



TIME - 3 HOURS

MAXIMUM MARKS - 60

Important instructions:

- All questions are compulsory.
 - Q. No. 1 to 8 are very short answer type questions and carry 1 mark each.
 - Q. No. 9 to 14 are short answer type questions carrying 2 marks each.
 - Q. No. 15 to 24 are short answer type questions carrying 3 marks each.
 - Q. No. 25 and 26 are long answer type questions carrying 5 marks each.
1. What is the difference between 5.0 g and 5.00 g? Which is more precise?
 2. What is the actual value of charge and mass of an electron?
 3. Which of the following pairs of elements would have a more electron gain enthalpy:
(a) O or N (b) F or Cl
 4. How many atoms of fluorine are present in 1.9×10^{-6} g of fluorine?
(atomic mass of fluorine = 19 u)
 5. Two flasks of equal volumes contain N_2 and O_2 gases at same temperature and pressure. Which will have greater number of molecules? Justify
 6. What do you mean by isolated system? Give an example.
 7. If 6.3 g of $NaHCO_3$ are added to 15.0 g of CH_3COOH , the residue is found to weigh 18.0 g. What is the mass of CO_2 released in the reaction?
 8. Noble gases form neither anions nor cations. Why?
 9. Define: (i) Bond angle and (ii) Bond length
 10. Explain by giving reasons: (i) Beryllium has higher ionisation enthalpies than boron.
(ii) Oxygen has lower ionisation enthalpies than nitrogen and Fluorine
 11. Define isothermal and adiabatic processes.
 12. Name one compound each involving sp and sp^2 hybridisation. Draw the structure of each molecule.
 13. What is the wavelength of the light emitted when the electron in the hydrogen atom undergoes transition from an energy level with $n=4$ to energy level $n=2$?
 14. Calculate the internal energy change in the following case: When a system absorbs 15 kJ of heat and does 5 kJ of work.
 15. A proton is accelerated to $1/10^{th}$ of the velocity of light. If its velocity can be measured with a precision of 0.5%, what must be its uncertainty in position? (mass of proton = 1.66×10^{-27} kg.)
 16. What is the concentration of sucrose ($C_{12}H_{22}O_{11}$) in moles/L if 40 g of sugar are dissolved in enough water to make a final volume up to 2 L?

✓17. A flask was heated from 27°C to 227°C at constant pressure. Calculate the volume of the flask if 0.1 dm³ of air measured at 227°C was expelled from the flask

✓18. State Boyle's law and show how it can be explained by kinetic theory of gases? How can the law be verified graphically?

OR

(a) Define Charles's law.

(b) A certain amount of gas occupies a volume of 400 ml at 17°C. To what temperature should it be heated so that the volume is reduced to half.

✓19. Write the electronic configuration of the following: (i) O²⁻ (ii) Ca (iii) Cr

✓20. An Oxide of nitrogen has the percentage composition N = 25.94 and O = 74.06. Calculate the empirical formula of the compound.

✓21. The kinetic energy of an electron is 3.0×10^{-25} J. Calculate its wavelength.

✓22. (a) Define Pauli's exclusion principle.

(b) Write the electronic configuration and the number of unpaired electrons in Fe²⁺ ion

✓23. Write three important postulates of kinetic theory of gases. What are the two postulates of theory are defective. Explain.

OR

What are the different types of molecular speed? Explain them by giving mathematical expression.

✓24. Define ionisation enthalpy. List the various factors on which the ionisation enthalpy depends.

✓25. (a) With the help of molecular orbital theory explain, why hydrogen forms di atomic molecule while helium remains mono atomic.

(b) On the basis of hybridisation discuss and draw the shape of the following molecules: (i) H₂O (ii) C₂H₂

✓26. (i) What is the relationship between wavelength and momentum of a particle?

(ii) Which element has only one electron in the d orbital?

(iii) The work function of Cs atom is 1.9 eV. Calculate (a) threshold wavelength and (b) the threshold frequency of the radiation. If the caesium element is irradiated with a radiation of wavelength 500 nm. Calculate the kinetic energy and the velocity of the ejected photo electrons.

OR

(a) Which of the following represent ground state configurations and which are excited state configurations: (i) $1s^2 2s^2 2p^4$ (ii) $1s^2 2s^2 2p^6 3s^1 3p^1$ (iii) $1s^2 2s^2 2p^6 3s^2 3p^4$

(b) How many unpaired electrons are present in Mn²⁺

(c) Find the total number of electrons in a molecule of phosphoric acid (H₃PO₄) (atomic numbers of H = 1, P = 15, O = 16)

(d) How many protons are present in 5.6 L of oxygen at NTP, using O-16 isotope only