

**Momentum – 2023 June O Level 5054**

**1. June/2023/Paper\_5054/11/No.10**

A constant frictional force acts on a moving object for a short amount of time causing the momentum of the object to decrease.

Which expression is used to calculate the time for which the force acts?

**A**  $\text{time} = \frac{\text{change in momentum}}{\text{force}}$

**B**  $\text{time} = \text{change in momentum} \times \text{force}$

**C**  $\text{time} = \frac{\text{momentum}}{\text{force}}$

**D**  $\text{time} = \text{momentum} \times \text{force}$

2. June/2023/Paper\_5054/21/No.2

In a safety test, a car of mass 1100 kg travels at a speed of 10 m/s and collides with a stationary van of mass 3000 kg.

After the collision the car and the van move together with a velocity  $v$ .

Fig. 2.1 shows the car and van before and after the collision.

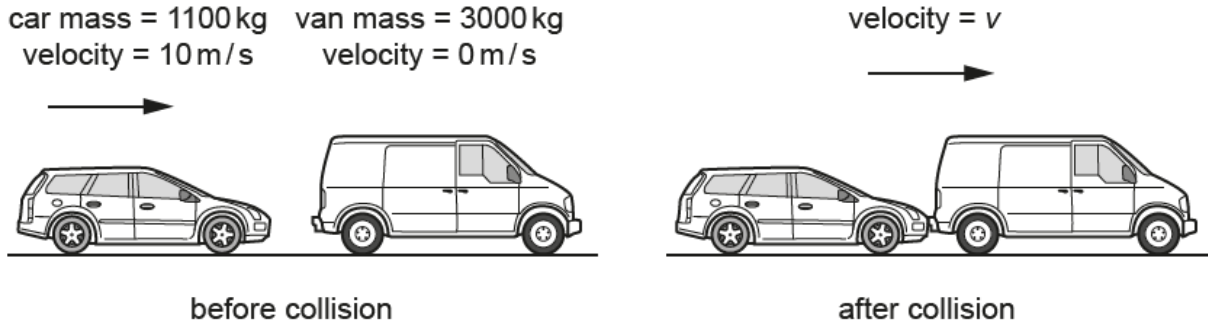


Fig. 2.1

The total momentum of the car and van is conserved during the collision.

(a) (i) Define 'momentum'.

.....  
..... [1]

(ii) State the unit of momentum.

..... [1]

(b) Calculate the velocity  $v$  of the car and van after the collision.

$v =$  ..... m/s [2]

(c) (i) Calculate the total kinetic energy of the car and van after the collision.

kinetic energy = ..... J [2]

(ii) State the transfer of energy that occurs in the collision.

.....

..... [1]

[Total: 7]

3. June/2023/Paper\_5054/22/No.1(a, c)

Fig. 1.1 shows the speed–time graph for a car travelling on a straight horizontal road.

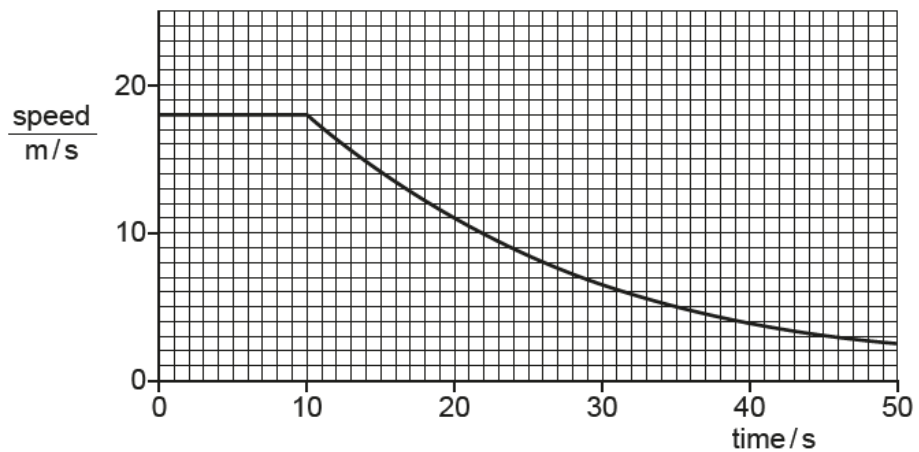


Fig. 1.1

(a) Describe the motion of the car shown in Fig. 1.1.

.....

.....

.....

..... [2]

(c) Between  $t = 10\text{ s}$  and  $t = 20\text{ s}$  the speed of the car changes from  $18\text{ m/s}$  to  $11\text{ m/s}$ .

The mass of the car is  $1200\text{ kg}$ .

(i) Calculate the change in momentum of the car in this time.

Give the unit of your answer

momentum change = ..... unit ..... [2]

(ii) Calculate the average resultant force exerted on the car during this time.

average resultant force = ..... N [2]