CHEMISTRY

1. Which of the following is not an ore of magnesium ?
   1) Carnallite
   2) Dolomite
   3) Calamine
   4) Sea water

2. The atomic numbers of *Ni* and *Cu* are 28 and 29 respectively. The electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}$ represents
   1) Cu^+
   2) Cu^{2+}
   3) Ni^{2+}
   4) Ni

3. In the following, the element with the highest ionisation energy is
   1) $[Ne]3s^2\,3p^1$
   2) $[Ne]3s^2\,3p^3$
   3) $[Ne]3s^2\,3p^2$
   4) $[Ne]3s^2\,3p^4$

4. In the conversion of Br_2 to BrO_3^-, the oxidation number of *Br* changes from
   1) zero to + 5
   2) + 1 to + 5
   3) zero to – 3
   4) + 2 to + 5

5. Among the alkali metals cesium is the most reactive because
   1) its incomplete shell is nearest to the nucleus
   2) it has a single electron in the valence shell
   3) it is the heaviest alkali metal
   4) the outermost electron is more loosely bound than the outermost electron of the other alkali metals.

(Space for Rough Work)

6. Which of the following represents the Lewis structure of N_2 molecule ?

1) $\overset{\times}{\underset{\times}{N}} \equiv N^{\times}_{\times}$
2) $\overset{\times\times\times}{\underset{\times}{N}} \equiv \overset{\times\times}{\underset{\times}{N}}$
3) $\overset{\times\times}{\underset{\times}{N}} - \overset{\times\times}{\underset{\times}{N}}$
4) $\overset{\times\times\times}{\underset{\times\times}{N}} = \overset{\times\times}{\underset{\times\times}{N}}$

7. Hydrogen bond is strongest in

1) $S - H$ ------ O
2) $O - H$ ----- S
3) $F - H$ ----- F
4) $O - H$ ----- N

8. The decomposition of a certain mass of $CaCO_3$ gave 11.2 dm^3 of CO_2 gas at STP. The mass of KOH required to completely neutralise the gas is

1) 56 g
2) 28 g
3) 42 g
4) 20 g

9. The density of a gas is 1.964 g dm^{-3} at 273 k and 76 cm Hg. The gas is

1) CH_4
2) C_2H_6
3) CO_2
4) Xe

10. 0.06 mole of KNO_3 solid is added to 100 cm^3 of water at 298 k. The enthalpy of KNO_{3aq} solution is 35.8 $kJmol^{-1}$. After the solute is dissolved the temperature of the solution will be

1) 293 k
2) 298 k
3) 301 k
4) 304 k

(Space for Rough Work)

11. 4 moles each of SO_2 and O_2 gases are allowed to react to form SO_3 in a closed vessel. At equilibrium 25 % of O_2 is used up. The total number of moles of all the gases present at equilibrium is

1) 6.5 2) 7.0
3) 8.0 4) 2.0

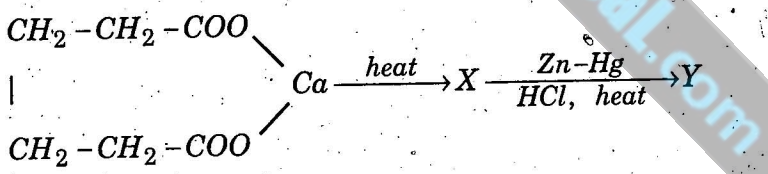
12. An example for autocatalysis is

1) oxidation of NO to NO_2
2) oxidation of SO_2 to SO_3
3) decomposition of $KClO_3$ to KCl and O_2
4) oxidation of oxalic acid by acidified $KMnO_4$

13. During the fusion of an organic compound with sodium metal, nitrogen of the compound is converted into

1) $NaNO_2$ 2) $NaNH_2$
3) $NaCN$ 4) $NaNC$

14. Identify the product Y in the following reaction sequence



1) pentane 2) cyclobutane
3) cyclopentane 4) cyclopentanone

15. The reaction $C_2H_5ONa + C_2H_5I \rightarrow C_2H_5OC_2H_5 + NaI$ is known as

1) Kolbe's synthesis 2) Wurtz's synthesis
3) Williamson's synthesis 4) Grignard's synthesis

(Space for Rough Work)

16. ΔG^0 Vs T plot in the Ellingham's diagram slopes downwards for the reaction

1) $Mg + \frac{1}{2}O_2 \rightarrow MgO$ 2) $2Ag + \frac{1}{2}O_2 \rightarrow Ag_2O$

3) $C + \frac{1}{2}O_2 \rightarrow CO$ 4) $CO + \frac{1}{2}O_2 \rightarrow CO_2$

17. Which of the following reaction taking place in the Blast furnace is endothermic ?

1) $CaCO_3 \rightarrow CaO + CO_2$ 2) $2\,C + O_2 \rightarrow 2\,CO$

3) $C + O_2 \rightarrow CO_2$ 4) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

