CANBERRA SECONDARY SCHOOL

NA

2019 Semestral Examination 2

Secondary Three Normal Academic

5105 SCIENCE (PHYSICS)
PAPER 1 & 2

07 Oct 2019
1 hour 15 minutes
0820h – 0935h

Name: _____ ( ) **Class:** _____

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.
Write your full name, class and index number in the spaces provided on the question paper and on any separate writing papers used.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **ALL** questions in **Paper 1**. Indicate your answers on the **OTAS** provided.
You are advised to spend no more than 30 minutes on **Paper 1.**

Answer ALL questions in **Paper 2 Section A** and any **TWO** questions in **Section B**.
Write all your answers on the space provided. You are required to show all your workings.

The number of marks is given in brackets [ ] at the end of each question or part question.

At the end of the examination, hand in your OTAS and question paper.

You may use a calculator for this examination.

FOR MARKER'S USE		
Section	Marks Awarded	Max Marks
Paper 1		20
Paper 2		30
Total		50

This question paper consists of 17 printed pages including the cover page.

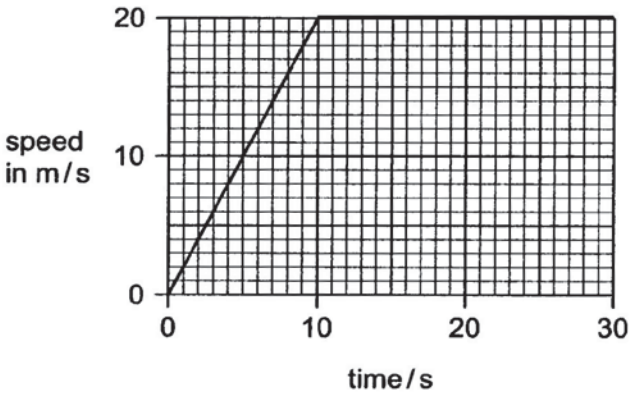
Setter: Mr Raj

Paper 1 (20 marks)

1 Which of the following sets shows scalar quantities only?

A mass, frequency, density, force
B time, mass, volume, frequency
C weight, velocity, acceleration, force
D mass, time, frequency, weight

2 The graph shows part of a car journey.



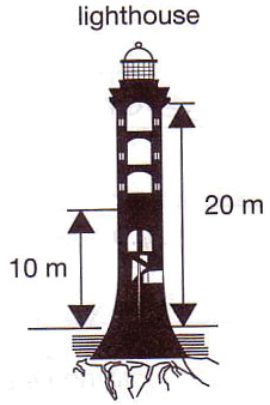
What is the acceleration of the car in the first 10 seconds?

A 0.5 m/s^2 **B** 1 m/s^2
C 2 m/s^2 **D** 6 m/s^2

3 A metal container has a mass of 200 kg. When the drum is filled with 1.0 m^3 of liquid, the total mass is 1200 kg. What is the density of the liquid?

A 0.005 kg/m^3
B 200 kg/m^3
C 1000 kg/m^3
D 1200 kg/m^3

4 Two similar squash balls are released from a lighthouse. One falls from a height of 20 m from the lighthouse and another from a height of 10 m as shown below.



Which quantity is the same for both the balls?

A acceleration
B final velocity
C increase in velocity
D time of travel

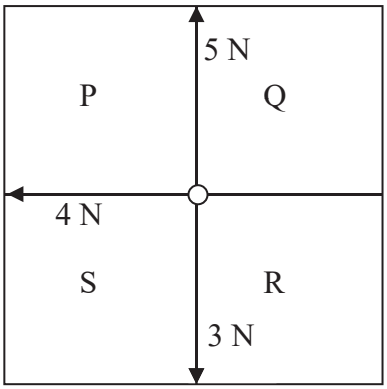
5 A 5 N force is applied to push a box across a horizontal ground at constant speed. What will happen to the box if the force is increased?

