

CHEMISTRY

(Solved Paper of CEE)



Assam Electronics Development Corporation Limited
(AMTRON)

(A Government of Assam Undertaking)

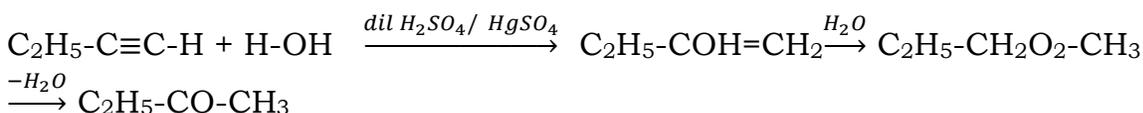
1. When 1-butyne is treated with aqueous H_2SO_4 in presence of HgSO_4 , the major product is

- [A] $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CHO}$
- [B] $\text{CH}_3\text{-CH}_2\text{-CO-CH}_3$
- [C] $\text{CH}_3\text{-CH}_2\text{-CH=CH}_2$
- [D] $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$

Answer: [B]

Hints: When 1-butyne is treated with aqueous H_2SO_4 in presence of HgSO_4 gives butanone.

The reaction below follows Markonikov's rule:



2. Diethyl ether, when heated with excess HI, produces

- [A] ethanol
- [B] iodoform
- [C] ethyl iodide
- [D] methyl iodide

Answer:[C]

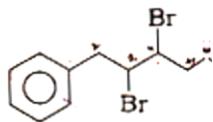
Hints: When diethyl ether heated with excess HI, gives ethyl iodide

3. When propionic acid is treated with aqueous sodium bicarbonate, CO_2 is liberated. The C of CO_2 comes from

- [A] methyl group
- [B] methylene group
- [C] carboxylic acid group
- [D] bicarbonate

Answer: [D]

6. The IUPAC name of the following compound is



- [A] 3,4 – dibromo-5-phenylpentane
- [B] 2,3- dibromo-1-phenylpentane
- [C] 3,2-dibromo-1-phenylpentane
- [D] 4,3-dibromo-5-phenylpentane

Answer:[B]

Hints:

Rules for Nomenclature:

1. Choose the longest carbon chain
2. Then, Count the carbon atoms of the longest carbon chain in such a way that the substituents get lowest serial number.

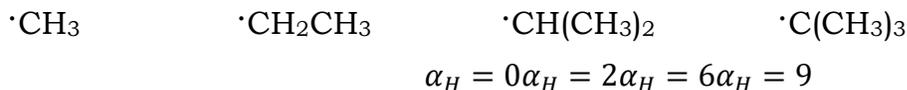
7. The stability order of the following alkyl free radical is



- [A] $\cdot\text{CH}_3 < \cdot\text{C}(\text{CH}_3)_3 < \cdot\text{CH}(\text{CH}_3)_2 < \cdot\text{CH}_2\text{CH}_3$
- [B] $\cdot\text{C}(\text{CH}_3)_3 < \cdot\text{CH}(\text{CH}_3)_2 < \cdot\text{CH}_2\text{CH}_3 < \cdot\text{CH}_3$
- [C] $\cdot\text{CH}_2\text{CH}_3 < \cdot\text{CH}_3 < \cdot\text{CH}(\text{CH}_3)_2 < \cdot\text{C}(\text{CH}_3)_3$
- [D] $\cdot\text{CH}_3 < \cdot\text{CH}_2\text{CH}_3 < \cdot\text{CH}(\text{CH}_3)_2 < \cdot\text{C}(\text{CH}_3)_3$

Answer: [D]

Hints:



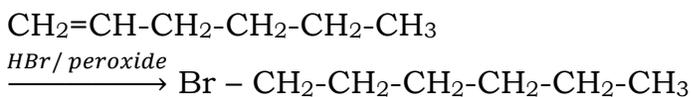
So, the stability order is:



8. The product obtained by the addition of HBr to hex-1-ene in presence of a peroxide is
- [A] 2-bromohexane
 - [B] 1-bromohexane
 - [C] 1,2-dibromohexane
 - [D] 2,2-dibromohexane

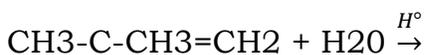
Answer: [B]

Hints:



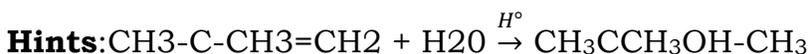
1-bromohexane

9. In presence of few drops of conc. H_2SO_4 , the product formed in the following reaction is

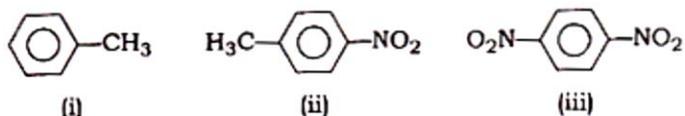


- [A] 2-methylpropan-2-ol
- [B] 2-methylpropanol
- [C] 1,2-dihydroxy-2-methylpropane
- [D] 2-methylpropanoic acid

Answer: [A]



10. Which one of the following is correct if the given compounds are arranged in order of their relative reactivity with an electrophile, E° ?



[A] (ii) > (i) > (iii)

[B] (i) > (ii) > (iii)

[C] (iii) > (ii) > (i)

[D] (iii) > (i) > (ii)

Answer: [B]

Hints: Methyl group increases the electron density in the benzene ring through +I effect, which, in turn, increases the rate of electrophilic reaction. But the nitro group decreases the electron density in the benzene ring through -I effect and thus the rate of electrophilic reaction decreases.

