| Name: | Index Number: | Class: |
|---|---|---|
| | | |

# YIO CHU KANG SECONDARY SCHOOL
# END-OF-YEAR EXAMINATION 2019
# SECONDARY THREE EXPRESS

## SCIENCE (PHYSICS)
Paper 1

5076/01
1 hour 45 minutes
(For Papers 1 and 2)

Additional Materials:
Optical Answer Sheet (OAS)

8 October 2019 (Tuesday)

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil on the OAS.
Do not use staples, paper clips, glue or correction fluid.
Write your name, index number and class on the OAS in the spaces provided.

There are **twenty** questions on this paper. Answer all questions.
For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate OAS.
Read the instructions on the OAS very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this question paper.
The use of an approved scientific calculator is expected, where appropriate.

| For Examiner's Use |
|---|
| 20 |

Setter: Ms Teo Hwee Hong

This document consists of **8** printed pages.

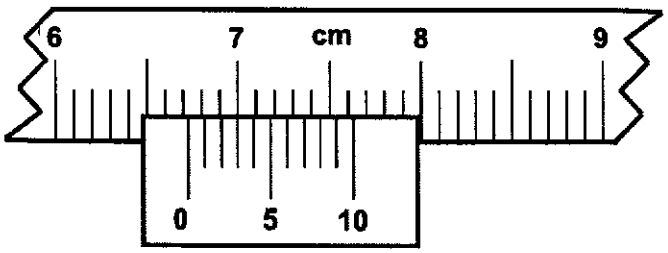
partnerInLearning
More papers at www.testpapersfree.com

partnerInLearning
More papers at www.testpapersfree.com

1 Which length is the longest?

A 0.00 000 095 Mm
B 0.00 095 Gm
C 950 000 nm
D 9 500 μm

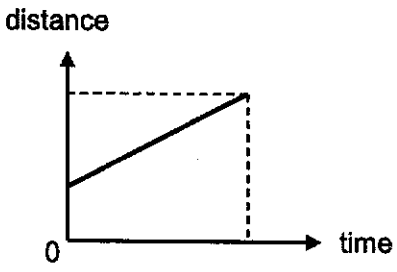
2 The main scale and vernier scale of a pair of vernier calipers are shown below.




What is the reading shown?

A 6.43 cm
B 6.47 cm
C 6.73 cm
D 6.77 cm

3 The distance-time graph shows the distance travelled by a moving vehicle.

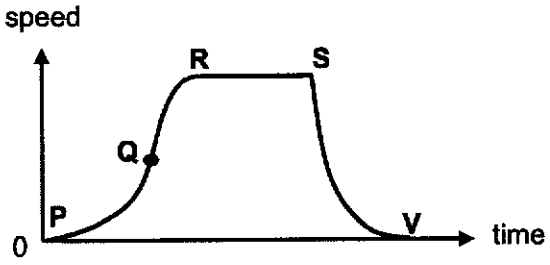



What feature of the graph gives the speed of the vehicle?

A the area between the line and the distance axis
B the area between the line and the time axis
C the difference between the starting and finishing distances
D the gradient of the line


partnerInLearning
More papers at www.testpapersfree.com

4 The diagram shows a speed-time graph.

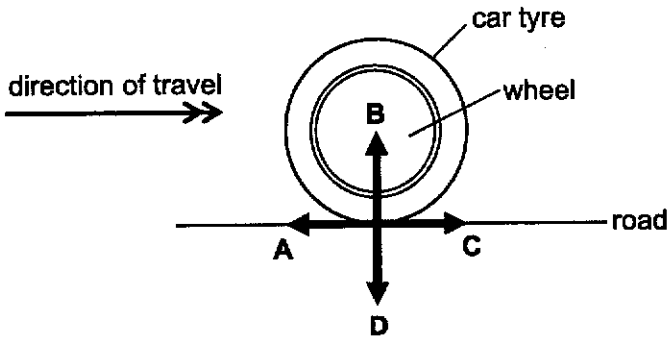



In which region is the acceleration increasing?

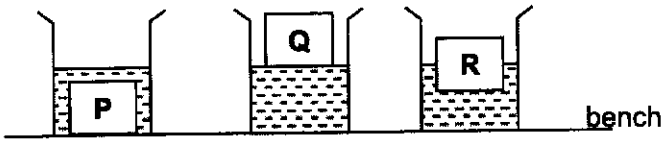
A P to Q
B Q to R
C R to S
D S to V

5 A car is accelerating along a road in the direction as shown.
The wheel shown is connected to the engine.

In which direction is the force of friction exerted by the road on the car tyre?




6 Three different types of wooden block which are of the same size are introduced into the same type of liquid as shown.

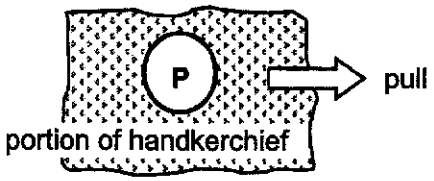



Which option shows the density of the wooden blocks in descending order?

A P, Q, R
B P, R, Q
C Q, P, R
D R, P, Q


partnerInLearning
More papers at www.bestpapersfree.com

7 A handkerchief is spread on a table top and a paper weight, **P**, is placed on top of the handkerchief as shown.




When Janelle pulls the handkerchief away quickly, the paper weight remains at the original position.

Which of the following properties causes this to happen?

**A** centre of gravity

**B** gravitational pull

**C** inertia

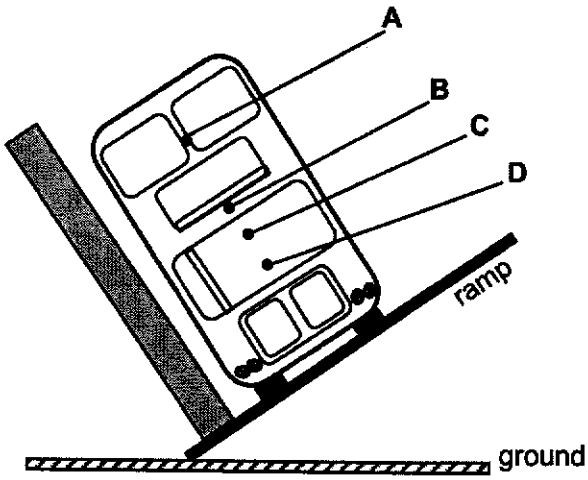
**D** principle of moments

8 A rock of mass 16 kg on Earth is brought to Mars.
The gravitational field strength on the Earth is 10 N/kg and on Mars is 3.8 N/kg.

What are the mass and weight of the rock on Mars?

| | mass / kg | weight / N |
|---|---|---|
| **A** | 16 | 60.8 |
| **B** | 16 | 160 |
| **C** | 60.8 | 60.8 |
| **D** | 60.8 | 160 |

9 The bus on a ramp is undergoing a stability test.

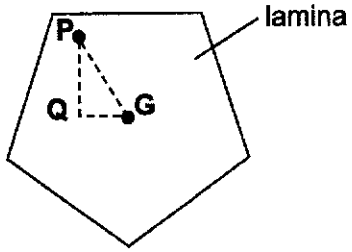



If the diagram shows the maximum angle of inclination for the bus before it topples over, which position is likely to be its centre of gravity?


partnerInLearning
More papers at www.testpapersfree.com

10 A lamina is freely pivoted from the point **P**.

The weight of the lamina is 3.5 N and the centre of gravity is at point **G**.




