Name:	Class:	Index No:

Yuan Ching Secondary School

End-of-year Examination 2018

Secondary Three Express

SCIENCE (PHYSICS) 5076/01

Paper 1 Multiple Choice **12 Oct 2018**

Papers 1: 1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and index number on the Answer Sheet in the spaces provided unless this has been done for you.

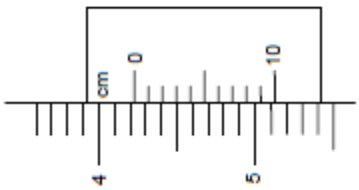
There are **twenty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Answers to Paper 1 and Paper 2 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised to spend no more than **30 minutes** on **Paper 1**.
You may proceed to answer Paper 2 as soon as you have completed Paper 1.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **6** printed pages.

1 The diagram shows a vernier scale placed against a ruler.



What is the vernier reading?

A 3.90 cm **B** 3.93 cm **C** 4.23 cm **D** 4.25 cm

2 A sea breeze happens in the day. An explanation of the sea breeze contains only five statements.

1 Density of the air decreases
2 Less dense air rises
3 The air above the land is heated and expand
4 Land mass warms up faster than the sea in the day
5 Cooler air from the sea moves in to form sea breeze

What is the correct order of these statements?

A 1 → 2 → 3 → 4 → 5
B 1 → 2 → 5 → 3 → 4
C 4 → 3 → 1 → 2 → 5
D 4 → 3 → 5 → 1 → 2

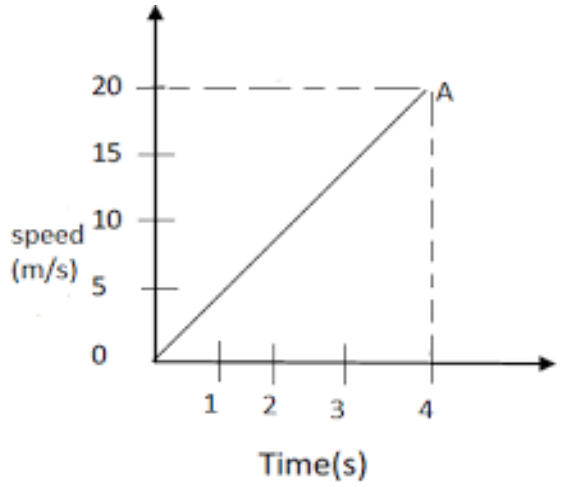
3 What is the name of the property of a body that resists a change in its state of rest or motion?

A Mass
B Speed
C Density
D Acceleration

4 A portable generator can supply 69 120 000 J of electrical energy in 24 hours. What is the average power output of the generator?

A 27 W **B** 800 W **C** 19 200 W **D** 2 880 000 W

5 The speed-time graph for a cyclist is shown below.



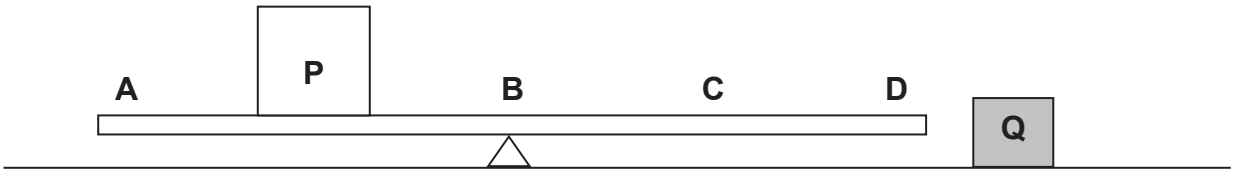
The mass of the cyclist with the bike is 70 kg.

What is the resultant force on the cyclist with bike?

A 140 N **B** 350 N **C** 3500 N **D** 14000 N

6 A uniform plank is balanced at the centre by a pivot. John placed block P on the plank as shown in the diagram below. Block Q is made of the same material as P but is smaller in volume.

Where should John place block Q to keep the plank in equilibrium?



7 A small table weighing 80 N stands on four legs, each having an area of contact of 0.001 m^2. What is the pressure of the table on the floor?

A 20 kPa **B** 80 kPa **C** 20 000 kPa **D** 80 000 kPa

8 A nylon jacket is filled with feather and down. Down is the fur found at the chest area of birds.

Which of the following best explain how the jacket keeps the user warm in winter?

A Nylon is shiny and is a poor absorber of cold.
B Feather is a poor conductor of heat.
C Down is very fine and stops convection current from getting set up.
D Feather and down is able to trap air, and air is a poor conductor of heat.

9 Which form of energy, that molecules have, is related to temperature?

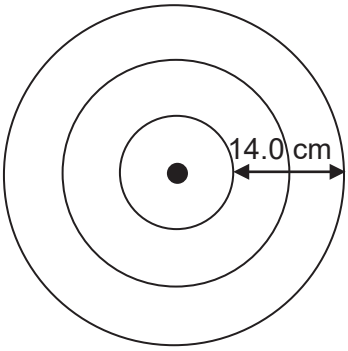
A nuclear energy
B kinetic energy
C potential energy
D thermal energy

10 Molten glass are poured onto a stick to be moulded into glass ball. The glass cools to its freezing point and begins to solidify.

As the glass solidifies, its temperature

A decreases and energy is lost from the glass.
B remains the same and energy is lost from the glass.
C decreases and no energy is lost from the glass.
D remains the same and no energy is lost from the glass.

11 John threw a pebble into the pond and created a ripple as shown below.



In two seconds, three complete waves are produced on the surface of the water. The distance between three crests is 14.0 cm.

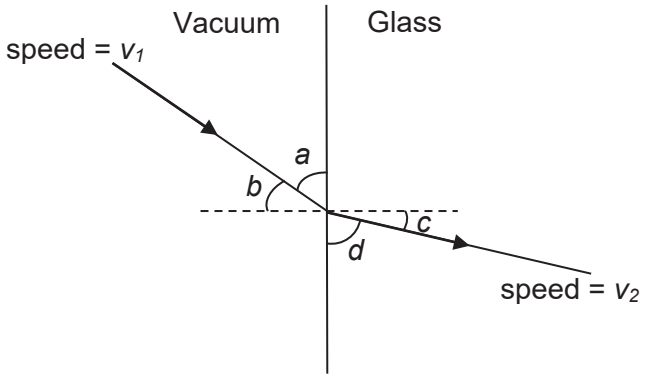
What is the speed of the wave?