11. The metal atoms present in haemoglobin, chlorophyll and vitamin B₁₂ respectively are

[A] Fe, Mg, Co

[B] Fe, Co, Mg

[C] Fe, Mg, Zn

[D] Mg, Fe, Co

Answer: [A]

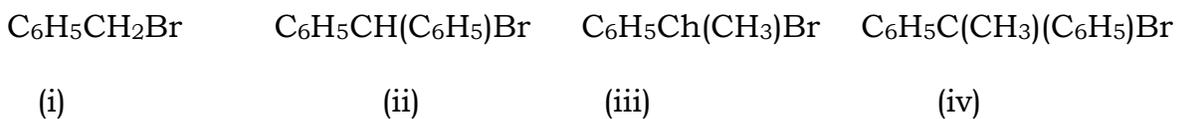
Hints: haemoglobin- Fe, Chlorophyll- Mg, Vitamin B₁₂-Co

12. Which one of the following can perform shape selective catalysis?

- [A] Silica
 - [B] Zeolite
 - [C] Alumina
 - [D] Graphite
- Answer: [B]

Hints: Zeolite used as shape –selective catalyst.

13. The decreasing order of reactivity of the following compound in S_N1 reaction is



- [A] (i)>(ii)>(iii)>(iv)
- [B] (iv)>(iii)>(ii)>(i)
- [C] (iv)>(ii)>(iii)>(i)
- [D] (iii)>(ii)>(i)>(iv)

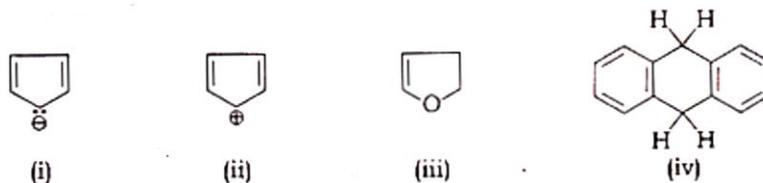
Answer: [C]

Hints:

Rate of S_N1 is directly proportional to stability of carbocation. Hence,

(iv)>(ii)>(iii)>(i)

14. Which one of the following compound is aromatic?



[A] (i)

[B] (ii)

[C] (iii)

[D] (iv)

Answer: [A]

Hints:

The compound which follows Huckel's rule of aromaticity

Here (i) follows Huckel's rule of aromaticity

$$4n+2 = 6$$

$$\therefore n=1$$

15. The state of hybridization of the asterisked carbon in the following compound is



[A] sp

[B] sp²

[C] sp³

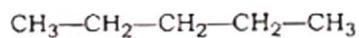
[D] None of these

Answer: [A]

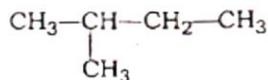
Hints:

Here C = 2σ + 0 sp

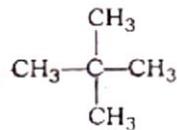
15. The ascending order of boiling points of the following compounds is



(i)



(ii)



(iii)

[A] (i) < (ii) < (iii)

[B] (i) < (iii) < (ii)

[C] (ii) < (i) < (iii)

[D] (iii) < (ii) < (i)

Answer: [D]

Hints: Boiling Point is inversely proportional to Branching.

17. A hydrocarbon containing one double bond gave on reductive ozonolysis, ethanal and propanone. The name of the hydrocarbon is

[A] 2-pentane

[B] 2-methyl-1-butene

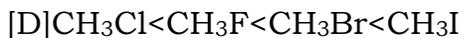
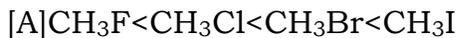
[C] 2-methyl-2-butene

[D] 3-methyl-1-butene

Answer: [C]

Hints: $\text{CH}_3-\text{C}-\text{CH}_3=\text{CH}-\text{CH}_3 \rightarrow \text{CH}_3-\text{CO}-\text{CH}_3 + \text{CH}_3-\text{CHO}$

18. Among the halomethanes, the C-X (X= halogen) bond energy increases in the order



Answer: [B]

Hints:

Bond energy decreases as the size of halogens increases from top to bottom, because the bond length increases from $\text{CH}_3\text{-F}$ to $\text{CH}_3\text{-I}$.

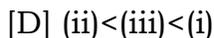
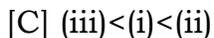
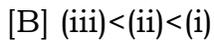
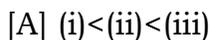
19. The correct stability order for the following carbanions is



(i)

(ii)

(iii)



Answer: [A]

Hints: Electro negativity is directly proportional to the percentage of s-character

Here (i) sp^3 (ii) sp^2 (iii) sp

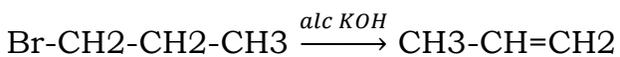
20. 12.3 g 1- bromopropane is treated with alcoholic KOH. What mass of product is obtained if yield is 50%?

[A] 6.05g [B] 12.3 g

[C] 4.2 g [D] 2.1 g

Answer: [D]

Hints:



No of moles= weight/molecular mass

$$\Rightarrow n = w/m = 12.3/123 = 0.1$$

$$\therefore \text{weight} = 0.1 \times 42 = 4.2 \text{ g}$$

yield is 50% , so

$$\text{weight} = 2.1 \text{ g}$$

21. Which one of the following compounds gives a secondary alcohol upon treatment with methyl magnesium bromide?

[A] Formaldehyde

[B] Formic acid

[C] Acetaldehyde

[D] Acetone

Answer: [c]

Hints: Aldehyde except formaldehyde gives a secondary alcohol upon treatment with methyl magnesium bromide

22. The acid strength of the following carboxylic acids increases in the order

HCOOH, CH₃COOH, CH₃CH₂COOH, CH₃CH₂COOH, CH₃CH₂CH₂COOH

[A] HCOOH < CH₃COOH < CH₃CH₂COOH < CH₃CH₂CH₂COOH

[B] CH₃CH₂CH₂COOH < CH₃CH₂COOH < CH₃COOH < HCOOH

[C] HCOOH < CH₃CH₂COOH < CH₃COOH < CH₃CH₂CH₂COOH

[D] CH₃COOH < CH₃CH₂COOH < CH₃CH₂CH₂COOH < HCOOH

Answer: [B]

Hints: Acid strength is inversely proportional to positive inductive effect

23. The number of electrons, protons and neutrons in p³⁻ ion is respectively

[A] 15, 15, 16

[B] 15, 16, 15

[C] 18, 15, 16

[D] 15, 16, 18

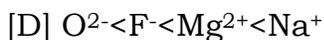
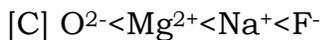
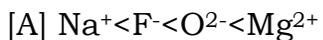
Answer: [C]

Hints: Here Electron = 18

Proton = 15

Neutron = 31 - 15 = 16

24. The increasing order of size for the following ionic species is



Answer: [B]

Hints: Isoelectronic are those which have same number of electrons. For isoelectronic, if no of protons are more than electrons then size will reduced due to the attractive forces.