**PQ** = 0.6 m

**QG** = 0.5 m

The lamina is displaced to the position shown.

What is the moment about **P** due to the weight of the lamina?

**A** 1.75 Nm in anticlockwise direction

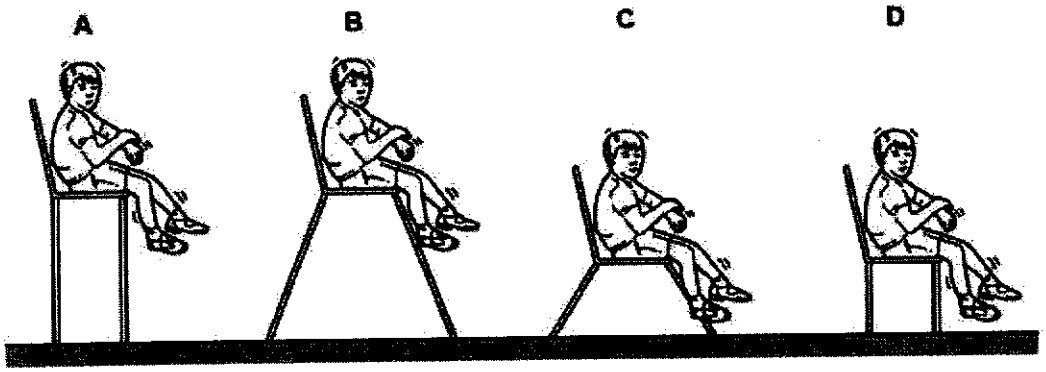
**B** 1.75 Nm in clockwise direction

**C** 2.10 Nm in anticlockwise direction

**D** 2.10 Nm in clockwise direction

11 The diagram below shows four different types of chairs for young children.

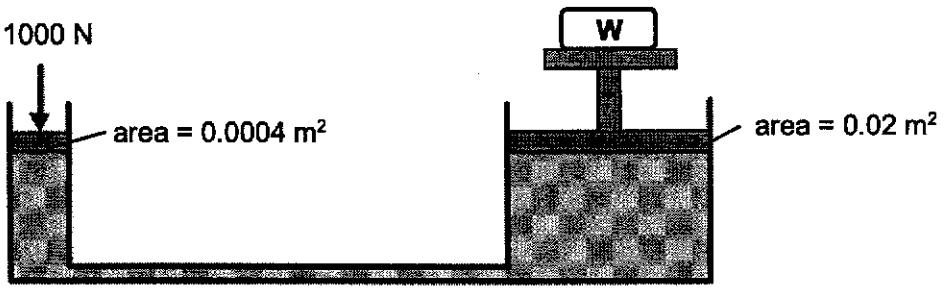
Which chair is the most stable?






partnerInLearning
More papers at www.testpapersfree.com

**12** A hydraulic lift is shown in the diagram below.




What is the maximum weight, **W**, that can be lifted?

**A** 0.00002 N

**B** 0.08 N

**C** 20 N

**D** 50 000 N

**13** An elephant has a weight of 48 000 N.
The area of contact of each foot of the elephant on the ground is 0.25 $m^2$.

Calculate the pressure exerted by the elephant on the floor while standing on two feet.

**A** 6 000 Pa

**B** 48 000 Pa

**C** 96 000 Pa

**D** 192 000 Pa

**14** An object moving at a speed of 40 m/s has a kinetic energy of 4800 J.

Calculate the mass of this object.

**A** 1.5 kg

**B** 6.0 kg

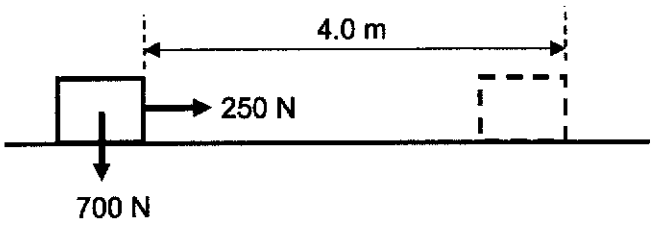
**C** 60 kg

**D** 240 kg



partnerInLearning
More papers at www.testpapersfree.com

15 When a 250 N force is applied to a box weighing 700 N, the box moves 4.0 m horizontally in 20 s.




Calculate the average power developed by the 250 N force.

**A** 3.13 W
**B** 50 W
**C** 140 W
**D** 190 W

16 An electric appliance is found to convert 75% of its input energy to heat, 20% to kinetic energy and 5% to sound energy.

What is this appliance?

**A** a hair dryer
**B** a loudspeaker
**C** an electric iron
**D** an electric heater

17 Which of the following statements about the kinetic model of matter is correct?

**A** Molecules expand when heated.
**B** Molecules in a gas are much further apart than in a liquid.
**C** Molecules in a solid are much further apart than in a liquid.
**D** Molecules in a solid can move around each other.


partnerInLearning
More papers at www.testpapersfree.com

18 What does the additional mechanism for heat transfer in a typical metallic conductor involve?

A atoms near the hotter end vibrating with big amplitudes about their fixed positions and transferring their energy to neighbouring atoms located in the cooler regions by knocking against them

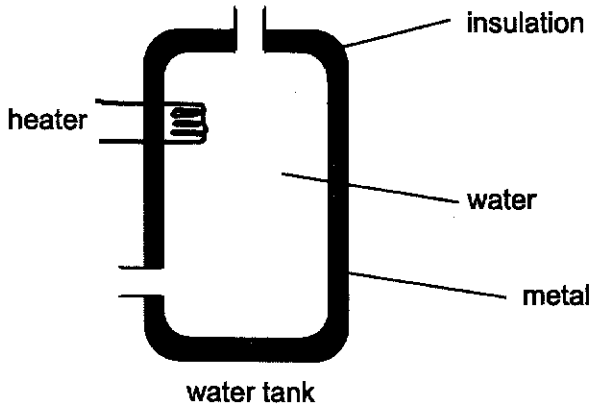
B the atoms near the hotter end sending out energy to atoms near the cooler end

C the diffusion of atoms in the conductor from the hotter end to the cooler end

D the diffusion of free electrons from the hotter end to the cooler end of the conductor carrying their energy along with them

19 Water at the top of a hot water tank is heated and the water becomes hot.

No water enters or leaves the tank.




Water at the bottom of the tank remains cold for a period of time.

Why is this so?

