

CHEMISTRY

(313)

Time : 3 Hours]

[Maximum Marks : 80

- Note :
- (i) This Question Paper consists of 43 questions in all.
 - (ii) All questions are compulsory.
 - (iii) Marks are given against each question.
 - (iv) Use log tables if necessary.
 - (v) Section-A consists of :
 - (a) Q. Nos. 1 to 16 - Multiple choice type questions (MCQs) carrying 1 mark each. Select and write the most appropriate option out of the four options given in each of these questions.
 - (b) Q. Nos. 17 to 28 - Objective type questions carrying 2 marks each. Attempt these questions as per the instructions given for each.
 - (vi) Section-B consists of :
 - (a) Q. No. 29 to 37 - Very short answer type questions carrying 2 marks each and to be answered in the range of 30 to 50 words.
 - (b) Q. No. 38 to 41 - Short answer type questions carrying 3 marks each and to be answered in the range of 50 to 80 words.
 - (c) Q. No. 42 and 43 - Long answer type questions carrying 5 marks each and to be answered in the range of 80 to 120 words.

An internal choice has been provided in some of the questions in Section - B. You have to attempt only one of the given choices in such questions.

NOTE :

- (1) Answers of all questions are to be given in the Answer-Book given to you.
- (2) 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 02.15 p.m. From 02.15 p.m. to 02.30 p.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

SECTION - A

Note : Question Nos. 1 to 16 are multiple choice type questions of 1 mark each.

1. The prefix 10^{12} is : 1
 (A) Giga (B) Tera (C) Mega (D) Nano
2. A chemical equation is balanced according to law of : 1
 (A) Multiple proportions (B) Constant proportions
 (C) Reciprocal proportions (D) Conservation of mass
3. The principal quantum number of an atom represents : 1
 (A) Shape of orbital (B) Number of electrons in an orbit
 (C) Distance of electron from Nucleus (D) Number of orbitals in an atom
4. Which of the following is correct for 2-p orbitals ? 1
 (A) $n = 2, l = 1$ (B) $n = 1, l = 0$ (C) $n = 2, l = 0$ (D) $n = 1, l = 2$
5. Element X is strongly electropositive and Y is strongly electronegative. Both are univalent. The compound formed would be : 1
 (A) $X^- Y^+$ (B) $X^+ Y^-$ (C) $X-Y$ (D) $X \rightarrow Y$
6. The ion that is isoelectronic with CO is : 1
 (A) CN^- (B) O_2^+ (C) O_2^- (D) N_2^+
7. Which of the following has strongest basic character ? 1
 (A) NaOH (B) KOH (C) Li(OH) (D) CsOH
8. Which of the following is not outer orbital complex ? 1
 (A) $[Fe(CN)_6]^{3-}$ (B) $[Cr(NH_3)_6]^{3+}$ (C) $[CoF_6]^{3-}$ (D) $[Fe(CN)_6]^{4-}$
9. Which one of the following do not show geometrical isomerism ? 1
 (A) $[Co(NH_3)_4Cl_2]$ (B) $[Co(C_2O_4)_2Cl_2]^{3-}$ (C) $[Co(en)_3]^{3+}$ (D) $[Co(en)_2Cl_2]^+$
10. The most stable carbocation is : 1
 (A) Tertiary carbocation (B) Methyl carbocation
 (C) Primary carbocation (D) Secondary carbocation
11. The thermal decomposition of alkane is known as : 1
 (A) Cracking (B) Isomerisation (C) Dehydration (D) Reforming
12. When ethanol is treated with chlorine gas in the presence of an alkali, the product obtained is : 1
 (A) CCl_4 (B) $CHCl_3$ (C) CH_3Cl (D) C_2H_5Cl
13. On oxidation secondary alcohols yields. 1
 (A) Carboxylic acid (B) Aldehydes
 (C) Ketones (D) Ketones and aldehyde both

14. Which one of the following is most acidic ? 1
(A) Butanoic acid (B) 3-Chlorobutanoic acid
(C) 4-Chlorobutanoic acid (D) 2-Chlorobutanoic acid

15. The monomer of neoprene is : 1
(A) Chloroprene (B) Styrene
(C) Vinyl Chloride (D) Adipic acid

16. Which of the following polymer has amide linkages ? 1
(A) PVC (B) Nylon (C) Terylene (D) Bakelite

- Note : Question Nos. 17 to 28 are objective type questions of 2 marks each. 1x2=2
17. Complete the following choosing from the given options : 1x2=2
(CH₂O, C₂H₄O, 6.022×10^{23} , 12×10^{23})
(a) An organic compound on analysis give C=54.5% H=9.1% by mass. Its empirical formula will be _____.
(b) The number of molecules of CO₂ present in 44 g of CO₂ will be _____.

