

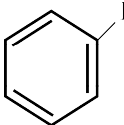
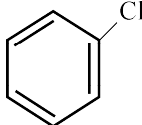
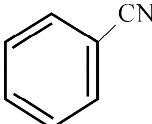
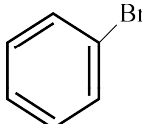

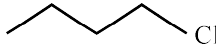
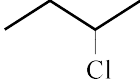
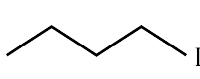
MHT-CET CHEMISTRY PAPER - 2022

11TH AUGUST (SHIFT - 2)

Time : 45 Minutes

No. of Questions : 50

Marks : 50

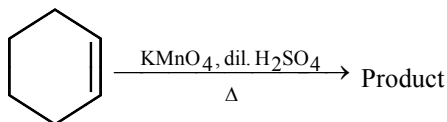
- For the reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$, rate of disappearance of $N_{2(g)}$ is $2.22 \times 10^{-3} \text{ mol dm}^{-3}$. What is the rate of appearance of $NH_{3(g)}$?
 (a) $2.22 \times 10^{-3} \text{ mol dm}^{-3}$ (b) $1.11 \times 10^{-3} \text{ mol dm}^{-3}$
 (c) $4.44 \times 10^{-3} \text{ mol dm}^{-3}$ (d) $3.33 \times 10^{-3} \text{ mol dm}^{-3}$
- Identify the products obtained when chlorine reacts with hot and conc. NaOH.
 (a) $NaClO_3$, NaCl and H_2O
 (b) NaCl and HOCl
 (c) Na_2O and NaCl
 (d) NaOCl and H_2O
- Which from following elements does NOT react with water?
 (a) Ca (b) Sr
 (c) Be (d) Mg
- Identify the type of hybridization involved in hexaamminecobalt (III) complex ion.
 (a) sp^3 (b) dsp^2
 (c) d^2sp^3 (d) sp^3d^2
- Calculate the solubility of a gas in water at 0.8 atm and $25^\circ C$.
 [Henry's law constant is $6.85 \times 10^{-4} \text{ mol dm}^{-3} \text{ atm}^{-1}$]
 (a) $2.74 \times 10^{-4} \text{ mol dm}^{-3}$ (b) $3.94 \times 10^{-4} \text{ mol dm}^{-3}$
 (c) $6.85 \times 10^{-4} \text{ mol dm}^{-3}$ (d) $5.48 \times 10^{-4} \text{ mol dm}^{-3}$
- What is the value of temperature in degree Celsius at absolute zero?
 (a) $273.15^\circ C$ (b) $-373.15^\circ C$
 (c) $0^\circ C$ (d) $-273.15^\circ C$
- Which among the following reactions does NOT correctly match with its reagent?
 (a) Stephen reaction : $SnCl_2$, HCl
 (b) Etard reaction : CrO_2Cl_2
 (c) Gatterman - Koch formulation : $CrO_3/(CH_3CO)_2O$
 (d) Rosenmund reduction : $H_2/Pd - BaSO_4$
- Which among the following compounds is NOT prepared by Sandmeyer's reaction?
 (a)  (b) 
 (c)  (d) 
- Which among the following compounds undergoes SN^2 reaction fastly?
 (a)  (b) 
 (c)  (d) 
- Which of the following molecules possesses highest dipole-dipole interactions?
 (a) HCl (b) HI
 (c) HBr (d) HF
- What is the total volume occupied by atoms in bcc unit cell?
 (a) 52.36% (b) 68%
 (c) 80% (d) 74%

