MHT-CET 2021 Question Paper

25th September 2021

1. Which from the following is NOT a primary amine?
   (A) Diphenyl amine (B) Benzyl amine
   (C) p - Toluidine (D) Allyl amine

2. Which among the following has the lowest boiling point?
   (A) $CH_3 - O - CH_2 - CH_3$
   (B) $CH_3 - CH_2 - CH_2 - OH$
   (C) $CH_3 - CH_2 - CH_2 - CH_3$
   (D) $CH_3 - COOH$

3. Which of the following equations represents relation between $t_{\frac{1}{2}}$ and rate constant for a first order reactions?
   (A) $k = \frac{2 \cdot 303}{t_{\frac{1}{2}}}$ (B) $t_{\frac{1}{2}} = \frac{0 \cdot 693}{k}$
   (C) $t_{\frac{1}{2}} = \frac{k}{0 \cdot 693}$ (D) $t_{\frac{1}{2}} = 2 \cdot 303\, k$

4. Which polymer is formed from hexamethylene diammonium adipate monomer?
   (A) Buna - S
   (B) Nylon 6,6
   (C) Nylon 6
   (D) Polyacrylonitrile

5. Calculate molar mass of solute if 5 g of it in 100 g of solvent has the depression in freezing point $2 \cdot 15$ K. (K_f for solvent = $14 \cdot 7$ K kg mol^{-1}).
   (A) 180 g mol^{-1} (B) 78 g mol^{-1}
   (C) 60 g mol^{-1} (D) 342 g mol^{-1}

6. Which among the following has the highest boiling point?
   (A) Propan-1-ol (B) Ethanoic acid
   (C) Propanone (D) Propanal

7. Which of the following formulae is used to calculate angular momentum of an electron in given stationary orbit?
   (A) $mvr = n\left(\frac{h}{2\pi}\right)$ (B) $mvr = n\left(\frac{2\pi}{h}\right)$
   (C) $\frac{mv}{n} = r\left(\frac{h}{2\pi}\right)$ (D) $mvr = \frac{n\pi}{h}$

8. Identify the catalyst used in following reaction.
   Vegetable oil + $H_2 \xrightarrow{\text{Catalyst}}$ vegetable ghee
   (A) $Ni_{(s)}$ (B) $Mo_{(s)}$
   (C) $Pb_{(s)}$ (D) $Fe_{(s)}$

9. What is the contribution of each particle at corner in unit cell of cubic system?
   (A) $\frac{1}{2}$ (B) $\frac{1}{8}$
   (C) $\frac{1}{4}$ (D) $\frac{1}{6}$

10. The enthalpy of formation of ammonia gas is –46 kJ mol^{-1}. Find the enthalpy of following reaction.
    $2N_{2(g)} + 6H_{2(g)} \longrightarrow 4NH_{3(g)}$
    (A) –184 kJ (B) –130 kJ
    (C) –38 kJ (D) –92 kJ

11. What is the value of dextrorotation of glucose and sucrose respectively?
    (A) + 66.5° and + 52.7°
    (B) + 52.7° and + 92.4°
    (C) + 52.7° and + 66.5°
    (D) + 92.4° and +57.7°

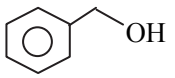
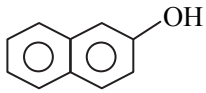
12. One mole maltose on hydrolysis forms _____.
    (A) one mole glucose and one mole galactose
    (B) two moles glucose
    (C) one mole glucose and one mole fructose
    (D) two moles galactose

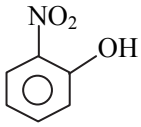
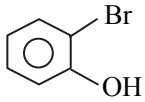
13. If 'a' is edge length of a simple cubic unit cell then atomic radius is given as _____.
    (A) 0.1 a (B) 0.5 a
    (C) a (D) 1.5 a

14. Identify optically inactive compound from the following.
    (A) 2-Bromopentane
    (B) 2-Bromo-3-methylbutane
    (C) 3-Bromohexane
    (D) 2-Bromo-2-methylbutane

15. Fraction of the total number of moles of an electrolyte dissociated when equilibrium is attained is known as _____.
    (A) van't Hoff factor
    (B) degree of dissociation
    (C) degree of hydrolysis
    (D) percentage dissociation

16. Which among the following compounds is NOT a phenol?

(A)  (B) 

(C)  (D) 

17. If Q is charge of one mole of electron equal to 96500 coulombs, then the number of moles of electrons actually passed during electrolysis is given as _____.

