6 s
(D) cannot be calculated from the given data

19. Assuming that Hund's rule is violated by the diatomic molecule B_2, its bond order and magnetic nature will be respectively
(A) 1, diamagnetic
(B) 1, paramagnetic
(C) 2, diamagnetic
(D) 2, paramagnetic

20. In a cubic crystal structure, divalent metal-ion is located at the body-centered position, the smaller tetravalent metal ions are located at each corner and the O^{2-} ions are located half way along each of the edges of the cube. The number of nearest neighbours for oxygen is
(A) 4
(B) 6
(C) 2
(D) 8

21. Organic compounds sometimes adjust their electronic as well as steric structures to attain stability. Among the following, the compound having highest dipole moment is

(A)

(B)

(C)

(D)
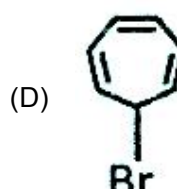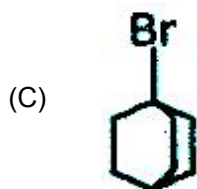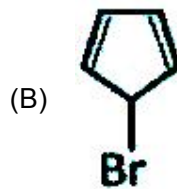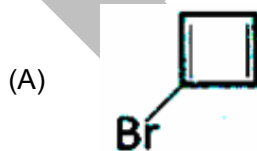
22. Cyanide ion is a very good complexing agent and also functions as a reducing agent. Hence many cyanide complexes of metals are known. Addition of an aqueous solution of KCN to a

solution of copper sulphate yields a white precipitate which is soluble in excess of aqueous KCN to form the complex:

(A) $[Cu(CN)_4]^{1-}$ (B) $[Cu(CN)_4]^{2-}$

(C) $[Cu(CN)_4]^{3-}$ (D) $[Cu(CN)_4]^{4-}$

23. When a certain metal was irradiated with light of frequency 3.2×10^{16} Hz, the photoelectrons emitted had twice the kinetic energy as did the photoelectrons emitted when the same metal was irradiated with light frequency 2.0×10^{16} Hz. The v_0 of the metal is
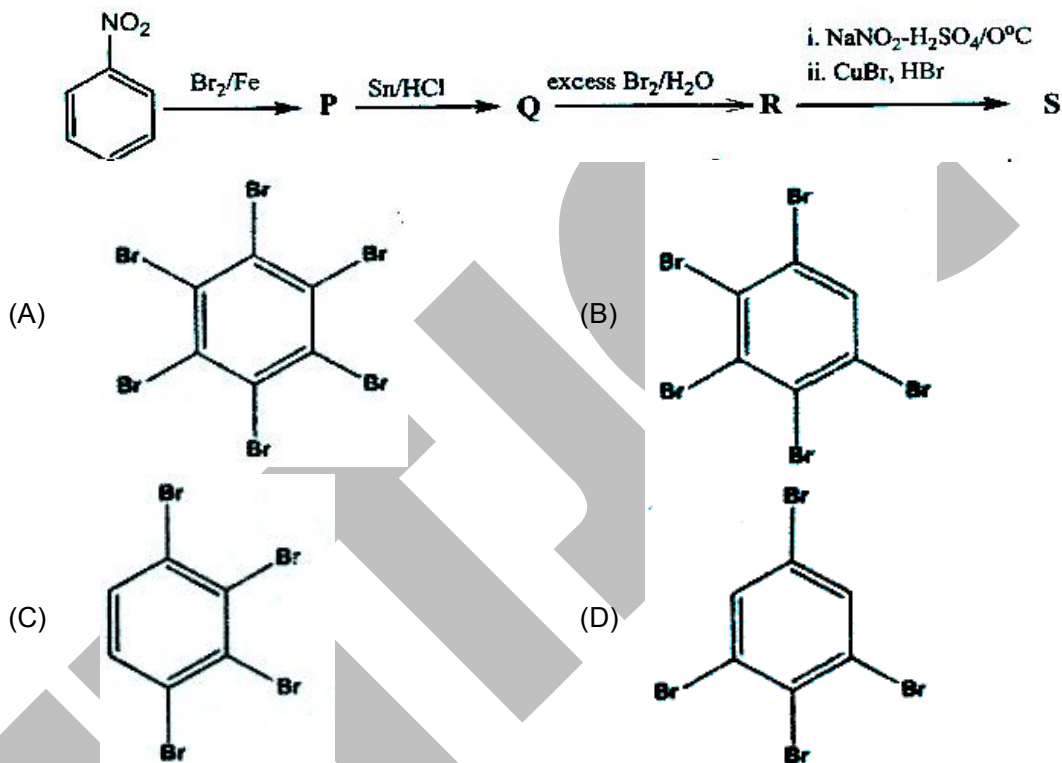
(A) 2.4×10^{16} Hz   (B) 8.0×10^{16} Hz

