CBSE

GRAVITATION WS 1

Class 09 - Science

Section A

1. There is no atmosphere on moon as **[1]**

   a) it gets light from sun.

   b) it is closer to the earth.

   c) it revolves round the earth.

   d) the gases have less requirement of velocity or energy to escape from its surface.

2. The value of quantity G in the law of gravitation **[1]**

   a) is independent of mass and radius of the earth

   b) depends on both mass and radius of the earth

   c) depends on mass of the earth only

   d) depends on radius of the earth only

3. Match the column I with column II and select the correct option from the given codes. **[1]**

Column I	Column II
(a) g at height h	(i) $g\left(1-\frac{2h}{R}\right)$
(b) g at depth h	(ii) $\frac{GM}{R^2}$
(c) g_{poles}	(iii) $g\left(1-\frac{h}{R}\right)$
(d) $g_{surface}$	(iv) Maximum

   a) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

   b) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

   c) (a) - (i), (b) - (iii), (c) - (iv), (d) - (ii)

   d) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

4. The gravitational force between two objects is F. If masses of both objects are halved without changing distance between them, then the gravitational force would become **[1]**

   a) F/2

   b) F

   c) 2 F

   d) F/4

5. The gravitational force between two masses kept at a certain distance is p N. The same two masses are now kept in water and the distance between them is kept same. The gravitational force between these two masses in water is q N. Then **[1]**

   a) p > q

   b) p < q

   c) p = q

   d) p $\neq$ q

6. In the relation F = $\frac{Gmm}{d^2}$, the quantity G **[1]**

   a) is greater at the surface of the earth

   b) depends on the value of g at the place of observation

c) is universal constant of nature

d) is used only when the earth is one of the two masses

7. The equation F = $\frac{Gm_1m_2}{r^2}$ is valid only for **[1]**

a) linear bodies

b) spherical bodies

c) circular bodies

d) elliptical bodies

8. Law of gravitation gives the gravitational force between **[1]**

a) any two bodies having some mass

b) two charged bodies only

c) the earth and Sun only

d) the earth and a point mass only

9. The atmosphere is held to the earth by **[1]**

a) wind

b) clouds

c) earth's magnetic field

d) gravity

10. The value of gravitational constant depends upon **[1]**

a) temperature of the atmosphere

b) masses

c) distance between the masses

d) none of these

11. A boy is whirling a stone tied with a string in a horizontal circular path the string breaks, the stone **[1]**

a) will continue to move in the circular path

b) will move along a straight line towards the centre of the circular path

c) will move along a straight line perpendicular to the circular path away from the boy.

d) will move along a straight line tangential to the circular path

12. The force of attraction between two unit point masses separated by a unit distance is called **[1]**

a) gravitational potential

b) universal gravitational constant

c) gravitational field

d) acceleration due to gravity

13. **Statement 1**: A pendulum can vibrate in an artificial satellite. **[1]**
Statement 2: Inside the satellite, acceleration due to gravity is zero.

a) Statement 1 is true but statement 2 is false.

b) Statement 1 is false but statement 2 is true.

c) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

d) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

14. Two particles are placed at some distance. If the mass of each of the two particles is doubled, keeping the distance between them unchanged, the value of gravitational force between them will be **[1]**

a) Unchanged

b) $\frac{1}{4}$ times

c) $\frac{1}{2}$ times

d) 4 times

15. **Assertion (A):** Universal gravitational constant G is a scalar quantity. **[1]**
Reason (R): The value of G is same throughout the universe.

a) Both A and R are true and R is the correct

b) Both A and R are true but R is not the

explanation of A.

correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** Kepler's second law of planetary motion is also known as Kepler's law of areas. **[1]**
Reason (R): The line joining the planet and the sun sweeps equal areas in equal intervals of time.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

17. **Assertion (A):** It is the gravitational force exerted by the sun and the moon on the sea water that causes to the formation of tides in the sea. **[1]**
Reason (R): Gravitational force of attraction is a strong force.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

18. **Assertion (A):** When the distance between two bodies is doubled and also the mass of each body is doubled, then the gravitational force between them remains the same. **[1]**
Reason (R): According to Newton's law of gravitation, a product of force is directly proportional to the product mass of bodies and inversely proportional to the square of the distance between them.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

