

**SCIENCE & TECHNOLOGY - I****Topic Test****Topic: 1. Gravitation****Std: X****Time : 1 hour****Total Marks: 20****Q.1. (A) Choose the correct alternative.****[2]**

- i. According to Kepler's first law, the orbit of a planet is \_\_\_\_\_ with Sun at one of the foci.  
(A) circle (B) ellipse  
(C) oval (D) spherical
- ii. If an object is released from a height of 100 metres then its velocity will be \_\_\_\_\_ (value of  $g$  is  $10 \text{ m/s}^2$ )  
(A)  $20\sqrt{5} \text{ m/s}$  (B)  $2 \text{ km/s}$   
(C)  $-20\sqrt{5} \text{ m/s}$  (D)  $-2 \text{ km/s}$

**Q.1. (B) Answer the following.****[3]**

- i. Find the odd one out and justify it.  
Centre of Earth, surface of Earth, Mount Everest, surface of Moon.
- ii. Complete the correlation.  
Mass : kg : : Weight : \_\_\_\_\_.
- iii. Name the following.  
Amount of matter present in an object.

**Q.2. (A) Give scientific reasons. (Attempt any 1)****[2]**

- i. If the value of  $g$  suddenly becomes twice its value, it will become two times more difficult to pull a heavy object along the floor.
- ii. 1 kg of gold would weigh different at the pole and equator.

**Q.2. (B) Answer the following. (Attempt any 1)****[2]**

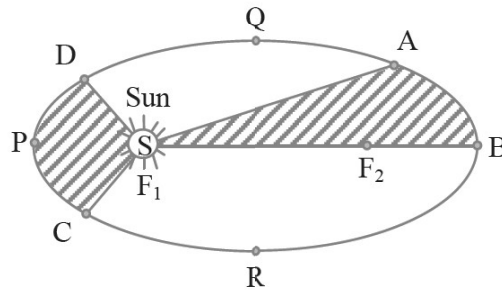
- i. State the difference between Universal gravitational constant ( $G$ ) and gravitational acceleration of Earth ( $g$ ).
- ii. Let the period of revolution of a planet at a distance  $2R$  from a star be  $T$ . Prove that if it was at a distance of  $8R$  from the star, its period of revolution will be  $8T$ .

**Q.3. Answer the following. (Attempt any 2)****[6]**

- i. a. Define acceleration due to gravity ( $g$ ).  
b. What would be the value of  $g$  on the surface of Earth if its mass was twice as large and its radius half of what it is now?
- ii. Using the law of conservation of energy, derive an expression for the escape velocity of an object from the surface of the earth.
- iii. An object thrown vertically upwards reached a height of 750 m. What was its initial velocity? How long will the object take to come back to the Earth? Assume  $g = 10 \text{ m/s}^2$

**Q.4. Answer the following. (Attempt any 1)****[5]**

- i. The figure shows the elliptical orbit of a planet about the Sun  $S$ . An ellipse is the curve obtained when a cone is cut by an inclined plane. It has two focal points. The sum of the distances to the two focal points from every point on the curve is constant.  $F_1$  and  $F_2$  are the two focal points of the ellipse. The shaded area  $CF_1D$  is twice the shaded area  $AF_1B$ .  $t_1$  is the time taken by the planet to move from  $C$  to  $D$  and  $t_2$  is the time to move from  $A$  to  $B$ .



- a. Which laws do we understand from the above diagram and description?
  - b. State the law regarding areas swept by the line joining the planet and the Sun.
  - c. State the law regarding the time period of revolution of a planet.
  - d. Out of the following points P, Q, R, B; at which point will the velocity of the planet be maximum?
  - e. Express relation between  $t_1$  and  $t_2$ .
- ii.
- a. A stone thrown vertically upwards with initial velocity  $u$  reaches a height ' $h$ ' before coming down. Show that the time taken to go up is same as the time taken to come down.
  - b. An object takes 5 s to reach the ground from a height of 5 m on a planet. What is the value of  $g$  on the planet?