12. Which among the following metals is involved in preparation of Grignard reagent ?
 (a) Magnesium (b) Sodium
 (c) Silver (d) Zinc
13. Which among the following properties of lanthanoids is NOT true ?
 (a) Good conductors of heat and electricity
 (b) All are non-radioactive elements
 (c) Have greater co-ordination number than six
 (d) Strongly paramagnetic
14. Which of the following is a Lewis acid but NOT a Bronsted acid ?
 (a) BCl_3 (b) HNO_3
 (c) NH_3 (d) HSO_4^-
15. Which of the following aqueous solutions of salts will have highest pH value ?
 (a) $\text{CH}_3\text{COONH}_4$ (b) Na_2CO_3
 (c) NH_4Cl (d) NaCl
16. Which among the following compounds represents a soap molecule ?
 (a) Ammonium salt of higher fatty acids
 (b) Sodium salt of formic acid
 (c) Potassium salt of higher fatty acids
 (d) Ammonium salt of formic acid
17. How long will it take to produce 5.4 g of Ag from molten AgCl by passing 5 amp current ?
 (Molar mass Ag = 108 g mol^{-1})
 (a) 1930 second (b) 193 second
 (c) 965 second (d) 9650 second
18. Which of the following is NOT an example of secondary voltaic cell ?
 (a) Lead storage battery (b) Dry cell
 (c) Nickel-cadmium cell (d) Mercury cell
19. What is the number of unpaired electrons in $[\text{Co}(\text{NH}_3)_6]^{3+}$ complex ?
 (a) Four (b) Two
 (c) Zero (d) Six
20. Which among the following methods is used to prepare Grignard reagent ?
 (a) Action of magnesium powder on alkyl halide in aqueous medium
 (b) Action of magnesium hydroxide on alkyl halide
 (c) Action of magnesium metal on alkyl halide in presence of dry ether
 (d) Action of MgCl_2 on alkyl halide in presence of dry ether
21. Calculate the density of metal having volume of unit cell $64 \times 10^{-24} \text{ cm}^3$ and molar mass of metal 192 g mol^{-1} containing 4 particles in unit cell.
 (a) 14.92 g cm^{-3} (b) 16.00 g cm^{-3}
 (c) 19.93 g cm^{-3} (d) 18.00 g cm^{-3}
22. Calculate the work done when 2 moles of an ideal gas expand from a volume of 5 dm^3 to $7 \times 10^{-3} \text{ m}^3$ against a constant external pressure of $2.02 \times 10^5 \text{ Nm}^{-2}$?
 (a) 20.2 J (b) -404 J
 (c) 202 J (d) -35.0 J
23. Which among the following pair of monomers does not generate polyamide polymer ?
 (a) Urea and Formaldehyde
 (b) Glycine and ϵ amino caproic acid
 (c) Adipic acid and hexamethylene diamine
 (d) 3-Hydroxybutanoic acid and 3-Hydroxy pentanoic acid
24. What type of following phenomena is NOT exhibited by adsorption ?
 (a) Irreversible (b) Bulk
 (c) Exothermic (d) Endothermic
25. Find the rate constant of first order reaction in second having half life of 2.5 hours.
 (a) $4.3 \times 10^{-5} \text{ sec}^{-1}$ (b) $7.7 \times 10^{-5} \text{ sec}^{-1}$
 (c) $6.9 \times 10^{-5} \text{ sec}^{-1}$ (d) $8.4 \times 10^{-5} \text{ sec}^{-1}$
26. Which nitrogen atom of pyrimidine base numbered from 1 to 6 is bonded with furanose sugar ?
 (a) 4 (b) 2
 (c) 1 (d) 5

27. Identify the element with smallest ionic radius in +3 oxidation state from following.

- (a) Er (b) Lu
(c) Eu (d) Yb

28. Identify the product in the following reaction.



- (a) (b)
(c) (d)

29. Which among following compounds possesses highest number of N atoms in it ?

- (a) Cytosine (b) Uracil
(c) Guanine (d) Thymine

30. What is the bond order of CO molecule ?

- (a) 1 (b) 2
(c) 3 (d) 0

31. Which of the following is NOT hydrogen like species ?

- (a) He (b) He^+
(c) Li^{2+} (d) Be^{3+}

32. What is the intermediate compound formed when chlorobenzene is treated with fused NaOH under pressure ?

- (a) Phenoxide ion
(b) Sodium phenoxide
(c) Benzene diazonium chloride
(d) Benzene