A cold water at the top will sink to the bottom

B hot water at the bottom of the tank rises to the top

C the insulation is a poor conductor of heat

D water is a poor conductor of heat

20 Which of the following correctly describes the changes that occur during melting?

| | attractive force between particles | distance between particles | kinetic energy of particles |
|---|---|---|---|
| A | decreases | increases | remains constant |
| B | decreases | decreases | increases |
| C | increases | decreases | remains constant |
| D | increases | increases | decreases |



partnerInLearning
More papers at www.testpapersfree.com

| Name: | Index Number: | Class: |
|---|---|---|
| | | |

# YIO CHU KANG SECONDARY SCHOOL
# END-OF-YEAR EXAMINATION 2019
# SECONDARY THREE EXPRESS

## SCIENCE (PHYSICS)
Paper 2

5076/02
1 hour 45 minutes
(For Papers 1 and 2)

8 October 2019 (Tuesday)

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your name, index number and class on the cover page.
Write in dark blue or black ink.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

**Section A**
Answer **all** questions in the spaces provided.

**Section B**
Answer any **two** questions in the spaces provided.

The number of marks is given in brackets [ ] at the end of each question or part question.
At the end of the examination, fasten all your work securely together.

For Examiner's Use

| | |
|---|---|
| Section A | / 45 |
| Section B | / 20 |
| Total | / 65 |

Parent's / Guardian's signature

Setter: Ms Teo Hwee Hong

This document consists of **19** printed pages and **1** blank page.

partnerInLearning
More papers at www.testpapersfree.com

## SECTION A

Answer **all** questions in this section in the spaces provided.

1 Vernier calipers and micrometer screw gauge are used to measure very short lengths.

**(a)** Complete the following sentence.

Vernier calipers may be used to measure to the nearest ..... mm. [1]

**(b)** Catherine measures the thickness of 60 sheets of paper with a micrometer screw gauge.

The barrel and the thimble of a micrometer screw gauge are shown in Fig. 1.1.

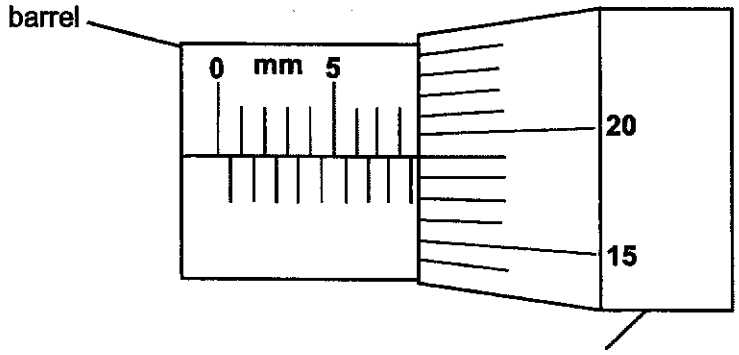



**Fig. 1.1**

(i) Record the reading of the micrometer screw gauge shown in Fig. 1.1.

reading = ..... mm [1]

(ii) Determine the thickness of **one** sheet of paper.

thickness = ..... mm [2]

**(c)** Jerrick is thinking of using a metre rule to measure the thickness of 60 sheets of paper.

State and explain if the metre rule is a suitable apparatus.

.....

.....

.....

..... [2]



partnerInLearning
More papers at www.testpapersfree.com

2 Three sets of pendulum, **P**, **Q** and **R**, of different lengths and angles of oscillation were set up as shown in Fig. 2.1.

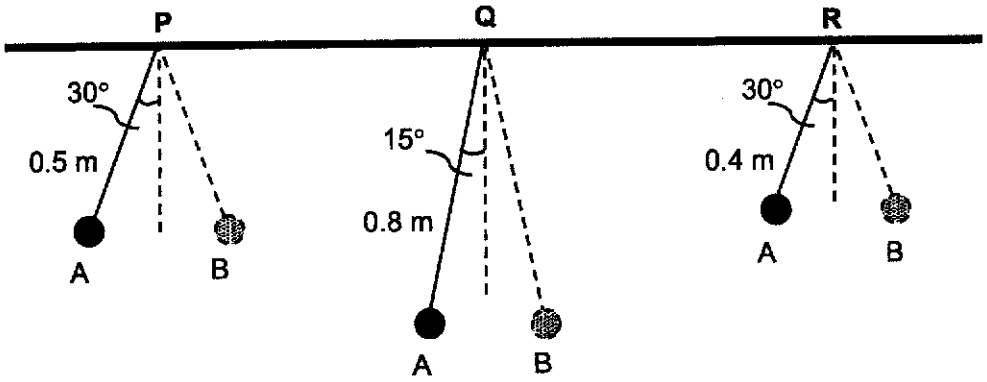



**Fig. 2.1** (not drawn to scale)

**(a)** Which pendulum will have the longest period?

Pendulum ..... [1]

**(b)** Calculate the period for pendulum **P** if it completes 20 oscillations in 61.5 seconds.

period = ..... s [2]

**(c)** The same experiment for pendulum **P** is done on the Moon.

State if the period of pendulum **P** will *increase*, *decrease* or *remain unchanged* on the Moon.
Explain your choice of answer.

.....

.....

.....

..... [2]



partnerInLearning
More papers at www.testpapersfree.com

3 Fig. 3.1 shows a lighthouse lantern that is held up by two wires in a garden. The tension in each wire is 65 N and the angle between the wires is 120°.

**(a)** Fig. 3.1 is drawn to scale. Indicate the scale used in this diagram.

On Fig. 3.1, draw a vector diagram to determine the resultant force, **F**, of the two wires. Label the resultant force **F** clearly.

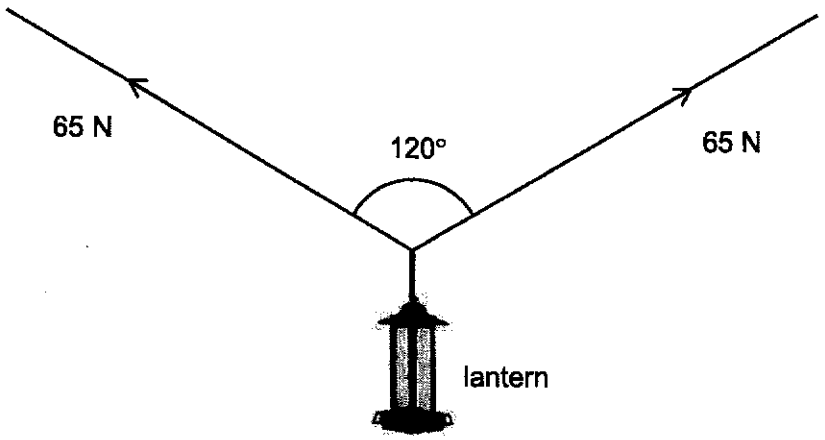



**Fig. 3.1**

scale is 1 cm : ..... N [1]

resultant force, **F** = ..... N [2]

**(b)** Using your answer from **(a)**, state the weight of the lighthouse lantern.

weight = ..... N [1]



partnerInLearning
More papers at www.testpapersfree.com

4 A solar panel uses energy from the Sun to charge a battery, as shown in Fig. 4.1.

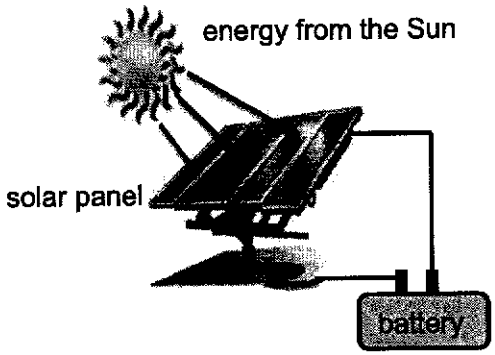



**Fig. 4.1**

Complete the following sentences to describe the energy transfers that take place.

