Answer any 4 questions from 1 to 5. Each carries 1 score. **(4 × 1 = 4)**

1. The number of moles of CO_2 present in 220 g of CO_2 is _____.

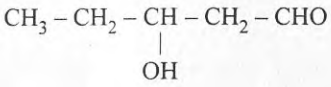
2. The IUPAC name of a compound with atomic number 104 is _____.

3. Which among the following is isoelectronic with O^{2-} ?

   (a) Na (b) Ca^{2+}

   (c) F^- (d) Mg

4. Write the IUPAC name of the compound given below :



5. Among the possible conformations of ethane, the most stable form is _____.

Answer any 8 questions from 6 to 15. Each carries 2 scores. **(8 × 2 = 16)**

6. (i) Define Molarity. **(1)**

   (ii) State the law of definite proportions. **(1)**

7. Write the de Broglie equation and explain the terms.

8. (i) Write the n and *l* values of a 3s electron. **(1)**

   (ii) Which among the following is the correct electronic configuration of Nitrogen (Z = 7). Name the rule that forms the basis of your answer.

   (a) $1s^2\ 2s^2\ 2p_x^2\ 2p_y^1\ 2p_z^0$

   (b) $1s^2\ 2s^2\ 2p_x^1\ 2p_y^1\ 2p_z^1$ **(1)**

9. (i) State modern periodic law. (1)

(ii) How does atomic radius vary down a group ? (1)

10. (i) What is ionization enthalpy ? (1)

(ii) First ionization enthalpy of Nitrogen is greater than that of Oxygen. Why ? (1)

11. State Hess's Law. Illustrate it with an example.

12. (i) Write the Bronsted – Lowry concept of acids and bases. (1)

(ii) Define pH. (1)

13. What is decomposition reaction ? Give an example for it.

14. Write the IUPAC name of the compound given below. Identify the number of sigma and pi bonds present in it.

$CH_2 = CH - CH = CH_2$

15. Complete the following reactions :

(i)  $+ 3H_2 \xrightarrow[\Delta]{Ni}$ _____. (1)

(ii) $2C_2H_5 - Br + 2Na \xrightarrow{ether}$ _____ $+ 2\ NaBr.$ (1)

Answer any 8 questions from 16 to 26. Each carries 3 scores. **(8 × 3 = 24)**

16. (i) Write the relationship between empirical formula and molecular formula. (1)

(ii) Calculate the amount of Oxygen required for the complete combustion of 48 g of methane. (2)

17. Write the observations and conclusions of Rutherford's α-ray scattering experiment.

18. Give reason for the following :

(i) Na^+ is smaller in size than Na atom. (1)

(ii) P forms PCl_5 while N cannot form NCl_5. (1)

(iii) The electron gain enthalpy of Cl is more negative than that of F. (1)

19. (i) What is dipole moment ? (1)

(ii) Dipole moment of NH_3 is higher than that of NF_3. Why ? (2)

20. (i) What is octet rule ? (1)

(ii) Write any two drawbacks of octet rule. (2)

21. (i) State the second law of thermodynamics. (1)

(ii) What is entropy ? (1)

(iii) Write how spontaneity of a chemical reaction is related with Gibb's energy change ? (1)

22. (i) What is buffer solution ? (1)

(ii) Write any one example for acidic and basic buffer. (1)

(iii) What is common ion effect ? (1)

23. Balance the following redox reaction by oxidation number method (Basic medium) :

$$MnO_4^-{}_{(aq)} + I^-{}_{(aq)} \rightarrow MnO_{2(s)} + I_{2(s)}$$

24. How will you detect the presence of the following elements in an organic compound by Lassaigne's test ?

(i) Nitrogen (1½)

(ii) Sulphur (1½)

25. (i) What is the major product formed when HBr is added to propene ? (1)

(ii) Name the rule used to choose the major product and state the rule. (2)

26. Explain the following reactions of alkanes :

(i) Isomerisation (1)

(ii) Aromatization (1)

(iii) Pyrolysis (1)

Answer any 4 questions from 27 to 31. Each carries 4 scores. **(4 × 4 = 16)**

27. (i) Write the name of any four series of spectral lines in the atomic spectrum of Hydrogen. (2)

(ii) What are the limitations of Bohr's model of atom ? (2)

28. (i) Write any two salient features of molecular orbital theory. (2)

(ii) Match the molecules given in Column A with their hybridization given in Column B : (2)

	A		B
I.	$BeCl_2$	a.	sp^3d
II.	PCl_5	b.	sp^3
III.	CH_4	c.	sp^2
IV.	BCl_3	d.	sp
		e.	sp^3d^2

29. (i) What is standard enthalpy of formation ? **(1)**

(ii) Calculate the standard enthalpy of formation of $CH_3 - OH_{(l)}$ from the following data :

$$CH_3 - OH_{(l)} + \frac{3}{2} O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}, \Delta_r H^\circ = -726 \text{ kJ/mol}$$

$$C_{(\text{graphite})} + O_{2(g)} \rightarrow CO_{2(g)}, \Delta_C H^\circ = -393 \text{ kJ/mol}$$

$$H_{2(g)} + \frac{1}{2} O_{2(g)} \rightarrow H_2O_{(l)}, \Delta_f H^\circ = -286 \text{ kJ/mol}$$ **(3)**

30. (i) What is homogeneous equilibria ? Give an example for it. **(2)**

(ii) Write the relationship between K_P and K_C for the reaction $H_2 + I_2 \rightleftharpoons 2HI$. **(2)**

31. (i) Write the name of any two methods for the purification of organic compounds. **(1)**

(ii) Which purification method is used to separate glycerol from spent lye ? **(1)**

(iii) What is electromeric effect ? Write two types of electromeric effect. **(2)**
