Momentum – 2023 IGCSE Physics 0625

1. Nov/2023/Paper_ 0625/21/No.7

A sphere X collides head on with a second identical sphere Y which is stationary.

The mass of each sphere is 0.15 kg.

Sphere X is travelling at a velocity of 2.0 m/s before the collision and produces an impulse of 0.21 N s on sphere Y.

What is the velocity of sphere X after collision?

A 0.60 m/s in the opposite direction to Y

B 0.60 m/s in the same direction as Y

C 1.4 m/s in the opposite direction to Y

D 1.4 m/s in the same direction as Y

2. Nov/2023/Paper_ 0625/22/No.7

A resultant force F accelerates a car of mass m along a straight horizontal road from rest to a speed v in time t, giving it momentum p.

Which pair of relationships for this situation is correct?

A $pt = mv$ and $F = pt$

B $p = mv$ and $F = pt$

C $p = mv$ and $Ft = p$

D $p = mvt$ and $Ft = v$

3. Nov/2023/Paper_ 0625/42/No.3(a)

(a) A balloon of mass 15 g is glued to a straw. The straw is threaded onto a horizontal string, as shown in Fig. 3.1.
The balloon is filled with air and then the air is released.

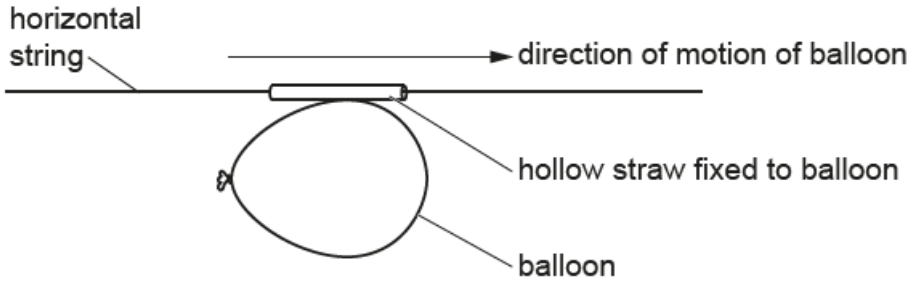

Fig. 3.1

As the air leaves the balloon, the balloon experiences a force.
The balloon accelerates from rest until it reaches a constant speed. It then travels 0.67 m in 0.18 s at this constant speed.

(i) Explain in words what is meant by the term impulse.

.....

..... [1]

(ii) Calculate the resultant impulse on the balloon while it is accelerating.

impulse = ... [3]

(iii) Explain how momentum is conserved as the balloon accelerates.

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..... [2]

4. Nov/2023/Paper_ 0625/43/No.3

Fig. 3.1 shows a boy throwing a ball at an object in a fairground.

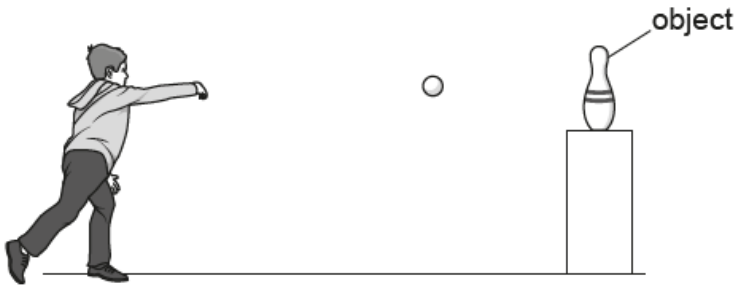

Fig. 3.1

The ball has a mass of 190 g and travels horizontally with a constant speed of 6.9 m/s.

(a) Calculate the momentum of the ball.

momentum = ... [2]

(b) After hitting the object, the ball bounces back along the same straight path with a speed of 1.5 m/s. The object has a mass of 1.8 kg.

Calculate the speed of the object after it is hit by the ball.

speed = ... [3]

(c) The kinetic energy of the ball is 4.5 J before the collision and 0.2 J after the collision.

Calculate the change in total kinetic energy of the ball and object during the collision.

change in total kinetic energy = ... [3]

[Total: 8]

5. June/2023/Paper_0625/21/No.9

An object of mass 1.2 kg is moving with a velocity of 2.0 m/s when it is acted on by a force of 4.0 N. The velocity of the object increases to 5.0 m/s in the same direction.

For which period of time does the force act on the object?

A 0.90 s **B** 1.1 s **C** 1.5 s **D** 3.6 s

6. June/2023/Paper_0625/22/No.9

A resultant force of 2.0 N acts on an object of mass 3.0 kg for 6.0 s.

What is the change in velocity of the object?

A 0.25 m/s **B** 1.0 m/s **C** 4.0 m/s **D** 36 m/s

7. June/2023/Paper_0625/23/No.9

A ball of mass 0.25 kg hits a wall at a speed of 16 m/s. It then rebounds back along its original path at a speed of 12 m/s.

What is the impulse experienced by the ball during its impact with the wall?

A 1.0 Ns **B** 3.0 Ns **C** 4.0 Ns **D** 7.0 Ns

8. June/2023/Paper_0625/42/No.2

A student catches a cricket ball. The speed of the ball immediately before it is caught is 18 m/s. The mass of the cricket ball is 160 g.

(a) Calculate the kinetic energy stored in the cricket ball immediately before it is caught.

kinetic energy = ... [3]

(b) It takes 0.12 s to catch the ball and bring it to rest.

Calculate the average force exerted on the ball.

average force = ... [2]

(c) As the student catches the ball, she moves her hands backwards.

Explain the effect of this action on the student's hands.

.....

..... [1]

[Total: 6]