2021
CHEMISTRY

Total marks : 70 Time : 3 hours

General instructions:

i) Approximately 15 minutes is allotted to read the question paper and revise the answers.

ii) The question paper consists of 30 questions. All questions are compulsory.

iii) Marks are indicated against each question.

α iv) Internal choice has been provided in some questions.

N.B: Check that all pages of the question paper is complete as indicated on the top left side.

1. Which of the following has the highest electronegativity? **1**
   (a) Li (b) Be (c) B (d) C

2. Boyle's law states that **1**
   (a) V α T (b) P α $\frac{1}{V}$ (c) P α T (d) V α n

3. For the process to occur under adiabatic condition, the correct condition is **1**
   (a) ΔT=0 (b) ΔP=0 (c) q = 0 (d) W = 0

4. During oxidation, the oxidation number of element **1**
   (a) increases (b) decreases
   (c) does not change (d) unpredictable.

5. In group – 14, the inert pair effect is most prominent in **1**
   (a) tin and lead (b) carbon and silicon
   (c) silicon and germanium (d) all of them.

6. State the law of multiple proportions. **1**

7. Write the general electronic configuration of d – block elements. **1**

8. State Dalton's law of partial pressure. **1**

9. Define standard enthalpy of formation. **1**

10. State Bronsted – Lowry concept of acids and bases. **1**

11. **a.** Calculate the molarity of NaOH in the solution prepared by dissolving its 4g in enough water to form 250 ml of the solution.

Or **2**

b. Calculate the percentage composition of C, H and O in C_2H_5OH.

12. What is electronic configuration? Write the electronic configuration of Cr. **2**

13. **a.** Draw the boundary surface diagrams of the three 2p orbital.

Or **2**

b. A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1Å. What is the uncertainty involved in the measurement of its velocity?

14. Define octet rule. Draw the Lewis dot structure of C_2H_2. **2**

15. Write one preparation of hydrogen peroxide. Give one use. **2**

16. **a.** Explain the amphoteric nature of water.

Or **2**

b. Write the treatment of temporary hardness of water by Clark's method.

17. **a.** What are the frequency and wavelength of a photon emitted during a transition from n=5 state to the n=2 state in the hydrogen atom?

Or **3**

b. What are quantum numbers? Explain the four types of quantum numbers.

18. What is atomic radius? How does it vary across a group and period in a periodic table? **3**

19. A neon-dioxygen mixture contains 70.6g dioxygen and 167.5g neon, if pressure of the mixture of gas in the cylinder is 25 bar. What is the partial pressure of dioxygen and neon in the mixture? **3**

20. The value of K_c= 4.24 at 800K for the reaction:
$CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$. Calculate the equilibrium concentration of CO_2,H_2,CO and H_2O at 800K, if only CO and H_2O are present initially at concentration of 0.10M each. **3**

21. **a.** What is buffer solution? Write the expression by Henderson – Hasselbalch equation where the weak acid HA ionizes in water.

Or **3**

b. What is meant by homogenous equilibria and heterogenous equilibria? Give one example each.

22. **a.** Write the net ionic equation for the reaction of potassium dichromate (VI) $K_2Cr_2O_7$ with sodium sulphate Na_2SO_3 in an acid solution to give chromium (III) ion and the sulphate ion.

Or **3**

b. What is displacement reaction? Explain the type of displacement reaction.

23. Why do lithium behaves differently from other alkali metals? Give reasons. **3**

24. **a.** Explain the properties of atomic and ionic radii and ionization enthalpy in alkali metals.

Or **3**

b. Write the preparation of calcium sulphate. Give one use.

25. Give reasons why: **3**

(a) boron is unstable to form BF_6^{3-} ion.

(b) white fumes appear around the bottle of anhydrous aluminium chloride.

(c) diamond is covalent, yet it have high melting point.

26. What are producer gas and water gas? Give reaction. **3**

27. Explain the acidic character of alkyne. **3**

28. **a.** What is hybridization? Draw the structure and mention the type of hybridization in PCl_5, SF_6 and NH_3.

Or **5**

b. Compare the relative stability of O_2, O_2^+ and O_2^- on the basis of molecular orbital theory.

29. **a.** Define entropy. A swimmer coming out from a pool is covered with a film of water weighing about 18g. How much heat must be supplied to evaporate this water at 298K. Calculate the internal energy of vaporization at 298K.

Or **5**

b. Calculate the lattice enthalpy of Na^+Cl^- by Born Haber cycle.

30. **a.** (i) Explain Markovnikov rule and anti-Markovnikov rule with reaction.

(ii) Give the IUPAC name of $CH_3CH_2CHOHCH_2CH_3$.

Or **5**

b. What are conformers? Explain the conformation of ethane for Sawhorse projections and Newman projections.

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