Motion

Question Paper 5

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Motion
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 5

Time Allowed: **70 minutes**

Score: **/58**

Percentage: **/100**

1 The apparatus shown in Fig. 5.1 is used to demonstrate how a coin and a piece of paper fall when they are released from rest.

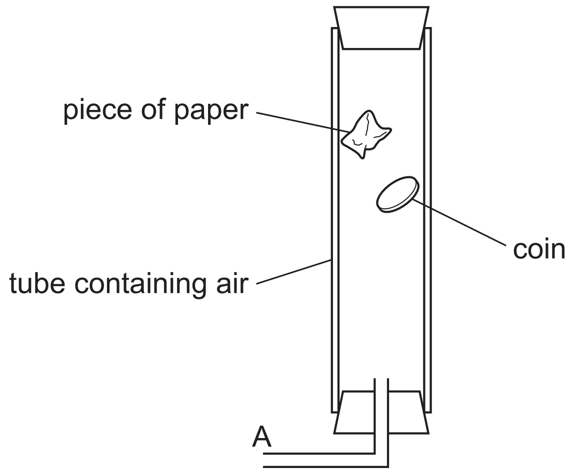

Fig. 5.1

(a) At the positions shown in Fig. 5.1, the paper is descending at constant speed but the coin still accelerates.

In terms of the forces acting, explain these observations.

paper ....

....

....

coin ....

....

.... [4]

(b) A vacuum pump is now connected at A and the air in the tube is pumped out.

The paper and coin are again made to fall from rest.

State one difference that would be observed, compared with what was observed when air was present.

....

.... [1]

[Total: 5]

2 A young athlete has a mass of 42 kg. On a day when there is no wind, she runs a 100 m race in 14.2 s. A sketch graph (not to scale) showing her speed during the race is given in Fig. 1.1.

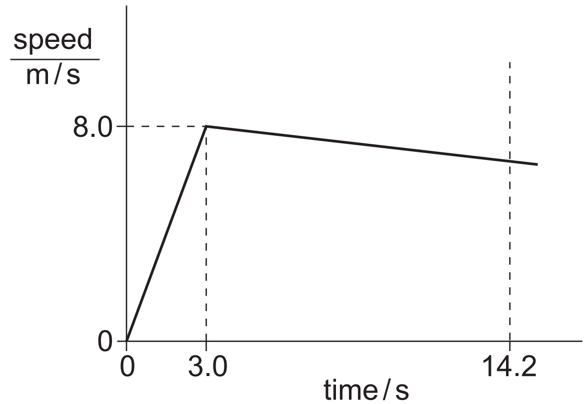

Fig. 1.1

(a) Calculate

(i) the acceleration of the athlete during the first 3.0 s of the race,

acceleration = ... [2]

(ii) the accelerating force on the athlete during the first 3.0 s of the race,

force = ... [2]

(iii) the speed with which she crosses the finishing line.

speed = ... [3]

(b) Suggest two differences that might be seen in the graph if there had been a strong wind opposing the runners in the race.

1. ....

....

2. ....

.... [2]

[Total: 9]

3 **(a)** Fig. 3.1 shows a skier descending a hillside. Fig. 3.2 shows the speed/time graph of his motion.

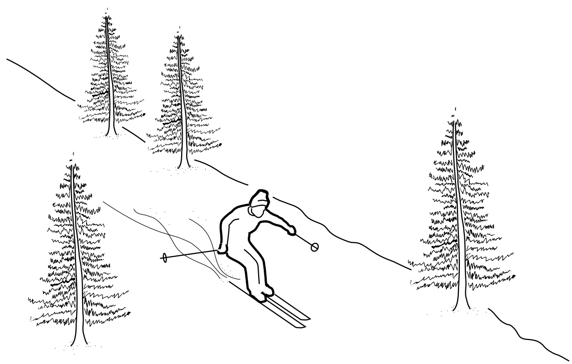

Fig. 3.1

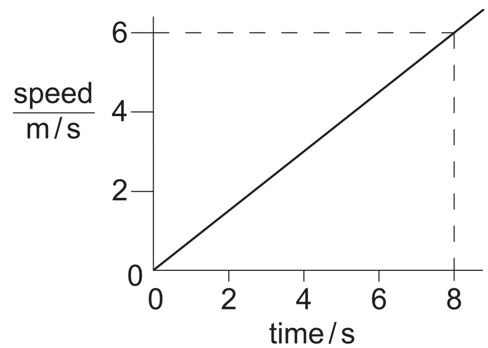

Fig. 3.2

(i) How can you tell that the acceleration of the skier is constant during the 8 s shown on the graph?

.... [1]

(ii) Calculate the acceleration of the skier.

acceleration = ... [2]

(b) Another skier starts from rest at the top of the slope. As his speed increases the friction force on the skier increases.

(i) State the effect of this increasing friction force on the acceleration.

.... [1]

(ii) Eventually the speed of the skier becomes constant.