(A) $\frac{96500}{Q}$ (B) $\frac{96500}{2Q}$

(C) $96500 \times Q$ (D) $\frac{Q}{96500}$

18. Identify neutral complex from the following.

(A) $[Fe(CN)_6]^{4-}$ (B) $[Fe(CO)_5]$

(C) $[Cu(NH_3)_4]^{2+}$ (D) $[Ni(CN)_4]^{2-}$

19. Which of the following polymer is used in the manufacture of drinking straws?

(A) Polypropylene (B) PET

(C) LDPE (D) Polystyrene

20. Aromatization reaction involves _____.

(A) dehydration and oxidation

(B) dehydrogenation and cyclization

(C) dehydrogenation and oxidation

(D) hydrogenation and cyclization

21. Which of the following oxoacids of sulphur is called as pyrosulphuric acid?

(A) $H_2S_2O_3$ (B) H_2SO_5

(C) $H_2S_2O_7$ (D) $H_2S_2O_8$

22. Find out the difference between ΔH and ΔU at 300 K for the following reaction.

$C_{(graphite)} + CO_{2(g)} \longrightarrow 2CO_{(g)}$

(A) 2.5 kJ (B) 5.0 kJ

(C) 3.6 kJ (D) 7.5 kJ

23. What is the relation between solubility and solubility product for lead iodide?

(A) $K_{sp} = 8S^3$ (B) $K_{sp} = 4S^3$

(C) $K_{sp} = S^2$ (D) $K_{sp} = 27S^4$

24. Which among the following reactions is used to prepare oleum?

(A) $SO_3 + H_2SO_4 \longrightarrow$

(B) $2NaOH + SO_2 \longrightarrow$

(C) $I_2 + SO_2 + 2H_2O \longrightarrow$

(D) $Na_2SO_3 + H_2O + SO_2 \longrightarrow$

25. $R–Cl + AgF \longrightarrow R–F + AgCl\downarrow$

This reaction is an example of _____.

(A) Sandmeyer's reaction

(B) Swartz reaction

(C) Finkelstein reaction

(D) Wurtz–Fitting reaction

26. Identify the pair of compounds from the following that exhibits chain isomerism.

(A) Ethanol and methoxymethane

(B) n-Butane and 2-methylpropane

(C) Ethoxyethane and n-butyl alcohol

(D) Keto form and enol form of carbonyl compounds

27. What is the value of Henry's law constant for CH_3Br if its solubility is 0.08 mol L^{-1} at 0.5 bar?

(A) 0.50 mol L^{-1} bar^{-1}

(B) 0.40 mol L^{-1} bar^{-1}

(C) 0.16 mol L^{-1} bar^{-1}

(D) 0.08 mol L^{-1} bar^{-1}

28. Identify the magnetic behavior and structure of $[Ni(CN)_4]^{2-}$ complex from the following.

(A) Paramagnetic and pyramidal

(B) Diamagnetic and tetrahedral

(C) Diamagnetic and square planar

(D) Paramagnetic and square planar

29. Calculate number of moles of nitrogen gas filled in a container of volume $3 \cdot 05\ dm^3$ at 32 °C and at $4 \cdot 7$ atm pressure. ($R = 0 \cdot 0821\ dm^3\ atm\ K^{-1}\ mol^{-1}$)

(A) 2.30 (B) 1.65

(C) 1.14 (D) 0.57

30. Which of the following compounds on reactions with Grignard's reagent followed by hydrolysis forms tertiary alcohol?

(A) Propanone (B) Ethanal

(C) Methanal (D) Propanal

31. Which among the following has the lowest pKa value?

(A) Monochloroacetic acid

(B) Acetic acid

(C) Trichloroacetic acid

(D) Dichloracetic acid

32. The reaction in which –C≡N group is converted into $–CH_2NH_2$ group is called _____.

(A) Hofmann alkylation

(B) Hofmann degradation

(C) Mendius reaction

(D) Hofmann elimination

33. What is the value of density of an element having bcc structure with edge length 5 A^o? (Atomic mass = 70 g mol^{-1})

