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TOPIC : GRAVITATION

SECTION – A CONCEPTUAL AND APPLICATION TYPE QUESTIONS

1. Why weight of a body becomes zero at the centre of earth ?
2. Can a pendulum vibrate in an artificial satellite ?
3. Imagine a spacecraft going from the earth to the moon . How does its weight vary as it goes from the earth ?
4. Difference between gravitational potential and gravitational field.
5. What is the value of gravitational potential energy at infinity ?
6. The gravitational potential energy of a body at a point in gravitational field of another body is $-GMm/r$. What does the negative sign indicate ?
7. State Kepler's Laws of Planetary motion .
8. Write two salient features of escape velocity ?
9. The escape velocity of a body when projected from earth's surface is 11.2 km/s. If it is projected at an angle of 50° from the horizontal , what will be the escape velocity ?
10. Name two factors which determine whether a planet would have an atmosphere or not ?
11. What is Geosynchronous satellite ?
12. What is a parking orbit ?
13. . Two artificial satellites are revolving around the earth , one closer to its surface and the other away

from it . Which has larger speed ?

14. . The gravitational potential energy of a body at a point in gravitational field of another body is $-GMm/r$. What does the negative sign indicate ?

SECTION – B NUMERICAL PROBLEMS

1. Find the percentage decrease in weight of a body when taken to a height of 32km above the surface of earth , $R = 6400$ km.
2. At what height above the surface of the earth does the acceleration due to gravity reduce to 64 % of its value on the surface of the earth . $R = 6400$ km.
3. How much below the surface of the earth does the acceleration due to gravity become 1 % of its value at earth's surface ?
4. A body weighs 63 N on the surface of the earth. What is the gravitational force on it due to the earth at a height equal to half the radius of the earth ?
5. Assuming the earth to be a sphere of uniform mass density, how much would a body weigh half way down to the centre of the earth if it weighed 250 N on the surface?
6. Find the potential energy of a system of four particles of equal masses M placed at the corners of a square of side L . Also obtain potential at the centre of the square.
7. A rocket is fired from the earth towards the sun. At what point on its path is the gravitational force on the rocket zero? Mass of sun = 2×10^{30} kg, mass of the earth = 6×10^{24} kg. Neglect the effect of other planets etc. Orbital radius = 1.5×10^{11} m.
8. A Saturn year is 29.5 times the earth year. How far is the Saturn from the sun if the earth is 1.5×10^8 km away from the sun?
9. The escape velocity of a projectile on earth's surface is 11.2 kms^{-1} . A body is projected out with thrice this speed. What is the speed of the body far away from the earth? Ignore the presence of the sun other planets.