What can be said about the friction force when the speed is constant?

.... [2]

(iii) 1. On the axes of Fig. 3.3, sketch a possible speed/time graph for the motion of the second skier.

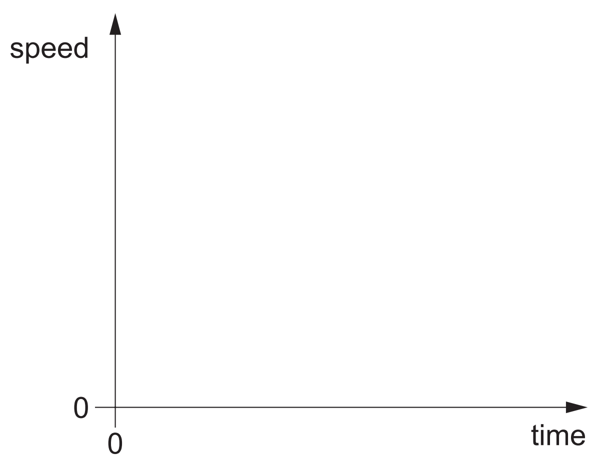

Fig. 3.3

2. On your graph, mark with the letter A a region where the acceleration is not constant. Mark with the letter B the region where the speed is constant. [4]

[Total: 10]

4 Fig. 1.1 shows the speed-time graphs for two falling balls.

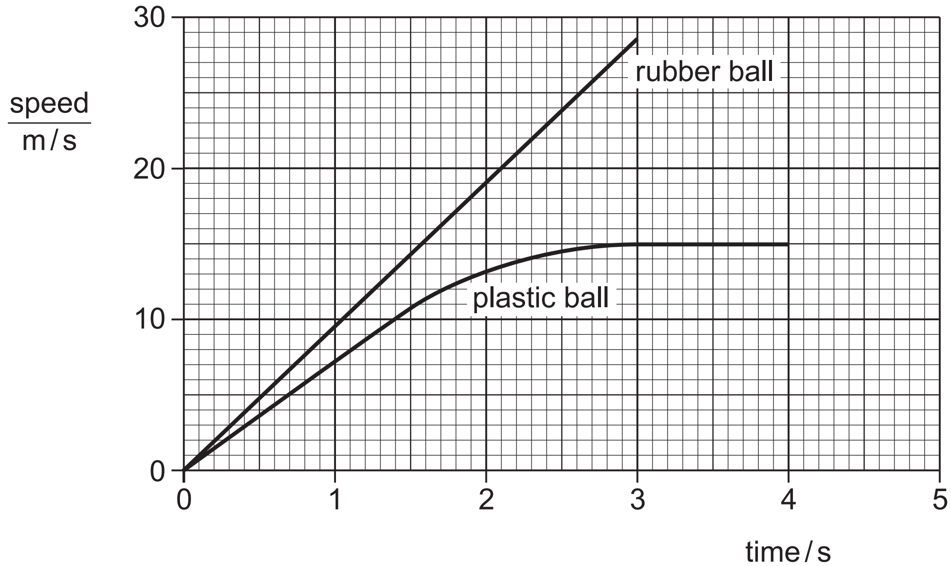

Fig. 1.1

Both balls fall from the same height above the ground.

(a) Use the graphs to find

(i) the average acceleration of the falling rubber ball during the first 3.0 s,

acceleration = ... [2]

(ii) the distance fallen by the rubber ball during the first 3.0 s,

distance = ... [2]

(iii) the terminal velocity of the plastic ball.

terminal velocity = ... [1]

(b) Both balls have the same mass but the volume of the plastic ball is much greater than that of the rubber ball. Explain, in terms of the forces acting on each ball, why the plastic ball reaches a terminal velocity but the rubber ball does not.

....

....

....

....

....

.... [3]

(c) The rubber ball has a mass of 50 g. Calculate the gravitational force acting on the rubber ball.

force = ... [2]

[Total: 10]

1 Fig. 1.1 shows the speed-time graph for a bus during tests.

At time t = 0, the driver starts to brake.

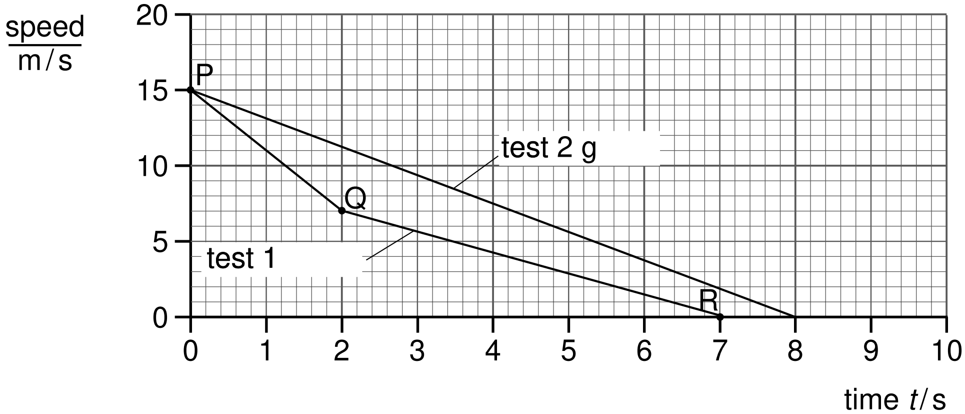

Fig. 1.1

(a) For test 1,

(i) determine how long the bus takes to stop,

....