(C) 8.0×10^{15} Hz   (D) 7.2×10^{16} Hz

24. The major product 'S' of the following reaction sequence is

25. 1.250 g of metal carbonate (MCO_3) was treated with 500 mL of 0.1 M HCl solution. The unreacted HCl required 50.0 mL of 0.500 M NaOH solution for neutralization. Identify the metal M

(A) Mg   (B) Ca

(C) Sr   (D) Ba

26. An electron beam can undergo diffraction by crystals which proves the wave nature of electrons. The potential required for a beam of electrons to be accelerated so that its wavelength becomes equal to 0.154 nm is

(A) 63.5 V   (B) 31.75 V

(C) 635 V   (D) 127 V

27. A biodegradable alternating copolymer of L-alanine and glycolic acid $(HO - CH_2 - COOH)$ is

(A)

(B)

(C)

(D)
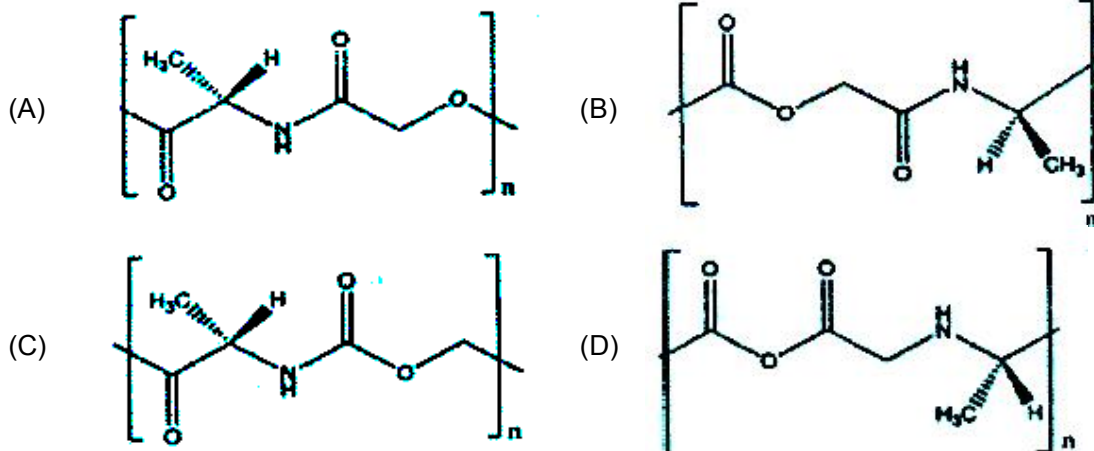
28. In which of the following complexes the metal ion has the lowest ionic radius?
(A) $[Ti(H_2O)_6]^{2+}$
(B) $[V(H_2O)_6]^{2+}$
(C) $[Cr(H_2O)_6]^{2+}$
(D) $[Mn(H_2O)_6]^{2+}$

29. In cold climate, the water in a radiator of a car gets frozen causing damage to the radiator. Ethylene glycol is used as an antifreezing agent. The amount of ethylene glycol that should be added to 5 kg of water to prevent if from freezing at -7°C is
(Given: K_f of water = 1.86 K mol^{-1} kg; Molar mass of ethylene glycol = 62 g mol^{-1})
(A) 1165 g
(B) 46.7 g
(C) 116.7 g
(D) 93.4 g

30. The ratio of the energy of the electron in ground state of hydrogen atom to that of the electron in the first excited state of Be^{3+} is
(A) 1 : 4
(B) 1 : 8
(C) 1 : 16
(D) 4 : 1

31. Water insoluble, but organic solvent soluble, dye is dissolved in three organic solvents and taken in three separating funnels a, b and c. To each solution, water is added, shaken and kept undisturbed. The solvents in separating funnels a, b and c from the following figures are respectively:

Organic solvent
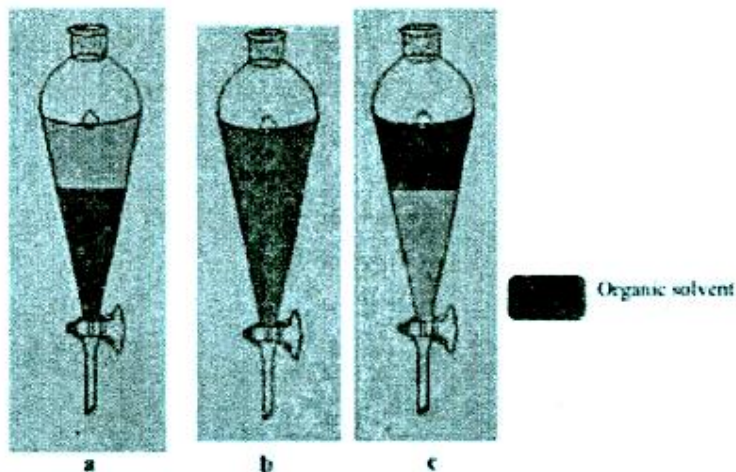
(A) a : EtOH, b: CCl$_4$, c: EtOAc
(B) a : CCl$_4$, b: EtOH, c: EtOAc
(C) a : EtOAc, b: CCl$_4$, c: EtOH
(D) a : CCl$_4$, b: EtOAc, c: EtOH

32. P, Q, R and S are four metals whose typical reactions are given below:
(I) Only Q and R react with dilute HCl to give H$_2$ gas.

(II) When Q is added to a solution containing the ions of the other metals, Metallic P, R and S are formed.

(III) P reacts with concentrated HNO_3 but S does not

The correct order of their reducing character is:

(A) S < P < R < Q   (B) S < R < P < Q

(C) R < Q< P < S   (D) Q < P < S < R

33. The kinetic energy of an electron that has a wave length of 10 nm is

(A) 2.4×10^{-21} J   (B) 4.8×10^{-21} J

(C) 2.4×10^{-29} J   (D) 4.8×10^{-29} J

34. Which of the following compounds contain 3-centered 2-electron bonding?

(i) $[BeF_2]_n$ (ii) $[Be(CH_3)_3]_n$ (iii) $[BeCl_2]_n$ (iv) $[BeH_2]_n$

(A) (i) and (ii)   (B) (ii) and (iii)

(C) (ii) and (iv)   (D) (iii) and (iv)

35. 3-Methylpentane on monochlorination gives four possible products. The reaction follows free radical mechanism. The relative reactivities for replacement of –H are $3° : 2° : 1° = 6 : 4 : 1$.
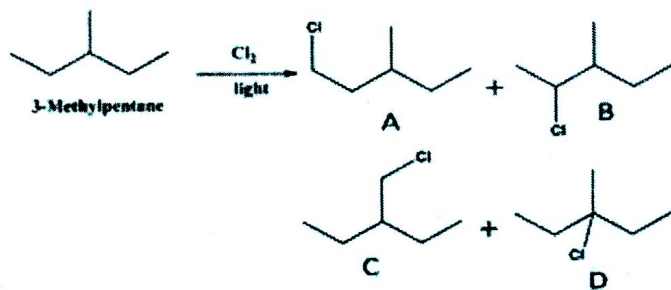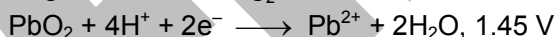

Relative amounts of A, B, C and D formed are

(A) 6/31, 16/31, 6/31, 3/31   (B) 16/13, 6/31, 6/31, 3/31

(C) 6/31, 16/31, 3/31, 6/31   (D) 6/31, 3/31, 6/31. 16/31

36. White phosphorous on reaction with NaOH gives PH_3 and

(A) Na_2HPO_3 (B) NaH_2PO_2

(C) NaH_2PO_3 (D) Na_3PO_4

37. Given the E_0 values for the half reactions:

$Sn^{4+} + 2e^- \longrightarrow Sn^{2+}$, 0.15 V

$2Hg^{2+} + 2e^- \longrightarrow Hg_2^{2+}$, 0.92 V

$PbO_2 + 4H^+ + 2e^- \longrightarrow Pb^{2+} + 2H_2O$, 1.45 V

Which of the following statements is true?

(A) Sn^{2+} is a stronger oxidizing agent than Pb^{4+}

(B) Sn^{2+} is a stronger reducing agent than Hg_2^{2+}.

