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Question 1:
A bus starting from rest moves with a uniform acceleration of 0.1ms^{-2} for 2 minutes. Find **(a)** the speed acquired, **(b)** the distance travelled.

Answer 1:
Here we have,

Initial velocity (u) = 0 m/s

Acceleration (a) = 0.1ms^{-2}

Time (t) = 2 minute = 120 seconds

(a) The speed acquired:

We know that, $v = u + at$

$\Rightarrow v = 0 + 0.1 \times 120$ m/s

$\Rightarrow v = 12$ m/s

Thus, the bus will acquire a speed of 12 m/s after 2 minute with the given acceleration.

(b) The distance travelled:

We know that, $s = ut + \frac{1}{2}at^2$

$= 0 \times 120 + \frac{1}{2} \times 0.1 \times (120)^2$

$= \frac{1}{2} \times 0.1 \times 14400$ m $= 720$ m

Thus, bus will travel a distance of 720 m in the given time of 2 minute.

Question 2:
A train is travelling at a speed of 90 km/h. Brakes are applied so as to produce a uniform acceleration of -0.5 m/s^2. Find how far the train will go before it is brought to rest.

Answer 2:
Here, we have,

Initial velocity, u = 90 km/h = $\frac{90 \times 1000}{3600}$ ms^{-1} = 25 ms^{-1}

Final velocity, v = 0 m/s

Acceleration, a = -0.5 m/s^2

Distance travelled = ?

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

$$s = \frac{v^2 - u^2}{2a} = \frac{0^2 - 25^2}{2(-0.5)} = 625 \text{ m}$$

Therefore, train will go 625 m before it brought to rest.

Question 3:
A trolley, while going down an inclined plane, has an acceleration of 2 cm/s^2. What will be its velocity 3 s after the start?

Answer 3:
Here we have,

Initial velocity, u = 0 m/s

Acceleration (a) = 2 cm/s^2 = 0.02 m/s^2

Time (t) = 3 s

Final velocity, v = ?

We know that, v = u + at

Therefore, v = 0 + 0.02 × 3 m/s

⇒ v = 0.06 m/s

Therefore the final velocity of trolley will be 0.06 m/s after start.

Question 4:
A racing car has a uniform acceleration of 4 m/s^2. What distance will it cover in 10 s after start?

Answer 4:
Here we have,

Acceleration, a = 4 m/s^2

Initial velocity, u = 0 m/s

Time, t = 10 s

Distance covered (s) =?

We know that, $s = ut + \frac{1}{2} at^2$

⇒ $s = 0 \times 10 + \frac{1}{2} \times 4 \times (10)^2$ m

⇒ s = 2 × 100 m

⇒ s = 200 m

Thus, racing car will cover a distance of 200 m after start in 10 s with given acceleration.

Question 5:
A stone is thrown in a vertically upward direction with a velocity of 5 m/s. If the acceleration of the stone during its motion is 10 m/s^2 in the downward direction, what will be the height attained by the stone and how much time will it take to reach there?

Answer 5:
Here we have,

Initial velocity (u) = 5 m/s

Final velocity (v) = 0 m/s

Acceleration (a) = $-$ 10 m/s^2

Height, i.e. Distance, s =?

Time (t) taken to reach the height =?

We know that, $v^2 = u^2 + 2as$

$\Rightarrow 0 = (5)^2 + 2 \times -10 \times s$

$\Rightarrow 0 = 25 - 20s$

$\Rightarrow s = 25/20$ m

$\Rightarrow s = 1.25$ m

Now, we know that, $v = u + at$

$\Rightarrow 0 = 5 + (-10) \times t$

$\Rightarrow 0 = 5 - 10t$

$\Rightarrow t = 5/10$ s

$\Rightarrow t = 0.5$ s

Thus, stone will attain a height of 1.25 m and time   taken to attain the height is 0.5 s.