(A) 4.35 g cm^{-3} (B) 3.72 g cm^{-3}

(C) 5.35 g cm^{-3} (D) 1.86 g cm^{-3}

34. Which of the following factors does NOT affect heat of reaction?
(A) The path by which final products are formed
(B) Temperature
(C) Physical states of reactants
(D) Physical states of products

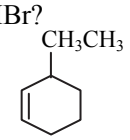
35. Which of the following molecules has the highest bond order?
(A) Cl_2 (B) O_2
(C) H_2 (D) N_2

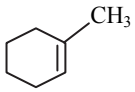
36. A weak monobasic acid is 0.1 % dissociated in 0.04 M solution. Calculate dissociation constant of acid.
(A) 4.5×10^{-6} (B) 2.8×10^{-6}
(C) 4.0×10^{-8} (D) 2.5×10^{-8}

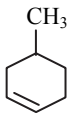
37. In carbinol system, sec-butyl alcohol is named as _____.
(A) sec-butyl carbinol
(B) ethyl methyl carbinol
(C) diethyl carbinol
(D) isopropyl carbinol

38. Which of the following metals when heated with hydrogen does NOT form hydride?
(A) Mg (B) Ca
(C) Si (D) Be

39. What is the molar conductivity of 0.20 M KCl solution if its conductivity is 0.0242 S cm^{-1} at 298 K?
(A) 148·4 S cm^2 mol^{-1}
(B) 82·6 S cm^2 mol^{-1}
(C) 121·0 S cm^2 mol^{-1}
(D) 484·0 S cm^2 mol^{-1}

40. Which of the following compounds forms 1-Bromo-1-methylcyclohexane when treated with HBr?
(A) 

(B) 
(C) 

(D) 

41. Which among the following statements about common properties of d-block elements is NOT true?
(A) These are bad conductors of heat and electricity.
(B) These have high tensile strength.
(C) These are electropositive metals.
(D) These are lustrous and shining.

42. A first order reaction takes 40 min for 50% decomposition; calculate its half life time.
(A) 20 min (B) 4 min
(C) 2 min (D) 40 min

43. Which among the following groups causes +I effect?
(A) Cyano (B) Carboxy
(C) Ethyl (D) Ester

44. How many coulombs of electricity is required to deposit 0.5 g of calcium metal (Molar mass = 40.0 g mol^{-1}) from calcium ions?
(A) 2412.5 C (B) 3612.5 C
(C) 2214.0 C (D) 3302.0 C

45. Which polymer from the following is used to manufacture toys?
(A) Rayon (B) HDP
(C) LDP (D) Glyptal

46. "A given compound always contains exactly the same proportion of elements by weight" is a statement of _____.
(A) Law of combining volumes of gases
(B) Law of conservation of mass
(C) Law of multiple proportion
(D) Law of definite proportion

47. What is the relation between boiling point elevation and molality of solution?
(A) $K_b = \frac{1}{\Delta T_b \times m}$ (B) $K_b = \frac{m}{\Delta T_b}$
(C) $K_b = \frac{\Delta T_b}{m}$ (D) $K_b = \Delta T_b \times m$

48. Which among the following lanthanoid hydroxides is the strongest base?
(A) $La(OH)_3$ (B) $Lu(OH)_3$
(C) $Sm(OH)_3$ (D) $Ho(OH)_3$

49. Identify the number of electrons lost by H_2O_2 when it is oxidised to O_2 according to following reaction.
$H_2O_{2(aq)} + ClO^-_{4(aq)} \longrightarrow ClO^-_{2(aq)} + O_{2(g)}$
(A) 2 electrons
(B) 1 electron
(C) No loss of electron
(D) 4 electrons

50. For the reaction $2NO + Cl_2 \longrightarrow 2NOCl$, what is the relation between $\frac{d[Cl_2]}{dt}$ and $\frac{d[NOCl]}{dt}$?
(A) $\frac{1}{2}\frac{d[NOCl]}{dt} = -2\frac{d[Cl_2]}{dt}$
(B) $\frac{d[NOCl]}{dt} = -\frac{d[Cl_2]}{dt}$
(C) $\frac{d[NOCl]}{dt} = -\frac{1}{2}\frac{d[Cl_2]}{dt}$
(D) $\frac{d[NOCl]}{dt} = -2\frac{d[Cl_2]}{dt}$