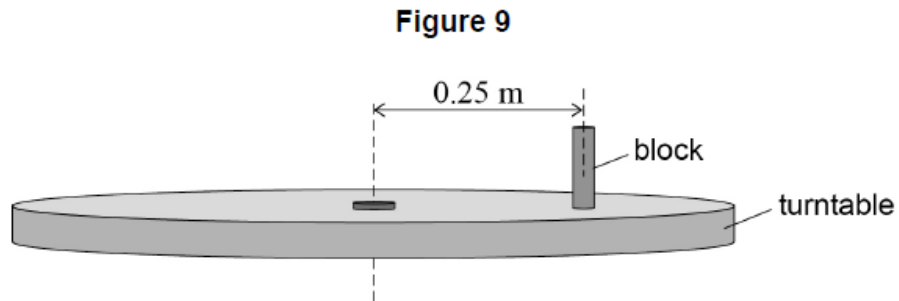


Periodic motion – A2 Physics P1 2022

1. June /2022/Paper_ 7408/1/No.5

0 5

A teacher sets up a demonstration to show the relationship between circular motion and simple harmonic motion (SHM). She places a block on a turntable at a point 0.25 m from its centre, as shown in Figure 9.



The turntable rotates with an angular speed of 1.8 rad s^{-1} and the block does not slip.

0 5 . 1

Calculate the time taken for the turntable to complete one revolution.

[2 marks]

time = _____ s

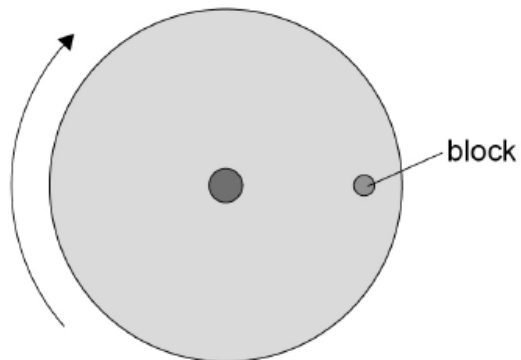
0 5 . 2

Figure 10 shows a plan view of the turntable and block.
The turntable rotates in a clockwise direction.

Draw an arrow on **Figure 10** to show the direction of the resultant force on the block.

[1 mark]

Figure 10



0 5 . 3

The mass of the block is 0.12 kg.

Calculate the magnitude of the resultant force on the block.

[2 marks]

magnitude of force = _____ N

0 5 . 4

Describe, with reference to one of Newton's laws of motion, the evidence that a resultant force is acting on the block.

[2 marks]

0 5 . 5

The teacher adjusts the angular speed of the turntable so that the block completes one rotation every 2.50 s.

She sets up a simple pendulum above the centre of the turntable so that it swings in phase with the movement of the block.

Calculate the length of the simple pendulum.

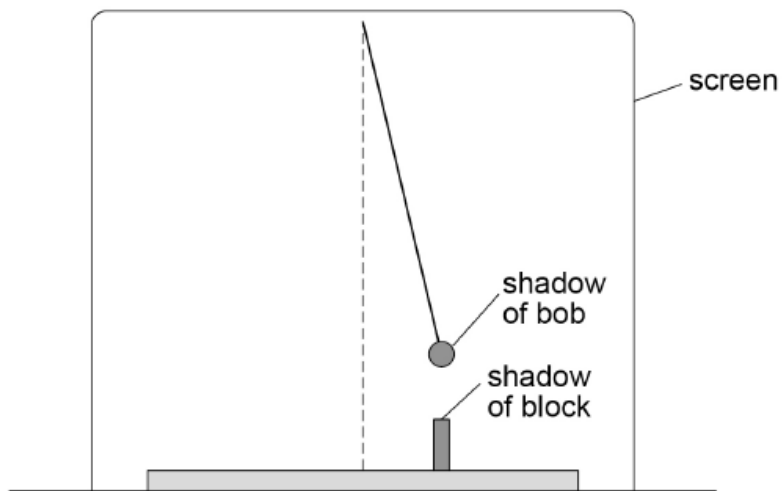
[2 marks]

length = _____ m

0 5 . 6

A lamp is used to project shadow images of the block and pendulum bob on a screen. Both shadows appear to move with SHM across the screen. **Figure 11** shows the images on the screen at one instant.

Figure 11



Initially the shadows move in phase with the same amplitude.

Air resistance affects the motion of the pendulum.

Suggest the effect this has on the amplitude relationship and the phase relationship between the moving shadows.

[2 marks]

amplitude _____

phase _____

2. June /2022/Paper_ 7408/1/No.31

A particle performs simple harmonic motion with a time period of 1.4 s and an amplitude of 12 mm.

What is the maximum speed of the particle?

[1 mark]

A 8.6 mm s⁻¹

B 27 mm s⁻¹

C 54 mm s⁻¹

D 110 mm s⁻¹