**(a)** The solar panel transfers the energy from the panel to the battery as

..... energy. [1]

**(b)** The battery stores the energy as ..... energy. [1]

**(c)** The total energy transferred to the battery is less than the total energy incident on the solar panel because

.....

.....

..... [1]



partnerInLearning
More papers at www.testpapersfree.com

5 In a car race, a driver starts from rest and accelerates uniformly to 85 m/s in 5 seconds. He maintains this speed for another 30 seconds before the car comes to a stop in another 15 seconds.
Fig. 5.1 shows the speed-time graph of his motion for the first 50 seconds.

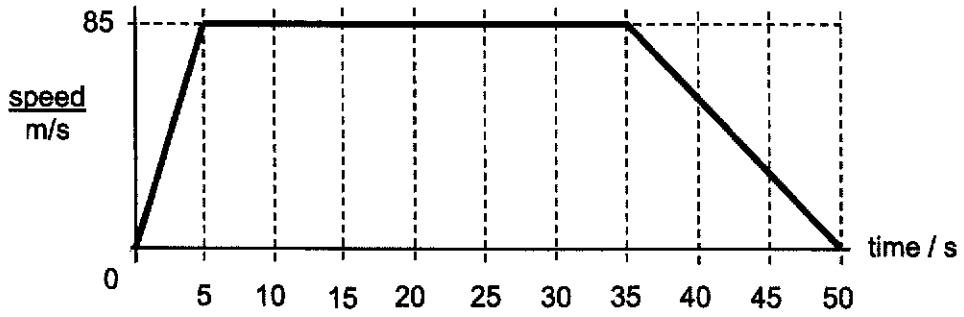



**Fig. 5.1**

**(a)** Calculate the acceleration of the car from the 35th s to 50th s.

acceleration = ..... m/s$^2$ [2]

**(b)** The total mass of the driver and car is 1 600 kg.
Using your answer from **(a)**, calculate the braking force acting on the car from the 35th s to 50th s.

braking force = ..... N [2]

**Question 5(c) continues on page 7**



partnerInLearning
More papers at www.testpapersfree.com

5 (c) Explain, in terms of forces, why the car moves with constant speed from the $5^{th}$ to $35^{th}$ s.

.....

.....

.....

.....

..... [2]

(d) Calculate the distance travelled by the car in the first 50 s.

distance = ..... m [2]



partnerInLearning
More papers at www.testpapersfree.com

6 Fig. 6.1 shows a rocket with a mass of 250 kg.

The gravitational field strength is 10 N/kg.

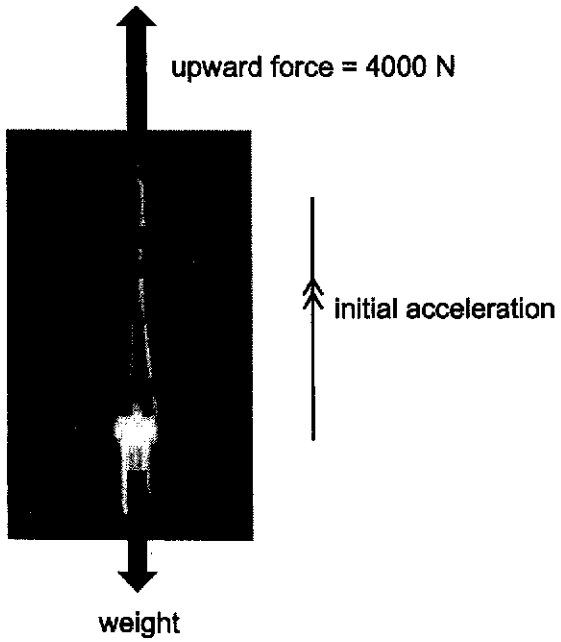



**Fig. 6.1**

**(a)** If the rocket engine exerts an upward force of 4000 N on the rocket at take-off, calculate the initial acceleration of the rocket.

acceleration = ..... $m/s^2$ [3]

**(b)** As the rocket travels into space, the fuel is used up rapidly.
However, the upward force exerted on the rocket by the engine remains constant.

Explain how the mass of the rocket changes as it travels into space.

.....

.....

..... [1]



partnerInLearning
More papers at www.testpapersfree.com

7 Explain, using the kinetic model of matter, why liquid cannot be compressed while gases can be compressed.

.....

.....

.....

.....

.....

..... [2]



partnerInLearning
More papers at www.testpapersfree.com

8 Fig. 8.1 shows a box with dimensions, 20 cm by L cm by 10 cm, placed on the ground.

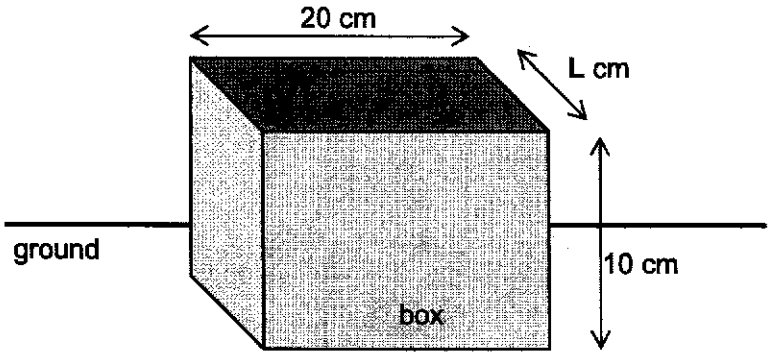



**Fig. 8.1** (not drawn to scale)

**(a)** State what is meant by *pressure*.

.....

.....

..... [1]

**(b)** The weight of the box is 80 N.
The pressure exerted by the box on the ground is 1.6 N/cm$^2$.

**(i)** Calculate the area in contact with the ground.

area = ..... cm$^2$ [2]

**(ii)** Using your answer from **(b)(i)**, determine the value of **L**.

**L** = ..... cm [1]

**Question 8(b)(iii) continues on page 11**



partnerInLearning
More papers at www.testpapersfree.com

8 (b) (iii) State **one** arrangement to place the box such that the pressure exerted on the ground is the greatest.

.....

.....

..... [1]

(c) State how the pressure exerted by the box would change, if any, if it is brought to Jupiter with a greater gravitational field strength than on Earth.

.....

.....

..... [1]



partnerInLearning
More papers at www.testpapersfree.com

9 Andrew moves a rock onto the back of a lorry, using a wheelbarrow and ramp.
Fig. 9.1 shows where he places the rock in the wheelbarrow.
The total weight of the rock and wheelbarrow is 500 N.
The ramp is 4.0 m long and the back of the lorry is 1.5 m above the ground.

