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CHRIST CHURCH SECONDARY SCHOOL
2022 PRELIMINARY EXAMINATION
FOUR EXPRESS/ FIVE NORMAL (ACADEMIC)

CANDIDATE
NAME

CLASS

CENTRE
NUMBER

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INDEX
NUMBER

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SCIENCE (PHYSICS, CHEMISTRY)

5076/01

Paper 1 Multiple Choice

19 July 2022

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, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions in 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.

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 booklet.

A copy of the Data Sheet is printed on page **16**.

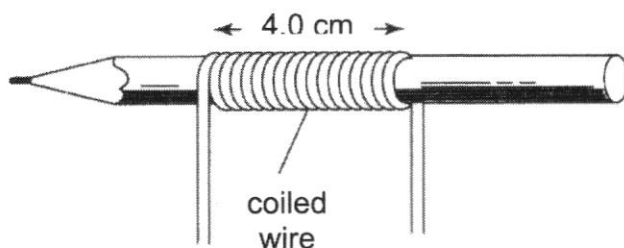
A copy of the Periodic Table is printed on page **17**.

This document consists of **17** printed pages.

2

- 1 The radius of a piece of copper wire is to be measured using a ruler. The wire is wound tightly round a pencil to make 18 turns. The length of the solenoid formed is then measured using a ruler.

The radius of the wire is _____.

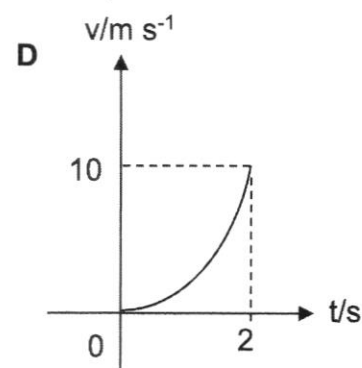
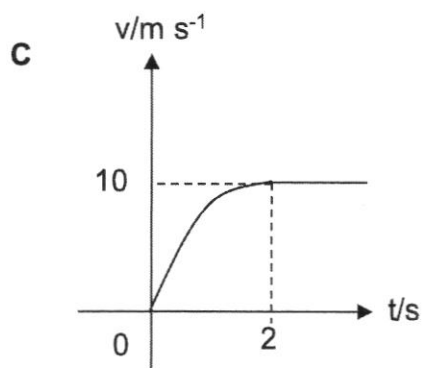
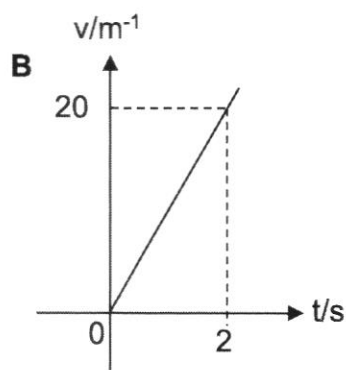
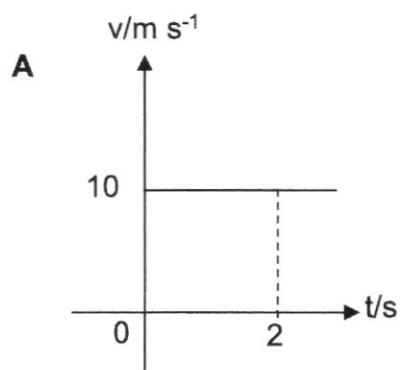


- A** 0.11 cm **B** 0.22 cm **C** 2.22 cm **D** 4.5 cm
- 2 The swings of a simple pendulum (of fixed length) are 10° wide and each swing takes two second.

How long will each swing take if the width of the swing is reduced to 5° ?

- A** 0.25 second **B** 0.50 second
C 1.00 second **D** 2.00 second
- 3 An iron ball falls through the air. The acceleration of free fall is 10 m/s^2 . Air resistance can be ignored.

Which of the following graphs below best describes the motion of the iron ball during the first two seconds of its fall?



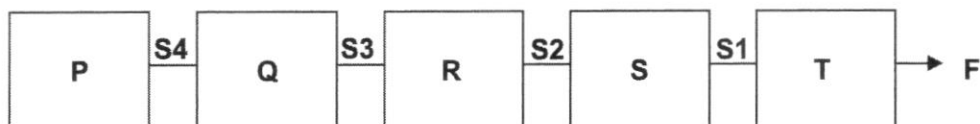
3

- 4 Two forces act on a ball. The magnitudes of the two forces are 8.0 N and 13.0 N.

Which of the following **cannot** be the resultant force acting on the ball?

