Chapter-3

Worksheet-3

Section 1

Q1. Suppose that the radius of the earth becomes twice of its original radius without any change in its mass. Then what will happen to your weight?

Q2. Prove that if the earth attracts two bodies placed at same distance from the centre of the earth with the same force, then their masses are equal.

Q3. Give three differences between acceleration due to gravity (g) and universal gravitational constant (G).

Q4. On the earth, a stone is thrown from a height in a direction parallel to the earth's surface while another stone is simultaneously dropped from the same height. Which stone would reach the ground first and why?

Q5. Calculate the average density of the earth in terms of g, G and R.

Q6. Prove that if a body is thrown vertically upward, the time of ascent is equal to the time of descent.

Q7. Two objects of masses ml and m2 having the same size are dropped simultaneously from heights h_1 and h_2, respectively. Find out the ratio of time they would take in reaching the ground. Will this ratio remain the same if (i) one of the objects is hollow and the other one is solid; and (ii) both of them are hollow, size remaining the same in each case? Give reasons.

Q8. Derive expression for force of attraction between two bodies and then define gravitational constant.

Q9. Show that the weight of an object on the moon is 16 th of its weight on the earth.

Q10. How does the weight of an object vary with respect to mass and radius of the earth? In a hypothetical case, if the diameter of the earth becomes half of its present value and its mass becomes four times of its present value, then how would the weight of any object on the surface of the earth be affected?

Section 2

Q11. On the moon's surface, the acceleration due to gravity is 1.67 ms^{-2}. If the radius of the moon is 1.74×10^6 m, calculate the mass of the moon.
($G = 6.67 \times 10^{11}\ Nm^2kg^{-2}$)

a) 7.6×10^{22} kg
b) 8.1×10^{10} kg
c) 6.4×10^{12} kg
d) 6.4×10^{22} kg

Answer: a

Q12. A stone is dropped from a cliff. What will be its speed when it has fallen 100 m?

a) 44.2 m/s
b) 31.5 m/s
c) 23.2 m/s
d) 40.1 m/s

Answer: a

Q13. From a cliff of 49 m high, a man drops a stone. One second later, he throws another stone. They both hit the ground at the same time. Find out the speed with which he threw the second stone.

a) 10.13 m/s
b) 12.10 m/s
c) 9.81 m/s

d) 11.54 m/s

Answer: b

Q14. Suppose the mass of the earth somehow increases by 10% without any change in its size. What would happen to your weight?

a) Weight becomes 0.9 times
b) Weight remains unchanged
c) Weight becomes 1.1 times
d) Weight becomes half

Answer: c

Q15. There are four objects of equal mass at a distance of 4m, 8m 6m and 10m from a pole. Which object will have maximum force of attraction with the pole?

a) The object which is 4 m away from the pole
b) The object which is 8 m away from the pole
c) The object which is 6 m away from the pole
d) The object which is 10 m away from the pole

Answer: a

Q16. Which of the following will require least force to penetrate the piece of wood?

a) Sharp iron Nail
b) Blunt iron rod
c) Thin sheet of metal
d) A Hammer

Answer: a

Q17. In vacuum, all freely falling objects have:

a) Same acceleration
b) Same speed
c) Same momentum
d) Same force

Answer: a

Q18. The value of universal Gravitational constant was first determined by:

a) Gregor Mendel
b) Ernst Haeckel
c) Henry Cavendish
d) Isaac Newton

Answer: c

Q19. The gravitational force between a man weighing 68 kg and a woman weighing 52 kg standing 4 metres apart.

a) 1.2×10^{-11} N
b) 1.48×10^{-9} N
c) 1.48×10^{-8} N
d) 1.50×10^{-11} N

Answer: c

Q20. A particle is released from rest from a height. Find the distance it falls through in 5 second.

a) 102.5 m
b) 122.5 m
c) 108.5 m
d) 109.5 m

Answer: b