18. Liquor ammonia bottles are opened only after cooling. This is because

1) it is a mild explosive 2) it is a corrosive liquid

3) it is a lachrymatory 4) it generates high vapour pressure

19. The formation of $O_2^+[P_t F_6]^-$ is the basis for the formation of Xenon fluorides. This is because

1) O_2 and Xe have comparable sizes

2) both O_2 and Xe are gases

3) O_2 and Xe have comparable ionisation energies

4) O_2 and Xe have comparable electronegativities

20. The highest magnetic moment is shown by the transition metal ion with the configuration

1) $3d^2$ 2) $3d^5$

3) $3d^7$ 4) $3d^9$

(Space for Rough Work)

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

1) a chelating agent
2) a central metal in a coordination compound
3) an oxidising agent
4) a reducing agent

22. In which of the following complex ion, the central metal ion is in a state of sp^3d^2 hybridisation ?

1) $[CoF_6]^{3-}$
2) $[Co(NH_3)_6]^{3+}$
3) $[Fe(CN)_6]^{3-}$
4) $[Cr(NH_3)_6]^{3+}$

23. Which of the following can participate in linkage isomerism ?

1) NO_2^-
2) $H_2\ddot{N}CH_2CH_2\ddot{N}H_2$
3) H_2O
4) $:NH_3$

24. Which of the following has the highest bond order ?

1) N_2
2) O_2
3) He_2
4) H_2

25. Which of the following is diamagnetic ?

1) H_2^+
2) O_2
3) Li_2
4) He_2^+

(Space for Rough Work)

26. The concentration of a reactant X decreases from 0.1 M to 0.025 M in 40 minutes. If the reaction follows I order kinetics, the rate of the reaction when the concentration of X is 0.01 M will be

1) $1.73 \times 10^{-4} M \text{ min}^{-1}$ 2) $3.47 \times 10^{-4} M \text{ min}^{-1}$

3) $3.47 \times 10^{-5} M \text{ min}^{-1}$ 4) $1.73 \times 10^{-5} M \text{ min}^{-1}$

27. Chemical reactions with very high E_a values are generally

1) very fast 2) very slow

3) moderately fast 4) spontaneous

28. Which of the following does not conduct electricity ?

1) fused $NaCl$ 2) solid $NaCl$

3) brine solution 4) Copper

29. When a quantity of electricity is passed through $CuSO_4$ solution, 0.16 g of Copper gets deposited. If the same quantity of electricity is passed through acidulated water, then the volume of H_2 liberated at STP will be [Given At.Wt. $Cu = 64$]

1) 4.0 cm^3 2) 56 cm^3

3) 604 cm^3 4) 8.0 cm^3

30. Solubility product of a salt AB is 1×10^{-8} M^2 in a solution in which the concentration of A^+ ions is 10^{-3} M. The salt will precipitate when the concentration of B^- ions is kept

1) between 10^{-8} M to 10^{-7} M 2) between 10^{-7} M to 10^{-6} M

3) $> 10^{-5}$ M 4) $< 10^{-8}$ M

(Space for Rough Work)

31. Which one of the following condition will increase the voltage of the cell represented by the equation : $Cu_{(s)} + 2Ag^{+}_{aq} \rightleftharpoons Cu^{2+}_{aq} + 2Ag_{(s)}$

1) increase in the dimensions of Cu electrode
2) increase in the dimensions of Ag electrode
3) increase in the concentration of Cu^{2+} ions
4) increase in the concentration of Ag^{+} ions

32. The pH of 10^{-8} M HCl solution is

1) 8
2) more than 8
3) between 6 and 7
4) slightly more than 7

33. The mass of glucose that should be dissolved in 50 g of water in order to produce the same lowering of vapour pressure as is produced by dissolving 1 g of urea in the same quantity of water is

1) 1 g
2) 3 g
3) 6 g
4) 18 g

34. Osmotic pressure observed when benzoic acid is dissolved in benzene is less than that expected from theoretical considerations. This is because

1) benzoic acid is an organic solute
2) benzoic acid has higher molar mass than benzene
3) benzoic acid gets associated in benzene
4) benzoic acid gets dissociated in benzene

35. For a reaction to be spontaneous at all temperatures

1) ΔG and ΔH should be negative
2) ΔG and ΔH should be positive
3) $\Delta G = \Delta S = 0$
4) $\Delta H < \Delta G$

(Space for Rough Work)

36. Which of the following electrolyte will have maximum flocculation value for $Fe(OH)_3$ sol. ?

1) $NaCl$ 2) Na_2S

3) $(NH_4)_3PO_4$ 4) K_2SO_4

37. For a reversible reaction : $X_{(g)} + 3Y_{(g)} \rightleftharpoons 2Z_{(g)}$

$\Delta H = -40$ kJ the standard entropies of X, Y and Z are 60, 40 and 50 $JK^{-1}\,mol^{-1}$ respectively. The temperature at which the above reaction attains equilibrium is about

