CLASS 11 — SCIENCE SAMPLE PAPER

Physics & Chemistry — Full Syllabus Practice Paper

Time Allowed: 3 Hours **Maximum Marks:** 100

General Instructions: (i) All questions are compulsory. (ii) The paper is divided into sections as marked. (iii) Read each question carefully before answering. (iv) Draw diagrams wherever necessary.

SECTION A — Physics (Very Short Answer, 1 mark each)

Answer in one word or one sentence.

1. Define dimensional formula. Write the dimensional formula of force.

2. Distinguish between distance and displacement.

3. Define instantaneous velocity and instantaneous acceleration.

4. State the horizontal range formula for a projectile and the condition for maximum range.

5. State Newton's second law of motion in terms of momentum.

6. Define impulse and state its relation with change in momentum.

7. State the work-energy theorem.

8. Define centre of mass of a system of particles.

9. State the law of conservation of angular momentum.

10. Write the formula for moment of inertia of a solid sphere about its diameter.

11. State Kepler's third law of planetary motion.

12. Define escape velocity and write its formula.

13. Define stress and strain.

14. State Pascal's law.

15. State Bernoulli's theorem.

16. Define surface tension.

17. State the zeroth law of thermodynamics.

18. Write the ideal gas equation.

19. Define degrees of freedom of a gas molecule.

20. Write the formula for the time period of a simple pendulum.

21. State the relation between wave speed, frequency, and wavelength.

SECTION B — Physics (Short Answer, 2-3 marks each)

Show complete derivations/calculations.

1. Derive the three equations of motion using calculus method.

2. A projectile is fired at an angle of 45° with a speed of 20 m/s. Calculate its maximum height and range (g = 10 m/s²).

3. Derive an expression for centripetal acceleration of a particle in uniform circular motion.

4. State and prove the law of conservation of mechanical energy for a freely falling body.

5. Derive an expression for the moment of inertia of a uniform rod about an axis through its centre, perpendicular to its length.

6. Derive the expression for escape velocity of a body from the Earth's surface.

7. Derive Bernoulli's equation for a flowing incompressible fluid, stating the assumptions made.

8. Derive the relation between the coefficients of linear, areal, and volume expansion of a solid.

9. State the first law of thermodynamics and apply it to an isothermal process.

10. Derive an expression for the time period of a simple pendulum using SHM.

11. Derive an expression for the speed of a transverse wave on a stretched string.

12. Explain the Doppler effect for sound and write the general formula for apparent frequency.

SECTION C — Chemistry (Very Short Answer, 1 mark each)

Answer in one word or one sentence.

1. Define molarity and molality of a solution.

2. State the value of Avogadro's number.

3. Define limiting reagent with an example.

4. State Heisenberg's uncertainty principle.

5. Write the formula for the energy of an electron in the nth orbit of a hydrogen atom (Bohr model).

6. Define de Broglie wavelength.

7. State Aufbau's principle, Pauli's exclusion principle, and Hund's rule.

8. Define ionisation enthalpy. How does it vary across a period?

9. State the octet rule.

10. Define bond order in molecular orbital theory.

11. State Boyle's law and Charles's law.

12. Write the van der Waals equation for a real gas.

13. State Hess's law of constant heat summation.

14. Define entropy. State its unit.

15. Write the expression for Gibbs free energy and the condition for spontaneity.

16. Define equilibrium constant Kc for a general reaction.

17. Write the relation between Kp and Kc.

18. Define pH and pOH. State the relation between them.

19. Define oxidation number with one example.

20. Write the general formula for alkanes, alkenes, and alkynes.

SECTION D — Chemistry (Short Answer, 2-3 marks each)

Show complete steps/calculations.

1. Calculate the molarity of a solution containing 4 g of NaOH dissolved in 500 mL of solution. (Molar mass of NaOH = 40 g/mol)

2. Calculate the number of moles and number of molecules present in 22 g of CO_2. (Molar mass = 44 g/mol)

3. Derive the empirical formula of a compound containing 40% carbon, 6.7% hydrogen, and 53.3% oxygen by mass.

4. Explain Bohr's model of the atom and derive the expression for the radius of the nth orbit.

5. Explain VSEPR theory and predict the shape of NH_3 and CH_4 molecules.

6. Calculate the pH of a 0.001 M HCl solution.

7. Explain Le Chatelier's principle with one example involving change in concentration.

8. Calculate ΔH for a reaction using Hess's law, given the enthalpies of two related reactions (illustrate with a suitable example).

9. Distinguish between ideal and real gases, explaining two deviations shown by real gases.

10. Explain the trend of atomic radius and electronegativity across a period and down a group.

SECTION E — Long Answer (5 marks each)

Answer in detail with diagrams and complete derivations.

1. State and derive the law of conservation of linear momentum from Newton's laws of motion. Apply it to explain the recoil of a gun.

2. Derive Bernoulli's theorem for streamline flow of an ideal fluid and explain any two of its applications in daily life.

3. Explain the kinetic theory of gases and derive an expression for the pressure exerted by an ideal gas in terms of the mean square speed of its molecules.

4. Explain Bohr's model of the hydrogen atom in detail, deriving expressions for the radius and energy of the nth orbit, and use it to explain the origin of spectral lines.

5. Explain the different types of hybridisation (sp, sp^2, sp^3) with suitable examples, and describe the shapes of the resulting molecules using VSEPR theory.