FORM TWO PHYSICS ASSIGNMENTS

Week 1 and week 2

1.A boy is swimming 25m below water level of density 1g/cm3. The atmospheric pressure at this place is equivalent to 72cmHg. Calculate the total pressure on his body in N/m2 (take ρ for mercury = 13600kg)

2 A water tank of height 4.8m is ¾ full. Determine the force exerted on a thin metal plate resting flat at the bottom of the bottom of the tank if the plate has an area of 2cm2. The density of water is 1000kg/m3 and the atmospheric pressure =104,000 Pa

3. A water tank of height 6m is full. Determine the force exerted on a thin metal plate resting flat at the bottom of the bottom of the tank if the plate has an area of 0.5m2. Take acceleration due to gravity, g = 10m/s2, the density of water to be 1000kg/m3 and the atmospheric pressure P=100,000 Pa

4. The height of mercury column in a barometer is found to be 76cm at a certain place. What would be the height on a water barometer in the same place? (Density of water is 1000kg/m3 and density of mercury is 13600kg/m3).

5. The height of mercury column in a barometer, at a place is 64cm. What would be the height of a column of paraffin in the barometer at the same place? (take density of mercury =13600kgm-3 and density of paraffin = 800 kg /m3).

6. A hole of diameter 1.0mm is made in the side of a water pipe. If the pressure of the flow is maintained at 3.0 x 106 Nm-2, calculate the force with which the water jets out of the hole.

7. A hole of area 200mm2 at the bottom of a tank 4.0m deep is closed with a cork. Determine the force due to water (Density of water is 1000kg/m3, and acceleration due to gravity is 10m/s2

The barometric height in a town is 65cmHg. Given that the standard atmospheric pressure is 76cmHg and the density of mercury is 13600kg/m3

8. A mountain climber with a mercury barometer discovered that the readings of the barometer at the bottom and top of a certain mountain were 750mmHg and 520mmHg respectively. Given that the density of air between the bottom and top of the mountain is uniform and equal to 1.25 Kg/m3, estimate the height of the mountain. (Take the density of mercury to be 1.36 x 104 Kg/m3) (3mk)

9. The height of mercury column in a barometer is found to be 67cm at a certain place. What would be the height on a water barometer in the same place. (Density of water is 1000kg/m3 and density of mercury is 13600kg/m3).

10. The height of mercury column in a barometer density 13600kg/ m-3, at a place is 64cm. What would be the height.

Week 3 and week 4

11. A body covers a distance of 10m in 4 seconds. It rests for 10 seconds and finally covers a distance of 90m in 60 seconds. Calculate the average speed.

12. Calculate the distance in metres covered by a body moving with a uniform speed of 180 km/h in 30 seconds

13. Calculate the time in seconds taken a by body moving with a uniform speed of 360km/h to cover a distance of 3,000 km?

14. A man runs 800m due North in 100 seconds, followed by 400m due South in 80 seconds. Calculate,

a. His average speed

b. His average velocity

c. His change in velocity for the whole journey

15. A tennis ball hits a vertical wall at a velocity of 10m/s and bounces off at the same velocity. Determine the change in velocity.

16. The velocity of a body increases from 72 km/h to 144 km/h in 10 seconds. Calculate its acceleration.

17. A car is brought to rest from 180km/h in 20 seconds. What is its retardation.

Equations of linear motion

The following equations are applied for uniformly accelerated motion;

$v = u + at$

$s = ut + \frac{1}{2} at^2$

$v^2 = u^2 + 2as$

Examples

1. A body moving with uniform acceleration of 10 m/s2 covers a distance of 320 m. if its initial velocity was 60 m/s. Calculate its final velocity.

2. A body whose initial velocity is 30 m/s moves with a constant retardation of 3m/s. Calculate the time taken for the body to come to rest.

3. A body is uniformly accelerated from rest to a final velocity of 100m/s in 10 seconds. Calculate the distance covered

Motion under gravity.

1. Free fall

The equations used for constant acceleration can be used to become,

$v = u + gt$

$s = ut + \frac{1}{2} gt^2$

$v2 = u + 2gs$

2. Vertical projection

Since the body goes against force of gravity then the following equations hold

$v = u - gt$ ……1

$s = ut - \frac{1}{2} gt2$ ……2

$v2 = u - 2gs$ ……3

N.B time taken to reach maximum height is given by the following

$t = u/g$ since $v = 0$ (using equation 1)

Time of flight

The time taken by the projectile is the timetaken to fall back to its point ofprojection. Using eq. 2 then, displacement =0

$0 = ut - \frac{1}{2} gt^2$

$0 = 2ut - gt2$

$t(2u - gt) = 0$

Hence, $t = 0$ or $t = 2u/g$

$t = o$ corresponds to the start of projection

$t = 2u/g$corresponds to the time of flight

The time of flight is twice the time taken to attain maximum height.

Maximum height reached.

Using equation 3 maximum height, Hmax is attained when $v = 0$ (final velocity).

Hence $v2 = u2 - 2gs$;- $0 = u2 - 2gHmax$, therefore

$2gHmax = u2$

$Hmax = u2/2g$

Velocity to return to point of projection.

At the instance of returning to the original point, total displacement equals to zero.

v2 =u2-2gs hence v2= u2

Thereforev=u or v=±u

QUESTIONS.

A stone is projected vertically upwards with a velocity of 30m/s from the ground.

Calculate,

a. The time it takes to attain maximum height

b. The time of flight

c. The maximum height reached

d. The velocity with which it lands on the ground. (take g=10m/s)

3. Horizontal projection

The path followed by a body (projectile) is called trajectory.

The maximum horizontal distance covered by the projectile is called range.

The horizontal displacement 'R' at a time't' is given by s=ut+1/2at2 Taking u=u and a=0 hence R=ut, is the horizontal displacement and h=1/2gt2 is the vertical displacement.

NOTE

The time of flight is the same as the time of free fall.

Example

A ball is thrown from the top of a cliff 20m high with a horizontal velocity of 10m/s.

Calculate,

a. The time taken by the ball to strike the ground

b. The distance from the foot of the cliff to where the ball strikes the ground.

c. The vertical velocity at the time it strikes the ground. (take g=10m/s)

a column of paraffin in barometer at the same place. (Density of paraffin = 8.0 x 102 kg /m3). (3mks)

week 5 :summary notes form one

week 6:summary notes form two.