(C) Hg^{2+} is a stronger oxidizing agent than Pb^{4+}.

(D) Pb^{2+} is a stronger reducing agent than Sn^{2+}.

38. For the conversion $CCl_4(\ell) \longrightarrow CCl_4(g)$ at 1 bar and 350 K, the correct set of thermodynamic parameters is (Boiling point of CCl_4 is 77°C)

(A) $\Delta G = 0, \Delta S = +ve$ (B) $\Delta G = 0, \Delta S = -ve$

(C) $\Delta G = -ve, \Delta S = 0$ (D) $\Delta G = -ve, \Delta S = +ve$

39 How many isomers are possible for complex $[Co(ox)_2Cl_2]^+$?
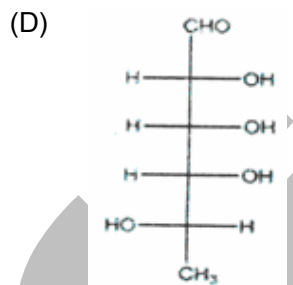
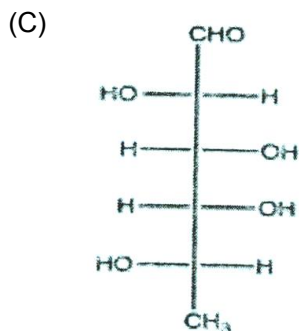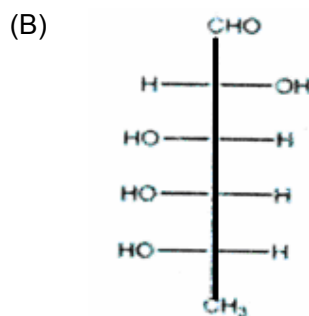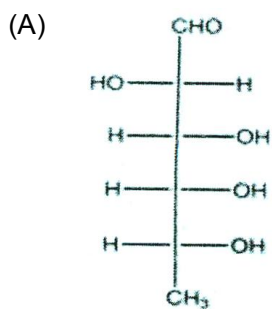(A) 1   (B) 3

(C) 2   (D) 4

40. The compound that **will not** react with silver perchlorate under normal conditions is
   (A) 3-bromocyclopropene
   (B) tetraethyl ammonium chloride
   (C) tetramethylammonium hydroxide
   (D) polyvinyl chloride

41. The conductivity of 0.10 M KCl solution at 298 K is 1.29×10^{-2} S cm^{-1}. The resistance of this solution is found to be 28.44 Ω. Using the same cell, the resistance of 0.10 M NH$_4$Cl solution is found to be 28.50 Ω. The molar conductivity of NH$_4$Cl solution in S cm^2 mol^{-1} is
   (A) 0.130
   (B) 13
   (C) 130
   (D) 1300

42. Consider a compound CsXY$_2$ where X and Y are halogens. Which of the following statement/s is/are correct?
   (i) X and Y have different oxidation states.
   (ii) For Y with lower atomic number than X, X can assume oxidation states higher than normal.
   (iii) Such compounds exist because Cs$^+$ has a high charge to size ratio.
   (A) Only (i)
   (B) (i) and (ii)
   (C) Only (ii)
   (D) (i) and (iii)

43. Match the compounds given in list I with their characteristic reactions in list II.

	List - I (Compound)		List - II (Reaction)
1	Tertbutyl amine	a	Liberation of ammonia on heating with aq. NaOH
2	2-methyl-2-pentanol	b	Effervescence with NaHCO$_3$
3	2,4,6-trinitrophenol	c	Foul smell with chloroform in alkaline condition.
4	Cyclohexane carboxamide	d	Formation of an water insoluble compound on treatment with conc. HCl and ZnCl$_4$

   (A) 1-a, 2-c, 3-d, 4-b
   (B) 1-c, 2-d, 3-b, 4-a
   (C) 1-a, 2-b, 3-c, 4-d
   (D) 1-d, 2-a, 3-b, 4-c

44. Which of the following statements is not correct regarding the galvanic cells?
   (A) Oxidation occurs at the anode.
   (B) Ions carry current inside the cell.
   (C) Electrons flow in the external circuit from cathode to anode.
   (D) When the cell potential is positive, the cell reaction is spontaneous.