18. Read the passage given below and answer the following questions : 1x2=2
According to Heisenberg principle it is not possible to simultaneously measure both the position and momentum of an electron accurately. In simple words, we may state that more accurately, when you measure a particle's position, the less accurately you are able to measure its momentum and vice versa.
(a) Give the mathematical expression of Heisenberg's principle.
(b) How Heisenberg's principle questioned the validity of Bohr's model ?

19. Write True (T) for correct statement and False (F) for incorrect statement : 1x2=2
(a) The covalent compounds are poor conductor of electricity.
(b) Molecular geometry of NH₃ is tetrahedral.

20. Complete the following choosing from the given options : 1x2=2
(Strong, Weak, 1.5, 2.5, Zero)
(a) Ionic compounds have high M.P. and B.P. It is due to _____ electrostatic interactions between the ions.
(b) The net dipole moment of CO₂ is _____.

21. Complete the following choosing from the given options : 1x2=2
(Less, High, NO₂, O₂)
(a) The first ionisation energy of N is _____ than O.
(b) On heating LiNO₃, the gas liberated is _____.

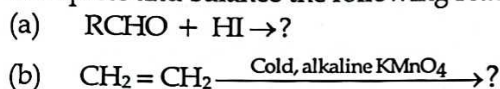
22. Read the passage given below and answer the following questions : 1x2=2
Oxygen is essentially required for burning or combustion of substances in air. Combustion is much more brilliant in pure oxygen. Molecular oxygen combines directly with most of elements. It is fairly good oxidising agent in aqueous solution.
(a) Write the balanced chemical equation of the reaction of C₂H₅OH with O₂.
(b) Name the flame which prevents oxidation of metals during welding.

23. Read the passage given below and answer the following questions : 1x2=2
 In addition to *d*-block elements, there are two rows of elements shown separately at the bottom of the periodic table. They are characterised by filling up of the antipenultimate $4f$ orbitals.
- (a) Name the two rows of elements present at the bottom of periodic table.
 (b) Write down general electronic configuration of 1st row of elements.

24. Match the items in **Column-I** with **Column-II** : 2

| Column - I (Element) | Column - II (Test) |
|-------------------------|------------------------------------|
| (a) Phosphorous | (i) AgNO_3 |
| (b) Nitrogen | (ii) Sodium nitro prusside |
| (c) Sulphur | (iii) FeSO_4 |
| (d) Halogens | (iv) $(\text{NH}_4)_2\text{MoO}_4$ |

25. Complete and balance the following reactions : 1x2=2



26. Read the passage given below and answer the following questions : 1x2=2

Alcohols are organic compounds that have one or more hydroxy ($-\text{OH}$) groups bonded to the carbon atoms in aliphatic compounds. They occur widely in nature and have many industrial and pharmaceutical applications.

Alcohols are classified primary (1°), Secondary (2°) and tertiary (3°) alcohols.

- (a) Give two examples of alcohols which are industrially important.
 (b) Which one 1° , 2° or 3° alcohol can be easily dehydrated ?

27. Write **True (T)** for correct statement and **False (F)** for incorrect statement : 1x2=2

- (a) A Protein called fibrinogen helps to stop bleeding.
 (b) D-Ribose is not a constituent of RNA and DNA.

28. Read the passage given below and answer the following questions : 1x2=2

Soaps and detergents are widely used as cleansing agents. Chemically soaps and detergents are quite different from each other. The common feature of soaps and detergents is that when dissolved in water the molecules of soaps and detergents tend to concentrate at the surface of the solution.

- (a) What is the difference between soaps and detergents ?
 (b) How do they affect the surface tension of the solution ?

SECTION - B

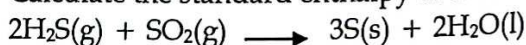
Note : Question Nos. 29 to 43 are subjective type questions. An internal choice has been provided in some of these questions. You have to attempt only one of the given choices of such questions.

29. Explain extensive property of a system and give its two examples. 2

OR

Define enthalpy of formation. Give one example.