25. If 1.5 moles of oxygen combine with Al to form Al_2O_3 , the mass of Al in gram used in the reaction is

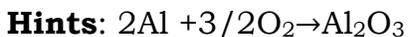
[A] 2.7

[B] 54

[C] 40.5

[D] 81

Answer: [B]



Here 1.5 mol of oxygen reacts with = 2 mol of Al

= 54 g

26. The series of lines present in the visible region of the hydrogen spectrum is

[A] Lyman

[B] Balmer

[C] Paschen

[D] Brackett

Answer: [B]

Hints: Balmer lies in the visible region of the hydrogen spectrum

27. Which one of the following is not possible?

[A] $n=3, l=0, m_l = 0$ [B] $n =3, l=1, m_l=-1$

[C] $n=2, l= 0, m_l= -1$ [D] $n=2, l=1, m_l = 0$

Answer: [C]

Solution: Because $m=-l,0,+l$

So, if $l=0$, $m= 0$

28. The energy associated with the electron present in the first orbit of He^+ is

[A] $-8.72 \times 10^{-18} J$

[B] $-8.72 J$

[C] -8.72 kJ

[D] $-2.18 \times 10^{-18} J$

Answer: [A]

Hints: $E_n = -21.76 - 21.76 \times 10^{-19} z^2 \div n^2$

Here, $n=1, z=2$

$E_n = -8.72 \times 10^{18} J$

29. The coloured ion is

[A] Zn^{2+}

[B] Sc^{3+}

[C] V^{3+}

[D] Na^+

Answer: [C]

Hints: The presence of unpaired electrons in (n-1) d orbitals permits (d-d) transition through the absorption of radiation in the visible region and hence colour appears.

30. The combination containing only isoelectronic species is

[A] N^{3-} , O^{2-} , Cl^- , Ne [B] P^{3-} , S^{2-} , Cl^- , Ar

[C] F^- , Ar, S^{2-} , Cl^- [D] N^{3-} , F^- , O^{2-} , Ar

Answer: [B]

Hints: Isoelectronic species is one which have same no of electrons

31. The correct order of chemical reactivity in terms of oxidizing property is

[A] $\text{F} > \text{Cl} > \text{O} > \text{N}$

[B] $\text{F} > \text{O} > \text{Cl} > \text{N}$

[C] $\text{Cl} > \text{F} > \text{O} > \text{N}$

[D] $\text{O} > \text{F} > \text{N} > \text{Cl}$

Answer: [C]

Hints: Oxidizing property of elements decreases from top to bottom of a group and increases from left to right in a period. Halogens are most oxidizing agent. Size of chlorine is more than that of fluorine.

32. The correct order of hybridization of the central atom in the species NH_3 , $[\text{PtCl}_4]^{2-}$, PCl_5 and BCl_3 is

[A] dsp^2 , dsp^3 , sp^2 , sp^3

[B] sp^3 , dsp^2 , sp^3d , sp^2

[C] dsp^2 , sp^2 , sp^3 , dsp^3

[D] dsp^2 , sp^3 , sp^2 , dsp^3

Answer: [B]

Hints: Here,

NH_3 is sp^3 hybridized.

$[\text{PtCl}_4]^{2-}$ is dsp^2 hybridized.

PCl_5 is sp^3d hybridized.

BCl_3 is sp^2 hybridized.

33. The molecule/ion which contains maximum number of electrons in the antibonding orbital is

[A] O_2

[B] O_2^{2-}

[C] O_2^-

[D] O_2^+

Answer: [B]

Hints: Electronic configuration of –

O_2 : $1s^2 \alpha^* 1s^2 \alpha^* 2s^2 \alpha^* 2s^2 \alpha^* 2p_z^2 \pi_{2p_x}^2 \pi_{2p_y}^2 \pi^* 2p_x^1 \pi^* 2p_y^1$

O_2^{2-} : $1s^2 \alpha^* 1s^2 \alpha^* 2s^2 \alpha^* 2s^2 \alpha^* 2p_z^2 \pi_{2p_x}^2 \pi_{2p_y}^2 \pi^* 2p_x^2 \pi^* 2p_y^2$

O_2^- : $1s^2 \alpha^* 1s^2 \alpha^* 2s^2 \alpha^* 2s^2 \alpha^* 2p_z^2 \pi_{2p_x}^2 \pi_{2p_y}^2 \pi^* 2p_x^2 \pi^* 2p_y^1$

O_2^+ : $1s^2 \alpha^* 1s^2 \alpha^* 2s^2 \alpha^* 2s^2 \alpha^* 2p_z^2 \pi_{2p_x}^2 \pi_{2p_y}^2 \pi^* 2p_x^1 \pi^* 2p_y^0$

Thus the number of antibonding electrons in O_2 , O_2^{2-} , O_2^- , O_2^+ are 6, 8, 7, 5 respectively.

34. The molecule ML_x is planar with six pairs of electrons around M in the valence shell. The value of X is

[A] 6

[B] 2

[C] 4

[D] 3

Answer: [C]

Hints: A square Planer complex must have 4 ligands. Therefore, the value of $x=4$.

