MHT-CET 2022 Question Paper

6th August 2022 (Shift – I)

1. What is the number of primary carbon atom in the compound  ?

   (A) 3 (B) 1
   (C) Zero (D) 2

2. Which among the following nitrogen bases of polynucleotides is NOT derived from pyrimidine?
   (A) Cytosine (B) Uracil
   (C) Thymine (D) Guanine

3. Which among the following is not a characteristic of alcohols?
   (A) Alcohols are polar molecules due to presence of –OH group.
   (B) Lower members of alcohols are insoluble in water as well as in organic solvents.
   (C) Boiling point of alcohols increases with increase in their molecular mass.
   (D) Methanol is toxic liquid.

4. What is change in internal energy if a system gains *x*J of heat and *y*J work is done on it?
   (A) $x - y$ (B) $-x + y$
   (C) $-x - y$ (D) $x + y$

5. Which from following equations is correct for relation between standard cell potential and equilibrium constant?
   (A) $E_{cell} = \frac{0.0592}{n} \log_{10} K$
   (B) $E^{o}_{cell} = \log_{10} K \frac{n}{0.0592}$
   (C)(C) $E^{o}_{cell} = \frac{0.0592}{n} \log_{10} K$
   (D) $E_{cell} = \log_{10} K \frac{n}{0.0592}$

6. Choose the false statement from following about SN^1 reaction mechanism.
   (A) Racemization takes place if reaction is carried out at chiral carbon in optically active substance.
   (B) Intermediate formed during the reaction is a carbocation.
   (C) Concentration of nucleophile does not affect the rate of reaction.
   (D) It is single step mechanism.

7. Which among the following carboxylic acids is found in Lemon?
   (A) Acetic acid (B) Citric acid
   (C) Formic acid (D) L–Lactic acid

8. If 65 kJ of work is done on the system and it releases 25 kJ of heat. What is change in internal energy of the system?
   (A) 90 kJ (B) 16.25 kJ
   (C) 2.6 kJ (D) 40 kJ

9. What is the product formed when $CH_3 – CH = CH_2$ is treated with B_2H_6 followed by the action of H_2O_2?
   (A) $CH_3CH_2CH_2OH$
   (B) $CH_3CH_2CH_3$
   (C) CH_3CH_2CHO
   (D) $CH_3CH(OH)CH_3$

10. Which among the following species can act as an acid as well as base according to Bronsted-Lowry theory?
    (A) HSO_4^- (B) H_3O^+
    (C) Cl^- (D) SO_4^{2-}

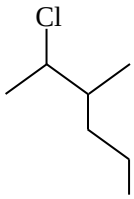
11. Calculate the number of atoms in 20 gram metal which crystallises to simple cubic structure having unit cell edge length 340 pm. (density of metal = 9.8 g cm^{-3})
    (A) 4.95×10^{22}
    (B) 5.81×10^{22}
    (C) 5.19×10^{22}
    (D) 5.42×10^{22}

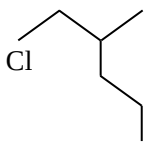
12. Identify correct pair of properties of $[Co(NH_3)_6]^{3+}$ complex ion.
    (A) Low spin, diamagnetic
    (B) High spin, diamagnetic
    (C) Low spin, paramagnetic
    (D) High spin, paramagnetic

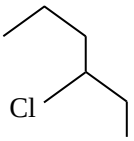
13. Identify the correct increasing order of energies of molecular orbitals for F_2 molecule.
    (A) $\sigma 1s < \overset{*}{\sigma} 1s < \sigma\, 2s < \overset{*}{\sigma} 2s$
    (B) $\sigma 1s < \sigma\, 2s < \overset{*}{\sigma} 1s < \overset{*}{\sigma} 2s$
    (C) $\sigma 1s < \overset{*}{\sigma} 1s < \overset{*}{\sigma} 2s < \sigma\, 2s$
    (D)(D) $\overset{*}{\sigma} 1s < \sigma 1s < \overset{*}{\sigma} 2s < \sigma\, 2s$

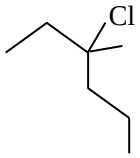
14. Identify the product obtained when sucrose is treated with conc. H_2SO_4.
    (A) Gluconic acid and fructose
    (B) Glucose and fructose
    (C) Sugar charcoal and water
    (D) Saccharic acid

15. Identify the compound that undergoes SN^1 mechanism most fastly.

(A) 

(B) 

(C) 

(D) 

16. Which among the following statements is against to the principles of green chemistry?
(A) Use of biodegradable polymers help to clean the environment.
(B) Use of renewable resources ensures the sharing of resources by future generation.
(C) Unnecessary derivatization should be minimized.
(D) Protecting and deprotecting functional groups in organic reactions reduces the number of steps.