A The box will start to accelerate.
B The box continues to move at constant speed.
C The box starts to slow down.
D The box moves at constant speed for a while and then speed up.

6 A body weighs 100 N on earth where the acceleration due to gravity is 10 m/s^2. When taken to the moon, where the acceleration due to gravity is 1.6 m/s^2, the weight of the body would be

A 0 N.
B 16 N.
C 32 N.
D 100 N.

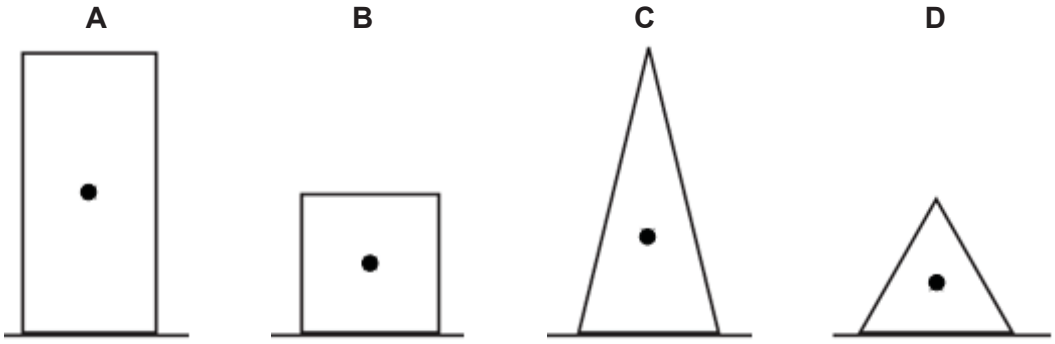
7 The diagram below shows the top view of a field separated into four sectors **P**, **Q**, **R** and **S**. A cart tied to three ropes is placed in the middle of the field. Three bull carts start to pull the ropes (with forces indicated in the diagram) at the same time.



In which sector will the cart start to move initially?

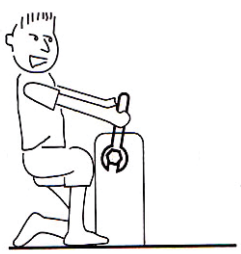
A sector **P**
B sector **Q**
C sector **R**
D sector **S**

8 The diagram below shows four objects of equal mass and base area. The position of the centre of gravity of each object is marked with a dot. Which object is the least stable?

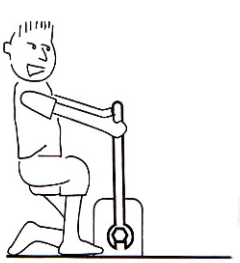


9 Tom is having difficulty in turning the nut using the spanner. He pulls with the same force in each case. Which diagram shows him producing the biggest turning effect?

A

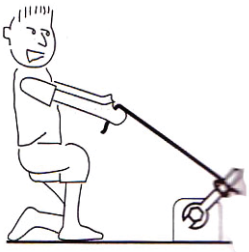


B



C

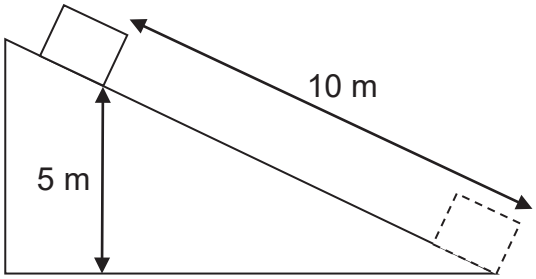
D



10 A car travels down a slope at a constant velocity without any energy input from its engine. Which of the following statements explains this phenomenon?

A The loss in gravitational potential energy is used to overcome friction.
B No energy conversion takes place since the engine is not doing any work.
C The loss in gravitational potential energy results in a gain in kinetic energy.
D It is not possible for the car to travel down the slope at a constant velocity since there is no energy input from the engine.

11 A box of mass 5 kg is pulled from the bottom of a frictionless slope to a position near the top of the slope, as shown in the diagram below. Take g = 10 N/kg.