A 3.11 cm/s **B** 4.67 cm/s **C** 7.00 cm/s **D** 10.5 cm/s

12 Which of the following statements about transverse waves is true?

A All transverse waves travels at the speed of 3.0×10^8 m/s in vacuum.
B Transverse waves are waves that travels parallel to the direction of its vibration.
C All transverse waves require a medium to travel.
D All transverse waves can be reflected or refracted.

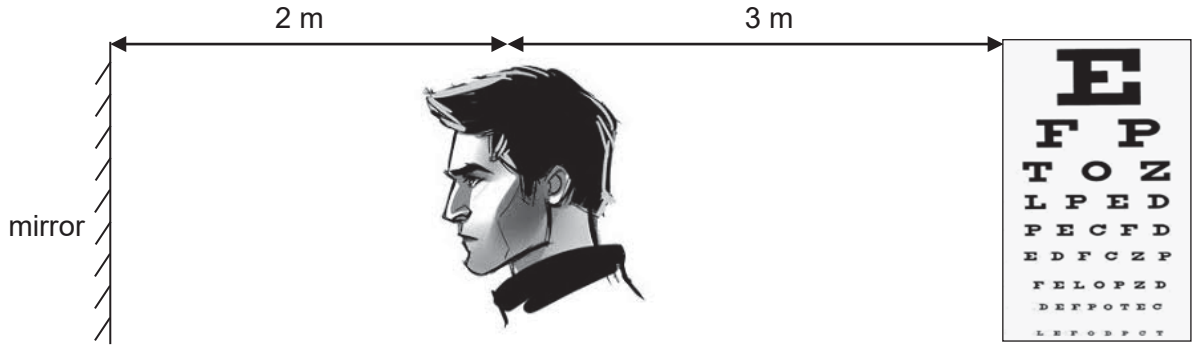
13 A ray of light travels from vacuum into glass.



What is the refractive index of the glass?

A sin *a* / sin *d*
B sin *c* / sin *b*
C v_1 / v_2
D v_2 / v_1

14 The diagram shows a patient having his eyes tested. A chart with letters on it is placed behind him and he sees the chart reflected in a plane mirror.

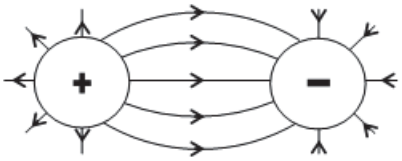


How far away from the patient is the image of the chart?

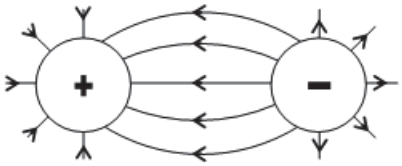
A 2 m **B** 5 m **C** 7 m **D** 10 m

15 Which diagram correctly shows the electric field pattern between two isolated point charges?

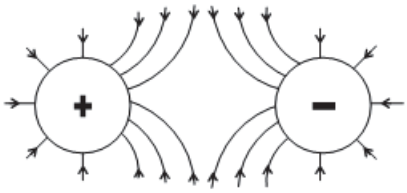
A



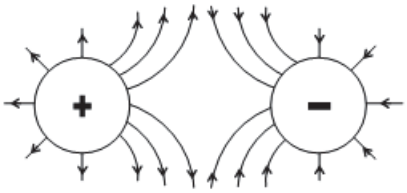
B



C



D

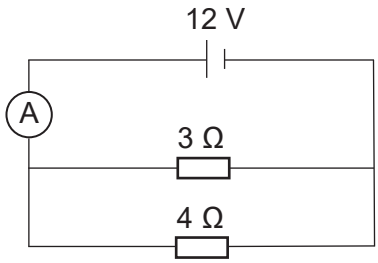


16 A wire has a resistance of 12 Ω. A second wire, made of the same material, has half the length and half the cross-sectional area.

What is the resistance of the second wire?

A 3.0 Ω **B** 6.0 Ω **C** 12 Ω **D** 48 Ω

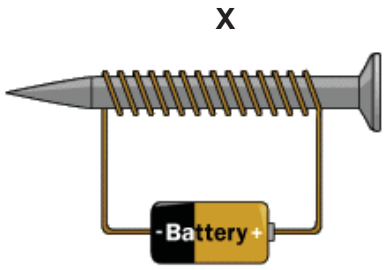
17 A 12 V battery is connected across a parallel arrangement of two resistors.



What is the reading on the ammeter?

A 1.7 A **B** 3.0 A **C** 4.0 A **D** 7.0 A

18 A compass is placed at **X** beside an electromagnet as shown in the diagram below.



Which of the drawings shows the correct direction of the compass needle?

A

B

C

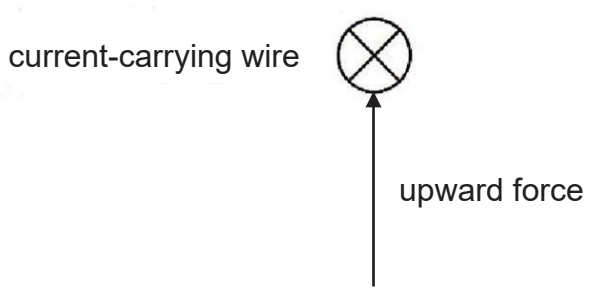
D

19 A combined Audio-Visual unit of a speaker and a television is controlled by one switch. The unit contains a 1.2 kW speaker and a 800 W television.
In one week, the television used 4.0 kWh of electrical energy.

How much electrical energy is used by the Audio-Visual unit in that one week?

A 2.0 kWh **B** 4.0 kWh **C** 6.0 kWh **D** 10 kWh

20 The diagram below shows an upwards force acting on a current-carrying wire in a magnetic field. What is the direction of the magnetic field?



A to the left
B to the right
C downward
D out of the paper

----- End of Paper -----
Efforts Today Rewards Tomorrow

YUAN CHING SECONDARY SCHOOL
Secondary Four Express / Five Normal (Academic) Course
Preliminary Examination 2018

CANDIDATE NAME

CLASS

INDEX NUMBER

SCIENCE (PHYSICS)

5076/02

Paper 2

14 September 2018

Candidates answer on the Question Paper.
No Additional Materials are required.

1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work that you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A (45 marks)
Answer **all** questions.

Section B (20 marks)
Answer **any two** questions.

Candidates are reminded that **all** quantitative answers should include appropriate units.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

At the end of the examination, fasten all work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 65.