- A** 4.0 N **B** 5.0 N **C** 14.0 N **D** 21.0 N

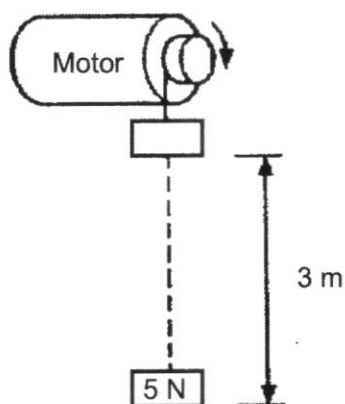
- 5 Five blocks **P**, **Q**, **R**, **S** and **T**, of different masses, are connected by four identical strings **S1**, **S2**, **S3** and **S4** as shown in the diagram below. They are pulled by a steadily increasing force **F**.



Which of the following strings is most likely to break?

- A** S1 **B** S2
C S3 **D** S4

- 6 An electric motor is used to lift a 5 N load through 3 m as shown in the diagram. The total amount of electrical energy used by the motor is 27 J.



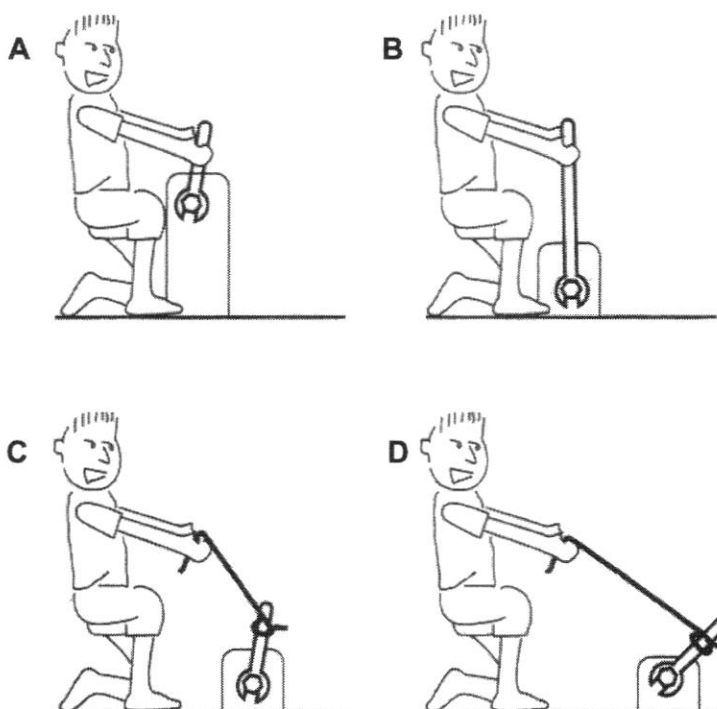
What is the amount of energy wasted by the motor?

- A** 9 J **B** 12 J
C 15 J **D** 22 J

4

- 7 Andy is having difficulty in turning the nut using the spanner. He pulls with the same force in each case.

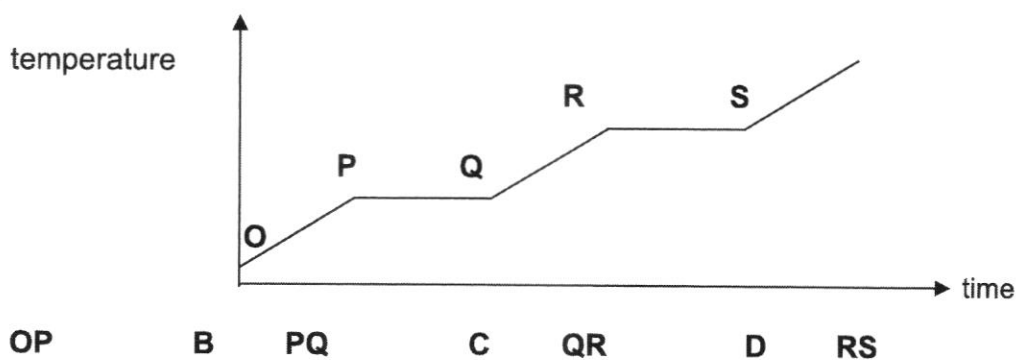
Which diagram below shows him producing the biggest turning effect?



- 8 Heat transfer can occur by conduction, convection or radiation.

