5)

Given,

distance covered by the truck (s) = 400m

time taken to cover the distance (t) = 20s

initial velocity (u) = 0

From the equations of motion,

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

Therefore,

$400 = 0(20\ sec) + \frac{1}{2}(a)(400s^2)$

$= 2\ ms^{-2}$

The acceleration of the truck is equal to $2\ ms^{-2}$

As per the 2nd law of motion,

Force = Mass × Acceleration.

Mass of the truck = $7000kg \times 2\ m/s^2$

$= 14000N$

$= 7000kg$ 7 tones

Force acting on truck = $7,000 kg \times 2 ms^{-2}$

$= 14000 N$

6) Given,

Mass of the stone (m) = 1 kg

Initial velocity (u) = 20 m/s

Final velocity (v) = 0 m/s

Distance travelled by the stone (s) = 50 m

As per third equation,

$(v^2 - u^2) = 2as$

The acceleration of the ~~stone~~ stone is given by

$$\frac{(v^2 - u^2)}{2s}$$

Therefore,

$$a = \frac{0 - 400}{100} \; ms^{-2}$$

$$= -4 \; ms^{-2}$$

As per second law,

$F = ma$

Therefore,

$F = 1 kg \times -4 ms^{-2}$

$= -4 N$

7.a) Given,

force exerted by the train (F) = 10,000N

force of friction = 5000N

Therefore,

the net acceleration = 10,000N + (-5,000N)

= 35,000N

b) Total mass of the train = mass of engine + mass of each wagon

= 8000kg + 5 x 2000kg

The total mass of the train is 18000kg

As per the second law of motion, F = ma

Therefore,

acceleration of the train = $\frac{35,000}{18,000}$

$= 1.94 ms^{-2}$

The acceleration of the train is $1.94 ms^{-2}$

c) Given,

mass of the vechicle (m) = 1500kg

deceleration (a) = $-1.7 ms^{-2}$

As per the second law of motion,

$F = ma$

$F = 1500kg \times (-1.7 ms^{-2})$

$= -2550N$

Therefore, a force of 2550N must act on the vehicle from opposite direction

9) What is the momentum of an object of mass m, moving with a velocity v?

ans) Since momentum is defined as the product of mass & velocity, ~~therefore~~ Therefore the correct ~~ans~~ answer is (d) mv.

10) Since the velocity of the carbinate is constant, its acceleration must be zero. Therefore, the effective force acting on it is also zero. This implies that the magnitude of opposing frictional force is equal to the force exerted on the calinate, which is 200N. Therefore, total frictional force is -200N.

11) Given,

mass of the object (m_1 & m_2) = 1.5kg

Initial velocity (u_1) = 2.5 m/s of the first object

Initial velocity of the (u_2) = -2.5 m/s 2nd object

When the two masses stick together, the resulting object has a mass

of 3 kg $(m_1 + m_2)$

Velocity of the resulting object (v) = ?

As per the law of conservation of momentum,

Total momentum before collision = $m_1u_1 + m_2u_2$

$= (1.5\,kg)(2.5\,m/s)$

$+ (1.5\,kg)(-2.5\,m/s)$

$= 0$

Therefore, total momentum after collision $= (m_1 + m_2)v$

$= (3\,kg)\,v = 0$

Therefore $v = 0$

Since the truck has a very high mass, the static friction between the road and the truck is high. When pushing the truck with a small force, the frictional force cancels out the applied force and the truck does not move.