45. L-Fucose with the following planar representation is a sugar component of the determinants of the A, B, O blood group typing.
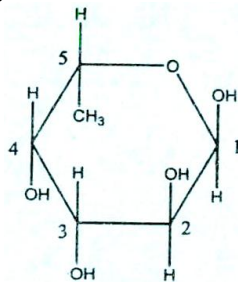

   The open chain structure of L-Fucose can be represented as

(A)

```
        CHO
HO ——|—— H
 H ——|—— OH
 H ——|—— OH
 H ——|—— OH
        CH₃
```

(B)

```
        CHO
 H ——|—— OH
HO ——|—— H
HO ——|—— H
HO ——|—— H
        CH₃
```

(C)

```
        CHO
HO ——|—— H
 H ——|—— OH
 H ——|—— OH
HO ——|—— H
        CH₃
```

(D)

```
        CHO
 H ——|—— OH
 H ——|—— OH
 H ——|—— OH
HO ——|—— H
        CH₃
```

46. In ammonia the bond angle is 107° 48′ while in SbH_3 the bond angle is about 91°18′. The correct explanation among the following is/are
(A) The orbitals of Sb used for the formation of Sb-H bond are almost pure p-orbitals
(B) Sb has larger size compared to N.
(C) Sb has more metallic character than N.
(D) All the statements are correct.

47. Equal masses of ethane and hydrogen gas are present in a container at 25°C. The fraction of the total pressure exerted by ethane gas is
(A) 1/2   (B) 1/16
(C) 15/16   (D) 1/8

48. The volume of nitrogen evolved on complete reaction of 9 g of ethylamine with a mixture of $NaNO_2$ and HCl at 273°C and 1 atm pressure is
(A) 11.2 dm³   (B) 5.6 dm³
(C) 4.48 dm³   (D) 22.4 dm³

49. If a dilute solution of aqueous NH_3 is saturated with H_2S then the product formed is
(A) $(NH_4)_2S$ (B) NH_4HS
(C) $(NH_4)_2S_x$ (D) $NH_4OH + S$

50. Three Faradays of electricity are passed through aqueous solutions $AgNO_3$, $NiSO_4$ and $CrCl_3$ kept in three vessels using inert electrodes. The ratio(in moles) in which the metals Ag, Ni and Cr are deposited is
(A) 1 : 2 : 3   (B) 3 : 2 : 1
(C) 6 : 3 : 2   (D) 2 : 3 : 6

51. Nepetalactone(X) is isolated as an oil from catnip.
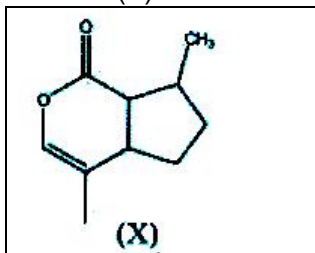
The number of chiral carbon atoms and the amount of KOH consumed by 83 mg of Nepatalactone are respectively
(A) 3, 50 mg
(B) 2, 56 mg
(C) 3, 56 mg
(D) 3, 28 mg

52. Number of P-S single bonds and P-S double bonds(P = S) in P_4S_{10} respectively
(A) 10, 6
(B) 16, 0
(C) 14, 2
(D) 12, 4

53. If the solubility product of iron(III) hydroxide is 1.8×10^{-37}, the pH of a saturated solution of iron(III) hydroxide in distilled water is close to
(A) 4
(B) 5
(C) 7
(D) 9

54. An alkyl halide(X) on reaction with ethanolic sodium hydroxide forms an alkene(Y) which on further reaction with HBr gives the same alkyl halide. The alkene(Y) on reaction with HBr/peroxide followed by reaction with Mg metal followed by reaction with HCN produces an aldehyde(Z). Z is

(A)

(B)

(C)

(D)
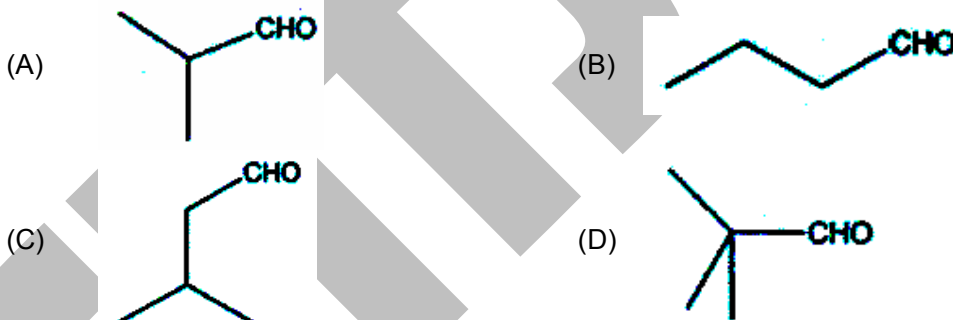
55. $HClO_4$ is a stronger acid than HClO. The correct statement is
(A) ClO_4^- ion is more stabilized than ClO^-
(B) ClO_4^- ion has higher hydration energy than ClO^-
(C) $HClO_4$ is better solvated in water than HClO
(D) in $HClO_4$, H is attached to Cl, while in HClO it is attached to O

