CHEMISTRY

1. In Carbylamine test for primary amines the resulting foul smelling product is

(A) CH_3NC (B) CH_3NCl_2 (C) $COCl_2$ (D) CH_3CN

2. Ethanoic acid undergoes Hell-Volhard Zelinsky reaction but Methanoic acid does not because of

(A) absence of α – H atom in ethanoic acid

(B) presence of α – H atom in methanoic acid

(C) higher acidic strength of ethanoic acid than methanoic acid

(D) presence of α – H atom in ethanoic acid

3. The general name of the compound formed by the reaction between aldehyde and alcohol is

(A) Glycol (B) Ester (C) Acetate (D) Acetal

4. Reaction by which benzaldehyde can not be prepared is

(A) Toluene $\xrightarrow[\text{(ii)} \quad H_3O^+]{\text{(i)} \quad CrO_2Cl_2 \text{ in } CS_2}$

(B) Benzene + CO + HCl $\xrightarrow{\text{anhydrous } AlCl_3}$

(C) Benzoyl chloride + H_2 $\xrightarrow[\Delta]{Pd - BaSO_4}$

(D) Benzoic acid $\xrightarrow{Zn\text{-}Hg \text{ and con.}HCl}$

5. The test to differentiate between pentan-2-one and pentan-3-one is

(A) Fehling's test (B) Baeyer's test (C) Iodoform test (D) Benedict's test

6. A secondary amine is

(A) a compound with an NH_2 group on the carbon atom in number 2 position

(B) an organic compound with two NH_2 group

(C) a compound in which 2 of the hydrogen of NH_3 have been replaced by organic groups

(D) a compound with two carbon atom and an NH_2 group

7. Which of the following is correctly matched ?

(A) Bakelite – Novolac

(B) Nylon – acrylonitrile

(C) Polyster – tetrafluoroethene

(D) Teflon – copralactum

8. Which institute has approved the emergency use of 2-deoxy-D-Glucose as additive therapy for COVID-19 patients ?

(A) Ministry of Health and Family Welfare

(B) Indian Council of Medical Research

(C) Drug Controller General of India

(D) World Health Organisation

9. A Nucleic acid, whether DNA or RNA gives on complete hydrolysis, two purine bases, two pyrimidine bases, a pentose sugar and phosphoric acid. Nucleotides which are intermediate products in the hydrolysis contain

(A) purine or pyrimidine base and ortho-phosphoric acid

(B) purine or pyrimidine base and pentose sugar.

(C) Purine or pyrimidine base, a pentose sugar and ortho-phosphoric acid

(D) a purine base, pentose sugar and ortho-phosphoric acid

Space For Rough Work

B-X

A
B

C-NH_2-C

R-NH-R

10. Which is most VISCOUS ?
(A) Ethylene glycol (B) Methanol (C) Glycerol (D) Ethanol

11. The volume of 2.8 g of CO at 27 °C and 0.821 atm. pressure is ($R = 0.08210$ lit. atm. K^{-1} mol^{-1})
(A) 3 litres (B) 0.3 litres (C) 30 litres (D) 1.5 litres

12. The work done when 2 moles of an ideal gas expands reversibly and isothermally from a volume of 1 L to 10 L at 300 K is ($R = 0.0083$ kJ K mol^{-1})
(A) 0.115 kJ (B) 11.5 kJ (C) 58.5 kJ (D) 5.8 kJ

13. An aqueous solution of alcohol contains 18 g of water and 414 g of ethyl alcohol. The mole fraction of water is
(A) 0.7 (B) 0.1 (C) 0.9 (D) 0.4

14. If wavelength of photon is 2.2×10^{-11} m and $h = 6.6 \times 10^{-34}$ J s, then momentum of photon
(A) 1.452×10^{-44} kg m s^{-1} (B) 3×10^{-23} kg m s^{-1}
(C) $6.89 \times 10^{+43}$ kg m s^{-1} (D) 3.33×10^{-22} kg m s^{-1}

15. Elements X, Y and Z have atomic numbers 19, 37 and 55 respectively. Which of the following statements is true about them ?
(A) Z would have the highest ionization potential.
(B) Their ionization potential would increase with increasing atomic number.
(C) Y would have the highest ionization potential.
(D) Y would have an ionization potential between those of X and Z.

