KENDRIYA VIDYALAYA SITAPUR (FIRST SHIFT)

Unit Test – 2 (Session 2022 – 2023)

Class – XI

Subject – Physics

Time – 90 minutes M.M. – 40 <u>General Instructions :</u>

1) There are 23 questions in all. All questions are compulsory.
2) This question paper has six sections: Section A, Section B, Section C, Section D, Section E and Section F. All the sections are compulsory.
3) Section A contains eight MCQ of 1 mark each, Section B contains eight questions of 1 mark each, Section C contains two questions of 2 marks each, Section D contains two questions of 3 marks each, Section E contains two long questions of 5 marks each and Section F 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, D and E. You have to attempt only one of the choices in such questions.
5) Use of calculators in not allowed.

<u>Section A (1 mark each)</u>

Q.1) If M is the mass of the earth and R is its radius, then the ratio of the gravitational acceleration and the gravitational contact is :

(a) R^2/M (b) M/R^2 (c) MR^2 (d) M/R

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) $\sqrt{2}$ km/s   (d) $2\sqrt{2}$ 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) An aeroplane gets its upward lift due to a phenomenon described by the :

(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

<u>Instructions:</u> For Question numbers 7 and 8, 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.7) Assertion (A) : Stress is the internal force per unit area of a body.

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

Q.8) 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 (1 mark each)

Q.9) State Newton's law of gravitation.

Q.10) How much will be the weight of a body at the centre of the earth ?

 Or

What is the relation between height h and depth d for the same change in g ?

Q.11) What is meant by gravitational potential energy of a body ?

Q.12) State Hooke's law.

Q.13) What is meant by the term elastic limit ?

 Or

Show that Poisson's ratio has no units and dimensions.

Q.14) The length of a suspended wire increases by 10^{-4} of its original length when a stress of 10^7 Nm^{-2} is applied on it . Calculate the Young's modulus of the material of the wire.

Q.15) State Pascal's law.

Q.16) What is an ideal fluid ?

Section C (2 marks each)

Q.17) State the Kepler's laws of planetary motion.

Q.18) Explain the working of hydraulic lift by drawing suitable diagram.

Section D (3 marks each)

Q.19) Define the following .

(a) Young's modulus (b) Bulk modulus (c) Shear modulus

Q.20) 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 E (5 marks each)

Q.21) 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.22) State Bernoulli's theorem. With the help of suitable diagram, establish Bernoulli's equation for liquid flow. Or

State Stoke's law. Derive an expression for the terminal velocity of a sphere falling through a viscous fluid.

Section F (4 marks)

Q.23) **Case Study : Earth Satellites**

Read the following paragraph and answer the questions given below.

Earth satellites are objects which revolve around the earth. Their motion is very similar to the motion of planets around the sun and hence Kepler's laws of planetary motion are equally applicable to them. In particular, their orbits around the earth are circular or elliptical.

(a) Which is the natural satellite of the earth ?
(b) Write the formula of the total energy of an circularly orbiting satellite.
(c) The escape velocity on earth is 11.2 km/s . What will be its value on a planet having double the radius and eight times the mass of the earth ?