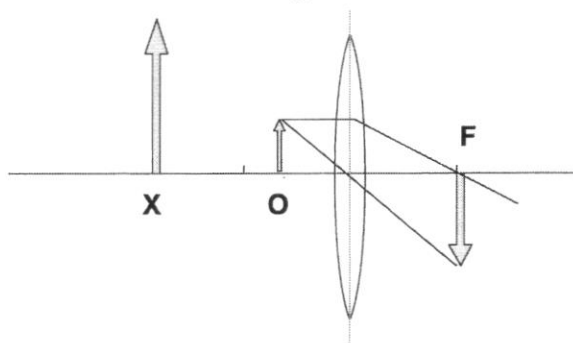
The best example of heat transfer by conduction is _____.

- A from the boiler to the hot water storage tank in the domestic hot water system
 - B from the frying-pan to its contents
 - C from the Sun to the Earth
 - D through glass into a greenhouse
- 9 A solid substance in a boiling tube was heated steadily. The temperature-time graph of the substance is as shown below.
- Which section of the graph indicates the substance being a mixture of solid and liquid?



5

- 10 A student starts to draw a ray diagram for an object at O, near a thin convex lens, but is not sure whether the image is formed at X or at F.



The correctly drawn image is _____.

- A real and at F. B real and at X.
C virtual and at F. D virtual and at X.

- 11 The table below represents the electromagnetic spectrum.

radio waves	X	infra-red rays	Y	ultraviolet rays	Z
-------------	---	----------------	---	------------------	---

What waves do X, Y and Z represent?

	X	Y	Z
A	microwaves	gamma rays	X rays
B	visible light	X rays	gamma rays
C	microwaves	visible light	X rays
D	visible light	microwaves	gamma rays

- 12 A man who is standing at point X between two parallel walls fires a pistol.

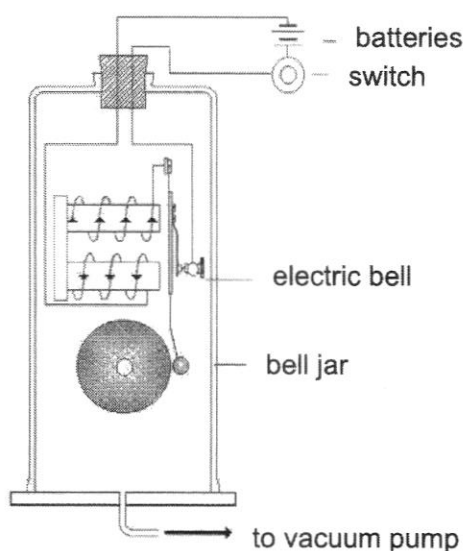


He hears echoes after 0.5 s and 0.8 s. A **further** echo is heard, after firing, at a time of _____.

- A 1.1 s B 1.3 s C 2.2 s D 2.6 s

6

- 13 An electric bell is placed inside a bell jar and the air inside the bell jar is removed using a vacuum pump.



Which of the following statements is **true**?

- A When the switch is closed, a ringing sound is heard because the core becomes magnetized and attracts the armature.
 - B The bell will produce only one ringing sound every time the switch is closed.
 - C The frequency of sound waves produced by the bell is less than 20 Hz, making the ringing sound inaudible.
 - D No sound is heard even when the switch is closed because the sound waves cannot travel through vacuum.
- 14 A positively charged object attracts a suspended light conducting ball.

The light conducting ball can be _____.

- I negatively charged
 - II neutral
 - III positively charged
- A I only
 - B III only
 - C I and II only
 - D II and III only
- 15 A current of 5 mA flows in a circuit for 2 minutes.

Calculate the amount of charge that passes through the circuit.

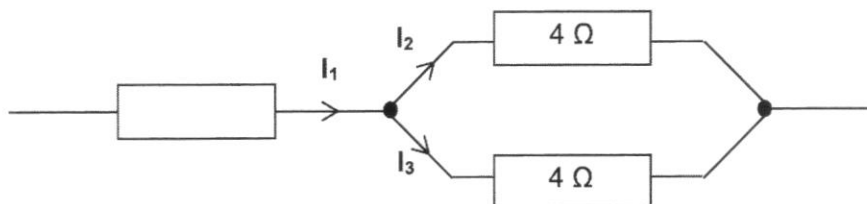
- | | |
|---------|---------|
| A 0.6 C | B 10 C |
| C 60 C | D 600 C |

- 16** A wire of radius, r , has a resistance of $20\ \Omega$.

If another similar wire, twice the length but half the cross-sectional area is used, what is the new resistance of the wire?