16. In oxygen and carbon molecule the bonding is
(A) $O_2 : 1\sigma, 1\pi ; C_2 : 0\sigma, 2\pi$ (B) $O_2 : 1\sigma, 1\pi ; C_2 : 1\sigma, 1\pi$
(C) $O_2 : 0\sigma, 2\pi ; C_2 : 2\sigma, 0\pi$ (D) $O_2 : 2\sigma, 0\pi ; C_2 : 0\sigma, 2\pi$

Space For Rough Work

$PV = nRT$ 12 + 16

17. Amphoteric oxide among the following :

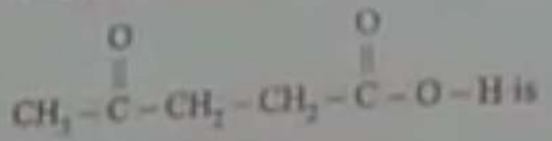
(A) Ag_2O (B) BeO (C) SnO_2 (D) CO_2

18. Which property of CO_2 makes it biologically and geo-chemically important ?

(A) Its low solubility in water (B) Its acidic nature

(C) Its high compressibility (D) Its colourless and odourless nature

19. The IUPAC name for



(A) 1-carboxybutan-3-one (B) 1-hydroxy pentane-1, 4-dione

(C) 4-oxopentanoic acid (D) 1, 4-dioxopentanol

20. 1 mole of HI is heated in a closed container of capacity of 2 L. At equilibrium half a mole of HI is dissociated. The equilibrium constant of the reaction is

(A) 0.25 (B) 1 (C) 0.35 (D) 0.5

21. Which among the following has highest pH ?

(A) 1 M H_2SO_4 (B) 1 M HCl (C) 0.1 M NaOH (D) 1 M NaOH

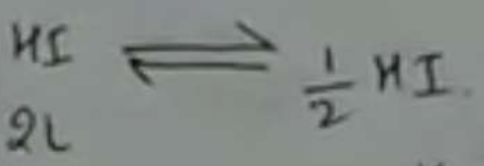
22. In which of the following compounds, an element exhibits two different oxidation states ?

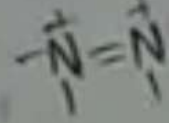
(A) N_2H_4 (B) NH_2CONH_2 (C) N_3H (D) NH_4NO_3

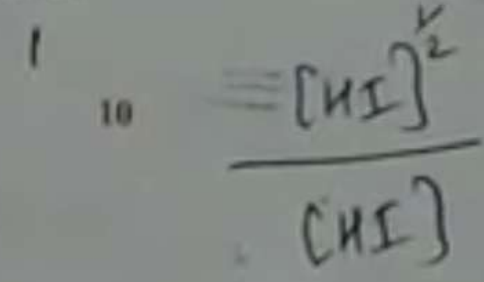
23. Which of the following hydrides is electron deficient ?

(A) CH_4 (B) NaH (C) B_2H_6 (D) CaH_2

Space For Rough Work







28. Which of the following colligative properties can provide molar mass of proteins, polymers, and colloids with greater precision ?

(A) Depression in freezing point
(B) Relative lowering of vapour pressure
(C) Osmotic pressure
(D) Elevation in boiling point

29. In Fuel cells _____ are used as catalysts.

(A) Zinc - Mercury
(B) Platinum - Palladium
(C) Lead – Manganese
(D) Nickel - Cadmium

30. The molar conductivity is maximum for the solution of concentration

(A) 0.005 M (B) 0.004 M (C) 0.001 M (D) 0.002 M

31. Alkali halides do not show dislocation defect because

(A) Cations and anions have almost equal size.
(B) Cations and anions have low co-ordination number.
(C) There is large difference in size of cations and anions.
(D) Anions cannot be accommodated in vacant spaces.