17. The degree of dissociation of weak acid is 7.2×10^{-4}. What is the value of it's percent dissociation in 0.025 M solution?
(A) 0.80 % (B) 0.062%
(C) 8.2% (D) 0.072%

18. Identify the product Y in the following reaction.

$$CH_3 - \overset{\overset{O}{\|}}{C} - CH_3 + 3NaOI \xrightarrow[\Delta]{NaOH,\, I_2} Y + CH_3 - COONa + 2NaOH$$

(A) CH_4 (B) CH_3I
(C) CHI_3 (D) CH_3OH

19. What is the co-ordination number of hcp crystal lattice?
(A) 8 (B) 12 (C) 6 (D) 4

20. Which is an oxidizing agent in following reaction?

$$Fe_{(s)} + Cu^{2+}_{aq} \longrightarrow Fe^{2+}_{aq} + Cu_{(s)}$$

(A) Fe^{2+}_{aq} (B) $Fe_{(s)}$
(C) Cu^{2+}_{aq} (D) $Cu_{(s)}$

21. What is the relation between molar mass of solute and boiling point elevation of solution?
(A) $M_2 = \frac{1000 \Delta T_b W_2}{K_b W_1}$ (B) $M_2 = \frac{1000 K_b W_2}{\Delta T_b W_1}$
(C) $M = \frac{\Delta T_b W_1}{1000 K W}$ (D) $M_2 = \frac{1000 K_b W_1}{\Delta T W}$

22. Under isothermal conditions a gas expands from 0.2 dm^3 to 0.8 dm^3 against a constant pressure of 2 bar at 300 K. Find the work done by the gas. (1 dm^3 bar = 100 J)
(A) 160 J (B) –120 J
(C) –40 J (D) 20 J

23. Calculate final volume of a gas when pressure of 60 mL gas is increased from 1 to 1.5 atm, keeping temperature constant.
(A) 2×10^{-2} dm^3 (B) 3×10^{-2} dm^3
(C) 5×10^{-2} dm^3 (D) 4×10^{-2} dm^3

24. What is the pH of the solution containing 1.342×10^{-3} M H^+ ions? (log 1.342 = 0.1277)
(A) 3.57 (B) 2.38
(C) 2.87 (D) 1.28

25. Identify the product B in the following reaction.
Benzoyl chloride + $H_2O \longrightarrow$ B + HCl
(A) Benzoic acid (B) Benzene
(C) Acetophenone (D) Benzaldehyde

26. Calculate rate constant of a zero order reaction if it is 90% completed in 90 second?
(A) 0.9 mol dm^{-3} s^{-1}
(B) 1.0 mol dm^{-3} s^{-1}
(C) 9.0 mol dm^{-3} s^{-1}
(D) 0.1 mol dm^{-3} s^{-1}

27. How many mole of electrons are required for the reduction of 1 mole of Cr^{3+} to $Cr_{(s)}$?
(A) 1 (B) $\frac{6.022 \times 10^{23}}{3}$
(C) 3 (D) 6

28. Identify anionic complex from following.
(A) Bis (ethylene diamine) dithiocyanato platinum (IV)
(B) Pentaamminecarbonatocobalt (III) chloride
(C) Pentacarbonyliron (0)
(D) Sodiumhexanitrocobaltate (III)

29. Time required for completion of 90% of a first order reaction is 't'. What is the time required for completion of 99.9% of the reaction?
(A) t (B) 2t
(C) 3t (D) $t/2$

30. Which among the following reactions does NOT form alkyl halides?
(A) Alcohol reacts with HCl in presence of anhydrous $ZnCl_2$.
(B) Alcohol reacts with halogen in presence of sunlight.
(C) Alcohol reacts with HI in presence of NaI/H_3PO_4.
(D) Alcohol reacts with HBr in presence of NaBr, H SO .

31. Which of the following reactions does not match correctly with its name?
(A) $R–CO–NH_2 + Br_2 + \underset{(aq)}{4KOH} \longrightarrow$: Hofmann degradation
(B) $R–NH_2 + 3R–X \longrightarrow$: Hofmann exhaustive alkylation
(C) $R–CO–NH_2 + 4[H] \xrightarrow{LiAlH_4}$: Mendius reduction
(D) $R–CH_2–\overset{+}{N}–(R)_3X^-$ $\xrightarrow[ii)\ \Delta,\ -H_2O]{i)\ moist\ Ag2O}$: Hofmann elimination

