

SAINIK SCHOOL GOPALGGANJ
CLASS & SECTION – XI
ASSIGNMENT ON GRAVITATION

SECTION A : MULTIPLE CHOICE QUESTION (TOTAL 05 QUESTIONS)

1. The earth is an approximate sphere. If the interior contained matter which is not of the same density everywhere, then on the surface of the earth, the acceleration due to gravity
 - (a) will be directed towards the centre but not the same everywhere.
 - (b) will have the same value everywhere but not directed towards the centre.
 - (c) will be same everywhere in magnitude directed towards the centre.
 - (d) cannot be zero at any point

2. As observed from earth, the sun appears to move in an approximate circular orbit. For the motion of another planet like mercury as observed from earth, this would
 - (a) be similarly true.
 - (b) not be true because the force between earth and mercury is not inverse square law.
 - (c) not be true because the major gravitational force on mercury is due to sun.
 - (d) not be true because mercury is influenced by forces other than gravitational

3. Satellites orbiting the earth have finite life and sometimes debris of satellites fall to earth. This is because,
 - (a) the solar cells and batteries in satellites run out.
 - (b) the laws of gravitation predict a trajectory spiralling inwards.
 - (c) of viscous forces causing the speed of satellite and hence height to gradually decrease
 - (d) of collisions with other satellites.

4. In our solar system, the inter-planetary region has chunks of matter (much smaller in size compared to planets) called asteroids. They
 - (a) will not move around the sun since they have very small masses compared to sun
 - (b) will move in an irregular way because of their small masses and will drift away into outer space.
 - (c) will move around the sun in closed orbits but not obey Kepler's laws.
 - (d) will move in orbits like planets and obey Kepler's laws

5. Which of the following are true?
 - (a) A polar satellite goes around the earth's pole in north-south direction.
 - (b) A geostationary satellite goes around the earth in east-west direction.
 - (c) A geostationary satellite goes around the earth in west-east direction.
 - (d) A polar satellite goes around the earth in east-west direction

SECTION B : SHORT ANSWERS QUESTIONS (TOTAL 05 QUESTIONS)

6. Molecules in air in the atmosphere are attracted by gravitational force of the earth.
Explain why all of them do not fall into the earth just like an apple falling from a tree.
7. Give one example each of central force and non-central force.
8. Draw areal velocity versus time graph for mars.
9. What is the direction of areal velocity of the earth around the sun?
10. Is it possible for a body to have inertia but no weight?

SECTION C : LONG ANSWER QUESTIONS (TOTAL 05 QUESTIONS)

11. A star like the sun has several bodies moving around it at different distances. Consider that all of them are moving in circular orbits. Let r be the distance of the body from the centre of the star and let its linear velocity be v , angular velocity ω , kinetic energy K , gravitational potential energy U , total energy E and angular momentum l . As the radius r of the orbit increases, determine which of the above quantities increase and which ones decrease.

12. Six point masses of mass m each are at the vertices of a regular hexagon of side

Calculate the force on any of the masses.

13. Earth's orbit is an ellipse with eccentricity 0.0167. Thus, earth's distance from the sun

and speed as it moves around the sun varies from day to day. This means that the length of the solar day is not constant through the year. Assume that earth's spin axis is normal to its orbital plane and find out the length of the shortest and the longest day. A day should be taken from noon to noon. Does this explain variation of length of the day during the year?

14. A satellite is in an elliptic orbit around the earth with aphelion of $6R$ and perihelion of

R where $R = 6400$ km is the radius of the earth. Find eccentricity of the orbit. Find the velocity of the satellite at apogee and perigee. What should be done if this satellite has to be transferred to a circular orbit of radius $6R$?

15. Explain the principle of launching of satellite.