32. Solubility of a gas in a liquid increases with

(A) increase of P and decrease of T
(B) increase of P and increase of T
(C) decrease of P and decrease of T
(D) decrease of P and increase of T

33. The rise in boiling point of a solution containing 1.8 g of glucose in 100 g of solvent is 0.1 °C. The molal elevation constant of the liquid is

(A) 2 K kg/mol (B) 0.1 K kg/mol (C) 10 K kg/mol (D) 1 K kg/mol

34. If 3 g of glucose (molar mass = 180 g) is dissolved in 60 g of water at 15 °C, the osmotic pressure of the solution will be

(A) 6.57 atm (B) 0.34 atm (C) 5.57 atm (D) 0.65 atm

Space For Rough Work

35. A first order reaction is half completed in 45 min. How long does it need 99.9% of the reaction to be completed ?

(A) 10 Hours (B) 5 Hours (C) 20 Hours (D) 7.5 Hours

36. The rate of the reaction :

$CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$ is given by the equation,

Rate = K $[CH_3COOC_2H_5]$ [NaOH]. If concentration is expressed in mol L^{-1}, the unit of K is

(A) L mol^{-1} s^{-1} (B) mol^{-2} L^2 s^{-1} (C) s^{-1} (D) mol L^{-1} s^{-1}

37. Colloidal solution commonly used in the treatment of skin disease is

(A) Colloidal Gold (B) Colloidal Sulphur

(C) Colloidal Antimony (D) Colloidal Silver

38. Specific conductance of 0.1 M HNO_3 is 6.3×10^{-2} ohm^{-1} cm^{-1}. The molar conductance of the solution is

(A) 6.300 ohm^{-1} cm^2 mol^{-1} (B) 630 ohm^{-1} cm^2 mol^{-1}

(C) 63.0 ohm^{-1} cm^2 mol^{-1} (D) 315 ohm^{-1} cm^2 mol^{-1}

39. For spontaneity of a cell, which is correct ?

(A) ΔG = +ve, ΔE = +ve (B) $\Delta G = 0$, $\Delta E = 0$

(C) ΔG = –ve (D) ΔG = –ve, $\Delta E = 0$

40. For n^{th} order of reaction, Half-life period is directly proportional to

(A) a^{n-1} (B) $\frac{1}{a^{n-1}}$ (C) a^{1-n} (D) $\frac{1}{a^{1-n}}$

41. Half-life of a reaction is found to be inversely proportional to the fifth power of its initial concentration, the order of reaction is

(A) 5 (B) 3 (C) 6 (D) 4

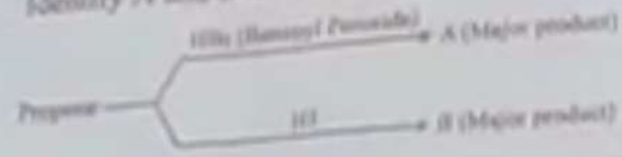
Space For Rough Work

$t_{1/2} \propto \frac{1}{a^5}$

$\frac{6.3 \times 10^{-2}}{0.1}$

6.3×10^{-1}

24. Identify A and B in the reaction



(A) A : CH_3-CH(Br)-CH_3,
B : CH_3-CH_2-CH_2-I

(B) A : CH_3-CH_2-CH_2-Br,
B : CH_3-CH_2-CH_2-I

(C) A : CH_3-CH(Br)-CH_3,
B : CH_3-CH(I)-CH_3

(D) A : CH_3-CH_2-CH_2-Br,
B : CH_3-CH(I)-CH_3

25. Vacant space in body centered cubic lattice unit cell is about

(A) 23% (B) 32% (C) 46% (D) 10%

26. How many number of atoms are there in a cube based unit cell, having one atom on each corner and 2 atom on each body diagonal of cube ?

(A) 4 (B) 8 (C) 9 (D) 6

27. Which of the following is NOT true about the amorphous solids ?

(A) Amorphous solids can be moulded by heating.

(B) On heating they may become crystalline at certain temperature.

(C) They are anisotropic in nature.

(D) They may become crystalline on keeping for long time.

Space For Rough Work

$C-C=CH_2 \rightarrow$

$C-CH-CH_2-Br$

$8 \times \frac{1}{8} +$

28. Which of the following colligative properties can provide molar mass of proteins, polymers and colloids with greater precision ?

