

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Q1.

A student carries out an investigation using a metre rule as a pendulum.

- (a) **Diagram 1** shows a metre rule.

Diagram 1



- (i) Draw, on **Diagram 1**, an **X** to show the position of the centre of mass of the rule.

(1)

- (ii) State what is meant by the 'centre of mass of an object'.

(1)

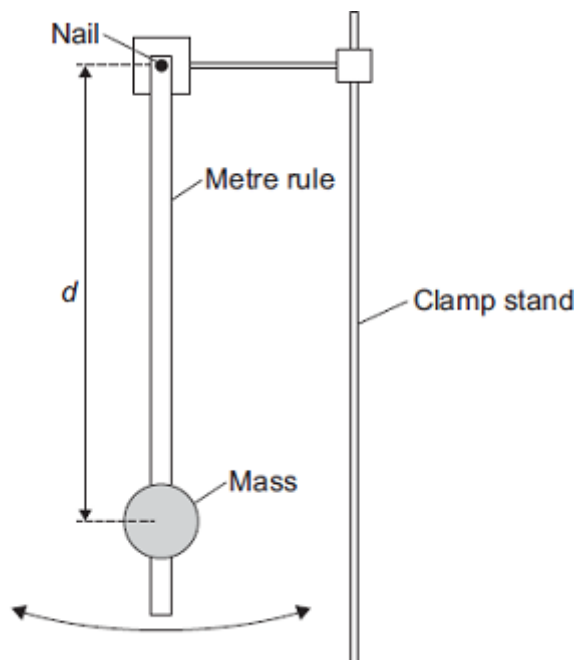
- (b) The student taped a 100 g mass to a metre rule.

She set up the apparatus as shown in **Diagram 2**.

She suspended the metre rule from a nail through a hole close to one end, so she could use the metre rule as a pendulum.

The distance d is the distance between the nail and the 100 g mass.

Diagram 2



- (i) Draw, on **Diagram 2**, a **Y** to show a possible position of the centre of mass of the pendulum. (1)
- (ii) The student carried out an investigation to find out how the time period of the pendulum varies with d .

Some of her results are shown in the table.

| Time for 10 swings in seconds | | | | | |
|-------------------------------|------------|-------------|------------|------------|----------------------------------|
| d in cm | First test | Second test | Third test | Mean value | Mean time for 1 swing in seconds |
| 10.0 | 15.3 | 15.4 | 15.5 | 15.4 | 1.54 |
| 30.0 | 14.7 | 14.6 | 14.7 | 14.7 | 1.47 |
| 50.0 | 15.3 | 15.6 | 15.4 | 15.4 | 1.54 |
| 70.0 | 16.5 | 16.6 | 16.5 | | |

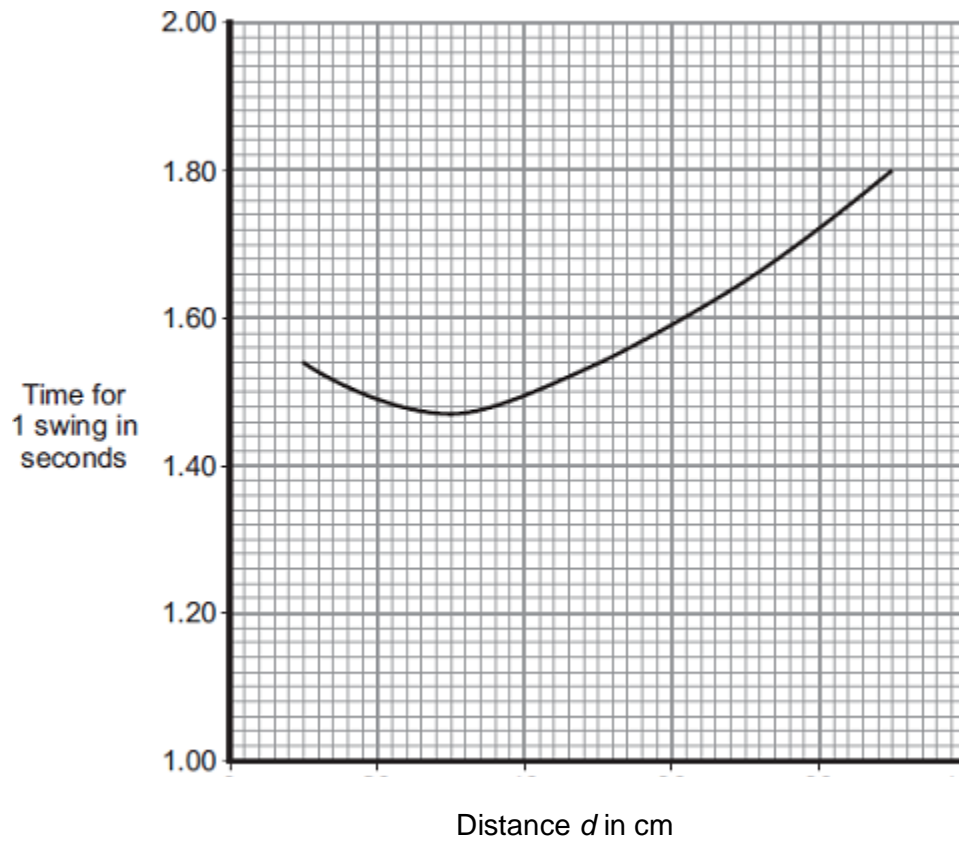
Complete the table.