56. For an elementary rearrangement reaction $A \rightleftharpoons P$, the following data was recorded at 303 K, when $[P]_0 = 0$:

Set No.	$[A]_0$/mol L^{-1}	Rate of conversions of A/mol L^{-1} min^{-1}
1	0.340	0.100
2	0.170	0.050
3	0.085	0.025

If the equilibrium constant of the reaction is 1.12 at 303 K, the rate constant for the reaction $P \rightarrow A$ is
(A) 0.263 min^{-1}
(B) 0.294 min^{-1}
(C) 0.526 min^{-1}
(D) 0.588 min^{-1}

57. Compound P on treatment with CH_2N_2 (diazomethane) produces compound Q. Compound Q on reaction with HI produces two alkyl iodides R and S. Alkyl iodide S with hither number of carbon atoms on reaction with KCN followed by hydrolysis gives 3-methylbutanoic acid. The compound P is
(A) 2-butanol
(B) 1-butanol
(C) 2-methyl-2-propanol
(D) 2-methyl-1-propanol

58. I_2 reacts with aqueous $Na_2S_2O_3$ to give $Na_2S_4O_6$ and NaI. The products of reaction of Cl_2 with aqueous $Na_2S_2O_3$ are
(A) $Na_2S_4O_6$ + NaCl
(B) $NaHSO_4$ + HCl
(C) $NaHSO_3$ + HCl
(D) $NaHSO_3$ + NaCl

59. The standard potentials(E^o) of MnO_4^- / Mn^{2+} and MnO_2/Mn^{2+} half cells in acidic medium are 1.51 V and 1.23 V respectively at 298 K. The standard potential of MnO_4^-/MnO_2 half-cell in acidic medium at the same temperature is
(A) 5.09 V
(B) 1.70 V
(C) 0.28 V
(D) 3.34 V

60. Aspartame(X) is an artificial sweetening agent and is 200 times sweeter than sugar. It is an ester of dipeptide of

(X)
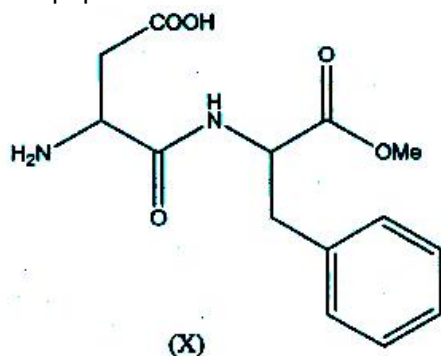
(A) alanine and phenylalanine
(B) aspartic acid and alanine
(C) phenylalanine and glycine
(D) aspartic acid and phenylalanine

61. Which one of the following reactions is correct?
(A) $\left[Fe(CO)_5\right] + 2NO \longrightarrow \left[Fe(CO)_2(NO)_2\right] + 3CO$
(B) $\left[Fe(CO)_5\right] + 2NO \longrightarrow \left[Fe(CO)_3(NO)_2\right] + 2CO$
(C) $\left[Fe(CO)_5\right] + 3NO \longrightarrow \left[Fe(CO)_2(NO)_3\right] + 3CO$
(D) $\left[Fe(CO)_5\right] + 3NO \longrightarrow \left[Fe(CO)_3(NO)_3\right] + 2CO$

62. Standard molar enthalpy of formation of $CO_2(g)$ is equal to
(A) zero
(B) the standard molar enthalpy of combustion of carbon(graphite)
(C) the standard molar enthalpy of combustion of C(g)
(D) the standard molar enthalpy of combustion of CO(g)

63. The reaction of 1-phenylpropane with limited amount of chlorine in the presence of light gives mainly
(A) 4-chloropropylbenzene
(B) 1-chloro-1-phenylpropane
(C) 3-chloro-1-phenylpropane
(D) 2-chloro-1-phenylpropane