What is the amount of work done?

A 25 J
B 50 J
C 250 J
D 500 J

12 A lift motor can transport a box weighing 1000 N through a vertical height. The box is placed on a contact surface area of 2 m^2 on the floor. What is the pressure exerted by the box?

A 500 Pa
B 1000 Pa
C 2000 Pa
D 5000 Pa

13 Which of the following statement best explains why gases have no fixed shape and size?

A They intermolecular force between molecules is strong so the molecules are able to move freely.
B The intermolecular force between molecules is strong so the space between molecules is wider than when they are in solid and liquid state.
C The intermolecular force between the molecules is weak as compared to its kinetic energy.
D The intermolecular force between the molecules is weak and they are far apart.

14 Conduction and convection can happen in various state of matter. Which of the following is correct?

	conduction of heat	**convection of heat**
A	can happen in liquid and gas only	can happen in solid, liquid and gas
B	can happen in solid, liquid and gas	can happen in a solid, liquid and gas
C	can happen in solid and liquid only	can happen in liquid and gas only
D	can happen in solid, liquid and gas	can happen in liquid and gas only

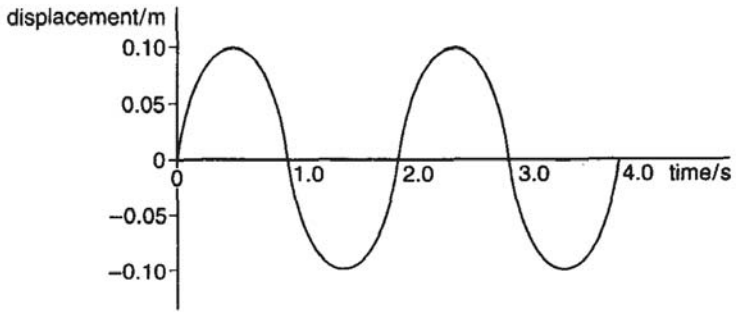
15 When a glass rod is heated on one end, the molecules at the heated end transfer thermal energy to the colder end by

A moving from the heated end to the colder end.
B radiating infra-red rays to the colder end.
C vibrating more vigorously and knocking into their neighbouring molecules.
D warming up the air above the heated end.

16 When water evaporates, some molecules escape. Which molecules escape?

A The molecules at the bottom of the liquid with more energy than others.
B The molecules at the surface with more energy than others.
C The molecules at the bottom of the liquid with less energy than others.
D The molecules at the surface with less energy than others.

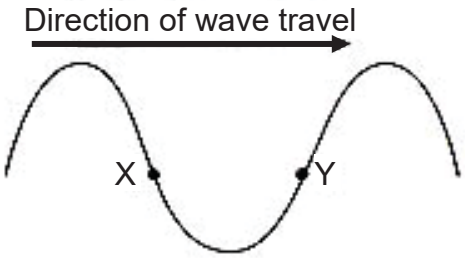
17 The diagram shows how the displacement varies with time as a wave passes a fixed point.



What is the time taken to travel ten cycles for this wave?

A 10.0 s
B 20.0 s
C 30.0 s
D 40.0 s

18 A transverse wave travels steadily from left to right as shown.



What is the direction of vibration of the particles **X** and **Y**?

	X	**Y**
A	downwards	downwards
B	downwards	upwards
C	to the right	to the right
D	upwards	downwards

19 Electromagnetic waves have many different applications. Which row identifies the type of electromagnetic wave used in each application?

	satellite television	**terrestrial television (not satellite)**	**television remote controllers**
A	microwaves	radio waves	infrared waves
B	microwaves	radio waves	microwaves
C	radio waves	infrared waves	infrared waves
D	radio waves	infrared waves	microwaves

20 A trumpet and a flute are played by two students. The note from the trumpet is louder and has a lower pitch than the note from the flute. How do the amplitude and frequency of the sound from the trumpet compare to the amplitude and frequency from the flute?