33. If rate of reaction is given as

$$\frac{1}{3} \frac{d[x]}{dt} = -\frac{1}{2} \frac{d[y]}{dt} = -\frac{d[z]}{dt},$$

the reaction can be represented as

- (a) $2y + Z \rightarrow 3x$ (b) $2y \rightarrow 3x + Z$
(c) $3x + 2y \rightarrow Z$ (d) $3x \rightarrow 2y + Z$

34. Which among the following compounds contains highest number of chlorine atoms in their single molecule ?

- (a) Mustard gas (b) Phosgene
(c) Tear gas (d) Phosphine

35. What is the heat of formation of $\text{HCl}_{(g)}$ from following equation ?



- (a) -388 kJ (b) -194 kJ
(c) -97 kJ (d) 194 kJ

36. Identify the concentration of the solution from following so that values of ΔT_f and K_f are same.

- (a) 1 m (b) 1 M
(c) 1 N (d) $\frac{N}{10}$

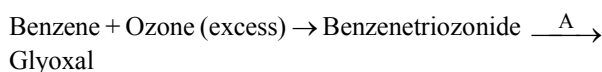
37. What is the product formed when cumene is air oxidised in presence of Co-naphthenate and further treated with dilute acid ?

- (a) Cumene hydroperoxide
(b) Phenol and CO_2
(c) Acetone and Benzoic acid
(d) Phenol + Acetone

38. Identify the use of polystyrene for household purposes.

- (a) To prepare shopping bags
(b) To prepare microwavable food trays
(c) To manufacture disposable cups and plates
(d) To prepare bottles for storage of mouth wash

39. Identify compound A in following reaction



- (a) conc. HNO_3 (b) Ni
(c) $\text{Zn} + \text{H}_2\text{O}$ (d) Zn

40. Which from following pairs of compounds is an example of metamerism ?

- (a) But-2-ene and But-1-ene
(b) m-Butane and 2-Methylpropane
(c) Ethoxyethane and methoxypropane
(d) Dimethyl ether and ethyl alcohol

41. If Q is the heat liberated from the system and W is the work done on the system then first law of thermodynamics can be written as,

- (a) $Q = W - \Delta U$ (b) $Q = \Delta U - W$
 (c) $Q = \Delta U + W$ (d) $Q = -W$

42. Calculate the number of atoms in 5 gram metal that crystallises to form simple cubic unit cell structure having edge length 336 pm. (Density of metal = 9.4 g cm^{-3})

- (a) 1.0×10^{22} (b) 2.1×10^{22}
 (c) 1.4×10^{22} (d) 1.8×10^{22}

43. Identify the molecule in which central atom undergoes sp^3 hybridisation ?

- (a) BF_3 (b) H_2O
 (c) C_2H_4 (d) BeCl_2

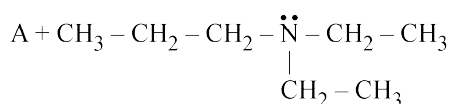
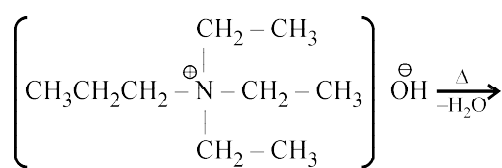
44. Which one of the following conversions does NOT involve either oxidation or reduction ?

- (a) $\text{Na} \rightarrow \text{Na}^+$ (b) $\text{VO}_2^+ \rightarrow \text{V}_2\text{O}_3$
 (c) $\text{Zn}^{2+} \rightarrow \text{Zn}$ (d) $\text{CrO}_4^{2-} \rightarrow \text{Cr}_2\text{O}_7^{2-}$

45. Calculate \wedge_0 of CH_2ClCOOH if \wedge_0 for HCl , KCl and CH_2ClCOOK are 4.2, 1.5 and $1.1 \Omega^{-1}\text{cm}^2\text{mol}^{-1}$ respectively ?