64. An ionic solid LaI_2 shows electrical conduction due to presence of
(A) La^{2+} and $2I^-$
(B) La^{3+}, $2I^-$ and e^-
(C) La^{2+}, I_2 and $2e^-$
(D) La^{3+}, I_2 and $3e^-$

65. For a gaseous reaction, A + B → Products, the energy of activation was found to be 2.27 kJ mol^{-1} at 273 K. The ratio of the rate constant (k) to the frequency factory (A) at 273 K is
(A) 0.368
(B) 3.68
(C) 4.34
(D) 0.434

66. In the case of dibromo derivatives of the following compound, the derivative having highest energy has the bromo substituents in positions
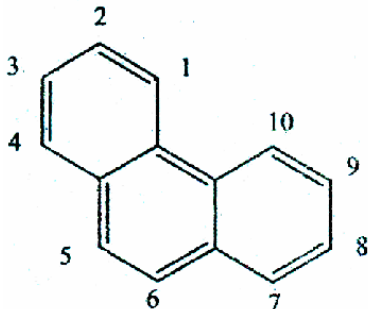

(A) 1, 2
(B) 2, 3
(C) 4, 5
(D) 1, 10

67. The ionization energy of a certain element is 412 kJ mol^{-1}. When the atoms of this element are in the first excited state, however, the ionization energy is only 126 kJ mol^{-1}. The region of the electromagnetic spectrum in which the wavelength of light emitted in transition from the first excited state to the ground state is
(A) Visible
(B) UV
(C) IR
(D) X – ray

68. The reaction of an olefin with HBr can proceed by ionic as well as radical mechanism. The reaction in the presence of light takes place by radical mechanism, as
(A) the free energy of the reaction in radical mechanism is higher than in ionic mechanism
(B) ionic mechanism requires a catalyst while radical mechanism does not.
(C) in the presence of light the activation energy of the reaction is lower than that for ionic mechanism.
(D) a radical reaction has very low activation energy as compared to that for the corresponding ionic reaction.

69. The correct statements is/are
I. Soap is excellent for cleaning, 100% broken down by bacteria in rivers and hence has no further environmental damaging repercussions.
II. Soap forms an insoluble precipitate/scum when hard water containing calcium and magnesium ion is used.
III. Soap can be used for cleaning under acidic solutions.
(A) Only I
(B) Only II
(C) Only III
(D) I and III

70. The kinetic data recorded at 278 K for the reaction
$NH_4^+ (aq) + NO_2^- (aq) \rightarrow N_2 (g) + 2H_2O (l)$ is

Set No.	$[NH_4^+]$ / M	$[NO_2]$ / M	Rate of reaction/ Ms^{-1}
1.	0.24	0.10	7.2×10^{-6}
2.	0.12	0.10	3.6×10^{-6}
3.	0.12	0.15	5.4×10^{-6}

The kinetic rate expressions and the unit of rate constant (k) of the above reaction are respectively

(A) $k\left[NH_4^+\right]\left[NO_2^-\right]$ and Ms^{-1}

(B) $k\left[NH_4^+\right]$ and s^{-1}

(C) $k\left[NH_4^+\right]\left[NO_2^-\right]$ and $M^{-1}s^{-1}$

(D) $k\left[NO_2\right]$ and s^{-1}

71. Which of the following statements in not true for Ce^{3+} and Yb^{3+}?
(A) Both absorb in UV region
(B) Both show f – f transition
(C) Both show 4f to 5d transition
(D) Both ions are colorless

72. Complete catalytic hydrogenation of naphthalene gives decalin $(C_{10}H_{18})$. The number of isomers of decalin formed and the total number of isomers of decalin possible are respectively
(A) 1, 2
(B) 2, 2
(C) 2, 4
(D) 3, 4

73. The mass of argon adsorbed per unit mass of carbon surface is plotted against pressure. Which of the following plots is correct if x and m represent the masses of argon and carbon respectively? (……represents extrapolated data)

(A)

(B)

(C)