	trumpet's amplitude	**trumpet's frequency**
A	larger	higher
B	larger	lower
C	smaller	higher
D	smaller	lower

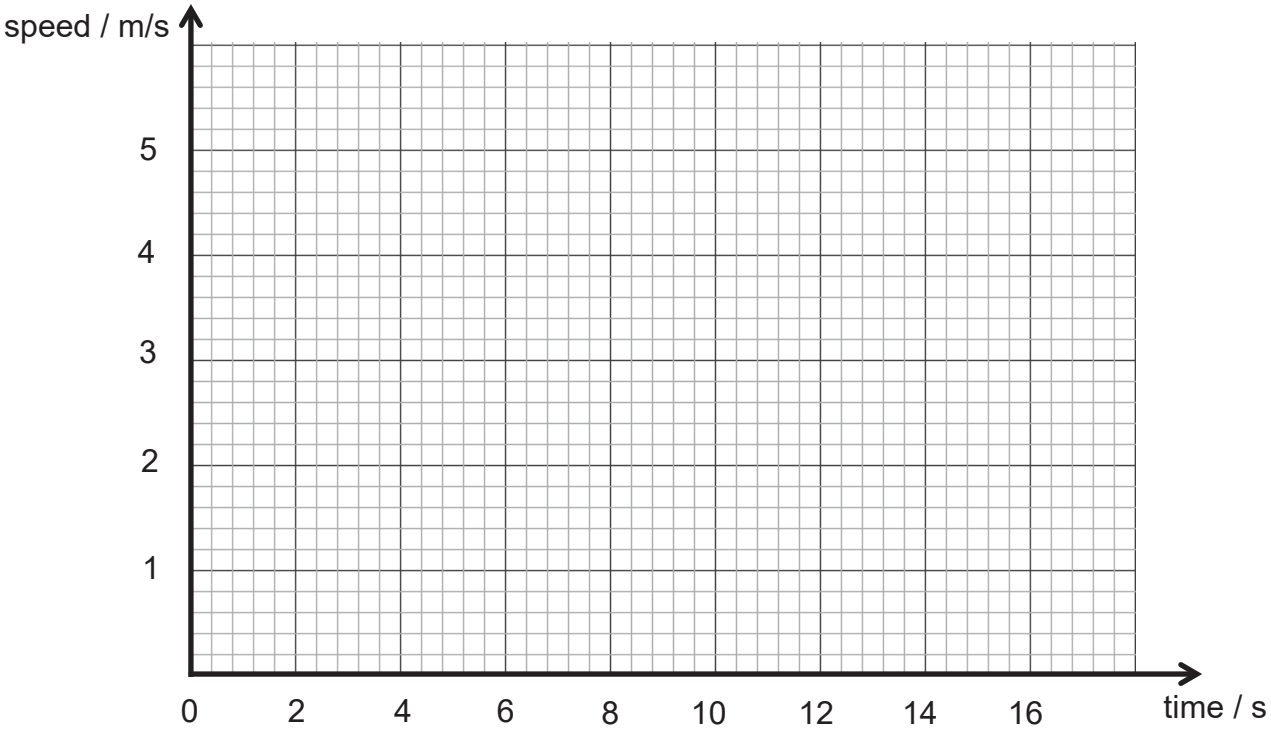
End of Paper 1

Paper 2
Section A
Answer all Questions (14 marks)

1 The table below shows the time and speed of a toy car moving down a slope.

time / s	speed / m/s
0	0.0
2	1.0
4	2.5
6	3.0
8	3.5
10	5.0

(a) Plot a graph of speed against time in the grid provided below. Mark each point with a cross (x). Draw a line of best fit. [2]



(b) Explain how can you infer from the graph that the acceleration of the toy car is constant. [1]

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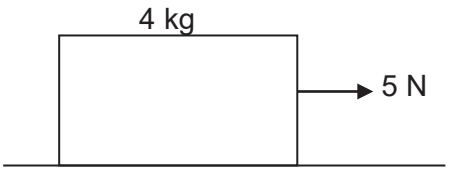
(c) Calculate the distance travelled by the toy car from 0 s to 10 s.

distance travelled = …….. m [2]

2 A box of mass 4 kg is initially at rest on a rough ground. A force of 5 N is applied horizontally to the right, giving the box an acceleration of 1 m/s^2, as shown in the figure below.