For Examiner's Use	
Section A	
Section B	
Total	**/ 65**

This paper consists of **15** printed pages.

Section A: [45 marks]
Answer **all** the questions in the spaces provided.

1 Fig. 1.1 shows the diagram of a speaker.

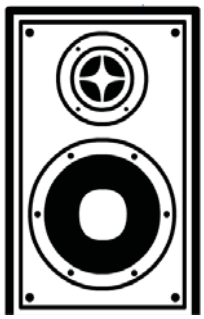


Fig. 1.1

(a) Sound is being produced and can be heard by everyone in the room. Describe how the sound from the loudspeaker reaches all parts of the room.

……
……
……
…… [2]

(b) The lowest frequency that a human with normal hearing can hear is 20 Hz and the highest frequency is 20 kHz.

(i) Explain what is meant by *frequency is 20 kHz*.

……...
……... [1]

(ii) Given that the speed of sound in air is 340 m/s, calculate the **longest** wavelength of sound that a human can hear.

wavelength =…….…… m [2]

2 A 1200 kg sports car travels at 20 m/s for 3.0 minutes.
It then accelerates uniformly to a speed of 45 m/s in 1.0 minute.
It travels at a uniform speed of 45 m/s for a further 5.0 minutes before decelerating non-uniformly to rest in 3.0 minutes.

(a) Plot a graph on Fig 2.1 to show how the speed of the sports car varies with time.

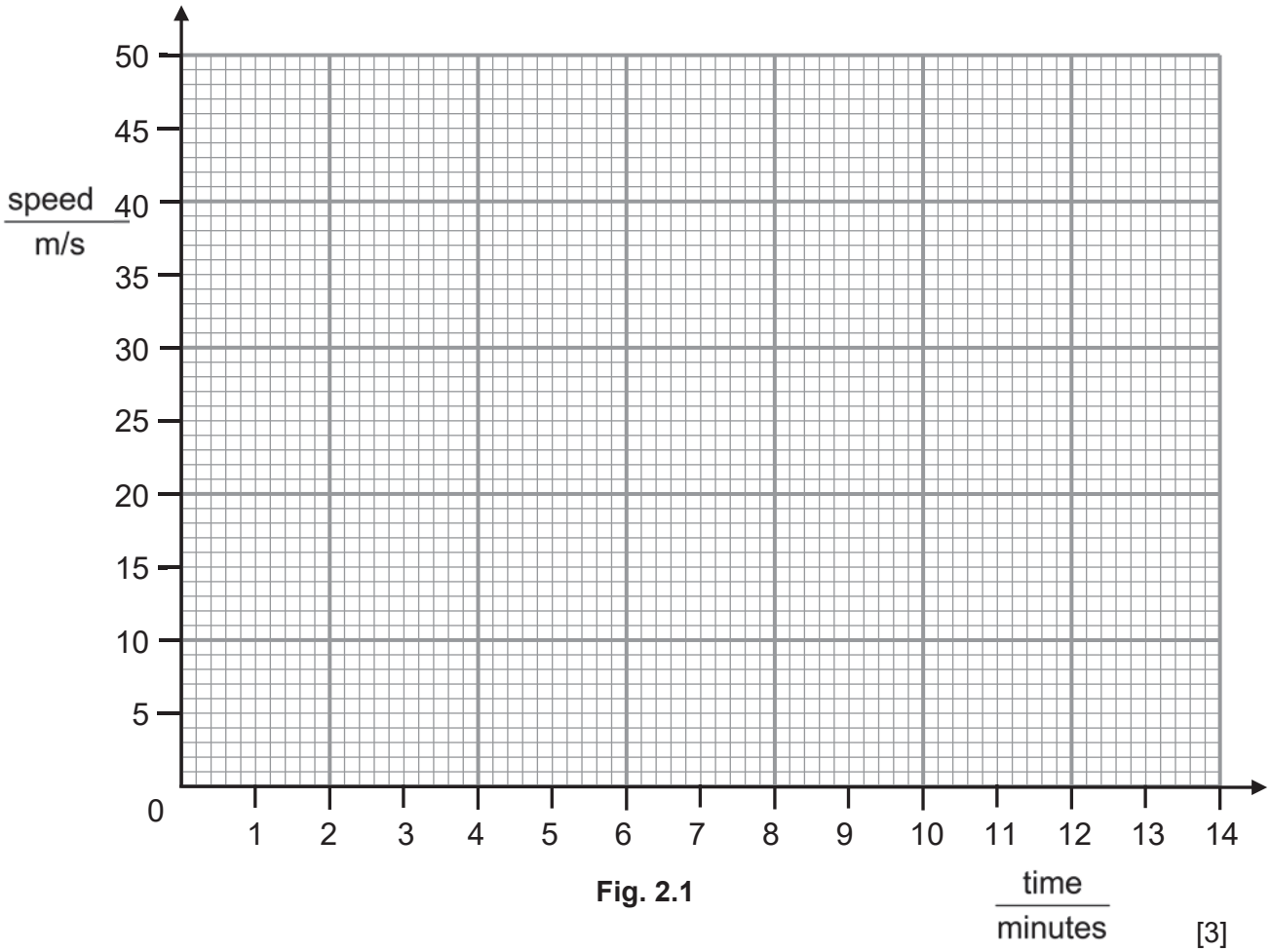


Fig. 2.1

[3]

(b) Calculate the acceleration of the sports car from 3.0 to 4.0 minute.

acceleration = …….. m/s^2 [3]

(c) Calculate the resultant force needed to result in this acceleration.

force = …… N [2]

3 A beaker can hold 250 cm^3 of liquid.
When it is completely filled with methanol (density 0.80 g/cm^3), the total weight is 2.6 N.
Take the gravitational field strength as 10 N/kg.

(a) Calculate the mass of the filled beaker.

mass = …… kg [1]

(b) Calculate the mass of methanol in the beaker. State clearly the formula used.

mass = …….. kg [2]

4 The diagram below shows a computer monitor resting on a uniform tabletop **AB** of weight 70 N that is hinged to the wall at **A**. The computer monitor has a weight of 50 N acting through a point 0.20 m from **A**. The tabletop is supported by a vertical force, **F** acting at **B** to keep it horizontal. The length of the tabletop is 0.80 m.