(A) Depression in freezing point
(B) Relative lowering of vapour pressure
(C) Osmotic pressure
(D) Elevation in boiling point

29. In Fuel cells _____ are used as catalysts.

(A) Zinc - Mercury
(B) Platinum - Palladium
(C) Lead – Manganese
(D) Nickel - Cadmium

30. The molar conductivity is maximum for the solution of concentration

(A) 0.005 M (B) 0.004 M (C) 0.001 M (D) 0.002 M

31. Alkali halides do not show dislocation defect because

(A) Cations and anions have almost equal size.
(B) Cations and anions have low co-ordination number.
(C) There is large difference in size of cations and anions.
(D) Anions cannot be accommodated in vacant spaces.

32. Solubility of a gas in a liquid increases with

(A) increase of P and decrease of T
(B) increase of P and increase of T
(C) decrease of P and decrease of T
(D) decrease of P and increase of T

33. The rise in boiling point of a solution containing 1.8 g of glucose in 100 g of solvent is 0.1 °C. The molal elevation constant of the liquid is

(A) 2 K kg/mol (B) 0.1 K kg/mol (C) 10 K kg/mol (D) 1 K kg/mol

34. If 3 g of glucose (molar mass = 180 g) is dissolved in 60 g of water at 15 °C, the osmotic pressure of the solution will be

(A) 6.57 atm (B) 0.34 atm (C) 5.57 atm (D) 0.65 atm

Space For Rough Work

35. A first order reaction is half completed in 45 min. How long does it need 99.9% of the reaction to be completed ?

(A) 10 Hours (B) 5 Hours (C) 20 Hours (D) 7.5 Hours

36. The rate of the reaction :

$CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$ is given by the equation,

Rate = $K[CH_3COOC_2H_5][NaOH]$. If concentration is expressed in mol L^{-1}, the unit of K is

(A) $L\,mol^{-1}\,s^{-1}$ (B) $mol^{-2}\,L^2\,s^{-1}$ (C) s^{-1} (D) $mol\,L^{-1}\,s^{-1}$

37. Colloidal solution commonly used in the treatment of skin disease is

(A) Colloidal Gold (B) Colloidal Sulphur

(C) Colloidal Antimony (D) Colloidal Silver

38. Specific conductance of 0.1 M HNO_3 is 6.3×10^{-2} $ohm^{-1}\,cm^{-1}$. The molar conductance of the solution is

(A) 6300 $ohm^{-1}\,cm^2\,mol^{-1}$ (B) 630 $ohm^{-1}\,cm^2\,mol^{-1}$

(C) 63.0 $ohm^{-1}\,cm^2\,mol^{-1}$ (D) 315 $ohm^{-1}\,cm^2\,mol^{-1}$

39. For spontaneity of a cell, which is correct ?

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

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

40. For n^{th} order of reaction, Half-life period is directly proportional to

(A) a^{n-1} (B) $\frac{1}{a^{n-1}}$ (C) a^{1-n} (D) $\frac{1}{a^{1-n}}$

41. Half-life of a reaction is found to be inversely proportional to the fifth power of its initial concentration, the order of reaction is

(A) 5 (B) 3 (C) 6 (D) 4

Space For Rough Work

$t_{1/2} \propto \frac{1}{a^5}$

$\frac{6.3 \times 10^{-2}}{0.1}$

6.3×10^{-1}

42. The strong reducing property of hypophosphorous acid is due to

(A) two $P-H$ bonds

(B) its concentration

(C) presence of phosphorus in its highest oxidation state

(D) the positive valency of phosphorus

43. A transition metal exists in its highest oxidation state. It is expected to behave as

(A) an oxidizing agent (B) a chelating agent

(C) a reducing agent (D) a central metal in a co-ordination compound

44. What will be the value of x in Fe^{x+}, if the magnetic moment $\mu = \sqrt{24}$ BM ?

(A) 0 (B) +2 (C) +1 (D) +3

45. Which can adsorb larger volume of hydrogen gas ?

(A) Finely divided platinum (B) Finely divided nickel

(C) Colloidal $Fe(OH)_3$ (D) Colloidal solution of palladium

46. The property of halogens which is not correctly matched is

(A) $I > Br > Cl > F$ (density) (B) $F > Cl > Br > I$ (ionization enthalpy)