(ii) state which part of the graph shows the greatest deceleration,

....

(iii) use the graph to determine how far the bus travels in the first 2 seconds.

distance = ...

[4]

(b) For test 2, a device was fitted to the bus. The device changed the deceleration.

(i) State two ways in which the deceleration during test 2 is different from that during test 1.

1 ....

2 ....

(ii) Calculate the value of the deceleration in test 2.

deceleration = ...
[4]

(c) Fig. 1.2 shows a sketch graph of the magnitude of the acceleration for the bus when it is travelling around a circular track at constant speed.

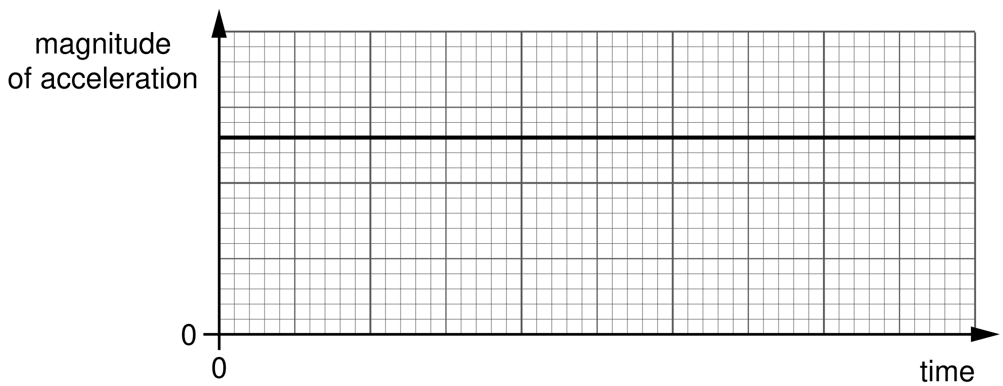

Fig. 1.2

(i) Use the graph to show that there is a force of constant magnitude acting on the bus.

....

....

(ii) State the direction of this force.

....
[3]

[Total : 11]

2 Fig. 1.1 shows a smooth metal block about to slide down BD, along DE and up EF. BD and DE are friction-free surfaces, but EF is rough. The block stops at F.

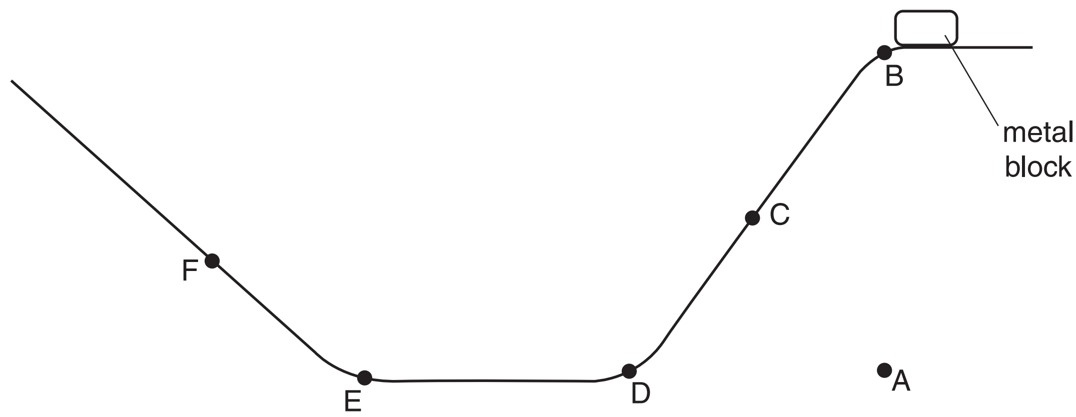

Fig. 1.1

(a) On Fig. 1.2, sketch the speed-time graph for the journey from B to F. Label D, E and F on your graph. [3]

Fig. 1.2

(b) The mass of the block is 0.2 kg. The vertical height of B above A is 0.6 m. The acceleration due to gravity is 10 m/s^2.

(i) Calculate the work done in lifting the block from A to B.

work done = ...

(ii) At C, the block is moving at a speed of 2.5 m/s. Calculate its kinetic energy at C.

kinetic energy = ...

[5]

(c) As it passes D, the speed of the block remains almost constant but the velocity changes. Using the terms *vector* and *scalar*, explain this statement.

....

....

....[2]

(d) F is the point where the kinetic energy of the block is zero. In terms of energy changes, explain why F is lower than B.

....

....

....

....[3]

[Total : 13]