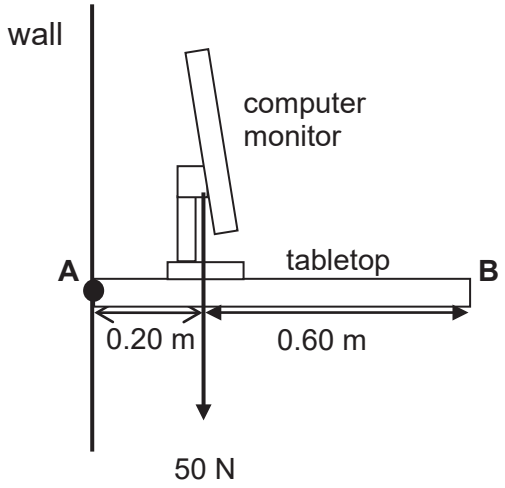


Fig. 4.1

(a) On **the diagram**, draw an arrow to represent the **weight** of the **tabletop**. Label it **W**. [1]

(b) Calculate the total moments due to the weight of the computer monitor and the tabletop.

total moment = ……Nm [2]

(c) Hence, by means of the principle of moments, calculate the vertical force, **F** applied at **B** that is required to keep the tabletop horizontal.

vertical force, F = …… N [2]

5 Fig. 5.1 shows an object **A** of mass 1.6 kg resting on top of a smooth plank which is 2.0 metres long.

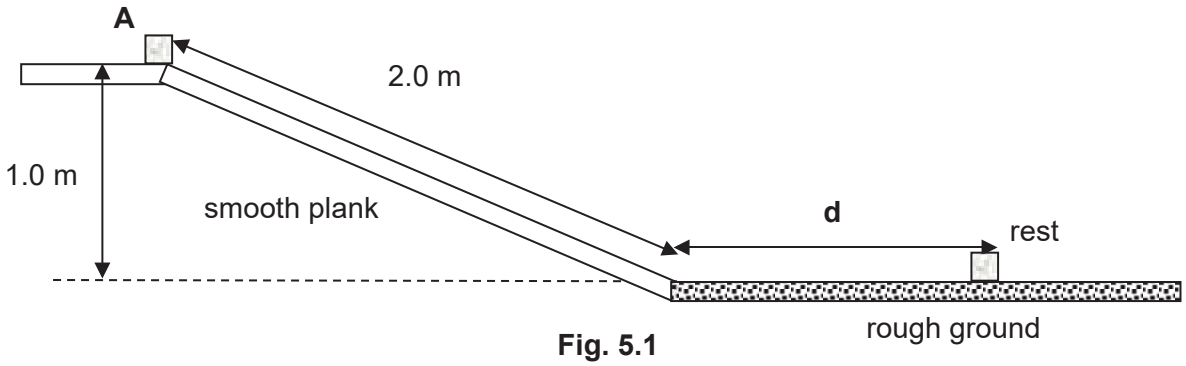


Fig. 5.1

When object **A** is released, it slides down the smooth plank and stops after travelling a distance **d** along the rough ground.

(a) Using the Principle of Conservation of Energy, calculate the speed of object **A** at the bottom end of the plank.

speed = …….. m/s [2]

(b) If the friction along the rough ground is 2.5 N, calculate the distance **d**.

distance **d** = …….. m [2]

6 Ultraviolet radiation and microwave are different types of radiation in the electromagnetic spectrum.

(a) State one use of ultraviolet radiation and of microwave.

(i) Ultraviolet radiation:

……. [1]

(ii) Microwave:

……. [1]

(b) State one property that both types of radiation have in common and one property that makes them different.

Common property:

……

……

[1]

Different property:

……

……

[1]

7 Fig. 7.1 shows a computer chip fitted with a heat sink with black metal fins.

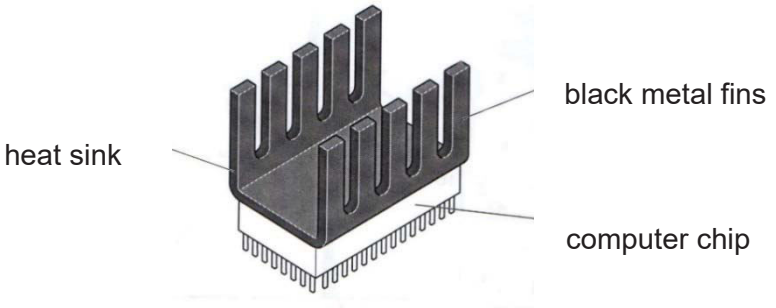


Fig. 7.1

The main function of the heat sink is to keep the computer chip cool.

(a) Explain any **two** features of the heat sink that allow thermal energy to be transferred easily away from the chip.

……

……

……

…… [4]

(b) Describe what happens to the motion of the molecules and their arrangement in the heat sink as it gains heat.

.....

.....

.....

..... [2]

8 Fig. 8.1 shows an iron rod resting on two brass strips between the poles of a magnet. When the switch is closed, a current passes through the iron rod from the two brass strips connected to a power supply.

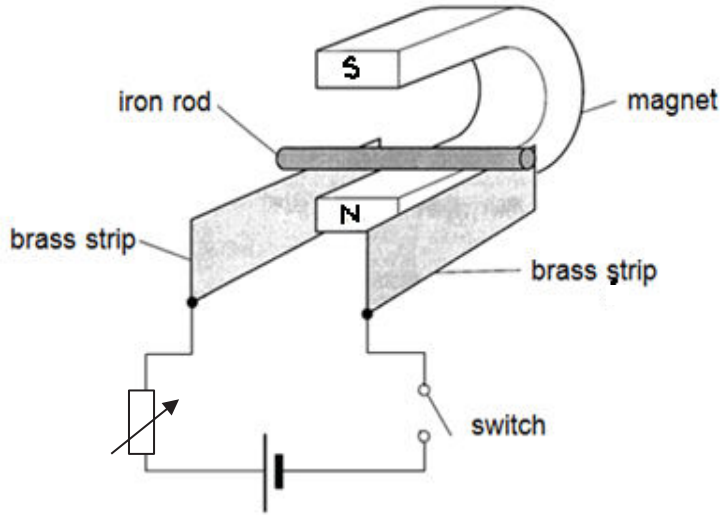


Fig. 8.1

(a) **(i)** Draw an arrow to indicate the direction of current in the iron rod. [1]

(ii) State the direction in which the rod would move.

.....

..... [1]

(b) State the effect on the movement of the iron rod when

(i) the resistance of the rheostat is increased,

.....

..... [1]

(ii) the current is reversed.

