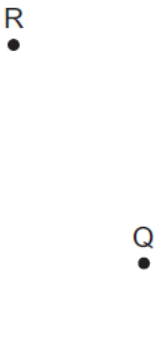
Kinematics – 2023 June AS Physics 9702

1. June/2023/Paper_ 9702/11/No.5

One object moves directly from P to R.



In a shorter time, a second object moves from P to Q to R.

Which statement about the two objects is correct for the journey from P to R?

A They have the same average speed.

B They have the same average velocity.

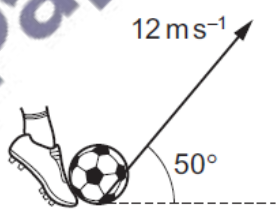
C They have the same displacement.

D They travel the same distance.

2. June/2023/Paper_ 9702/11/No.6

A ball is kicked so that it has an initial velocity of $12\,m\,s^{-1}$ at an angle of 50° to horizontal ground.

Assume that air resistance is negligible.

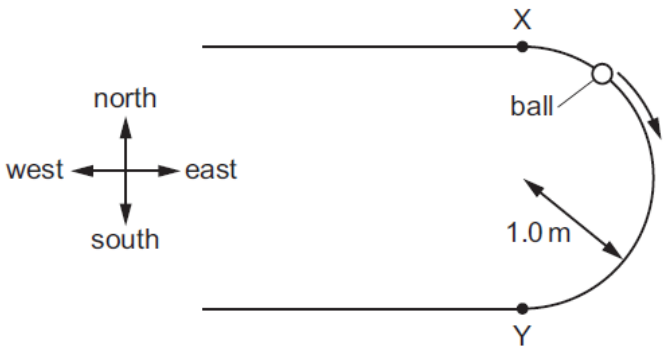


What is the maximum height above the ground that is reached by the ball?

A 0.47 m **B** 3.0 m **C** 4.3 m **D** 7.3 m

3. June/2023/Paper_ 9702/12/No.5

A ball travels from point X to point Y around a semicircular track of radius 1.0 m, as shown.



What is the displacement of the ball from X to Y?

A 2.0 m

B 2.0 m due south

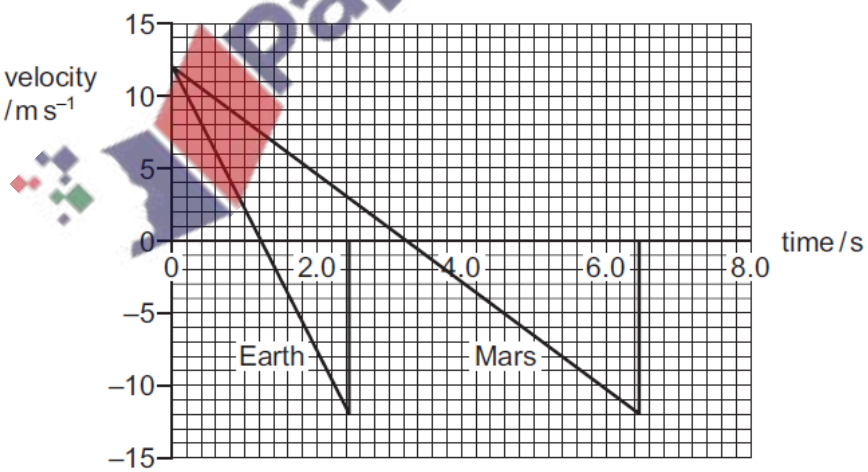
C 3.1 m

D 3.1 m due south

4. June/2023/Paper_ 9702/12/No.6

A rock is launched vertically upwards from the surface of the Earth and an identical rock is launched vertically upwards from the surface of Mars. Each rock is launched with an initial velocity of 12 m s^{-1}.

Each rock then reaches its maximum height above the surface before returning back down to the surface. The velocity–time graph for each rock is shown. In both cases, air resistance is negligible.



What is the difference in the maximum heights of the two rocks?

A 12 m **B** 15 m **C** 19 m **D** 24 m

5. March/2023/Paper_ 9702/12/No.5

A ball is kicked upwards at an angle of 45° to horizontal ground. After a short flight, the ball returns to the ground.

It may be assumed that air resistance is negligible.

What is **never** zero during the flight of the ball?

A the horizontal component of the ball's acceleration

B the horizontal component of the ball's velocity

C the vertical component of the ball's momentum

D the vertical component of the ball's velocity

6. March/2023/Paper_ 9702/22/No.1(b)

(b) A toy car moves in a horizontal straight line. The displacement s of the car is given by the equation

$$s = \frac{v^2}{2a}$$

where a is the acceleration of the car and v is its final velocity.

State **two** conditions that apply to the motion of the car in order for the above equation to be valid.

1 .....

2 .....

[2]

7. March/2023/Paper_ 9702/22/No.2(d)

A motor uses a wire to raise a block, as illustrated in Fig. 2.1.

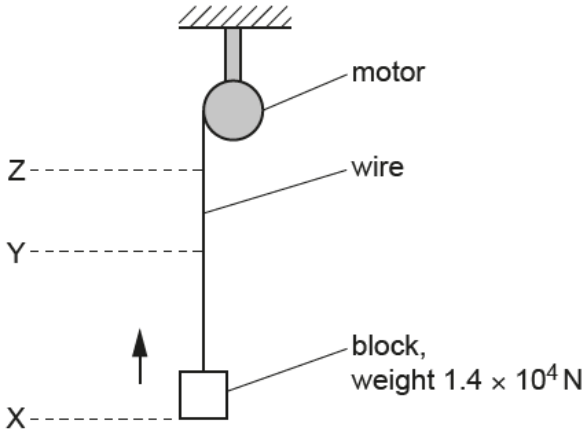


Fig. 2.1 (not to scale)

The base of the block takes a time of 0.49 s to move vertically upwards from level X to level Y at a constant speed of 0.64 m s^{-1}. During this time the wire has a strain of 0.0012. The wire is made of metal of Young modulus 2.2 × 10^{11} Pa and has a uniform cross-section.

The block has a weight of 1.4 × 10^4 N. Assume that the weight of the wire is negligible.

(d) The base of the block is at levels X, Y and Z at times t_X, t_Y and t_Z respectively.

On Fig. 2.2, sketch a graph to show the variation with time t of the distance d of the base of the block from level X. Numerical values of d and t are not required.

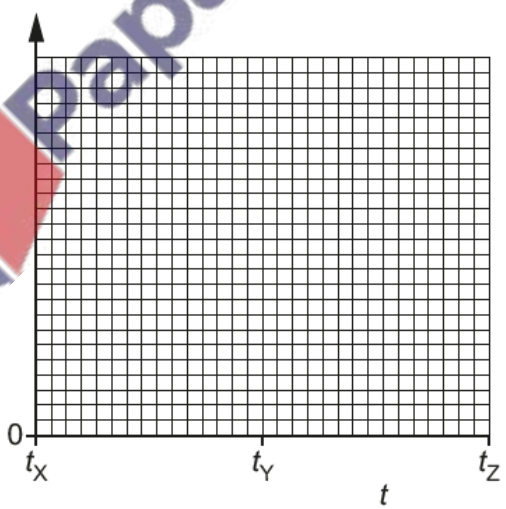


Fig. 2.2

[2]