(C) $F > Cl > Br > I$ (electron gain enthalpy) (D) $F > Cl > Br > I$ (electronegativity)

47. Which noble gas has least tendency to form compounds ?

(A) Ar (B) He (C) Kr (D) Ne

48. $(NH_4)_2 Cr_2O_7$ on heating liberates a gas. The same gas will be obtained by

(A) treating H_2O_2 with $NaNO_2$ (B) heating NH_4NO_3

(C) treating Mg_3N_2 with H_2O (D) heating NH_4NO_2

Space For Rough Work

$\sqrt{24} \rightarrow \sqrt{n(n+1)}$

$\sqrt{n^2+n}$

55. The major product obtained when ethanol is heated with excess of conc. H_2SO_4 at 443 K is

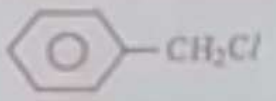
(A) ethane (B) ethene (C) methane (D) ethyne

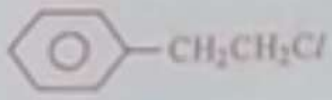
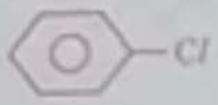
56. Among the following, the products formed by the reaction of anisole with HI are :

(A) Benzene + Methanol (B) Phenol + Iodomethane

(C) Phenol + Methane (D) Sodium phenate + Methanol

57. Which one of the following Chlorohydrocarbon readily undergoes solvolysis ?

(A)  (B) $CH_2 = CHCl$

(C)  (D) 

58. Identify the products A and B in the reactions :

$R - X + AgCN \rightarrow A + AgX$

$R - X + KCN \rightarrow B + KX$

(A) A = RNC ; B = RCN (B) A = R – CN ; B = RCN

(C) A = RNC ; B = RNC (D) A = RCN ; B = RNC

59. An organic compound with molecular formula C_7H_8O dissolves in NaOH and gives a characteristic colour with $FeCl_3$. On treatment with bromine, it gives a tribromo derivative $C_7H_5OBr_3$. The compound is

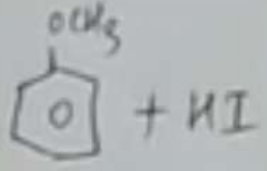
(A) m – Cresol (B) Benzyl alcohol (C) p – Cresol (D) o – Cresol

60. In Kolbes reaction the reacting substances are

(A) Sodium phenate and CCl_4 (B) Sodium phenate and CO_2

(C) Phenol and $CHCl_3$ (D) Phenol and CCl_4

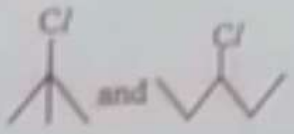
Space For Rough Work



49. The complex hexaamine platinum (IV) chloride will give _____ number of ions on ionization.

(A) 3 (B) 5 (C) 2 (D) 4

50. In the following pairs of halogen compounds, which compound undergoes faster SN^1 reaction ?

(i)  and

(ii) 

(A) (i)  (ii) 

(B) (i)  (ii) 

(C) (i)  (ii) 

(D) (i)  (ii) 

51. The only Lanthanoid which is radioactive

(A) Promethium (B) Lanthanum (C) Praseodymium (D) Cerium

52. All Cu(II) halides are known, except the iodide, the reason for it is that

(A) Cu^{+2} has much more negative hydration enthalpy.

(B) Iodide is bulky ion.

(C) Cu^{+2} ion has smaller size.

(D) Cu^{+2} oxidises iodide to iodine.

53. The correct IUPAC name of cis-platin is

(A) diammine dichlorido platinum (O) (B) diammine dichlorido platinum (II)

(C) dichlorido diammine platinum (IV) (D) diammine dichlorido platinum (IV)

54. Crystal Field Splitting Energy (CFSE) for $[CoCl_6]^{4-}$ is 18000 cm^{-1}. The Crystal Field Splitting Energy (CFSE) for $[CoCl_4]^{2-}$ will be

(A) 8000 cm^{-1} (B) 18000 cm^{-1} (C) 10,000 cm^{-1} (D) 16000 cm^{-1}

Space For Rough Work

$(Cl\,NH_2NH_2Cl)^{+}$