

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) $\overset{\times}{N} \equiv N^{\times}$
 - 2) $\overset{\times}{N}^{\times} \equiv N^{\times}$
 - 3) $\overset{\times}{N}^{\times} - \overset{\times}{N}^{\times}$
 - 4) $\overset{\times}{N}^{\times} = \overset{\times}{N}^{\times}$
7. Hydrogen bond is strongest in
- 1) $S-H \cdots O$
 - 2) $O-H \cdots S$
 - 3) $F-H \cdots F$
 - 4) $O-H \cdots N$
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 $KNO_{3(aq)}$ 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

- [illegible]

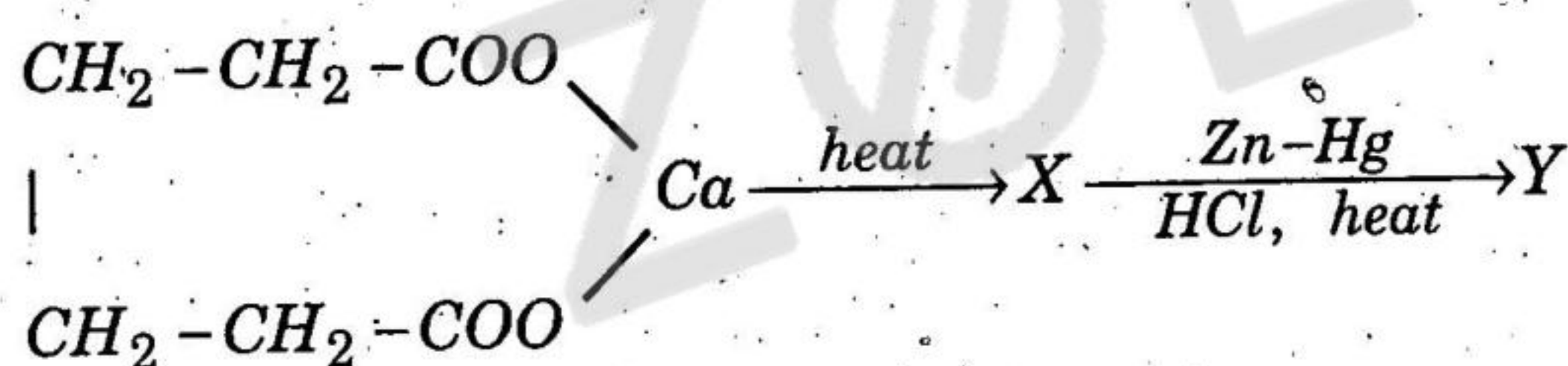
12. An example for autocatalysis is

- 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° 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) $2C + O_2 \rightarrow 2CO$
 - 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 $O_2^+ [Pt F_6]^-$ 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) $3d^9$

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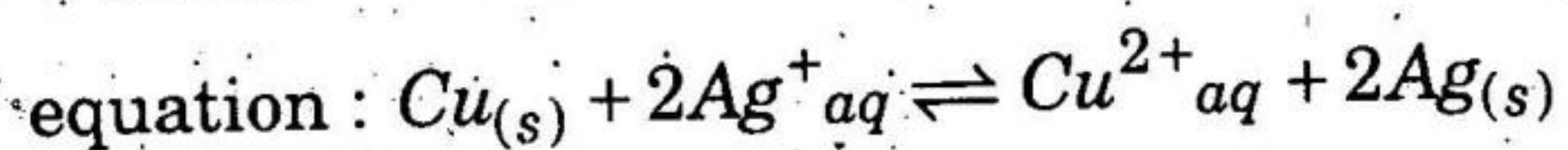
21. A transition metal ion exists in its highest oxidation state. It is expected to behave as
- 1) a chelating agent
 - 2) a central metal in a coordination compound
 - 3) an oxidising agent
 - 4) a reducing agent
22. In which of the following complex ion, the central metal ion is in a state of sp^3d^2 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) $H_2NCH_2CH_2NH_2$
 - 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) $1.73 \times 10^{-4}\text{ M min}^{-1}$
 - 2) $3.47 \times 10^{-4}\text{ M min}^{-1}$
 - 3) $3.47 \times 10^{-5}\text{ M min}^{-1}$
 - 4) $1.73 \times 10^{-5}\text{ M min}^{-1}$
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. $\text{Cu} = 64$]
- 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 $1 \times 10^{-8}\text{ M}^2$ 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) $> 10^{-5}\text{ M}$
 - 4) $< 10^{-8}\text{ M}$

(Space for Rough Work)

31. Which one of the following condition will increase the voltage of the cell represented by the



- 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 : $X_{(g)} + 3Y_{(g)} \rightleftharpoons 2Z_{(g)}$
 $\Delta H = -40 \text{ kJ}$ the standard entropies of X, Y and Z are 60, 40 and 50 $\text{JK}^{-1} \text{mol}^{-1}$ 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) $(CH_3)_2CHCHO$
- 2) $CH_3CH_2CH_2CHO$
- 3) $CH_3CH_2CHBrCHO$
- 4) $CH_3CH_2CBr_2CHO$

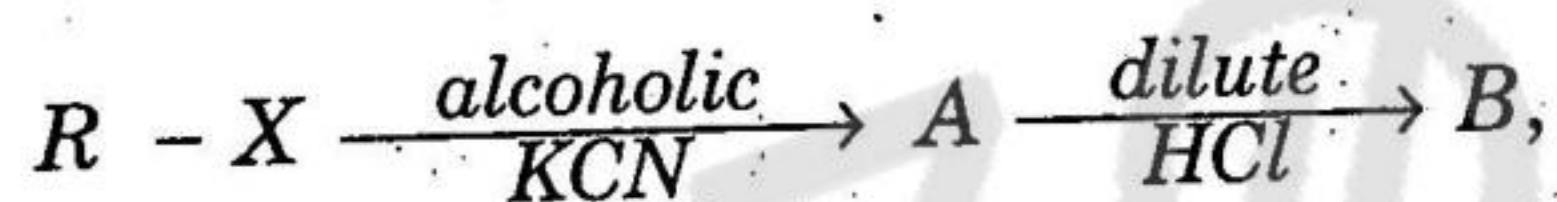
43. Which cycloalkane has the lowest heat of combustion per CH_2 group?

- 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



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) $\begin{array}{c} \text{O} \\ || \\ \text{R}-\text{C}-\text{Cl} \end{array}$
 - 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)