35. The heats of Vaporization of H_2O , C_2H_5OH and CS_2 are 40.6 kJ mol^{-1} , 38.6 kJ mol^{-1} and 26.8 kJ mol^{-1} respectively. The order of intermolecular forces in these liquids is

[A] $H_2O > C_2H_5OH > CS_2$

[B] $CS_2 > C_2H_5OH > H_2O$

[C] $H_2O > CS_2 > C_2H_5OH$

[D] $CS_2 > H_2O > C_2H_5OH$

Answer: [A]

Hints: Heat of Vaporization is inversely proportional to intermolecular forces

36. If $K < 1.0$, then value of ΔG° will be

[A] 1.0

[B] Zero

[C] negative

[D] positive

Answer: [D]

Hints: We know that,

$$\Delta G^\circ = -RT \ln K$$

When $K < 1$, $\Delta G^\circ > 0$

37. The bond energies of C-C, C=C, H-H and C-H bonds are 350 KJ mol, 600 KJ mol, 400 kJ mol respectively. The enthalpy of hydrogenation of ethane is

[A] -170 kJmol⁻¹

[B] -260 kJmol⁻¹

[C] -400 kJmol⁻¹

[D] -450 kJmol⁻¹

Answer: [A]

Hints: $\Delta H = \sum \text{Bond Energy (reactant)} - \sum \text{Bond Energy (product)}$

38. The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of 10L to 100 L at 27°C is

[A] 35.8 JK⁻¹

[B] 32.3 JK⁻¹

[C] 42.3 Jk⁻¹

[D] 38.3 JK⁻¹

Answer: [D]

Hints: $\Delta S = 2.303nR \log_{10} V_2/V_1$

$$\Delta S = 2.303 \times 2 \times 8.314 \times \log_{10} 100/10$$

$$= 38.2 \text{ Jk}^{-1}$$

39. If a neutral solution has $pK_w = 13.36$ at 50°C , then pH of the solution is

[A] 6.68

[B] 7

[C] 7.63

[D] None of these

Answer: [A]

Hints: For a neutral Solution, $P^H = P^{OH}$

Since, $P^{kw} = P^H + P^{OH}$

$$P^H = 13.36/2$$

$$= 6.68$$

40. For the reaction $\text{CO (g)} + \text{Cl}_2 \text{(g)} = \text{COCl}_2 \text{(g)}$, K_p/K_c is equal to

[A] $1/RT$

[B] RT

[C] \sqrt{RT}

[D] 1.0

Answer: [A]

Hints: $K_p = K_c (RT)^{\Delta n}$

For above reaction, $\Delta n = 1 - (1+1) = -1$

$$\therefore K_p = K_c (RT)^{\Delta n}$$

41. The oxidation number of P in PO_4^{3-} , of S in SO_4^{2-} and that of Cr in $\text{Cr}_2\text{O}_7^{2-}$ are respectively

[A] -3 , +6 , and +6

[B] +5 , +6 and +6

[C] +3 , +6 and +5

[D] +5 , +3, and +6

Answer: [B]

Hints: $\text{PO}_4^{3-} = +5$

$\text{SO}_4^{2-} = +6$

$\text{Cr}_2\text{O}_7^{2-} = +6$

42. An aqueous solution of borax is

[A] neutral

[B] amphoteric

[C] basic

[D] acidic

Answer: [C]

Hints: Borax is highly soluble in water. In aqueous solution, it undergoes hydrolysis to form NaOH which is a strong base.

43. A sample of hydrogen peroxide is labelled as 10 volume. Its strength in gL^{-1} is

[A] 30.00

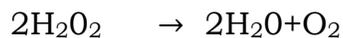
[B] 60.70

[C] 15.17

[D] 45.42

Answer: [A]

Hints:



$$(2 \times 34) \text{ gm} \qquad 22.4 \times 10^3 \text{ ml at STP}$$

∴ At STP

$$22.4 \times 10^3 \text{ ml O}_2 \equiv 68 \text{ gm H}_2\text{O}_2$$

$$\therefore 10 \text{ ml O}_2 \equiv 68 \times \frac{10}{22.4} \times 10^3$$

$$= 0.03036 \text{ gm H}_2\text{O}_2$$

$$\therefore 1 \text{ ml 10 volume H}_2\text{O}_2 \text{ contains} = 0.03036 \text{ gm H}_2\text{O}_2$$

$$\begin{aligned} \therefore 1000 \text{ ml 10 volume H}_2\text{O}_2 \text{ contains} &= 0.03036 \times 1000 \\ &= 30.36 \text{ gm. H}_2\text{O}_2 \end{aligned}$$

44. The electrolysis of an aqueous solution of potassium acetate gives

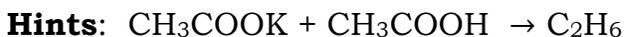
[A] methane

[B] ethane

[C] butane

[D] All of these

Answer: [B]



45. The van't Hoff factor for 0.1 M $\text{Ba}(\text{NO}_3)_2$ solution is 2.74. The degree of dissociation is

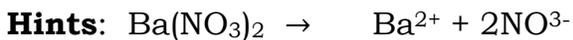
[A] 91.3%

[B] 87%

[C] 100%

[D] 74%

Answer: [B]



$$1 \text{ mol} \qquad 1 \text{ mol} \quad 2 \text{ mol}$$

$$\therefore \alpha = i - 1 \div (x + y) - 1$$

$$= 2.74 - 1 / (1 + 2) - 1$$

$$= 1.74 / 2$$

$$= 87\%$$

46. For a reaction $\text{A} + \text{B} \rightarrow \text{C}$, it is found that doubling the concentration of A increases the rate by 4 times and doubling the concentration of B doubles the reaction rate. The overall order of the reaction is

[A] 4

[B] 3/2

[C] 3

[D] 1

Answer: [C]

Hints:

The reaction is $\text{A} + \text{B} \rightarrow \text{C}$

Let rate, $r = K[\text{A}]^m [\text{B}]^n \rightarrow$ (i)