.....

..... [1]

9 Fig. 9.1 shows three resistors **X**, **Y** and **Z** connected in a circuit. The current flowing through **X** is 1.5 A and **X** has a resistance of 3.0 Ω.

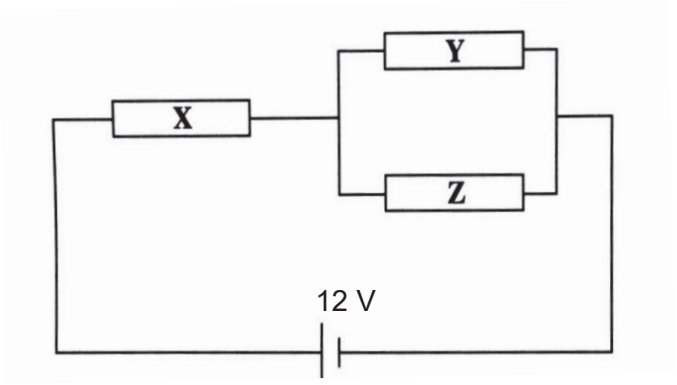


Fig. 9.1

(a) Calculate the potential difference across **X**.

potential difference = ... V [2]

(b) The resistance of **Z** is 6.0 Ω. Calculate the current flowing through **Z**.

current = ... A [2]

(c) Calculate the resistance of **Y**.

resistance = ... Ω [2]

Section B [20 marks]

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

10 Fig. 10.1 shows a hand-operated hydraulic press.

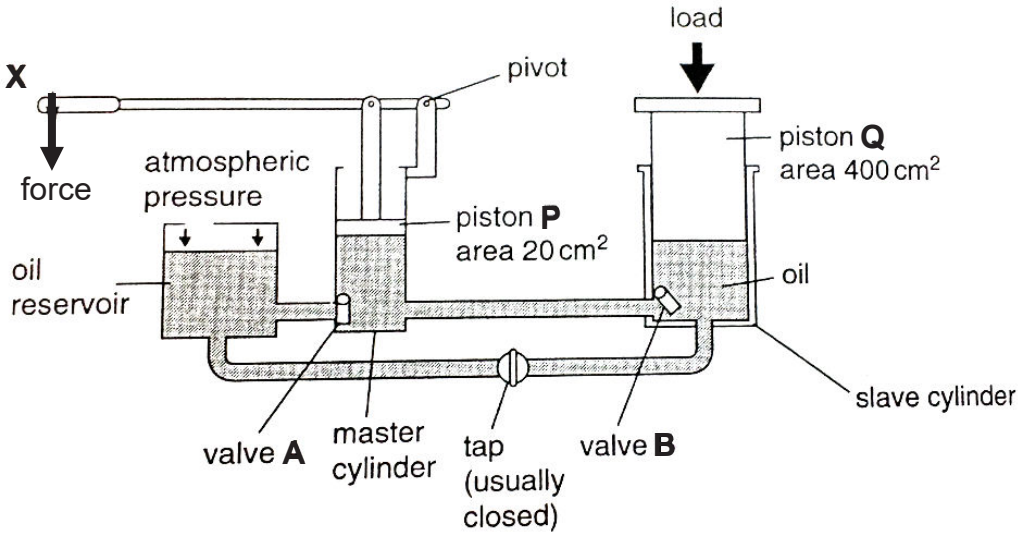


Fig. 10.1

A force is applied downwards at **X** as shown. When piston **P** moves downwards, valve **A** closes, valve **B** opens and oil is forced through to raise piston **Q** in the slave cylinder.

(a) The cross-sectional area of the piston **P** is 20 cm^2 and the cross-sectional area of piston **Q** is 400 cm^2. Piston **P** exerts a downward force of 300 N on the oil.

(i) Calculate the pressure, in N/cm^2, exerted by piston **P** on the oil.

pressure = …….. [2]

(ii) State the value of the pressure in the slave cylinder.

pressure = …….. [1]

(iii) Hence, calculate the force exerted by the oil on piston **Q**.

force = …….. [1]

(b) Piston **P** moves down 5.0 cm.

(i) Calculate the volume of oil that moves out of the master cylinder.

volume = …….. [1]

(ii) Hence, calculate the distance moved by piston **Q**.

distance = …….. [1]

(c) After **X** is pushed down, it is lifted up again.
State what happens to valve **A**, valve **B** and piston **Q** when **X** is lifted up.

……
……
…… [2]

(d) Using kinetic theory of matter, explain why oil rather than air is used in the hydraulic press.

……
……
…… [2]

11 Fig. 11.1 shows an object placed in front of a converging lens. F_1 and F_2 are the focal points of the lens.

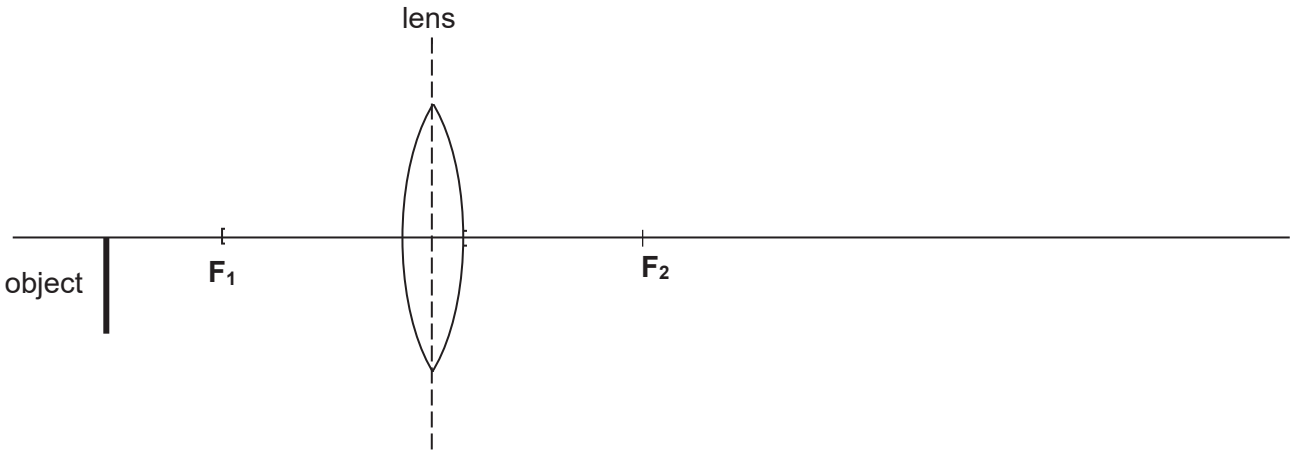


Fig. 11.1

(a) Draw the ray diagram on Fig 11.1 to locate the image of the object. [2]

(b) State two characteristics of the image formed.