19. **Assertion (A):** Any two objects in the universe attract each other by a force called gravitation force. **[1]**
Reason (R): The force of gravitation exerted by the earth is called gravity.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** According to the universal law of gravitation, every object in the universe attracts every other object with some force. **[1]**
Reason (R): The direction of force is along the line joining the centres of the two bodies.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

21. **Assertion (A):** The motion of the moon around the earth is due to the centripetal force. **[1]**
Reason (R): The centripetal force causes acceleration and keeps the body moving along the circular path.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

22. Inverse-square law means $F \propto$ _____. **[1]**

a) $\frac{1}{r}$

b) $\frac{1}{r^4}$

c) $\frac{1}{r^2}$ d) $\frac{1}{r^3}$

23. If the distance between the object increase, mass remaining same then the gravitational forces between the object will _____. **[1]**

a) Decrease b) Remain the same

c) Increase d) first decrease then increase

24. The S. I unit of G is _____. **[1]**

a) Nm/kg^2 b) Nm^2/kg^2

c) N^2m/kg d) Nkg^2/m^2

25. Which of the two statements is true? **[1]**

Statement A: The force of gravitation may be attractive or repulsive.

Statement B: Inverse-square law means $F\alpha\frac{1}{r^2}$.

a) Statement B b) Statement A

c) Neither statement A nor B d) Both statement A and B

26. Explain the universal law of gravitation. **[1]**

27. The earth is acted upon by gravitation of the sun, even though it does not fall into it. Why? **[1]**

28. Which force causes things to fall towards the earth? **[1]**

29. Give reason-stone falls towards the earth but earth do not rise towards the stone. **[1]**

30. Suppose gravity of the earth suddenly becomes zero, then which direction will the moon begin to move, if no other celestial body affects it? **[1]**

31. Who found out the value of gravitational constant (G)? **[1]**

32. If the moon attracts the earth, why does the earth not move towards the moon? **[1]**

33. Two objects kept in a room do not move towards each other as per the universal law of gravitation. Why? **[1]**

34. What do you understand by the gravitational force of earth and weight? **[1]**

35. What do we call the gravitational force between the earth and an object? **[1]**

Section B

36. What happens to the force between two objects, if **[2]**

i. The mass of one object is doubled?

ii. The distance between the objects is doubled and tripled?

iii. The masses of both objects are doubled?

37. Write the formula to find a magnitude of the gravitational force between the earth and an object on the surface of the earth. **[2]**

38. State the universal law of gravitation. **[2]**

39. What is the source of the centripetal force that a planet requires revolving around the Sun? On what factors does that force depend? **[2]**

40. If the force of gravity somehow vanished away, why would we be sent flying in space? **[2]**

41. How does a force of gravitation between two objects change when the distance between them is reduced to half? **[2]**

42. Mention any five phenomena that the universal law of gravitation was able to explain. **[2]**

43. What is the magnitude of the gravitational force between the earth and a 1 kg object on its surface? (Mass of the earth is 6×10^{24} kg and radius of the earth is 6.4×10^6 m.) **[2]**

44. Write the formula to find the magnitude of the gravitational force between the earth and an object on the surface of the earth. **[2]**

45. If gravitation is the power by which all bodies tend to fall towards each other, then why do all bodies tend towards the centre of the earth? **[2]**

46. What is the importance of universal law of gravitation? **[2]**

47. When dropped from the same height a body reaches the ground quicker at poles than at the equator. Why? **[2]**

48. How does the force of attraction between the two bodies depend upon their masses and distance between them? **[2]**
A student thought that two bricks tied together would fall faster than a single one under the action of gravity. Do you agree with his hypothesis or not? Comment.