- (a) $2.7 \Omega^{-1}\text{cm}^2\text{mol}^{-1}$ (b) $3.8 \Omega^{-1}\text{cm}^2\text{mol}^{-1}$
 (c) $1.9 \Omega^{-1}\text{cm}^2\text{mol}^{-1}$ (d) $4.2 \Omega^{-1}\text{cm}^2\text{mol}^{-1}$

46. Identify the product A in the following reaction.



- (a) $\text{CH}_3 - \text{CH} = \text{CH}_2$ (b) $\text{H}_2\text{C} = \text{CH}_2$
 (c) $\text{CH}_3 - \text{CH}_2 - \text{CH}_3$ (d) $\text{CH}_3 - \text{C} \equiv \text{CH}$

47. Calculate the amount of solute dissolved in 160 gram solvent that boils at 85°C , the molar mass of solute is 120 g mol^{-1} .

(K_b for solvent = $2.7^\circ\text{C kg mol}^{-1}$ and boiling point of solvent = 76°C)

- (a) 42 gram (b) 60 gram
 (c) 64 gram (d) 50 gram

48. Identify ether from the following compounds.

- (a) Benzenol (b) Benzene-1, 2-diol
 (c) Methoxymethane (d) Propan-2-ol

49. Which from following polymers is used to obtain bristles for brushes ?

- (a) Nylon 2 - nylon 6 (b) Nylon 6, 6
 (c) Nylon 6 (d) Polyacrylamide

50. What is the pH of $2 \times 10^{-3} \text{ M}$ solution of monoacidic weak base if it ionises to the extent of 5% ?

- (a) 14 (b) 6
 (c) 4 (d) 2

ANSWERS

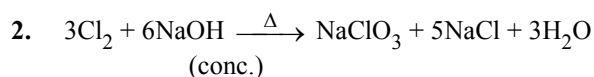
1. c	2. a	3. c	4. d	5. d
6. d	7. c	8. a	9. d	10. d
11. b	12. a	13. c	14. a	15. b
16. c	17. c	18. b	19. c	20. c
21. c	22. b	23. d	24. b	25. b
26. b	27. b	28. c	29. c	30. c
31. a	32. b	33. a	34. c	35. c
36. a	37. d	38. c	39. c	40. c
41. b	42. c	43. b	44. d	45. b
46. b	47. c	48. c	49. b	50. c

HINTS

$$1. \frac{d[\text{N}_2]}{dt} = \frac{1}{2} \frac{d[\text{NH}_3]}{dt};$$

$$\therefore \frac{d[\text{NH}_3]}{dt} = 2 \frac{d[\text{N}_2]}{dt}$$

$$\frac{d[\text{NH}_3]}{dt} = 2 \times 2.22 \times 10^{-3} = 4.44 \times 10^{-3}$$



3. Down the group metallic character increases reactivity with water increases.

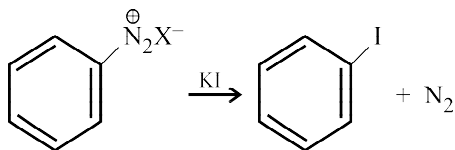
4. Definition

$$5. S = kP = 6.85 \times 10^{-4} \times 0.8 = 5.48 \times 10^{-4} \text{ mol/dm}^3$$

6. Definition

7. Gatterman Koch - CO, HCl and Anhydrous AlCl_3

8. It requires only KI



9. Primary iodide will undergo SN^2 reaction fast.

10. Greater the dipole moment higher is dipole-dipole interaction.

11. Total volume occupied in BCC is 68%.

12. Alkyl magnesium halide is Grignard reagent.

13. Electronic configuration

14. BCl_3 can accept a pair of electron but does not donate a proton i.e. H^+ .

15. Na_2CO_3 is the only alkaline solution having highest pH value. It is salt of weak acid (H_2CO_3) and strong base (NaOH).