B/Q $4r = K \{2[\text{A}]^m [\text{B}]^n \rightarrow$ (ii)

and $2r = K[\text{A}]^m \{2[\text{B}]\}^n \rightarrow$ (iii)

$$\therefore \text{(ii)} \div \text{(i)} \Rightarrow 4 = 2^m$$

$$\therefore m = 2$$

$$\text{(iii)} \div \text{(i)} \Rightarrow 2 = 2^n$$

$$\Rightarrow n = 1$$

Overall order = $2+1 = 3$

47. The enthalpy of adsorption for physical adsorption is

[A] 20-40 kJmol^{-1}

[B] 50-100 kJmol^{-1}

[C] 0-20 kJmol^{-1}

[D] 40-100 kJ mol^{-1}

Answer: [A]

Hints: Refer to N.C.E.R.T

48. The pair of metals which are purified by Van Arkel method is

[A] Ni and Fe

[B] Ga and In

[C] Zr and Ti

[D] Ag and Au

Answer: [C]

Hints: Refer to N.C.E.R.T

49. The chelating ligand which is used in the treatment of lead poisoning is

[A] ethane-1, 2-diamine

[B] EDTA

[C] dimethylglyoxime

[D] None of these

Answer: [B]

50. The sodium laurylsulphate is

- [A] an anionic detergent
- [B] a cationic detergent
- [C] a non- ionic detergent
- [D] All of these

Answer: [A]

51. An example of sulphur –containing amino acid is

- [A] lysine
- [B] serine
- [C] cysteine
- [D] tyrosine

Answer: [C]

Hints: cysteine is s sulphur containing amino acid.

52. The reagent which is used to distinguish between acetophenone and benzophenone is

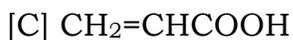
- [A] Fehling's solution
- [B] $I_2 + NaOH$
- [C] Tollen's reagent
- [D] Brady's solution

Answer: [B]

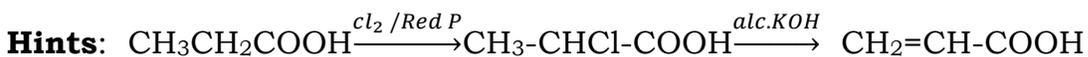
Hints: Acetophenone shows iodoform reaction as it contains CH₃-C(=O)- group. But benzophenone does not show iodoform reaction.



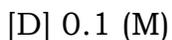
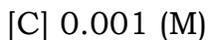
The product B is



Answer: [C]



54. 6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of the solution is



Answer: [B]

Hints: Mole = No of Molecules / Avogadro Number

55. Which one of the following does not act as a buffer solution?

[A] Na_3PO_4 and Na_2HPO_4

[B] Sodium propanoate and propanoic acid

[C] Boric acid and borax

[D] Sodium acetate and sodium propanoate

Answer: [D]

Notes: There are two types of buffer solution-

(i) Weak acid and its salt with a strong base.

(ii) Weak base and its salt with a strong acid.

So, sodium acetate and sodium propanoate are salt of weak acid with strong base.

56. In B_2H_6

[A] there is a B-B bond

[B] the structure is similar to C_2H_6

[C] the boron atoms are linked through hydrogen bridges

[D] all the atoms lie in one plane

Answer: [C]

Notes: Refer to the structure of Hydrogen bridge

57. Ozone, on reaction with KI solution, finally produces

[A] Cl_2

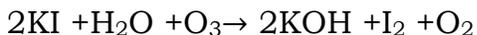
[B] I_2

[C] HI

[D] IO_3^-

Answer: [B]

Hints: $O_3 \rightarrow O_2 + [O]$



58. In salt bridge, KCl is used because

[A] KCl is present in the calomel electrode

[B] K^+ and Cl^- ions have the same transport number

[C] K^+ and Cl^- ions are isoelectronic

[D] KCl is an electrolyte

Answer: [B]

Hints: In salt bridge those strong electrolytes are used in which velocity of positive ion is equal to velocity of negative ion.

59. Which one of the following is different from the other three?

[A] MgO

[B] SnO

[C] ZnO

[D] PbO

Answer: [A]

Hints: SnO, ZnO, PbO are amphoteric oxides.

60. Li is not kept in Kerosene oil because

[A] it reacts with Kerosene oil

[B] it has low density

[C] it has maximum hydration energy

[D] All of these

Answer: [D]

Notes: Lithium has low density so it floats on kerosene oil and also reacts vigorously with Kerosene oil and it has maximum hydration energy. So, it kept under paraffin.

61. If the dissociation constant of a base MOH is 4×10^{-6} , then the dissociation constant of its conjugate acid is

[A] 2.5×10^{-9}

[B] 2.7×10^{-10}

[C] 3.5×10^{-8}

[D] 3.1×10^{-7}

Answer: [A]

Hints: $K_a \times K_b = K_w = 10^{-14} \Rightarrow K_a \times 4 \times 10^{-6} = 10^{-14} \Rightarrow K_a = 2.5 \times 10^{-9}$

62. The metal extracted through self-reduction process is

[A] Al

[B] Cu

[C] Ag

[D] Zn

Answer: [B]

Hints: Cu is extracted by self reduction process.

63. The number of neutrons present in the nucleus of the original element which produces ^{14}N by emitting β -particle is

[A] 6

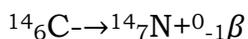
[B] 7

[C] 8

[D] 14

Answer: [C]

Hints:



Number of Neutrons: $14 - 6 = 8$

64. P_2O_5 turns white paper to black because it

[A] oxidizes the cellulose of the paper

[B] reduces the cellulose of the paper

[C] dehydrates the cellulose of the paper

[D] None of the above

Answer: [C]

Hints: P_2O_5 has higher affinity towards water, so it acts as a strong dehydrating agent and absorbs water from cellulose.

65. What is the mole fraction of ethanol and water respectively in a sample of rectified spirit which contains 95% of ethanol by weight?

[A] 0.5 and 0.5

[B] 0.6 and 0.4

[C] 0.75 and 0.25

[D] 0.88 and 0.12

Answer: [D]

Hints: 95% Ethanol by weight means, 100 gm. of ethanol contains 95gm ethanol and 5 gm water.