……

…… [1]

(c) State one use of the above converging lens when the object is placed as in the diagram.

…… [1]

(d) Explain the change in the focused image, if any, when the top half of the lens is blocked by a piece of cardboard.

……

……

…… [2]

(e) Fig. 11.2 shows a rectangular glass block, **PQRS**, with a refractive index of 1.54. A light ray is incident on the side **PS** of the glass block as shown.

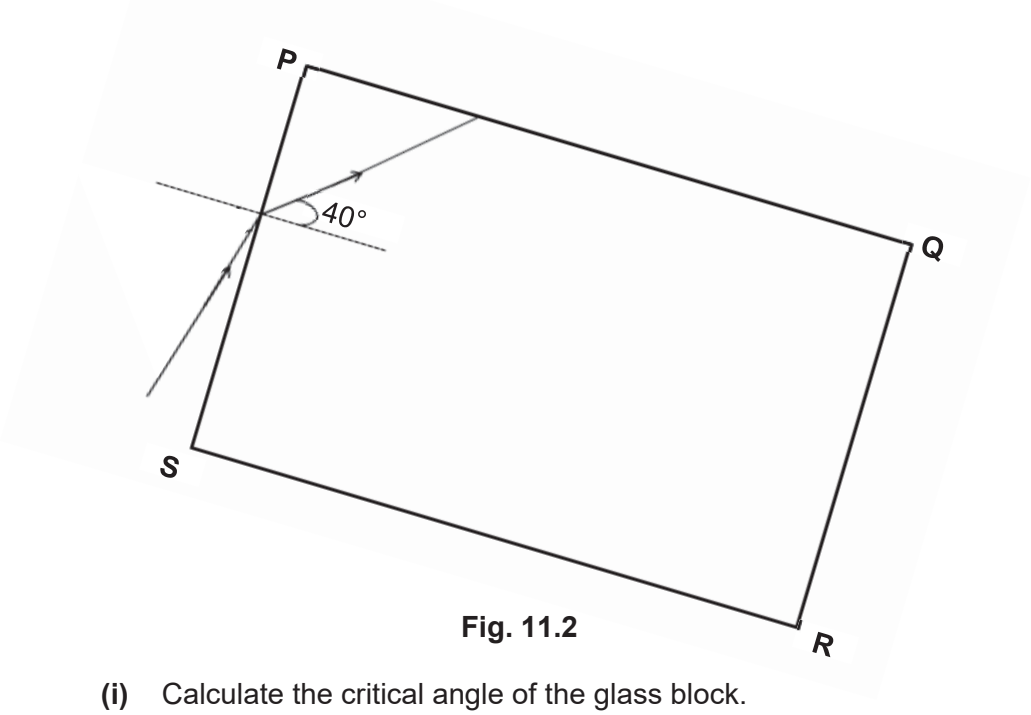


Fig. 11.2

(i) Calculate the critical angle of the glass block.

critical angle = ……..

[2]

(ii) Continue the path of the light ray in Fig. 11.2 at side **PQ** and explain the path you have drawn.

……

……

……

[2]

12 Fig. 12.1 shows the electrical wiring in a table lamp.

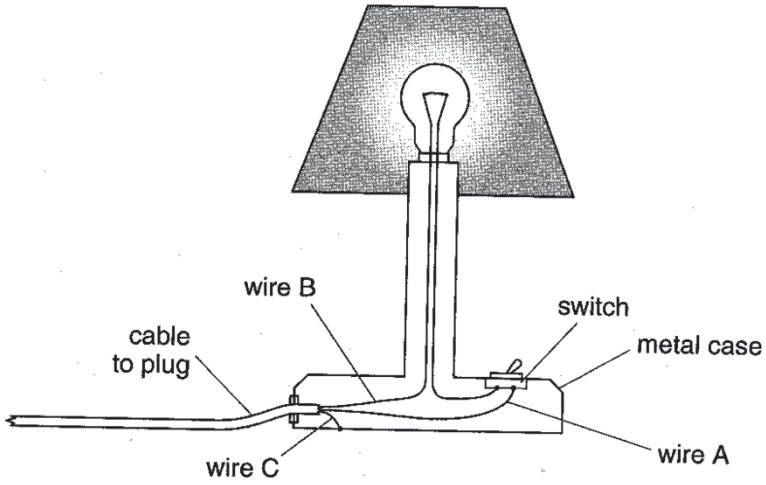


Fig. 12.1

(a) The lamp is marked “240 V, 100 W”.

(i) Calculate the resistance of the lamp.

resistance = …….. [2]

(ii) The lamp is switched on for 5 hours daily. Calculate the cost of using the lamp for 1 day, given that the electrical consumption rate is $0.24 per kWh.

cost = …….. [2]

(b) Explain why wire **A** rather than wire **B** is connected to the live terminal in the plug.

……

…… [2]

(c) State which wire carries no current when the table lamp is working normally.

.....

..... [1]

(d) Fig 12.2 shows a circuit breaker that is connected to the table lamp.

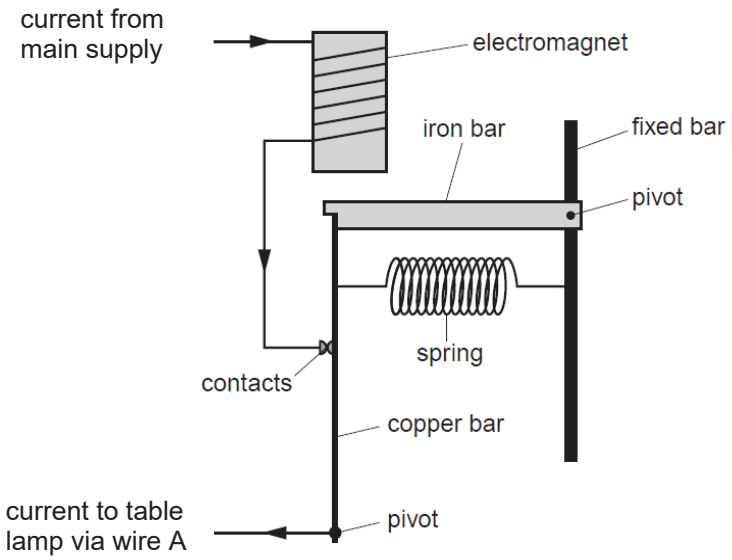


Fig. 12.2

Wire **A** in the table lamp becomes loose and touches the metal case. When this electrical fault occurs, explain how the circuit breaker in Fig 12.2 switches off the main current.