(D)
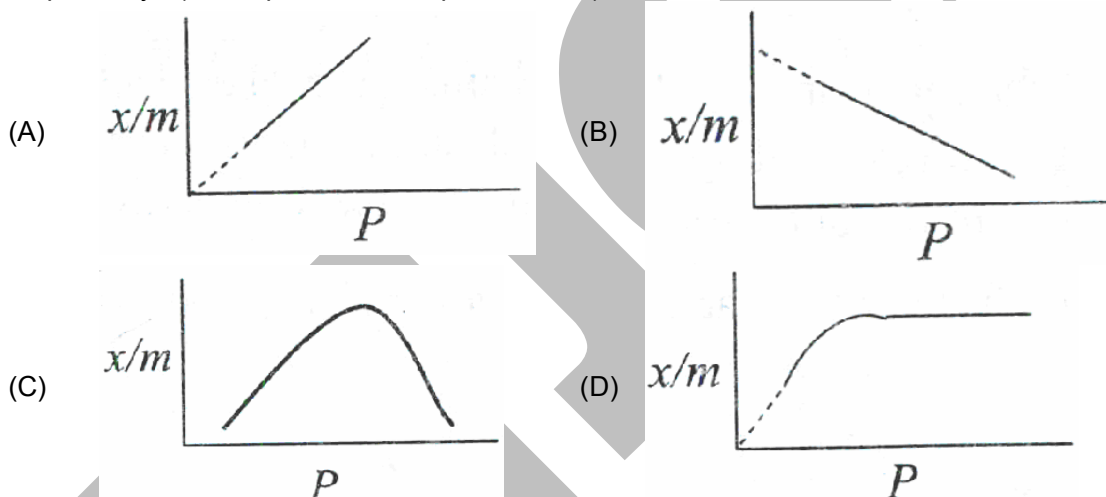
74. In a process n – propyl chloride is reacted with sodium butanoate in an aqueous medium. After the reaction diethyl ether is added and the solution is shaken. The two layers are separated. The **incorrect** statement with respect to this procedure is
(A) The reaction gives a solid product which precipitates in the aqueous solution.
(B) The reaction takes place in the aqueous medium
(C) The product is extracted in diethyl ether and the organic layer is the upper layer.
(D) The salt formed in the reaction remains in aqueous medium.

75. Which of the following statements about ammonium cerium (IV) nitrate $(NH_4)_2\left[Ce(NO_3)_6\right]$ is false?
(A) NO_3^- acts as a monodenate ligand
(B) The Ce atom has a coordination number of 12
(C) The shape of the complex ion is icosahedron.
(D) The solution is used as oxidizing agent

76. The correct order of the magnitude of bond energy (kJ/mol) of the central C – C bond in the following compounds is
(i) $CH_2=CH-CH=CH_2$ (j) Me_3C-CPh_3 (k) $MeCO-CO=Me$ (l) $CH\equiv C-C\equiv CH$
(A) $k>i>l>j$
(B) $j>k>l>i$
(C) $i>j>k>l$
(D) $l>i>k>j$

77. Which one of the following information about the compounds is correct?

Compounds	Oxidation. State of P	No. of P–OH bonds	No. of P–H bonds	No. of P = O bonds
[I] H_3PO_2 Hypophosphorous acid	1+	2	1	0
[II] $H_4P_2O_5$ pyropophosphorous acid	3+	2	2	2
[III] $H_4P_2O_6$ Hypophosphoric acid	4+	2	2	2
[IV] $H_4P_2O_7$ pyrophosphoric acid	5+	3	1	4

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

78. The best method of preparation of 2 – benzyloxynaphthalene is a base catalysed reaction of
(A) benzyl chloride and 1 – naphthol
(B) I – chloromethylnaphthalene and phenol
(C) I – chloronaphthalene and benzyl alcohol
(D) benzyl alcohol and 1 – naphthol

79. The pair that is isostructural (i.e. having the same shape and hybridization is)
(A) NF_3 and BF_3 (B) BF_4^- and NH_4^+
(C) BCl_3 and $BrCl_3$ (D) NH_3 and NO_3^-

80. A group which departs from the substrate in a nucleophilic reaction is called a leaving group. The ease of departure is determined by the acidity of the conjugate acid of the leaving group; higher the acidity better is the leaving group. The correct order of the reactivity of the following compounds in a given nucleophilic reaction is
(A) $R – Cl > R – OCOCH_3 > R – OSO_2CH_3 > RI$
(B) $R – OSO_2CH_3 > R – Cl > R – OCOCH_3 > ROH$
(C) $R – I > RNH_2 > R – OCOCH_3 > ROSO_2CH_3$
(D) $R – Br > R – OSO_2CH_3 > R – OCOCH_3 > ROCH_3$