You may use the space below to show your working.

(3)

- (iii) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe how the student would carry out the investigation to get the results in the table



- (i) Describe the pattern shown by the graph.

(2)

- (ii) The student thinks that the measurements of time for $d = 10$ cm might be anomalous, so she takes a fourth measurement.

Her four measurements are shown below.

15.3 s 15.4 s 15.5 s 15.3 s

State whether you consider any of these measurements to be anomalous.

Justify your answer.

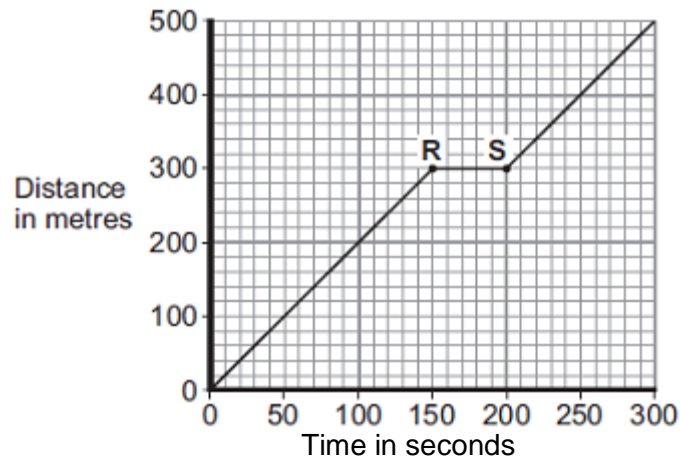
(2)

(Total 16 marks)

Q2.

(a) **Figure 1** shows the distance–time graph for a person walking to a bus stop.

Figure 1



(i) Which **one** of the following statements describes the motion of the person between points **R** and **S** on the graph?

Tick (✓) **one** box.

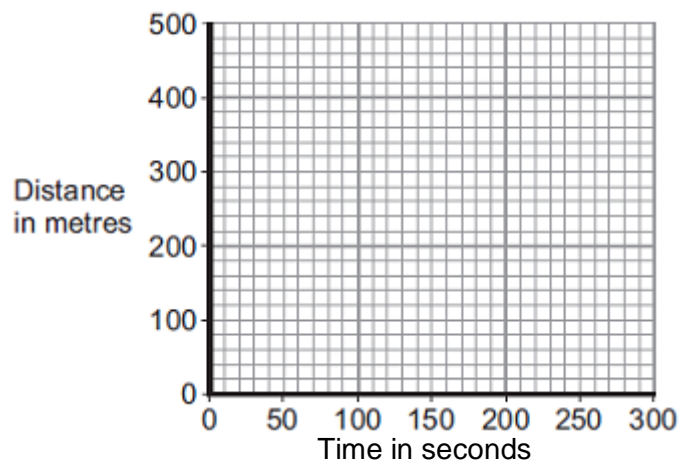
- Not moving
- Moving at constant speed
- Moving with increasing speed

(1)

(ii) Another person, walking at constant speed, travels the same distance to the bus stop in 200 seconds.

Complete **Figure 2** to show a distance–time graph for this person.

Figure 2



(1)

(b) A bus accelerates away from the bus stop at 2.5 m/s^2 .

The total mass of the bus and passengers is 14 000 kg.

Calculate the resultant force needed to accelerate the bus and passengers.

Resultant force = _____ N

(2)

(Total 4 marks)