(a) Draw and label clearly the frictional force acting on the box. [1]

(b) Calculate the resultant force acting on the box. Show your working.

resultant force = ...N [2]

(c) Hence, calculate the frictional force acting between the box and the rough ground.

frictional force = …….....N [1]

(d) The applied force of 5 N is removed after a few seconds. Describe what happens to the motion of the box after the 5 N force is removed. [1]

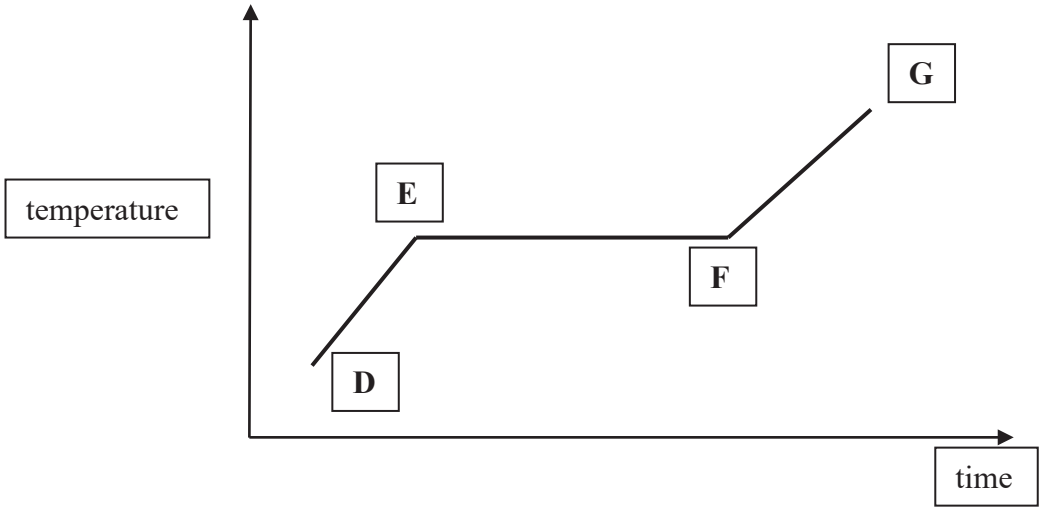
……...

……

3 A Sonar system sends a sound signal to the bottom of the sea and receives the echo 2 s later. If sound travels at 1500 m/s in sea water, calculate the depth of the sea.

depth = ……..... m [2]

4 The graph below shows how the temperature of a pure substance varied as heat was supplied to it at a constant rate.



At point **D**, the substance was solid.

Explain what happened to the substance between **DE** and **EF**. [2]

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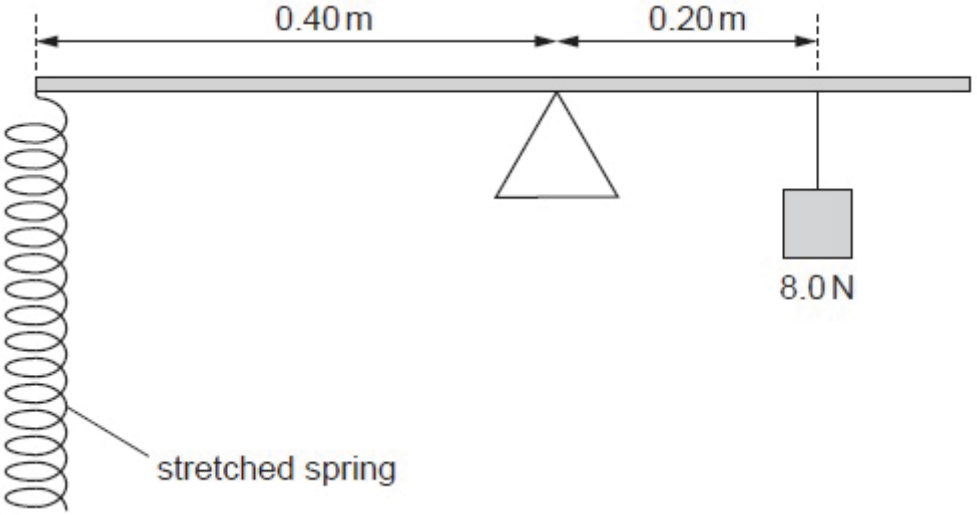
Section B
Answer any TWO questions (16 marks)