.....

.....

.....

.....

..... [3]

End of Paper

2018 4E5N PRELIM P1

Answers:

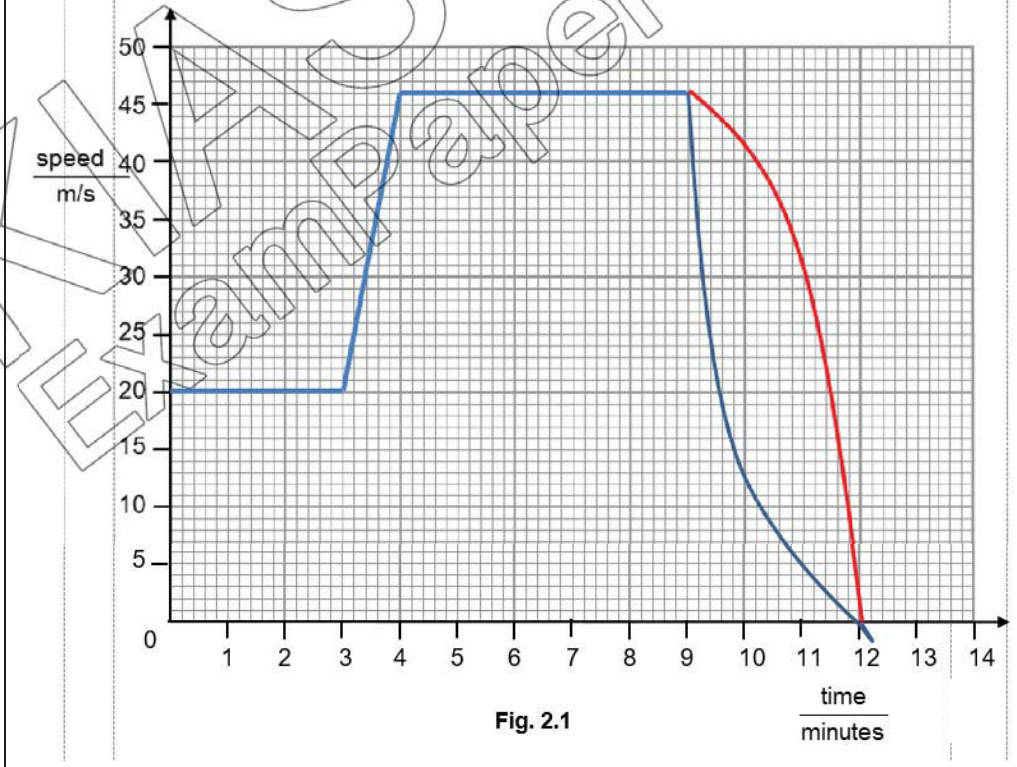
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
C	C	A	B	B	D	A	B	B	C
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
D	B	C	C	A	C	D	B	D	A
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
A	D	B	D	C	B	D	D	B	A
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
D	B	C	D	D	A	D	D	D	C

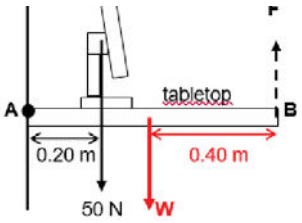
Marking Scheme 4E/5NA

Section A: [20]

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
11.	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**

Section B: [45]

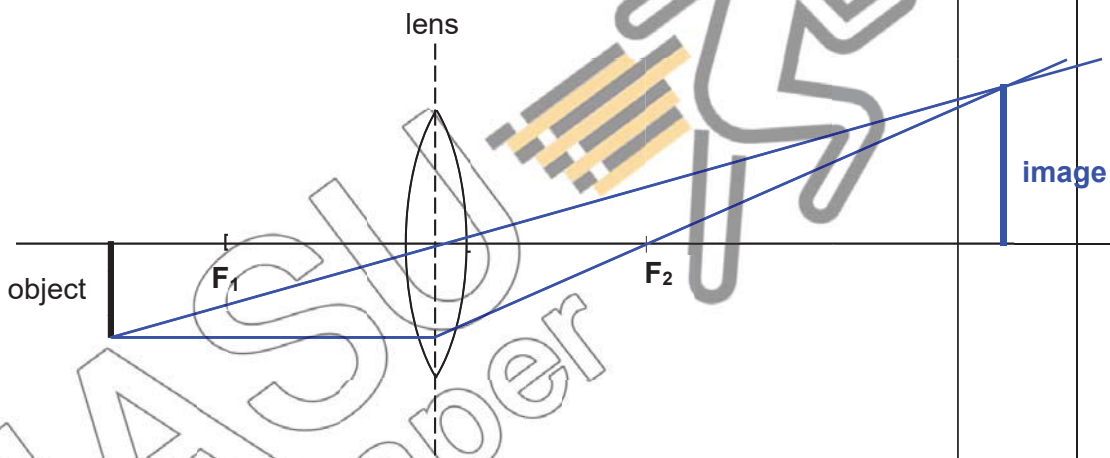
1	**(a)**	• The vibrating speaker pushes and pulls the surrounding air particles causing it to vibrate in the same direction as the wave motion. • This first layer of air will in turn pushes and pulls the next layer of air, • This process continues. • Producing a series of compression and rarefaction in the air.	[1/2] [1/2] [1/2] [1/2]
	(b)(i)	20000 waves are produced in 1 second.	[1]
	(ii)	$v = f\lambda$ $\lambda = v / f$ For longest wavelength, use f = 20 Hz $\lambda = 340\ ms^{-1} / 20\ Hz$ $= 17.0\ m$	 [1] [1]
2	**(a)**	 **Fig. 2.1** ½ m for each constant speed section of plot. 1m for constant acceleration & 1m for non-uniform deceleration If time duration is wrong, 0 m for each section.	[3]

