Momentum – 2020 IGCSE 0625

1. March/2020/Paper_42/No.2

Fig. 2.1 shows an athlete crossing the finishing line in a race. As she crosses the finishing line, her speed is 10.0 m/s. She slows down to a speed of 4.0 m/s.

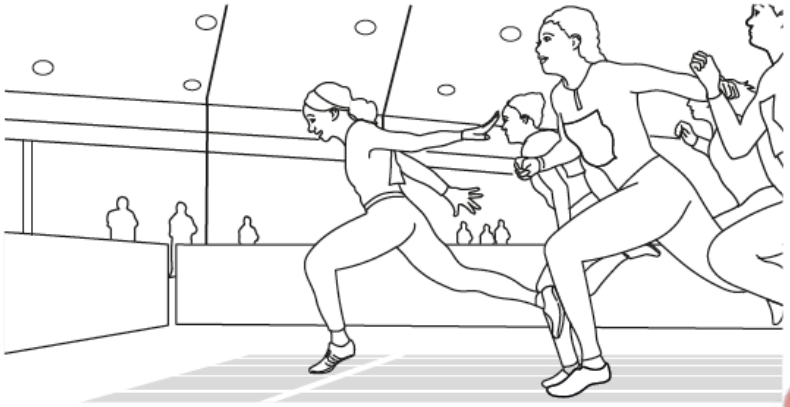

Fig. 2.1

(a) The mass of the athlete is 71 kg. Calculate the impulse applied to her as she slows down.

impulse = ... [3]

(b) **(i)** Define *impulse* in terms of *force* and *time*.

.....

..... [1]

(ii) The athlete takes 1.2 s to slow down from a speed of 10.0 m/s to a speed of 4.0 m/s.

Calculate the average resultant force applied to the athlete as she slows down.

force = ... [2]

(c) Calculate the force required to give a mass of 71 kg an acceleration of 6.4 m/s^2.

force = ... [2]

[Total: 8]

2. June/2020/Paper_23/No.9

A ball falls vertically to the floor and rebounds vertically upwards.

Just before it hits the floor, its speed is 4.0 m / s.

As it rebounds, its speed is 3.0 m / s.

The mass of the ball is 0.50 kg.

What is the change in momentum of the ball?

A 0.50 kg m / s downwards

B 0.50 kg m / s upwards

C 3.5 kg m / s downwards

D 3.5 kg m / s upwards

3. June/2020/Paper_41/No.1

An aeroplane of mass 2.5×10^5 kg lands with a speed of 62 m/s, on a horizontal runway at time $t = 0$. The aeroplane decelerates uniformly as it travels along the runway in a straight line until it reaches a speed of 6.0 m/s at $t = 35$ s.

(a) Calculate:

(i) the deceleration of the aeroplane in the 35 s after it lands

deceleration = ... [2]

(ii) the resultant force acting on the aeroplane as it decelerates

force = ... [2]

(iii) the momentum of the aeroplane when its speed is 6.0 m/s.

momentum = ... [2]

(b) At $t = 35$ s, the aeroplane stops decelerating and moves along the runway at a constant speed of 6.0 m/s for a further 15 s.

On Fig. 1.1, sketch the shape of the graph for the distance travelled by the aeroplane along the runway between $t = 0$ and $t = 50$ s. You are **not** required to calculate distance values.

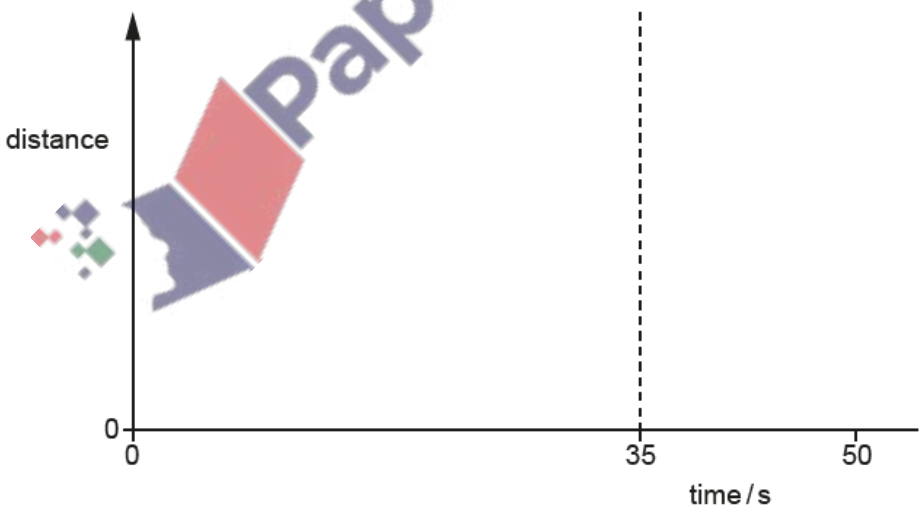

Fig. 1.1

[3]

(c) As the aeroplane decelerates, its kinetic energy decreases.

Suggest what happens to this energy.

.....

..... [1]

[Total: 10]

4. June/2020/Paper_42/No.2

Fig. 2.1 shows a train.

Fig. 2.1

The total mass of the train and its passengers is 750 000 kg. The train is travelling at a speed of 84 m/s. The driver applies the brakes and the train takes 80 s to slow down to a speed of 42 m/s.

(a) Calculate the impulse applied to the train as it slows down.

impulse = ... [3]

(b) Calculate the average resultant force applied to the train as it slows down.

force = ... [2]

(c) Suggest how the shape of the train helps it to travel at high speeds.

.....

..... [1]

(d) The train took 80 s to reduce its speed from 84 m/s to 42 m/s. Explain why, with the same braking force, the train takes more than 80 s to reduce its speed from 42 m/s to zero.

.....

..... [1]

(e) On a wet day, the train travels a greater distance before it stops along the same track. The train has the same speed of 84 m/s before the brakes are applied.

Suggest a reason for this.

.....

..... [1]

[Total: 8]