5 A metre rule is pivoted as shown in the figure below.

A weight of 8.0 N is suspended from the rule at a distance of 0.20 m from the pivot, as shown in the figure below. The meter rule is held horizontally by means of a stretched spring that is 0.40 m from the pivot. (Take the rule to be weightless)



(a) State the principle of moments. [1]

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……

(b) Calculate

(i) the moment of the 8.0 N weight about the pivot,

moment = ……Nm [2]

(ii) the force exerted on the metre rule by the spring.

force = ……N [1]

(c) Given that the spring extends by 2 cm after the force has been applied for 5 s, calculate

(i) the work done in stretching the spring,

work done = ……J [2]

(ii) the power developed by the 8.0 N weight.

power = ……W [1]

(d) Stretching the same spring through the same distance on the Moon would require the pupil to do less work than on the Earth.

Suggest why the work done would be less. [1]

……...

……...

6 (a) There are two types of waves, transverse and longitudinal. Give an example of each type.

(i) Transverse : …… [1]

(ii) Longitudinal : …… [1]

(b) State the difference between a transverse and a longitudinal wave. [1]

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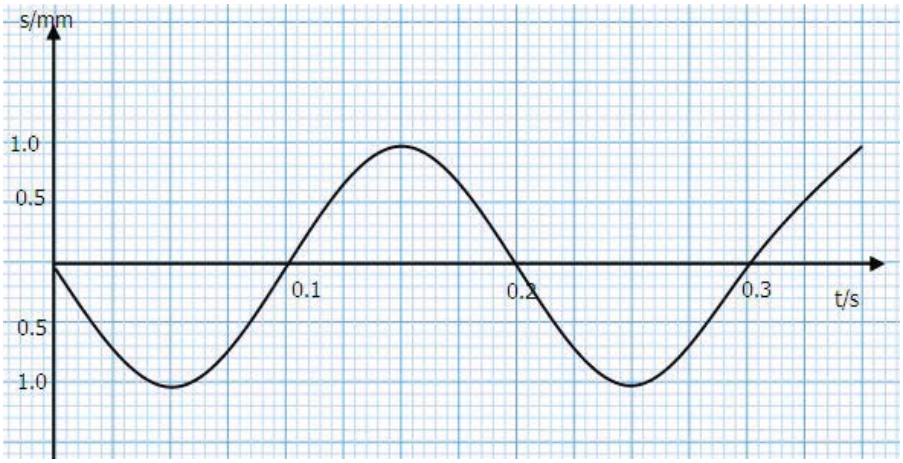
(c) The figure below shows a graph of the vertical displacement s of a wave with time t travelled by the wave.