Number of moles= weight/molecular mass

$$\begin{aligned}\therefore \text{mole number in 95gm of ethanol} &= 95/46 \\ &= 2.06\end{aligned}$$

$$\begin{aligned}\text{And mole number in 5 gm of water} &= 5/18 \\ &= 0.278\end{aligned}$$

$$\begin{aligned}\therefore \text{mole fraction, } X_{\text{ethanol}} &= 2.06/2.06 + 0.278 \\ &= 0.88\end{aligned}$$

$$\begin{aligned}\text{And } X_{\text{water}} &= 0.278/2.06 + 0.278 \\ &= 0.12\end{aligned}$$

66. What is the free energy change in dissolving one mole of NaCl with its lattice energy and hydration energy of 777.8 KJ/mol and -777.4 KJ/mol respectively at 25°C? (Given, $\Delta S = 0.043 \text{ kJ/K mol}$)

[A] -18.2 kJ/mol

[B] -36.4 kJ/mol

[C] -9.1 kJ/mol

[D] 18.2 kJ/mol

Answer: [C]

Hints:

$$\Delta s = 0.043 \text{ kJ/mol}$$

$$\Delta H = 3.8$$

$$\Delta G = \Delta H - T\Delta S$$

$$= 3.8 - 298 \times 0.043$$

$$= -9.1 \text{ KJ/mol}$$

67. Which one of the following allows other cells to transform glucose into energy through the body?

[A] Glycogen

[B] Insulin

[C] Thyroxin

[D] Heparin

Answer: [B]

Hints: In human body, insulin regulates glucose metabolism.

68. Which one of the following orders is correct in case of energy of the given electrons?

$$P : n = 4; l = 3$$

$$Q : n = 5; l = 2$$

$$R : n = 5; l = 1$$

$$S : n = 4; l = 2$$

[A] $S < R < P < Q$

[B] $R < P < S < Q$

[C] $Q < S < R < P$

[D] $S < Q < P < R$

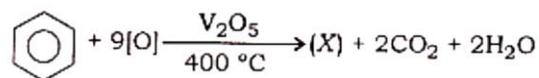
Answer: [A]

Hints: According to $(n+1)$ rule-

(i) Greater the value of $(n+1)$, more will be the energy of the orbital.

(ii) For two orbitals having same value of $(n+1)$, the orbital with greater value of n will have higher energy

69. What is the product (X) of the following reactions?



[A] Acetic anhydride

[B] Acetaldehyde

[C] Acetone

[D] Maleic anhydride

Answer: [D]

70. Who among the following scientist synthesized Prontosil in 1932?

[A] H.W. Flory

[B] Paul Ehrlich

[C] Alexander Fleming

[D] Kekule

Answer: [B]

Hints: Prontosil is a sulphadruug synthesized by Paul Ehrlich in 1932

71. Guanidine is

[A] an imido analogue of urea

[B] a liquid

[C] a very week base

[D] acidic

Answer: [A]

72. Which one of the following sweetening agents is almost 550 times sweeter than sugar?

[A] Aspartame

[B] Alitame

[C] ortho-sulphobenzimide

[D] Sucralose

Answer: [C]

Hints:

Sweetner	Relative sweetner
Aspartame	180
Alitame	2000
Orth-sulphobenzimide	550
Sucralose	650

73. In the reduction of ethylbenzene in presence of Ni catalyst, which one of the following products is formed?

[A] Diphenyl

[B] Ethylcyclohexane

[C] Xylene

[D] Cyclohexane

Answer: [B]

Hints: ethylbenzene $\xrightarrow{Ni/3H_2}$ ethylcyclohexane

74. Which one of the following samples of metals can produce the most hydrogen by reacting with water?

[A] 0.5 mol of Na

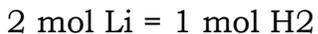
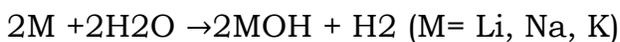
[B] 0.5 mol of Ba

[C] 0.05 mol of Li

[D] 0.5 mol of K

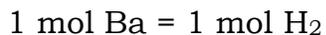
Answer: [B]

Hints:



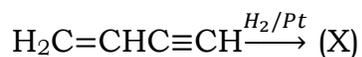
$$\begin{aligned} 0.05 \text{ mole Li} &= \frac{1}{2} \times 0.05 = 0.025 \text{ mol H}_2 \\ &= 0.025 \times 2.016 \text{ gm} \\ &= 0.0504 \text{ gm H}_2 \end{aligned}$$

$$\begin{aligned} \text{And } 0.5 \text{ mol Na or K} &= \frac{1}{2} \times 0.5 = 0.25 \text{ mol H}_2 \\ &= 0.25 \times 2.016 \text{ gm H}_2 \\ &= 0.504 \text{ gm H}_2 \end{aligned}$$



$$\begin{aligned} 0.5 \text{ mol Ba} &= 0.5 \text{ mol H}_2 \\ &= 1.008 \text{ gm H}_2 \end{aligned}$$

75. The product (X) of the following reaction is



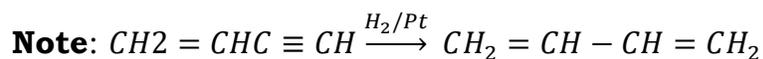
[A] ethene

[B] ethyne

[C] 1, 3-butadiene

[D] propane

Answer: [C]



76. The natural polymer with repeating unit intervals of 4.8 Å is named as

[A] Rubber

[B] Buna-S

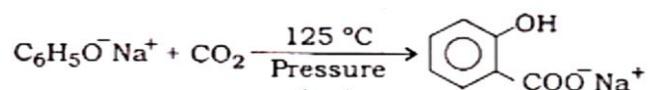
[C] Gutta-percha (trans)

[D] Thiokol

Answer: [A]

Here in these options, rubber is only natural polymer and the other three are synthetic polymers.

77. What is the name of the following synthesis?



[A] Sandmeyer synthesis

[B] Reimer-Tiemann synthesis

[C] Fries rearrangement

[D] Kolbe's synthesis

Answer: [C]

Hints:

Phenoxide on treatment with CO₂ at elevated temperature under pressure produces ortho and para carboxylates of Phenol. This is called Kolbe's Synthesis.