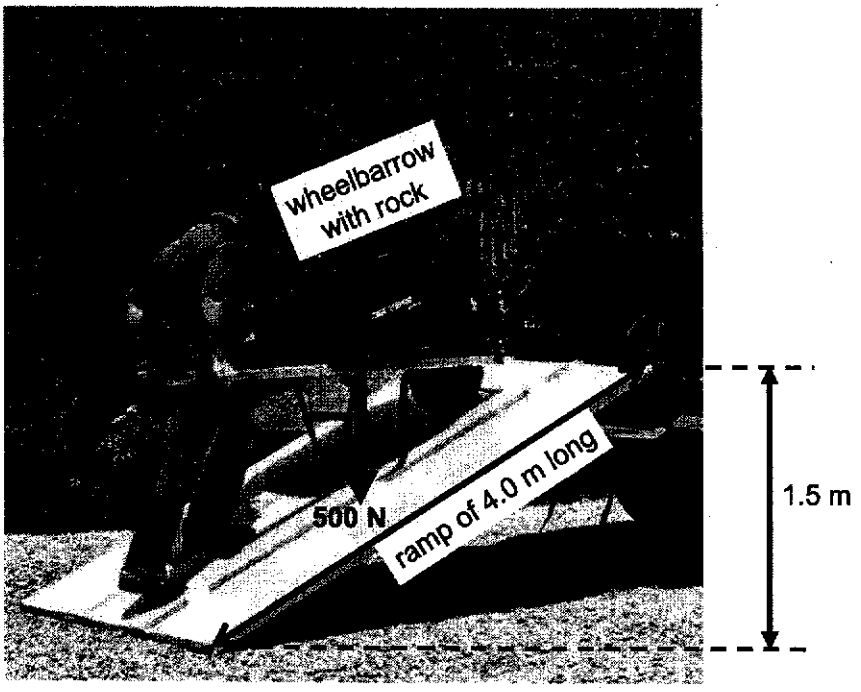



**Fig. 9.1** (not drawn to scale)

**(a)** Calculate the work done against gravity in moving the rock and wheelbarrow up the ramp onto the back of the lorry.

work done against gravity = ..... J [2]

**(b)** The work done against friction in moving the rock and wheelbarrow up the ramp is 150 J.

Calculate the total work done.

total work done = ..... J [1]



partnerInLearning
More papers at www.testpapersfree.com

**10** Electrical components in our laptops can get hot easily when the laptops are used for long hours. In order to prevent damage to them due to overheating, these electrical components are mounted onto a heat sink.

Fig. 10.1 shows a heat sink which is made of aluminium and consists of a flat base with cooling fins protruding out.

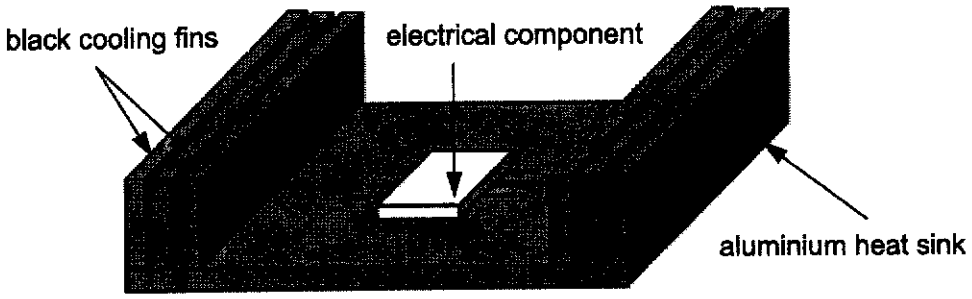



**Fig. 10.1**

**(a)** Explain why the cooling fins are black in colour.

.....

.....

.....

.....

..... [2]

**(b)** Explain why the heat sink has many protruding fins.

.....

.....

.....

.....

..... [2]



partnerInLearning
More papers at www.testpapersfree.com

## SECTION B

Answer any **two** questions in this section in the spaces provided.

**11** In an experiment, Andy places a metre rule on the edge of a triangular prism.
The prism acts as a pivot and the metre rule balances at the 50.0 cm mark.
Andy then places a wooden block at the 10.0 cm mark and a measuring cylinder at the 80.0 cm mark on the metre rule, as shown in Fig. 11.1.
The metre rule is in equilibrium.

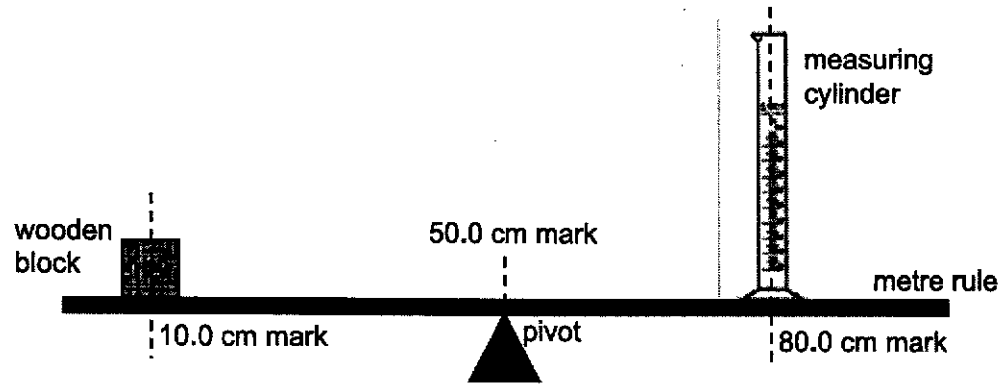



**Fig. 11.1**

Andy then places a 0.35 N load on top of the wooden block. He then pours oil slowly into the measuring cylinder.
The metre rule is balanced again when 55 $cm^3$ of oil is poured into the measuring cylinder.
The gravitational field strength is 10 N/kg.

**(a)** Using the Principle of Moments, calculate the weight of the oil in the measuring cylinder.

weight = ..... N [2]

**(b)** Using your answer from **(a)**, determine the mass of the oil, in grams, in the measuring cylinder.

mass = ..... g [2]

**Question 11(c) continues on page 15**



partnerInLearning
More papers at www.testpapersfree.com

**11** **(c)** State what is meant by *density of oil*.

.....

.....

..... [1]

**(d)** Determine the density of oil.

density = ..... g/cm$^3$ [2]

**(e)** Without any calculation, state the density of oil if only half the amount of oil is used in the experiment.

density = ..... g/cm$^3$ [1]

**(f)** Andy decided to use water instead of oil to repeat the experiment.
The density of water is 1.0 g/cm$^3$.

Explain clearly whether the volume of water that is required to balance the additional 0.35 N load on the wooden block will be *more* or *less than* the 55 cm$^3$ of oil used in the first experiment.

.....

.....

.....

.....

.....