16. Definition of soap

17.
$$t = \frac{m \times 96500}{\text{mol. ratio}} = \frac{5.4 \times 96500 \times 1}{108 \times 5} = 965 \text{ second}$$

18. Dry cell is an example of primary voltaic cell.

19. Configuration of Co^{3+} is $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^6, 4s^0$

20. Grignard reagent reacts in aqueous medium hence dry ether is used.

21.
$$D = \frac{M \cdot N}{V \cdot N_A} = \frac{192 \times 4}{64 \times 10^{-24} \times 6.022 \times 10^{23}}$$

$$= \frac{192 \times 4}{6.4 \times 6.022} = 19.93 \text{ gcm}^{-3}$$

22.
$$W = -P_{\text{ext}}(V_2 - V_1)$$

$$= -2.02 \times 10^5(7 \times 10^{-3} - 5 \times 10^{-3})$$

$$= -404 \text{ J}$$

23. None of the monomers has $-\text{NH}_2$ group.

24. Adsorption is surface phenomena.

25.
$$\lambda = \frac{0.693}{t_{1/2}} = \frac{0.693}{2.5 \times 60 \times 60} = 7.7 \times 10^{-5} \text{ sec}^{-1}$$

26. 2nd nitrogen atom of pyrimidine base is bonded to furanose sugar.

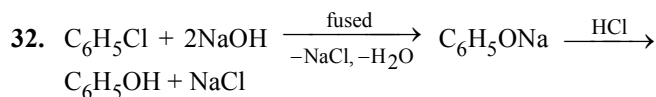
27. Ionic radius decreases across lanthanide ions.

28. The carbon atoms of double bond will form $-\text{COOH}$ on oxidation.

29. Guanine has five N atoms in its molecule.

30. Bond order of CO = $\frac{6 - 0}{2} = 3$

31. He has 2 electron whereas others have 1 electron like hydrogen.



33. Definition

34. Tear gas $\text{CCl}_3(\text{NO}_2)$ contains three Cl-atoms.

35.
$$\Delta_f H \text{ of HCl} = \frac{1}{2}(-194) = -97 \text{ kJ}$$

36.
$$\Delta T_f = K_f \cdot m$$

37. Preparation of phenol

38. Uses of polystyrene

39. $\text{Zn} + \text{H}_2\text{O}$ is used for ozonolysis.

40. Divalent oxygen is bonded to two different alkyl group having same molecular formula.

41. First law of thermodynamics is $\Delta U = Q + W$

42. No. of atoms = $\frac{m \times N}{D \times a^3} = \frac{5 \times 1}{9.4 \times (3.36 \times 10^{-8})^3}$

$$= 1.4 \times 10^{22}$$

43. "O" is sp^3 hybridised in H_2O

44. No change in oxidation number of chromium nor of oxygen.

45.
$$\Delta_0 = (\wedge_{\text{CH}_2\text{ClCOOK}} + \wedge_{\text{HCl}}) - \wedge_{\text{KCl}}$$

$$= (1.1 + 4.2) - 1.5$$

$$= 3.8 \Omega^{-1}\text{cm}^2\text{mol}^{-1}$$

46. Hoffmann's β -elimination reaction.

47.
$$\Delta T_b = K_b \cdot m; 9 = 2.7 \left(\frac{m}{0.12} \times \frac{1}{0.16} \right)$$

$$m = \frac{9 \times 0.12 \times 0.16}{2.7} = 0.064 \text{ kg} = 64 \text{ g}$$

48. Methoxymethane $\text{CH}_3 - \text{O} - \text{CH}_3$ is ether.

49. Uses of Nylon 6, 6

50.
$$[\text{H}^+] = c\alpha = 2 \times 10^{-3} \times 5 \times 10^{-2} = 10^{-4} \text{ M}$$

$$\therefore \text{pH} = 4$$