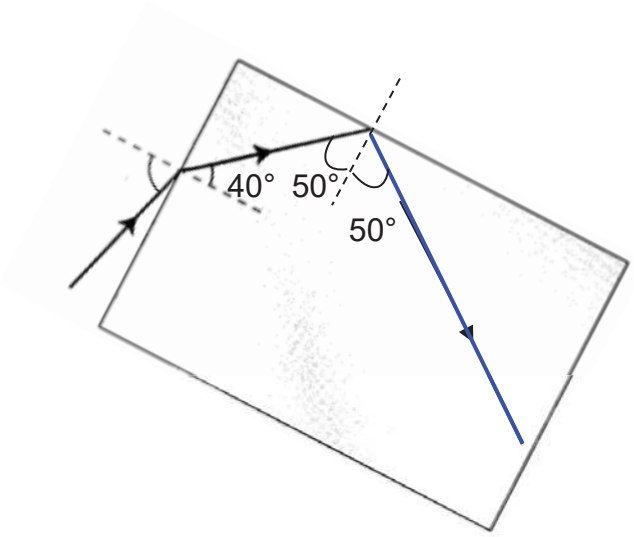
	(b)	$a = \frac{v-u}{t} = \frac{45-20}{4-3} = 25/60$ $= 0.417$ m/s² changing 1 min to 60 s (1m)	[M1] [A1]
	(c)	Force = 1200 X 0.417 = 500 N	[1] [1]
3	**(a)**	mass = w/g = 2.6/10 = 0.26 kg	[1]
	(b)	mass = density x volume = 0.80 x 250 = 200 g = 0.2 kg	[1] [1]
4	**(a)**	 give 1m so long w is vertical downward arrow near or at the centre of the tabletop.	[1]
	(b)	(1m) (1m) Resultant moment = (W x $D_{monitor}$) + (W x $D_{tabletop}$) = (50 N x 0.20 m) + (70 N + 0.40 m) = 10 Nm + 28 Nm = 38 Nm	[2]
	(c)	Sum of Anti-Clockwise moment = Sum of Clockwise moment F x 0.8 m = 38 Nm F = 38 / 0.8 F = 47.5 N	[1] [1]
5	**(a)**	KE = mgh $(0.5)(1.6)(v^2) = (1.6)(10)(1)$ = 16 v = 4.47 m/s	[1] [1]
	(b)	work done = KE (2.5)d = 16 d = 6.4 m	[1] [1]
6	**(a)(i)**	Ultraviolet radiation is used in sun beds / sterilisation of equipment.	[1]
	(ii)	Microwave is used for microwave oven / satellite communication	[1]

	(b)	Common: They are all transverse waves or They can travel through vacuum. Or They travel at a speed of 3.0 x 10^8 m/s in vacuum Difference: They have different wavelength / frequency (accept any other plausible answers)	[1] [1]
7	**(a)**	• Heat sink is made of metal, which is a good conductor of thermal energy allows thermal energy to be conducted quickly away from the chip. or • The heat sink/metal fins are painted black which is a good emitter / radiator of heat, which allow heat to be radiated more quickly. or • The metal fins have a large combined surface area , that allows radiant heat to be radiated more quickly through convection current. *(either two)*	[2] [2]
	(b)	As the temperature rises, the molecules in the heat sink vibrate more rigorously. The average spacing between the molecules increases.	[1] [1]
8	**(a)(i)**	Current in the rod from left to right	[1]
	(ii)	The rod moves outward	[1]
	(b)	(i) The rod moves with **slower speed outward**. [½ , ½] (ii) The rod moves in **the opposite direction** to its initial direction / inwards **in the same speed**. [½ , ½] **Must have both direction and speed to gain 1 mark*	[1] [1]
9	**(a)**	V = 1.5 x 3 = 4.5 V	[1] [1]
	(b)	V = 12 –4.5 = 7.5 V (allow ecf) I = 7.5 / 6 = 1.25 A or 1.3 A	[1] [1]
	(c)	V = 7.5V I = 1.5 – 1.25 = 0.25 A R = 7.5 / 0.25 = 30 Ω	 [1] [1]

Section B

10	**(a)(i)**	P = force / area = 300 N / 20 cm^2 = 15 N/cm^2	 [1] [1]
	(ii)	15 N/cm^2	[1]
	(iii)	Force = 15 N/cm^2 X 400 cm^2 = 6000 N	[1]
	(b) (i)	Volume = area x length = 20 cm^2 x 5 cm = 100 cm^3	 [1]

	(ii)	Length = Volume / area = 100 cm^3 / 400 cm^2 = 0.25 cm	[1]
	(c)	Valve A open and oil flows from the reservoir into piston P; valve B closes; pistonQ remains where it is. *(missing/wrong 1 deduct 1 mark)	[2]
	(d)	Oil, being a liquid, has molecules closely packed. As such it is not compressible. Air has molecules which are far apart. As such it is compressible.	[1] [1]
11	**(a)**	 At least 2 light rays coming from the top of the object to the opposite side of lens. Light rays must include arrow. Image drawn correctly without arrow head.	[1] [1]
	(b)	Real, inverted and enlarged – any two (missing/wrong 1 deduct 1 mark)	[1]
	(c)	projector	[1]
	(d)	The image becomes dimmer/less bright. With half the lens covered, less light passes through the remaining half of the lens to form the image.	[1] [1]
	(e)(i)	n = 1/sin c 1.54 = 1/sin C c = 40.5°	[1] [1]

	(ii)	 Correct ray direction [1/2] Correct angle given [1/2] Missing arrows/ incorrect arrows minus 1/2 mark Explain: With the incident angle at side PQ greater than the critical angle while going from denser medium to a less dense medium, Total Internal Reflection occurs at side PQ.	[1] for drawing [1/2] [1/2]
12	**(a)** **(i)**	P = VI 100 = 240 I I = 0.417 A R = V/I = 240 ÷ 0.417 = 576 Ω **OR** P = V^2 / R 100 = 240^2 / R R = 240^2 / 100 = 576 Ω	[1] [1] [1] [1]
	(ii)	E = Pt = 0.1 x 5 = 0.5 kWh Cost = 0.5 x 0.24 = $0.12	[1] [1]
	(b)	This is because wire A has a **switch** connected to it. So when the switch is open, the appliance will be **disconnected from the high voltage live wire**. Thus preventing the possibility of electric shock to the user.	[1] [1]
	(c)	Wire C	[1]

	(d)	When the fault occurs, large current flows into the circuit breaker the electromagnet is magnetised strong enough to attract the iron bar. The copper bar is pulled away from the contact by the spring. The contact is broken.	[1] [½, ½] [1]