..... [2]



partnerInLearning
More papers at www.testpapersfree.com

**12** Fig. 12.1 shows a roller coaster track with a carriage at **P**.
The total mass of the carriage and passengers is 3500 kg.
The carriage starts from rest at **P** and is pulled up to **Q** by a motor.
The gravitational field strength is 10 N/kg.

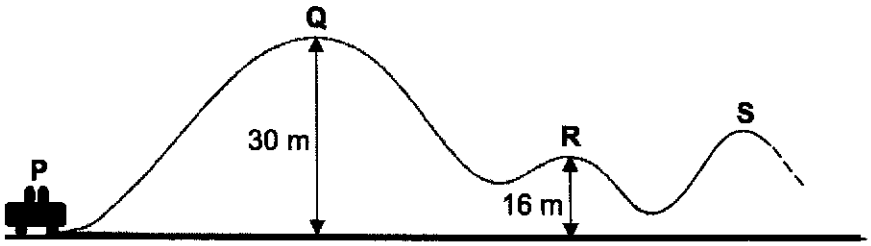



**Fig. 12.1** (not drawn to scale)

**(a)** Calculate the gain in gravitational potential energy when the carriage reaches **Q**.

gravitational potential energy = ..... J [2]

**(b)** The motor does 1.2 MJ of work to pull the carriage to **Q** in 2 minutes.

**(i)** Explain why there is a difference between the answer in **(a)** and the input energy of 1.2 MJ.

.....

.....

..... [1]

**(ii)** Calculate the **useful power** generated when the carriage is pulled up to **Q**.

useful power = ..... W [2]

**Question 12(c) continues on page 17**



partnerInLearning
More papers at www.testpapersfree.com

12 (c) At **Q**, the carriage is momentarily at rest before it moves down and then up the track to **R**.

The track between **Q** and **S** is assumed to be **frictionless**.

(i) Calculate the gain in gravitational potential energy when the carriage reaches **R**.

gravitational potential energy = ..... J [1]

(ii) State the *Principle of Conservation of Energy*.

.....

.....

..... [1]

(iii) Using your answer from **(a)** and **(c)(i)**, calculate the kinetic energy of the carriage at point **R**.

kinetic energy = ..... J [1]

(iv) Using your answer from **(c)(iii)**, calculate the speed of the carriage at point **R**.

speed = ..... m/s [2]



partnerInLearning
More papers at www.testpapersfree.com

**13** Figure 13.1 shows a stove used to heat up the water in a kettle.

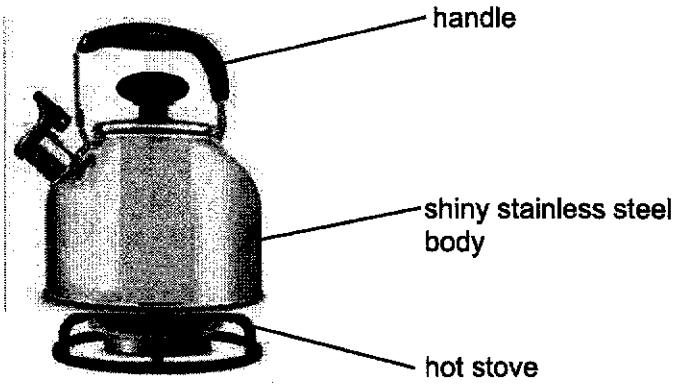



**Fig. 13.1**

**(a)** State the main process of transfer of thermal energy from the hot stove to the bottom of the kettle.

..... [1]

**(b)** Describe the process by which all the water in the kettle is heated by the hot stove.

.....

.....

.....

.....

..... [2]

**(c)** Describe what happens to the molecules in water as its temperature increases.

.....

.....

.....

.....

..... [2]

**(d)** Suggest what will happen to the pressure exerted on the inner wall of the kettle as the temperature of the water increases.

.....

..... [1]

**Question 13(e) continues on page 19**



partnerInLearning
More papers at www.testpapersfree.com

13 (e) Suggest and explain what material is suitable for the handle of kettle.

.....

.....

.....

.....

..... [2]

(f) The shiny stainless steel kettle is replaced by an electric kettle.

Suggest and explain what colour or texture is suitable for the inner walls of the electric kettle.

.....

.....

.....

.....

..... [2]



partnerInLearning
More papers at www.testpapersfree.com

**BLANK PAGE**



partnerInLearning
More papers at www.testpapersfree.com

**YIO CHU KANG SECONDARY SCHOOL**

**MARKING SCHEME**

Exam: **EOY Exam 2019** Subject: **5076 Science (Physics)** Level: **3E**

## PAPER ONE

| | | |
|---|---|---|
| 1 | B | 0.00 000 095 Mm = 0.00 000 095 $\times 10^6$ = 0.95 m<br>0.00 095 Gm = 0.00 095 $\times 10^9$ = 950 000 m (longest)<br>950 000 nm = 950 000 $\times 10^{-9}$ = 0.00 095 m<br>9 500 μm = 9 500 $\times 10^{-6}$ = 0.0 095 m |
| 2 | C | Reading = 6.7 + 3(0.01) = 6.73 cm |
| 3 | D | Speed = Gradient of distance-time graph |
| 4 | A | Acceleration increasing<br>⇒ 1. velocity is increasing non-uniformly +<br>2. gradient to the curve is increasing |
| 5 | C | Since the direction of travel is towards the right, the wheel is moving in clockwise direction with respect to the road, so the friction exerted by the road on the tyre is towards the right. |
| 6 | B | Density of P > density of R > density of Q<br>(densest, sink in liquid) (least dense, floats on liquid) |
| 7 | C | Inertia of an object refers to the reluctance of the object to change its state of rest or motion, due to its mass. |
| 8 | A | Mass remains unchanged no matter where you are.<br>On Mars, W = mg depends on the g-value of Mars<br>= 16 × 3.8 = 60.8 N |
| 9 | D | Vertical line through the centre of gravity at point D is still within the base in contact with the ground (which is the tyre on the left side) |
| 10 | B | Moment of weight about **P**<br>= Weight × ⊥ distance between weight & pivot<br>= 3.5 N × 0.5 m = 1.75 Nm in clockwise direction |
| 11 | C | Stability depends on<br>• low centre of gravity (heavy weight near the bottom) or<br>• wide base so that chances of vertical line through centre of gravity within the base is higher |
| 12 | D | Pressure exerted on right piston = Pressure exerted on left piston<br>$\frac{W}{0.02} = \frac{1000}{0.0004}$<br>$W = 0.02 \times \frac{1000}{0.0004}$ = 50 000 N |
| 13 | C | Pressure exerted by elephant on 2 feet = $\frac{\text{Weight}}{2 \times \text{area of contact}} = \frac{48\,000}{2 \times 0.25}$ = 96 000 Pa |
| 14 | B | K.E. = $\frac{1}{2}mv^2 = 4\,800$<br>$\frac{1}{2} \times m \times 40^2 = 4\,800$<br>$m = \frac{4\,800 \times 2}{40^2}$ = 6.0 kg |
| 15 | B | Power = $\frac{\text{Work done}}{\text{time taken}} = \frac{\text{Force} \times \text{distance in direction of force}}{\text{time taken}} = \frac{250 \times 4}{20}$ = 50 W |
| 16 | A | Hair dryer converts majority of the electrical energy to thermal energy (heat) and it also have a motor which will have kinetic energy. Sound is also produced when it is used. |
| 17 | B | Molecules will NOT expand upon heating. |