78. When 50 cm³ of 2.0 mol/lit HCL mixes with 50 cm³ of 2.0 mol/lit of NaoH in a polystyrene cup, the temperature rises to 13.5 K. What is the enthalpy change in the reaction?

[A] -5643 kJ/mol

[B] -4180 J/mol

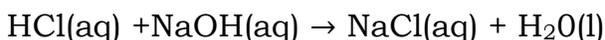
[C] -56.4 kJ/mol

[D] -100 kJ/mol

Answer: [C]

Hints:

The reaction is-



The enthalpy change for this reaction is nearly - 56.4 kJ/mol

79. What type of bonds will be formed between a pair of atoms A and B, if their electronegativity difference is greater than 1.5?

[A] Covalent

[B] Ionic

[C] van der waals bond

[D] No bond

Answer: [B]

Hints:

Electronegativity Difference	Ionic character
>1.7	Ionic
0.4-1.7	Polar covalent, which is also ionic
<0.4	Covalent
0	Non -Polar

80. How many isomers are possible for the complex ion $[\text{Cr}(\text{NH}_3)(\text{OH})_2\text{Cl}_2]^{2-}$?

[A] 3

[B] 2

[C] 4

[D] 5

Answer: [C]

Hints: 4 isomers are possible for the complex ion $[\text{Cr}(\text{NH}_3)(\text{OH})_2\text{Cl}_2]^{2-}$ with respect to the relative position of the ligands.

81. What is the value of (X) and how many (X) are produced in the following radiochemical reaction at 10th cycle?



[A] (X) = ${}^0_1\text{e}$; Number of (X) = 16

[B] (X) = 2β ; Number of (X) = 32

[C] (X) = 2^1_0n ; Number of (X) = 1024

[D] (X) = 2α - particles; Number of (X) = 254

Answer: [C]

Hints: The above reaction releases 2 neutrons in each step as it is a chain reaction. Therefore the total no of neutrons = $20^{10} = 1024$

82. What is the hydronium ion concentration of a solution containing 0.2 mol of $\text{HC}_2\text{H}_3\text{O}_2$ in 1.0 litre solution? ($K_a = 1.80 \times 10^{-5}$)

[A] 1.89×10^{-3} (M)

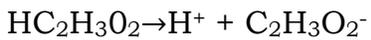
[B] 1 (M)

[C] 1.5×10^{-2} (M)

[D] 2 (M)

Answer: [A]

Hints



$$\therefore K_a = \text{C}\alpha^2$$

$$\Rightarrow \alpha = \sqrt{k_a/c} = \sqrt{1.80} \times 10^{-5} \div 0.2$$

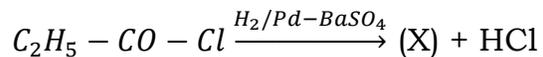
$$= 9.48 \times 10^{-3}$$

$$[\text{H}^+] = \text{C}\alpha$$

$$= 0.2 \times 9.48 \times 10^{-3}$$

$$= 1.89 \times 10^{-3} \text{ M}$$

83. What is the product (x) of the following reaction?



[A] $\text{C}_2\text{H}_5\text{OH}$

[B] CH_3COOH

[C] $\text{C}_2\text{H}_5\text{CHO}$

[D] CH_3COCH_3

Answer: [C]

84. What is smoke screen?

[A] NH_4Cl

[B] SO_2

[C] P_2O_5

[D] HCl

Answer: [C]

Hints: PH_3 is used to create smoke screens as it produces vapours of P_2O_5 when it burns in air.

85. Which one of the following compounds is used as a drying agent under the name Anhydrone?

[A] H_2SO_4

[B] CaCl_2

[C] $\text{Mg}(\text{ClO}_4)_2$

[D] P_2O_5

Answer: [C]

Hints: Magnesium perchlorate with formula $\text{Mg}(\text{ClO}_4)_2$ is known as anhydrous which is a superior drying agent for gas analysis.

86. The bond angle and O-O bond length in O_3 are respectively

[A] 116.8° and 1.28A°

[B] 90° and 1.38A°

[C] 120° and 1.1A°

[D] 60° and 1.5A°

Answer: [A]

Hints: The ozone molecule is angular with O-O bond lengths 1.28\AA and bond angle 117°

87. Which one of the following compounds is used for the manufacture of violet coloured glass?

[A] CuO

[B] Cr_2O_3

[C] CoO

[D] MnO_2

Answer: [D]

Hints:

Added salt/compound	Colour of glass
Cobalt oxide	Blue
CuO	Deep blue
Fe^{2+}	Green
Fe^{3+}	Yellow
Cu_2O	Red
MnO_2	Violet
Cr_2O_3	Green

88. What is the free energy change per mole of Cu(II) ion formed in a cell consisting of Cu/Cu(II) ion half-cell suitably connected to a Ag/Ag^+ ion half-cell?

(Given $E^\circ = 0.46\text{ V}$)

[A] -75 kJ

[B] -89 kJ

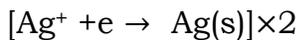
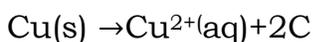
[C] -45 kJ

[D] -25 kJ

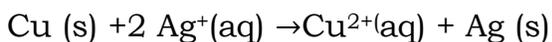
Answer: [B]

Hints:

The Cell reaction is-



The overall reaction is:



$$\therefore n=2$$

$$\therefore \Delta G^{\circ} = -nFE^{\circ}_{\text{cell}}$$

$$= -2 \times 96500 \times 0.46$$

$$= -88780 \text{ J/mol}$$

$$= -88.78 \text{ KJ/mol}$$

$$\approx -89 \text{ KJ/mol}$$

89. What volume of H₂ is produced under standard conditions when 1.95 g of Zn reacts with excess HCL?

[A] 572 cm³

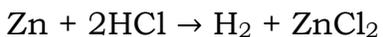
[B] 450 cm³

[C] 100 cm³

[D] 672 cm³

Answer: [D]

Hints: The reaction is as follows:



Now,

1 mol Zn produce = 1 mol H₂

65 g Zn produces = 1 mol H₂

1 g Zn produces = 1/65 mol H₂

Therefore,

∴ 1.95 g Zn produces = 1.95 ÷ 65 mol H₂

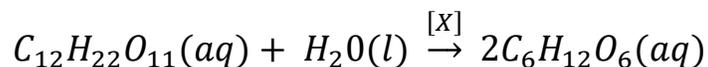
= 0.03 mol H₂

= 0.03 × 22400 mol H₂

= 672 cm³

When 1.95 g of Zn reacts with excess HCL, 672 cm³ H₂ will be produced.