49. If the earth attracts an apple, does the apple also attract the earth? If so, why does the earth not move towards the apple? **[2]**

50. Prove that if the earth attracts two bodies placed at the same distance from the centre of the earth with the same force, then their masses are equal. **[2]**

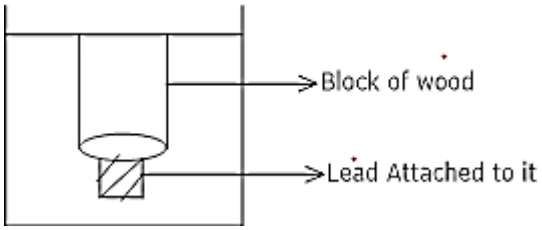
51. How does the force of gravitation between two objects change when the distance between them is reduced to half? **[2]**

52. The acceleration due to gravity at the moon's surface is 1.67 ms^{-2}. If the radius of the moon is 1.74×10^6, calculate the mass of the moon. Use the known value of G. **[2]**

53. Give three differences between acceleration due to gravity (g) and universal gravitational constant (G). **[2]**

Section C

54. A block of wood tied to the bottom of water tank as shown. The wooden block exerts tension, on the wire tied to it. The dimension of the block are 20 cm × 20 cm × 40 cm. **[3]**



The density of the wood is 600 Kg/m^3. What is the tension in the wire?

55. What happens to the magnitude of the force of gravitation between two objects, if **[3]**
i. distance between the objects is tripled?
ii. mass of both objects is doubled?
iii. mass of both objects as well as the distance between them is doubled?

56. The mass of the earth is 6×10^{24} kg and that of the moon is 7.4×10^{22} kg. If the distance between the earth and the moon is 3.84×10^5 km, calculate the force exerted by the earth on the moon. (Take G = 6.7×10^{-11} $Nm^2 kg^{-2}$) **[3]**

57. Calculate the force of gravitation between the earth and the Sun, given that the mass of the earth = 6×10^{24} kg and of the Sun = 2×10^{30} kg. The average distance between the two is 1.5×10^{11} m. **[3]**

58. The mass of the mars is 6.39×10^{23} kg and that of the jupiter is 1.89×10^{27} kg. If the distance between mars and jupiter is 749×10^3 m. Calculate the force exerted by the jupiter on the mars. (G = 6.7×10^{-11} $Nm^2 kg^{-2}$) **[3]**

59. i. According to universal law of gravitation, every object in this universe attracts every other object. Explain, why then a table and a chair lying in the same room do not collide with each other? **[3]**
ii. An object is thrown vertically upwards to a height of 12 m. Calculate its

a. velocity with which it was thrown upwards.

b. time taken by the object to reach a height of 12 m.

Section D

60. **Fill in the blanks:** **[5]**

(a) The _____ force holds the Solar System together. **[1]**

(b) The force with which the earth pulls the objects towards it is called _____. **[1]**

(c) The _____ of the body is the force with which it is attracted towards the centre of the earth. **[1]**

(d) The motion of the moon around the earth is due to the _____ force. **[1]**

(e) _____ is the force acting perpendicularly on a unit area of the object. **[1]**

61. **[5]**

i. At some moment, two giant planets Jupiter and Saturn of the solar system are in the same line as seen from the earth. Find the total gravitational force due to them on a person of mass 50 kg on the earth. Could the force due to the planets be important?

Mass of the Jupiter = 2×10^{27} kg

Mass of the Saturn = 6×10^{26} kg

The distance of Jupiter from the earth = 6.3×10^{11} m

The distance of Saturn from the earth = 1.28×10^{12} m

ii. A bag of sugar weighs 'w' at a certain place on the equator. If this bag is taken to Antarctica, then will it weigh the same or more or less. Give a reason for your answer.

62. What is the magnitude of the gravitational force between the earth and a 1 kg object on its surface? (Mass of the earth is 6×10^{24} kg and radius of the earth is6.4×10^{6} m). **[5]**

63. Derive an expression for the force of attraction between two bodies and then define gravitational constant. **[5]**

Section E

64. **State True or False:** **[7]**

(a) Universal Law of Gravitation was given by Sir Isaac Newton. **[1]**

(b) Kepler’s First Law states that the cube of the mean distance ‘r’ of a planet from the Sun is directly proportional to the square of its orbital period 'T'. **[1]**

(c) The centripetal force is provided by the force of attraction of the earth. **[1]**

(d) The earth attracts or pulls all the objects towards the center. **[1]**

(e) Kepler's First Law states that the planets move around the Sun in elliptical orbits, with the Sun at one of the two foci of the elliptical orbit. **[1]**

(f) According to Newton, every object in this universe attracts every other object with a certain force, called gravitational force. **[1]**

(g) The gravitational force holds the Solar System together. **[1]**