CHEMISTRY

(**313**)

Time: 3 Hours] [Maximum Marks: 80

(i) This Question paper consists of two Sections, viz., 'A' and 'B'

(ii) All question from Section 'A' are to be attempted.

(iii) Section 'B' has got more than one option. Candidates are required to attempt questions from one option only.

SECTION- A

1. A sample of chlorine gas contains $3.01*10^{23}$ Cl_2 molecules. How many moles of Cl atoms are there? ($N_A = 6.02*10^{23}$ Mol^{-1}) 1

2. Why do molecular crystals have how low melting point? 1

3. Clotting of blood occurs when a dilute solution of ferric chloride is applied to it. Why? 1

4. Define the term 'internal energy of a system' 1

5. At what stage does a reaction reach the equilibrium state? 1

6. Define an acid according to Bronsted-Lowry theory. 1

7. Why does fluorine have lower electron affinity than chlorine? 1

8. Define the term 'transition elements' 1

9. Stat one use of heavy water specifying the property on which it is based. 1

10. State two uses of silicones. 1

11. Complete the following chemical equation. : 1

$CH_2=CH_2 + HBr \rightarrow$

12. Give one example of Geometrical Isomerism. 1

13. What is the volume of one mole of an ideal gas at standard temperature and pressure? How will this value change if—

(a) Temperature is increased;

(b) Pressure is increased? 2

14. With the help of a suitable example, distinguish between empirical and molecular formulae of a compound. 2

15. If 4.00 of H_2 and 30.0 g of O_2 are mixed and reacted to form water, —

(a) Which is the limiting reagent;

(b) What is the maximum amount of water that can be formed? 2

[At. Mass of H= 1.0, O= 16.0 a.m.u.]

16. State 'Dalton's law of partial pressure ' . Why is Dalton's law not applicable to a system consisting of hydrogen and oxygen? 2

17. The combustion reaction of glucose is given below:

$C_6H_{12}O_6(s) + 6O_2(g) — 6CO_2(g) + 6H_2O(I)$ $\Delta H = -2840$ kJ

Calculation the energy required for the production of 3.06 g of glucose. [Molar mass of glucose = 180 g mol^{-1}] 2

18. Define 'entropy'. Explain why entropy is not regarded as good criteria for determining the spontaneity of a process. 2

19. State Faraday's, Second law of electrolysis'. 0.365 g of copper is deposited by a current of 0.2 ampere in one hour. Calculate the electrochemical equivalent of copper. 2

20. List two examples of electromagnetic radiations. Mention two properties of electromagnetic radiations which indicate that they behave as waves. 2

21. Define 'electron affinity'. Describe the variation of electron affinity

    (a) Along a period;

    (b) Down a group

    in the period table. 2

22. Name the chief ore of aluminum. Write its formula happens when this ore is treated with a solution of sodium hydroxide at 420 K under pressure? 2

23. Distinguish between calcinations and roasting. Write chemical equation to represent the roasting of zinc sulphide (Zns) ore. 2

24. Write IUPAC names of the following :

(i) $CH_3 - CH_2 - \overset{\overset{O}{\|}}{C} - OCH_3$ (ii) 

2

25. Account for the following : 2

    (a) Aniline cannot be nitrated directly

    (b) Aldehydes are easily oxidized while oxidation of ketones is difficult

26. Write one chemical equation each to represent the following: 2

(a) Electrophilic addition reaction.

(b) Nucleophilic substitution reaction.

27. State Raoult's law for solution containing non-volatile solute. Calculate the boiling point of a solution containing 1.04 g glucose ($C_6H_{12}O_6$) dissolved in 160.4g of water. (Kb for H_2O = 0.52K mol-1). 3

28. State 'second law of thermodynamics; When does the entropy increase in a reaction? Examine the following situations and pick out one for occurrence of forward reaction. 3

(i) $T\Delta S > \Delta H$

(ii) $T\Delta S = \Delta H$

(iii) $T\Delta S < \Delta H$

29. For the reaction, N_2 (g) $+3H_2$ (g) --- $2HN_3$ (g) differentiate between 'average rate' and 'instantaneous rate 'of the reaction. Mention any two factors which affect the rate of a reaction. 3

30. With the help of potential energy diagram, explain why atoms combine to form a molecule. 3

31. With the help of necessary chemical equations, describe a large-scale production of potassium dichromate from the chromate ore. 3

32. (a) Write a chemical test to distinguish between ethane and ethane.

(b) Write chemical equations to represent the action of (i) PCL_5 and (ii) PCL_3 on C_2H_5OH. 3

33. (a) Show pictorially the formation of a bond and a bond in O2 molecule.

(b) Why is a bond considered weaker than a bond?

(c) Give the hybridization of the central atom and the shape of $SnCL_2$ molecule. 4

34. (a) Complete and balance the equation:

heat

$P_4+NaOH+H_2O \longrightarrow$

(b) Name the oxyacid of nitrogen which can act both as an oxidizing as well as a reducing agent. write its structure.

(c) How is that only xenon amongst noble gases reacts with fluorine?

(d) Arrange the hydracids in the decreasing order of their acid strength in aqueous solution. 4

35. (a) (i) How can ethanamine be prepared from propanamide?

(ii) Write chemical equation to represent the reaction involved.

(b) Describe with chemical equation, what happens when ethanamine reacts with nitrous acid.

(c) Which is more basic, Ethan amine or aniline? Why? 4

SECTION –B

OPTION-I

(Agricultural Chemistry)

36. What is meant by soil texture? 1

37. What is Farm –yard Manure (FYM)? 1

38. Define IPM. 1

39. List any four dangers of injudicious use of pesticides. 2

40. What is 'composting'? Why do we need composting? 2

41. What are plant growth hormones? State the functions of auxin and rhizobium in plant growth. . 3

OPTION-II

(Biochemistry)

36. Name the product formed when an aldehyde reacts with an alcohaol. 1

37. Why are fats considered better source of energy than glucose? 1

38. What are lipoproteins? 1

39. What is a peptide bond? Illustrate the formation of a peptide bond 2

40. What are enzymes? How do enzymes increase the rate of a reaction? 2

41. (a) Name the three distinct chemical constituents which make up the nucleic acid molecule.

(b) Where do (i) DNA and (ii) RNA mostly occur?

(c) Which or the two, RNA or DNA contains (i) thymine, (ii) uracil? 3

OPTION-III

(**Environment Chemistry**)

36. What is the effect of CFCs on ozone layer? 1

37. Name two air pollutants which form photochemical smog. 1

38. How does the presence of excess of nitrates in drinking water cause harm to humans. 1

39. (a) Name the mercury derivative which is very toxic to human beings. 2

(b) List two water plants by which mercury pollution can be checked.

40 .What is 'Greenhouse Effect'? List any two of its consequences. 2

41. List three possible hazards to humans and the environment from nuclear reactors. 3