partnerInLearning
More papers at www.testpapersfree.com

| | | |
|---|---|---|
| 18 | D | Metal have additional advantage in the conduction of heat as it has additional electrons which will carry and transfer the thermal energy from the hotter region to the cooler region. |
| 19 | D | Water is a poor conductor of heat.<br>The heater is near the upper region of water tank. So water around the heater will be heated via conduction, becomes less dense and rises.<br>The cooler water below the heater will not be heated directly by the heater, so will remains cold for a period of time. |
| 20 | A | Melting: from solid to liquid state. Heat gained is used to overcome the forces of attraction between the particles in solid state to form the liquid state.<br>So the particles will be further apart as compared to that in solid state.<br>Since temperature remains constant during melting, kinetic energy remains constant. |

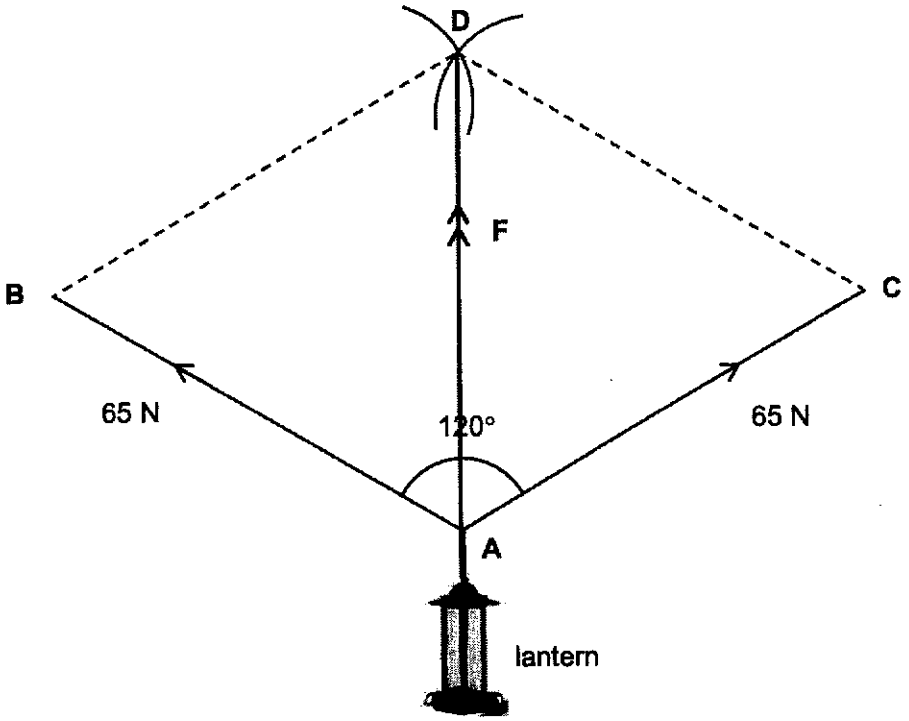
**PAPER TWO**

**SECTION A:**

| | | | |
|---|---|---|---|
| 1 | (a) | Precision of vernier calipers is to 0.01 cm = **0.1 mm** | [1] |
| | (b)(i) | Reading of micrometer screw gauge = 8.5 + 19 (0.01) = **8.69 mm** | [1] |
| | (b)(ii) | Thickness of 1 sheet of paper = $\frac{8.69}{60}$<br>= 0.14483<br>≈ **0.145 mm**<br>(to 3 s.f.) | [1] with ecf<br>[1] with ecf & to 3 s.f. |
| | (c) | Metre rule is **NOT** a suitable apparatus.<br>Precision of metre rule is only to **0.1 cm (or to 1 decimal place in cm).**<br>Working:<br>Thickness of 60 sheets of paper = 8.69 mm = 0.869 cm (3 d.pl) | [1]<br>[1] |
| 2 | (a) | Pendulum **Q**.<br>Reason:<br>• Longest period ⇒ longest length<br>• Angle of oscillation does not affect the periodic time of pendulum. | [1] |
| | (b) | $T = \frac{61.5}{20}$<br>= 3.075 s<br>≈ 3.08 s<br>(to 3 s.f.) | [1]<br>[1] & to 3 s.f. |
| | (c) | • Period **increases**.<br>• The The gravitational field strength on the Moon is **lesser than** the gravitational field strength on Earth, so pendulum will take longer time to make one complete oscillation. | [1]<br>[1] |



partnerInLearning
More papers at www.testpapersfree.com

| | | | |
|---|---|---|---|
| 3 | (a) |  | |
| | | Scale is 1 cm : **10 N**<br><br>Resultant force, **F** = AD × 10 N<br>= 6.5 cm × 10 N<br>= **65 N ± 1 N**<br><br>**Resultant force**:<br>• **Construction of BD and CD** using **dotted lines without arrows;**<br>• Drawing **resultant force AD with solid line, double arrows** and labelled **F.** | [1]<br><br>[1]<br><br>[1] for **both** points |
| | (b) | Weight = value of F = **65 N** | [1] with ecf |
| 4 | (a) | **Electrical** energy | [1] |
| | (b) | **Chemical potential** energy | [1] |
| | (c) | Some of the light energy is<br>• being **reflected off** the solar panel surface or<br>• **converted to thermal energy** on the battery. | [1] for either one |



partnerInLearning
More papers at www.testpapersfree.com

| | | | |
|---|---|---|---|
| 5 | (a) | Acceleration = gradient or $a = \frac{v-u}{t}$<br>$= \frac{0-85}{50-35}$<br>$= -5.6666$<br>$\approx -5.67\ m/s^2$<br>(3 s.f.) | [1] for formula / substitution<br><br>[1] to 3 s.f. |
| | (b) | Braking force = ma<br>$= 1600 \times 5.6666$<br>$= 9066.56\ N$<br>$\approx 9\,070\ N$<br>(3 s.f.)<br>**Note**:<br>Only take the numerical value (positive value) of acceleration when calculating braking force. | [1] for formula / substitution<br><br>[1] to 3 s.f. |
| | (c) | • **Resultant force is zero** since acceleration is zero (constant speed)<br>• **Forward force** is **balanced by** the **resistive force**. | [1]<br>[1] |
| | (d) | Distance travelled = Area under graph<br>$= \frac{1}{2} \times [50 + (35-5)] \times 85$<br>$= 3\,400\ m$ | [1]<br>[1] |
| 6 | (a) | Weight = mg<br>$= 250 \times 10$<br>$= 2\,500\ N$<br><br>Resultant force = ma<br>Upward force – weight = ma<br>$4000 - 2500 = 250 \times a$<br>$a = \frac{4000-2500}{250}$<br>$= 6\ m/s^2$ | [1] for weight<br><br>[1] for formula / substitution with ecf<br><br>[1] with ecf |
| | (b) | Mass of rocket will **decrease** since the **fuel is used up**. | [1] with explanation |
| 7 | | In liquid state,<br>• **particles are still quite closely packed as compared to gases**,<br>• **there is little spaces between the particles.**<br><br>So liquid cannot be compressed as compared to gases. | [1]<br>[1] |