1) 400 K 2) 500 K

3) 273 K 4) 373 K

38. The radii of Na^+ and Cl^- ions are 95 pm and 181 pm respectively. The edge length of $NaCl$ unit cell is

1) 276 pm 2) 138 pm

3) 552 pm 4) 415 pm

39. Inductive effect involves

1) displacement of σ electrons 2) delocalisation of π electrons

3) delocalisation of σ electrons 4) displacement of π electrons

40. The basicity of aniline is less than that of cyclohexylamine. This is due to

1) $+R$ effect of $-NH_2$ group 2) $-I$ effect of $-NH_2$ group

3) $-R$ effect of $-NH_2$ group 4) hyperconjugation effect

(Space for Rough Work)

41. Methyl bromide is converted into ethane by heating it in ether medium with
1) Al 2) Zn
3) Na 4) Cu

42. Which of the following compound is expected to be optically active ?
1) $(CH_3)_2 CH\ CHO$ 2) $CH_3 CH_2 CH_2 CHO$
3) $CH_3 CH_2 CHBr\ CHO$ 4) $CH_3 CH_2 CBr_2 CHO$

43. Which cycloalkane has the lowest heat of combustion per CH_2 group ?
1) cyclopropane 2) cyclobutane
3) cyclopentane 4) cyclohexane

44. The catalyst used in the preparation of an alkyl chloride by the action of dry HCl on an alcohol is
1) anhydrous $AlCl_3$ 2) $FeCl_3$
3) anhydrous $ZnCl_2$ 4) Cu

45. In the reaction

$$R - X \xrightarrow[KCN]{alcoholic} A \xrightarrow[HCl]{dilute} B,$$

the product B is
1) alkyl chloride 2) aldehyde
3) carboxylic acid 4) ketone

(Space for Rough Work)

46. Which of the following compound would not evolve CO_2 when treated with $NaHCO_3$ solution ?

1) salicylic acid
2) phenol
3) benzoic acid
4) 4-nitro benzoic acid

47. By heating phenol with chloroform in alkali, it is converted into

1) salicylic acid
2) salicylaldehyde
3) anisole
4) phenyl benzoate

48. When a mixture of calcium benzoate and calcium acetate is dry distilled, the resulting compound is

1) acetophenone
2) benzaldehyde
3) benzophenone
4) acetaldehyde

49. Which of the following does not give benzoic acid on hydrolysis ?

1) phenyl cyanide
2) benzoyl chloride
3) benzyl chloride
4) methyl benzoate

50. Which of the following would undergo Hoffmann reaction to give a primary amine ?

1) $R-\overset{\overset{O}{\|}}{C}-Cl$
2) $RCONHCH_3$
3) $RCONH_2$
4) $RCOOR$

(Space for Rough Work)

51. Glucose contains in addition to aldehyde group
1) one secondary *OH* and four primary *OH* groups
2) one primary *OH* and four secondary *OH* groups
3) two primary *OH* and three secondary *OH* groups
4) three primary *OH* and two secondary *OH* groups

52. A distinctive and characteristic functional group of fats is
1) a peptide group
2) an ester group
3) an alcoholic group
4) a ketonic group

53. At pH = 4 glycine exists as
1) $H_3\overset{+}{N}-CH_2-COO^-$
2) $H_3\overset{+}{N}-CH_2-COOH$
3) H_2N-CH_2-COOH
4) $H_2N-CH_2-COO^-$

54. Insulin regulates the metabolism of
1) minerals
2) amino acids
3) glucose
4) vitamins

55. The formula mass of Mohr's salt is 392. The iron present in it is oxidised by $KMnO_4$ in acid medium. The equivalent mass of Mohr's salt is
1) 392
2) 31.6
3) 278
4) 156

(Space for Rough Work)

56. The brown ring test for nitrates depends on

1) the reduction of nitrate to nitric oxide
2) oxidation of nitric oxide to nitrogen dioxide
3) reduction of ferrous sulphate to iron
4) oxidising action of sulphuric acid

57. Acrolein test is positive for

1) polysaccharides
2) proteins
3) oils and fats
4) reducing sugars

58. An organic compound which produces a bluish green coloured flame on heating in presence of copper is

1) chlorobenzene
2) benzaldehyde
3) aniline
4) benzoic acid

59. For a reaction $A + B \rightarrow C + D$ if the concentration of A is doubled without altering the concentration of B, the rate gets doubled. If the concentration of B is increased by nine times without altering the concentration of A, the rate gets tripled. The order of the reaction is

1) 2
2) 1
3) $\frac{3}{2}$
4) $\frac{4}{3}$

60. Which of the following solutions will exhibit highest boiling point ?

1) 0.01 M $Na_2SO_{4(aq)}$
2) 0.01 M $KNO_{3(aq)}$
3) 0.015 M urea$_{(aq)}$
4) 0.015 M glucose$_{(aq)}$

(Space for Rough Work)