30. Calculate the standard enthalpy of the reaction. 2



Given that

$$\Delta_f H^\circ(\text{H}_2\text{S}) = -20.6 \text{ kJmol}^{-1}, \Delta_f H^\circ(\text{SO}_2) = -296.9 \text{ kJmol}^{-1}, \Delta_f H^\circ(\text{H}_2\text{O}) = -289.9 \text{ kJmol}^{-1}$$

31. Explain an isolated system with example. 2

32. What do you understand by the term amphoteric? Show with the help of equations that water is amphoteric in nature. 2

OR

What is meant by degree of dissociation? Upon which factors it depends? 2

33. A voltaic cell is set up at 25°C with the following half cells. 2

$\text{Ag}^+ (0.001\text{M}) / \text{Ag}$ and $\text{Cu}^{2+} (0.10\text{M}) / \text{Cu}$

What would be the voltage of this cell?

($E^\circ_{\text{cell}} = 0.46\text{ V}$)

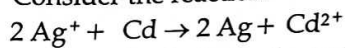
OR

A voltaic cell is set up at 25°C with the following half cells.

$\text{Al} / \text{Al}^{3+} (0.001\text{M})$ and $\text{Ni} / \text{Ni}^{2+} (0.50\text{M})$

Calculate the cell voltage [$E^\circ \text{Ni}^{2+} / \text{Ni} = -0.25\text{ V}$, $E^\circ \text{Al}^{3+} / \text{Al} = -1.66\text{ V}$]

34. Consider the reaction 2



The standard electrode potential for Ag^+ / Ag and $\text{Cd}^{2+} / \text{Cd}$ couples are 0.80 V and -0.40 V, respectively. Calculate Standard Potential E° for this reaction.

OR

What is meant by corrosion? Give two general methods for the protection of corrosion.

35. Define Molality of a solution. How is it affected by temperature? 2

OR

Find the molarity of solution which contains 32.0 g of methyl alcohol (CH_3OH) in 200 ml solution.

36. Explain why H_2O_2 acts as an oxidising and reducing agent in acidic and alkaline medium. 2

37. Complete and balance the following reactions: 2



38. Non-ideal solutions exhibit either positive or negative deviation from Raoult's law. What are these deviations? Explain with one example of each. 3

OR

State Raoult's law for a solution containing volatile components. Name the solution which follow Raoult's law at all concentrations and temperature. Give one example.

39. 15.0 g of unknown molecular material is dissolved in 450 g of water. The resulting solution freezes at -0.34°C . What is molar mass of the material? 3

(K_f for water = $1.86\text{ K kg mol}^{-1}$)

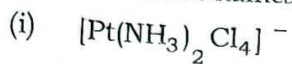
40. (Which type of battery is lead storage battery?) Write the anode and cathode reactions and the overall cell reaction occurring in operation of lead storage battery. 3

OR

What is standard electrode potential? How is it measured?

41. What is a Buffer solution ? On the basis of pH give one example for each of an acidic and basic Buffer solution. 3

42. (a) Give the IUPAC names of the following : 5



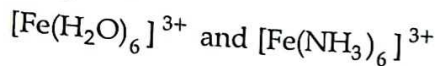
(b) Give one example of linkage isomers.

(c) Write down geometrical isomers of $[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$.
Which geometrical isomers will be optically active and why ?

OR

(a) What is the use of EDTA in medicine ?

(b) Explain the shapes hybridization and magnetic behaviour of the following complexes.



43. (a) Give the chemical reaction for the following : 5

(i) Hell-Volhard-Zelinsky Reaction

(ii) Aldol Condensation

(iii) Coupling Reaction

(b) How will you convert Aniline to Acetanilide?

(c) Why ethers have lower boiling points as compared to alcohols ?
(Same Molecular Mass)

OR

(a) Arrange the following towards decreasing order of reactivity with alcohols.
 CH_3COOH , RCH_2COOH , R_2CHCOOH , R_3CCOH

(b) Give simple chemical test to distinguish between the following pairs of compounds.

(i) CH_3NH_2 and $\text{C}_6\text{H}_5\text{NH}_2$

(ii) $\text{CH}_3\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}=\text{CH}_2$

(c) Classify the following species as electrophiles or nucleophiles.
 CN^- , $^+\text{CH}_3$, $(\text{CH}_3)_2\text{CH}$, $^-\text{C}_6\text{H}_5$

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