PM SHRI KENDRIYA VIDYALAYA SITAPUR (FIRST SHIFT)

Unit Test – 2 (Session 2023 – 2024)

Class – XI

Subject – Physics

Time – 90 minutes **M.M. – 40**

General Instructions :

1) There are 20 questions in all. All questions are compulsory.
2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
3) Section A contains eleven MCQ of 1 mark each, Section B contains three questions of 2 marks each, Section C contains three questions of 3 marks each, Section D contains two long questions of 5 marks each and Section E contain one case study based question of 4 marks.
4) There is no overall choice. However, an internal choice has been provided in section B, C and D. You have to attempt only one of the choices in such questions.
5) Use of calculators in not allowed.

Section A (1 mark each)

Q.1) The kinetic energy needed to project a body of mass m from the earth's surface (radius R) to infinity is :
(a) mgR /2 (b) 2 mgR (c) mgR (d) mgR /4

Q.2 The value of escape velocity on a certain planet is 2 km/s , then the value of orbital velocity for a satellite orbiting close to its surface is :
(a) 12 km/s (b) 1 km/s (c) √2 km/s (d) 2√2 km/s

Q.3 In the following which is most elastic :
(a) Iron (b) Copper (c) Quartz (d) Wood

Q.4) If longitudinal strain for a wire is 0.03 and its Poisson's ratio is 0.5, then its lateral strain is :
(a) 0.015 (b) 0.003 (c) 0.4 (d) 0.0075

Q.5) Dynamic lift is related to :
(a) Archimede's principle (b) Bernoulli's principle (c) Buoyancy principle (d) Pascal law

Q.6) Bernoulli's equation is a consequence of conservation of :
(a) energy (b) mass (c) linear momentum (d) angular momentum

Q.7) If the density of earth is doubled keeping its radius constant then acceleration due to gravity g becomes :
(a) 20 m/s2 (b) 10 m/s2 (c) 5 m/s2 (d) 2.5 m/s2

Q.8) Energy stored in stretching a string per unit volume is :
(a) stress × strain (b) 1/2 × stress × strain (c) 1/3 × stress × strain (d) 1/4 × stress × strain

Q.9) The SI unit of surface tension is :
(a) N/m (b) N/m2 (c) Nm (d) dyne/cm

Instructions: For Question numbers 10 and 11, two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) are as given below.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false and R is also false.

Q.10) Assertion (A) : Stress is the internal force per unit area of a body.

Reason (R) : Rubber is more elastic than steel.

Q.11) Assertion (A) : A hydrogen filled balloon stops rising after it has attained a certain height in the sky.

Reason (R) : When the atmospheric pressure becomes equal to the pressure inside the balloon then the balloon stops rising.

Section B (2 marks each)

Q.12) State the Kepler's laws of planetary motion.
Q.13) State Hooke's law and define modulus of elasticity .
Q.14) State Pascal's law and define hydrostatic paradox.

Or

Define viscosity . Write the SI unit and dimensions of coefficient of viscosity.

Section C (3 marks each)

Q.15) Explain the working of hydraulic brakes by drawing suitable diagram.

Q.16) Define surface tension. Obtain the relation between surface tension and surface energy.

Q.17) Draw stress - strain curve for a loaded wire. On the graph mark :

(a) Hooke's limit (b) Elastic limit (c) Yield point (d) Breaking point

Or

What is meant by elastic potential energy ? Derive an expression for the elastic potential energy of stretched wire. Prove that its elastic energy density is equal to ½ × stress × strain .

Section D (5 marks each)

Q.18) Define escape velocity. Derive an expression for the escape velocity of a satellite projected from the surface of the earth.

Or

Define orbital velocity. Establish a relation for orbital velocity of a satellite orbiting very close to the surface of the earth.
Q.19) State Bernoulli's theorem. With the help of suitable diagram, establish Bernoulli's equation for liquid flow.

Or

State Stoke's law. What is terminal velocity, derive an expression for the terminal velocity of a sphere falling through a viscous fluid.

Section E (4 marks)

Q.20) **Case Study : Reynolds Number**

Read the following paragraph and answer the questions given below.
When the rate of flow of fluid is large, the flow no longer remains laminar, but becomes turbulent. In a turbulent flow the velocity of the fluids at any point in space varies rapidly and randomly with time. Reynolds observed that turbulent flow is less likely for viscous fluid flowing at low rates. He defined a dimensionless number, whose value gives one an approximate idea whether the flow would be streamline or turbulent. This number is called the Reynolds number denoted by Re .

(a) Write the value of Re for streamline flow.
(b) Write the value of Re for turbulent flow.
(c) Write the value of Re for unsteady flow.
(d) Write the formula for finding Reynolds number.