# Physics (New Book) - 9th Class Physics Chapter 5 Long Question Preparation

Q1. Q no: 5 (A) What ismeant by the force of gravitation? Also explain the law of gravitation.

**Ans 1:** everybody in the universeattracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres.

According to the law of gravitation the gravitationalforce of attraction F with which the two masses m1 and m2 separated by a distance `d' attract each other is given by:
F x m1m2
F x 1/d²
F x m1m2/d²
F=G m1m2/d²

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Q2. Q no: 6 (A) State Law of gravitation and derived the equation.

**Ans 1:** Everybody in the universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres.
F x m1m2
F x 1/d²
F x m1m2/d²
F= Gm1m2/d²

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Q3. Determine the mass of earth using Newtons law of gravitation

**Ans 1:** Mass of earth: the mass of earth can be calculated by using Newtons law of gravitationExplanation; consider a body of mass m is placed on the surface of the earth. The distance between the center of the body and the earth is R which is equal to radius of the earth. The mass of earth is Me.We know that the force with which the earth attracts a body on its surface towards its center is equal to the weight of the body

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Q4. State and explain gravitational field

**Ans 1:** Gravitational pull of earth acting on the body whether the body is in contact with earth or not is called the field force and the are for this force around the earth is called gravitational field

**Ans 2:** For example: the velocity of a body, thrown up, goes on decreasing while on return its velocity goes on increasing. It is due to the gravitational pull earth acting on the body, which is a field force. It is assumed that a gravitational field exists all around the earth. This field is directed towards the center of the earth. The gravitational field becomes weaker and weaker as we go farther and farther away from the earth

**Ans 3:** Gravitational field strength: in the gravitational field of the earth, the gravitational force per unit mass is called the gravitational field strength of the earth. At any place its value is equal to the value of g at that point

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Q5. Q no: 6 (B) Calculate the value of g at a height of 3600 km above the surface of the Earth.

**Ans 1:** Solution:

$g_n$ =?

h = 3600km = 3600 x 1000m

R = 6400 x $10^3$ m

G = 6.673 x 10-$^{11}$ Nm$^2$kg-$^2$

Me = 6x $10^{24}$ kg

g = GMe/R$^2$

$g_n$ = Gme/(R+h)$^2$

6.673 x10-$^{11}$ x 6 x $10^{24}$/6400 x$10^3$ + 3600 x$10^3$

$g_n$ = 4ms-$^2$

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Q6. How gravitation is discovered. what is the force of gravitation

**Ans 1:** The first man who came up with the idea of gravity was Isaac newton. It was an evening of 1665 when he was trying to solve the mystery why planets revolve around the sun. Suddenly an apple fell from the tree under which he was sitting. The idea of gravity flashed in his mind. he discovered not only the cause of falling apple but also the cause that makes the planet to revolve around the sun and the moon around the earth.

Force of gravitation: force due to which every body of the universe attracts every other body is called force of gravitation.

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Q7. Q no(B) Define satellites. Find the orbital velocity of on artificial satellites.

**Ans 1:** Satellite:

An object that revolves around a planet is called satellite . The moon revolves around the earth as moon is a natural satellite of the earth.

Scientists have sent many objects into space Some of these objects revolve around the earth. These are called artificialsatalites. Most of the artificial satallite orbiting around the Earth are usedfor communication purposes .Artificial satellites carry instruments or passengers to perform experiments in space.

Large number of artificial satellites have been launched in different orbits around the Earth.

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Q8. Q no: (B) A polar satellite is launched at 850 km above earth. Find its orbital speed.

**Ans 1:** Solution:

Height= 850 km

= 850 x 1000m

850000m = 8.5 x $10^5$m

orbital speed = v=?

V=√GMe/(R+h)

=√6.673 x 10-$^{11}$ x 6 x $10^{24}$/(6.4 x $10^6$ + 8.5 x $10^5$ )

= 743.13 ms-$^1$

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Q9. Describe the motion of artificial satellite and derive the formula for the orbital speed of the artificial satellite

**Ans 1:** Artificial satellite: Artificial satellites are launched for space research and telecommunication. With their help, we are able to enjoy live coverage of cricket matches, Olympic games and many other programs directly on our television sets.

Artificial satellites keep on revolving around the earth in different geo stationary satellite orbits with uniform speed due to gravitational force

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Q10. Q no 7 (A) Explain the motion of Artificial satellites.

**Ans 1:** A satellite requires centripetal force of attraction between the salellite and the Earth provides the necessary centripetal

force.

Consider a satellite of mass revolving round the earth at an altitude h in a orbit of radian to with orbital velocity Vo The necessary centripetal force required is given by equation

$fc = mv^2o/r_o$

$Fc = w' = mg_n$

$mg_h mv^2o/r_o$

$V_o^2 = g_h\, ro$

$vo = \sqrt{g_h ro}$

$V_o = \sqrt{g_n(R+h)}$

Equation ( 5.10) gives the velocity which a satellite must possess when launched in an orbit of radius $r_o$=9R+h) around the Earth

R+h= R

$g_n = g$

$v_o = \sqrt{gR}$

A satellite revolving around very close to the Earth has speed $V_o$ nearly 8kms-¹ or 29000 kmh-¹