Gravitation Formative assessment

Multiple choice Questions

1) Which of the following is true?
a) The acceleration due to gravity acting on a freely falling body is directly proportional to the mass of the body
b) Mass of the object is same on Moon and Earth
c) G value is always constant
d) The weight of an object at the center of earth will be zero

Solution (b), (d), (c)

2) A big stone and small are dropped from the roof of the house at the same time. Which one will reach the ground first?
a) Big Stone
b) Small stone
c) Both at the same time
d) Not able to determine with the given data

Solution C

3) The value of acceleration due to gravity of earth
a) Same on equator and poles
b) Is the least at equator
c) Is the least on poles
d) Increase from pole to equator

Solution ©

4) An object is thrown vertically upwards and rises to a height of 10 m. Calculate the velocity with which the object was thrown upwards? Take g=9.8 m/s^2
a) 14m/s
b) 16m/s
c) 10m/s
d) 9.8 m/s

Solution
Distance traveled, s = 10 m

Final velocity, $v = 0\ m\ s^{-1}$
Acceleration due to gravity, $g = 9.8\ m\ s^{-2}$
Acceleration of the object, $a = -9.8\ m\ s^{-2}$
(i) $v^2 = u^2 + 2a\ s$
$0 = u^2 + 2 \times (-9.8\ m\ s^{-2}) \times 10\ m$
$-u^2 = -2 \times 9.8 \times 10\ m^2\ s^{-2}$
$u = 14\ m\ s^{-1}$

5) The time taken by the object to reach the highest point in the above question
a) 1.42s
b) 1.5 s
c) 1 s
d) 1.43 s

Solution
$v = u + a\ t$
$0 = 14\ m\ s^{-1} - 9.8\ m\ s^{-2} \times t$
$t = 1.43\ s.$

6) Which of the them is true for two bodies separated by some distance?
a) When the distance between them is halved, Gravitational force becomes 4 times
b) When one of the mass becomes halved, Gravitational force becomes halved
c) When the distance between them is increased four times, Gravitational force becomes 1/16 times
d) None of the above

Solution (a) (b) (c)

The above can be simply calculated from the below formula

$$F = G\frac{m_1 m_2}{r^2}$$

7) The Weight of the body at a certain place is 30 N. The acceleration due to gravity at that point is 10 m/s. Find out the mass and weight of the object at the place where acceleration due to gravity is zero?
a) 3,0
b) 3,30
c) 3,3
d) None of these

Solution: mass of the body=30/10=3 Kg
Mass remains same everywhere, Weight varies as per acceleration due to gravity which is zero at g=0

(a)

8. The acceleration due to gravity at three point A,B and C are 9.8 m/s^2 ,10m/s^2 and 5 m/s^2 on the earth surface?
Which of the following is true?

a) B is at least distance out of three point from the center of the earth
b) C is at farthest distance out of three point from the center of the earth
c) Weight of the object is lowest at point C out of three point
d) The weight of the object varies as
$W_B > W_A > W_C$

Solution: All are correct and self explanatory

Short Questions

1) What is the difference between mass and Weight?
2) Derive the inverse square of Newton.
3) Define 'G' and give its value.
4) A ball is thrown up with speed of 10 m/s. How high will it go before it begins to falls? Take g=10m/s^2

Solution:
v=0 ,u=10m/s a=-10m/s^2 h=?
$v^2 = u^2 + 2ah$

Substituting the above values
H=5 m

5) The weight of the man on earth is 150 N and on certain planet is 25 N.
Take g=10m/s^2 on earth
i) Find the mass of the man on earth and planet
ii) Find the acceleration due to gravity on the planet

Solution
Weight on earth -=150 N
So mass of man on earth= 150/10=15 kg.

Now mass does not varies and it will remain same on earth and planet

Now weight on Planet=25N
Mass =15 N

Acceleration due to gravity on Planet= 25/15=1.66 m/s^2

6) Is acceleration due to gravity (g) constant? Tell us how it is there at different places on earth?

What are these?

(i) Product Rule
(ii) Inverse Square rule
(iii) Universal gravitational constant
(iv) Universal law of gravitation