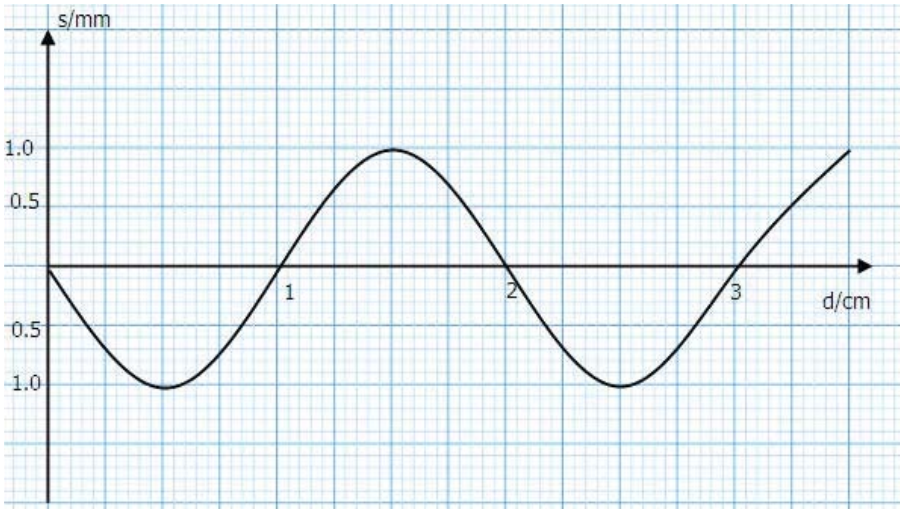
(i) State the period of the wave.

period = ……s [1]

(ii) Determine the frequency of the wave.

frequency = ……Hz [2]

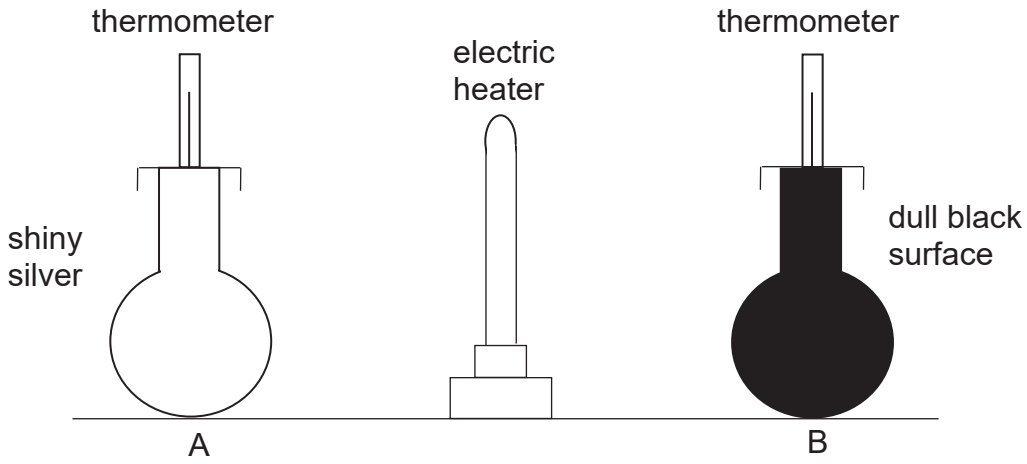
(d) The graph below shows the vertical displacement **s** with distance **d** travelled by the same wave in part (c).



By using your answer in part (c), calculate the speed of the wave.

speed = ……m/s [2]

7 The diagram shows two similar metal flasks. One has a dull black surface and the other has a shiny silver surface. The flasks are filled with equal volumes of water. A lid, with thermometer, is placed on each flask. The flasks are placed the same distance from an electric heater. The initial temperature of the water in each flask is the same.



(a) State the main process by which energy from the electric heater reaches the flasks. [1]

……..……..

(b) The temperature of the water in both flasks rises. In which flask, **A** or **B**, will the temperature rise more quickly? Explain your answer. [2]

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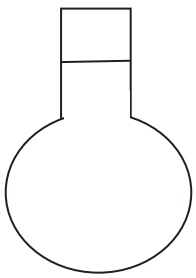
(c) Draw an arrow on the diagram to show the movement of the water flow in the shiny silver flask heated up by the electric heater. [1]



(d) Name the process involved in (c). [1]

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(e) When the water reaches its boiling point, state and explain what would happen to the final temperature of the water if it is heated more strongly. [2]

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(f) State one difference between boiling and evaporation. [1]

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End of Paper