90. Which one of the following enzyme catalysts (X) is used in the conversion of maltose to glucose?



Maltose

Glucose

[A] Invertase

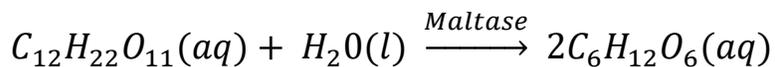
[B] Zymase

[C] Diastase

[D] Maltase

Answer: [D]

Hints:



91. What is the critical micelle concentration range for soap?

[A] 10^{-4} mol lit⁻¹ to 10^{-3} mol lit⁻¹

[B] 10^{-5} mol lit⁻¹ to 10^{-3} mol lit⁻¹

[C] 10^{-3} mol lit⁻¹ to 10^{-2} mol lit⁻¹

[D] 10^{-6} mol lit⁻¹ to 10^{-5} mol lit⁻¹

Answer: [A]

Hints:

Micelle is an aggregated particles in an associated colloids. The micelle formation take place above a particular concentration Known as critical micelle concentration (CMC). For Soaps CMC is 10^{-4} to 10^{-3} mol/L

92. An ore containing Zns and Pbs can be separated by treating them with agent like NaCN in froth-floatation process. What is the name of this agent in metallurgy?

[A] Depressant agent

[B] Coagulating agent

[C] Dressing agent

[D] Magnetic agent

Answer: [A]

Hints:

In froth-floatation process, some substances are used to separate two sulphides during froth floatation. Such substances are called depressants.

93. Which one of the following is a neutral oxide?

[A] SO₂

[B] BaO

[C] N₂O

[D] CO₂

Answer: [C]

Hints: All oxides of non metal are acidic except CO, NO, N₂O (these are neutral oxide)

94. What is the colour and compound formed when an iron salt is heated in an oxidizing flame in borax bead test?

[A] Green and Fe(BO₂)₂

[B] Yellow and Fe (BO₂)₂

[C] Red and Fe(BO₂)₃

[D] Yellow and Fe(BO₂)₃

Answer: [D]

Hints: (a) $2Fe_2(SO_4)_3 + 3B_2O_3 \xrightarrow{\Delta} 2Fe(BO_2)_3 + 3SO_3 \uparrow$ (Oxidising flame)
(yellow)

(b) $2Fe_2(BO_2)_3 + 2NaBO_2 + C \xrightarrow{\Delta} 2Fe(BO_2)_2 + Na_2B_4O_7 + CO \uparrow$ (Reducing Flame)
(Green)

95. The bond order of a molecule is given by

[A] the total number of electrons in bonding and antibonding orbitals

[B] the difference between the number of electrons in bonding and antibonding orbitals

[C] twice the difference between the number of electrons in bonding and antibonding orbitals.

[D] half the difference between the number of electrons in bonding and antibonding orbitals

Answer: [D]

Hints: Bond Order = $1/2[N_{\text{bonding}} - N_{\text{antibonding}}]$

96. The ion that contains $p\pi - d\pi$ overlapping is

[A] NO_3^-

[B] PO_4^{3-}

[C] CO_3^{2-}

[D] NO_2^-

Answer: [B]

97. On hybridization of which of the following sets of atomic orbitals, a square planar complex is formed?

[A] s, p_x, p_y, d_{yz}

[B] $s, p_x, p_y, d_{x^2-y^2}$

[C] s, p_x, p_y, d_z^2

[D] s, p_x, p_y, d_{xy}

Answer: [B]

Hints:

Shape	Orbitals taking part in hybridization
Octahedral	$S + P_x + P_y + P_z + d_{z^2} + d_{x^2-y^2}$
Square Planar	$S + P_x + P_y + P_{x^2-y^2}$
Tetrahedral	$S + P_x + P_y + P_z$
Trigonal-bipyramidal	$S + P_x + P_y + P_z + d_{z^2}$
Square pyramidal	$S + P_x + P_y + P_z + d_{x^2-y^2}$

98. 1-Phenyl-2-chloropropane, on heating with alcoholic KOH, gives mainly

- [A] 1-phenylpropene
- [B] 3-phenylpropene
- [C] 1-phenylpropan-2-ol
- [D] 3-phenylpropan-1-ol

Answer: [A]

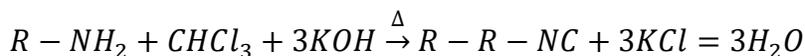
Hints: Halo alkanes on heating with alcoholic KOH yields the corresponding alkenes, e.g.

99. Which one of the following will give carbylamine test?

- [A] NH_2CONH_2
- [B] CH_3CONH_2
- [C] $\text{C}_2\text{H}_5\text{NH}_2$
- [D] All of these

Answer: [C]

Hints: Carbylamines test is shown by primary amines only.



100. *m*-Nitrobenzaldehyde, on reaction with aqueous concentrated NaOH solution at room temperature, gives

- [A] sodium *m*-nitrobenzoate and *m*-nitrobenzyl alcohol
- [B] *m*-hydroxybenzaldehyde and *m*-nitrobenzyl alcohol
- [C] *m*-nitrobenzyl alcohol and *m*-hydroxybenzyl alcohol
- [D] sodium *m*-nitrobenzoate and *m*-hydroxybenzyl alcohol

Answer: [A]

Hints: This is an example of Cannizzao Reaction