32. Which among the following elements is used in nuclear reactors as moderator?
(A) Ca (B) K (C) Mg (D) Be

33. Which from following is an example of multimolecular colloid?
(A) Cellulose (B) Plastic
(C) S_8 molecule (D) Starch

34. Which from following polymers is obtained using  ?
(A) Buna-S (B) Polyacrylonitrile
(C) PVC (D) Glyptal

35. Calculate the pressure of gas if the solubility of gas in water at 25°C is 6.85×10^{-4} mol dm^{-3}.
(Henry's law constant is 6.85×10^{-4} mol dm^{-3} bar^{-1})
(A) 1 bar (B) 0.5 bar
(C) 1.5 bar (D) 2.0 bar

36. The reagent used in Hofmann elimination reaction is
(A) Moist Ag_2O (B) $LiAlH_4$
(C) Na-Hg/H_2O (D) HNO_2

37. Identify the use of Buna-S from following.
(A) To obtain tyres
(B) To obtain unbreakable dinner ware
(C) To obtain gaskets
(D) To obtain waterpipes

38. What is the molar mass of solute when 2.3 gram non-volatile solute dissolved in 46 gram benzene at 30°C?
(Relative lowering of vapour pressure is 0.06 and molar mass of benzene is 78 gram mol^{-1})
(A) 72 gram mol^{-1} (B) 48 gram mol^{-1}
(C) 65 gram mol^{-1} (D) 80 gram mol^{-1}

39. Identify the correct decreasing order of ease of dehydrohalogenation of alkyl halides.
(A) 2° > 3° > 1° (B) 1° > 3° > 2°
(C) 1° > 2° > 3° (D) 3° > 2° > 1°

40. Which among the following is correct decreasing order of covalent character of ionic bond?
(A) $NaCl > MgCl_2 > AlCl_3$
(B) $AlCl_3 > NaCl > MgCl_2$
(C) $AlCl_3 > MgCl_2 > NaCl$
(D) $MgCl_2 > NaCl > AlCl_3$

41. What is the intermediate product obtained in the preparation of phenol from aniline?
(A) Sodium phenoxide
(B) Benzene diazonium chloride
(C) Anilinium cation
(D) Benzene

42. What is the quantity of sugar charcoal obtained when 34.2 g sugar is charred using required quantity of conc. sulphuric acid under ideal conditions?
(A) 14.4 g (B) 11.0 g
(C) 114 g (D) 10.5 g

43. What is the density of water in kg dm^{-3} if it's density in g cm^{-3} is 0.863?
(A) 7.86 (B) 0.863
(C) 8.63 (D) 4.60

44. Ammonia and oxygen react at high temperature as in reaction,
$4HN_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(g)}$
If rate of formation of NO is 3.6×10^{-3} mol L^{-1} sec^{-1}. Calculate the rate of formation of water.
(A) 6.0×10^{-3} mol L^{-1} sec^{-1}
(B) 3.6×10^{-3} mol L^{-1} sec^{-1}
(C) 1.8×10^{-3} mol L^{-1} sec^{-1}
(D) 5.4×10^{-3} mol L^{-1} sec^{-1}

45. Which from following pair of elements have one electron in 5d-subshell in observed electronic configuration?
(A) Sm (Z=61) and Eu (Z=63)
(B) Gd (Z=64) and Lu (Z=71)
(C) Ce (Z=58) and Nd (Z=60)
(D) Lu (Z=57) and Dy (Z=66)

46. Calculate the wave number of photon emitted during the transition from the orbit n = 2 to n = 1 in hydrogen atom (R_H = 109677 cm^{-1})
(A) 72740 cm^{-1} (B) 83560 cm^{-1}
(C) 82258 cm^{-1} (D) 92820 cm^{-1}

47. Which among the following amino acids is NOT synthesized in our body?
(A) Alanine (B) Valine
(C) Tyrosine (D) Proline

48. Which among the following is an actinoid element?
(A) Pa (B) Lu
(C) Gd (D) Pr

49. Calculate the molar mass of metal having density 22.4g cm^{-3}, crystallizes to form unit cell containing 4 particles. ($a^3 = 5.6 \times 10^{-23}$ cm^3)
(A) 280.2 g mol^{-1} (B) 210.6 g mol^{-1}
(C) 140 g mol^{-1} (D) 188.8 g mol^{-1}

50. What is standard reduction potential of $Cu^{2+}|Cu_{(s)}$ if E° of following cell is 0.46V?
$Cu_{(s)}|\underset{(aq)}{Cu^{2+}} \| \underset{(aq)}{Ag^+}|Ag_{(s)}$ ($E^o_{Ag^+/Ag} = 0.80$ V)
(A) 1.56 V (B) 1.44 V
(C) 1.26 V (D) 0.34 V