partnerInLearning
More papers at www.testpapersfree.com

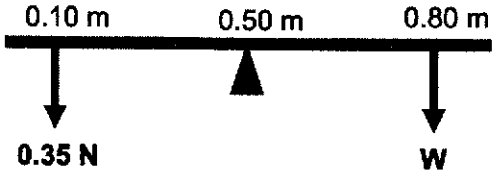
| | | | |
|---|---|---|---|
| 8 | (a) | Pressure is the **force acting per unit area in contact.** | [1] |
| | (b)(i) | $\text{Pressure} = \frac{\text{Force}}{\text{Area in contact}}$<br>$1.6 = \frac{80}{\text{Area in contact}}$<br>$\text{Area in contact} = \frac{80}{1.6}$<br>$= 50\ \text{cm}^2$ | [1] for formula / substitution<br>[1] |
| | (b)(ii) | Area $= 50\ \text{cm}^2$<br>$L \times 20 = 50$<br>$L = \frac{50}{20}$<br>$= 2.5\ \text{cm}$ | [1] with ecf |
| | (b)(iii) | **Smallest area in contact with the ground** is required in order to achieve greatest pressure.<br>Or<br>Use the **side with 2.5 cm by 10 cm**. | [1] with ecf |
| | (c) | Pressure exerted on the ground will be **greater** on Jupiter.<br><br>Reason:<br>Weight of the box will be greater on Jupiter since the g-value is greater than that on the Earth.<br>So pressure ( $= \frac{\text{weight}}{\text{area in contact}}$ ) will increase. | [1] |
| 9 | (a) | Work done against gravity<br>= Force × distance in direction of force<br>= 500 × 1.5<br>= 750 J | [1] for formula / substitution<br>[1] |
| | (b) | Total work done<br>= Work done against gravity + Work done against friction<br>= 750 + 150<br>= 900 J | [1] with ecf |
| 10 | (a) | • Black is a **good emitter of heat.**<br>• **Heat is transferred from the heat sink to the surrounding environment** at a **faster rate.** | [1]<br>[1] |
| | (b) | • The protruding fins **increases the surface area** of heat sink,<br>• Thus **increasing rate of radiation of heat to the surrounding** | [1]<br>[1] |



partnerInLearning
More papers at www.testpapersfree.com

**SECTION B:**

**11 (a)**




Taking moments about pivot,

TCM = TAM

$W \times (0.80 - 0.50) = 0.35 \times (0.50 - 0.10)$ [1] for substitution

$W = \frac{0.35 \times 0.4}{0.3}$

$W = 0.46666$

$\approx 0.467$ N (3 s.f.) [1] to 3 s.f.

**(b)** $W = mg$

Mass of oil $= \frac{W}{g} = \frac{0.46666}{10}$ [1] for formula / substitution with ecf

$= 0.046666$ kg

$= 46.666$ g

$\approx 46.7$ g (3 s.f.) [1] with ecf, to 3 s.f.

**(c)** Density of oil is the **mass per unit volume of oil**. [1]

**(d)** Density of oil $= \frac{\text{mass}}{\text{volume}} = \frac{46.666}{55} \frac{\text{g}}{\text{cm}^3}$ [1] for formula / substitution with ecf

$= 0.84847$ g/cm$^3$

$\approx 0.848$ g/cm$^3$ (3 s.f.) [1] with ecf, to 3 s.f.

**(e)** Density of oil remains unchanged = 0.848 g/cm$^3$ [1] with ecf

**(f)** Volume of water used will be **less than** 55 cm$^3$. [1]

For the **same mass**, a smaller volume of water is required since **density of water is greater than that for oil**. [1] with ecf

Formula:

Density $= \frac{\text{mass}}{\text{volume}}$.

[redacted]



partnerInLearning
More papers at www.testpapersfree.com

**12 (a)** Gain in GPE at Q = mgh [1] for formula / substitution

= 3500 × 10 × 30

= 1 050 000 J [1]

( = 1. 05 × $10^6$ J )

**(b)(i)** Difference in energy is due to **energy lost to overcome friction** [1] **in the form of heat and sound energy.**

**(b)(ii)** Useful power = $\frac{\text{Work done}}{\text{Time taken}}$ [1] for formula / substitution

$= \frac{\text{Gain in GPE}}{\text{Time taken}} = \frac{1\,050\,000}{(2 \times 60)}$

= 8 750 W [1]

**(c)(i)** Gain in GPE at R = mgh

= 3500 × 10 × 16

= 560 000 J [1]

**(c)(ii)** • The Principle of Conservation of Energy states that energy cannot be created nor destroyed, but can only be converted from one form to another. [1] for **both** points

• The total energy in an isolated system is constant.

**(c)(iii)** Total energy at R = Total energy at Q

$G.P.E_R + K.E_R = G.P.E_Q + K.E_Q$

560 000 + KE at R = 1 050 000 + 0

KE at R = 1 050 000 – 560 000

= 490 000 J [1] with ecf

**(c)(iv)** $KE = \frac{1}{2} m v^2 = 490\,000$

$\frac{1}{2} \times 3500 \times v^2 = 490\,000$ [1] for formula / substitution with ecf

$v = \sqrt{\frac{490\,000 \times 2}{3\,500}}$

= 16.733

≈ 16.7 m/s (3 s.f.) [1] with ecf, to 3 s.f.



partnerInLearning
More papers at www.testpapersfree.com

13 (a) **Conduction** [1]

(b) All the water in the kettle is heated:

- When the **water** at the bottom of the kettle is **heated**, water expands and becomes **less dense** and **rises**. **Cooler water** at the top being **denser** will **sink** to replace the heated water. [1] for **both** points

- A **convection current** is thus set up to transfer heat throughout the water in the pan. [1]

(c) There is a **gain in thermal energy** as temperature increases
⇒ **Gain in average kinetic energy** of the molecules [1]
⇒ **Increase in average speed of the molecules** in water. [1]

(d) Pressure exerted on the inner wall of the kettle will **increase** as temperature increases. [1]

(e) **Plastic** is suitable for the handle. [1]

Plastic is a **good insulator of heat** or **poor conductor of heat**. [1]
This minimises the heat transferred from the hot water to the handle or hand.

(f) **White or silver** is suitable for the inner walls of the electric kettle. [1]

Silver is a **poor absorber of heat**. [1]
This minimises heat loss from the water to the surrounding.

Or
Silver is a **good reflector of heat.**
It **reflects heat back to the liquid** or inner wall of kettle. This **reduces heat loss by radiation**.


partnerInLearning
More papers at www.testpapersfree.com

partnerInLearning
More papers at www.testpapersfree.com