- | | | | |
|----------|-------------|----------|-------------|
| A | 5 Ω | B | 10 Ω |
| C | 40 Ω | D | 80 Ω |

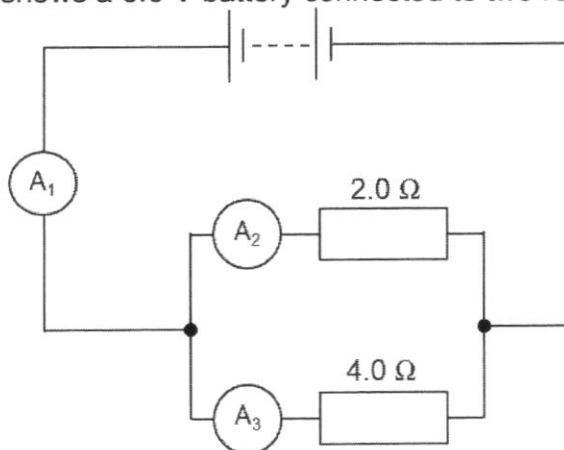
- 17** In the diagram below, I_1 is the current supplied by a source. I_2 and I_3 are the currents in each branch of the parallel arrangement shown.



Which of the following statements concerning I_1 , I_2 and I_3 is correct?

- A** I_1 is equal to I_2 but greater than I_3 .
B I_2 is greater than I_3 but smaller than I_1 .
C I_3 is greater than I_2 but smaller than I_1 .
D I_2 is equal to I_3 but smaller than I_1 .

- 18** The diagram shows a 6.0 V battery connected to two resistors in parallel.



Which row shows the currents, in amperes, in the three ammeters?

	A ₁	A ₂	A ₃
A	1.0	1.0	1.0
B	1.0	3.0	1.5
C	4.5	1.5	3.0
D	4.5	3.0	1.5

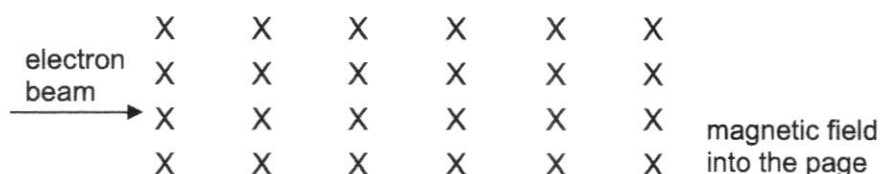
8

- 19** An electric heater is connected to a 3-pin socket. The current in the 'live' wire is 1 A. The potential difference between the 'live' and 'neutral' wire is 240 V.

Which of the following correctly describes the current and the potential difference between the 'neutral' and 'earth' wire?

	current in 'neutral' wire (A)	potential difference between 'earth' and 'neutral' wire (V)
A	0	0
B	1	0
C	1	240
D	0	240

- 20** The diagram below shows a beam of electrons about to enter a magnetic field. The direction of the field is into the page.



What will be the direction of the deflection, if any, as the beam passes through the magnetic field?

- A** towards the top of the page
- B** towards the bottom of the page
- C** out of the paper
- D** no deflection



CHRIST CHURCH SECONDARY SCHOOL
2022 PRELIMINARY EXAMINATION
SECONDARY 4 EXPRESS / 5 NORMAL (ACADEMIC)

CANDIDATE
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SCIENCE (PHYSICS, CHEMISTRY)

Paper 2 Physics

5076/02

13 July 2022

1 hour 15 minutes

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

READ THESE INSTRUCTIONS FIRST

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

The use of an approved scientific calculator is expected, where appropriate.
 You may lose marks if you do not show your working or if you do not use appropriate units.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.

Write your answers in the spaces provided on the question paper

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

For Examiner's Use	
Section A	
Section B	
Total	

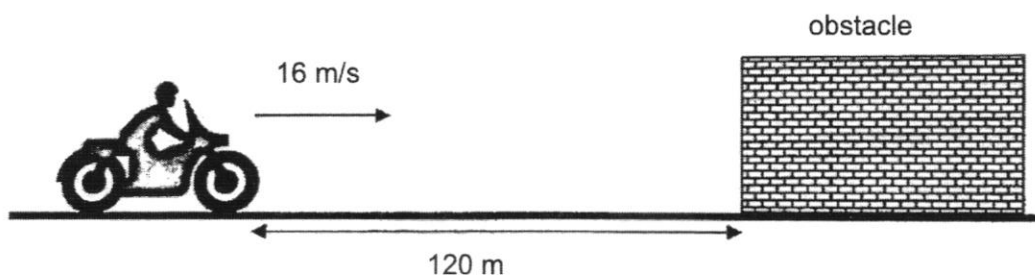
This document consists of **15** printed pages.

2

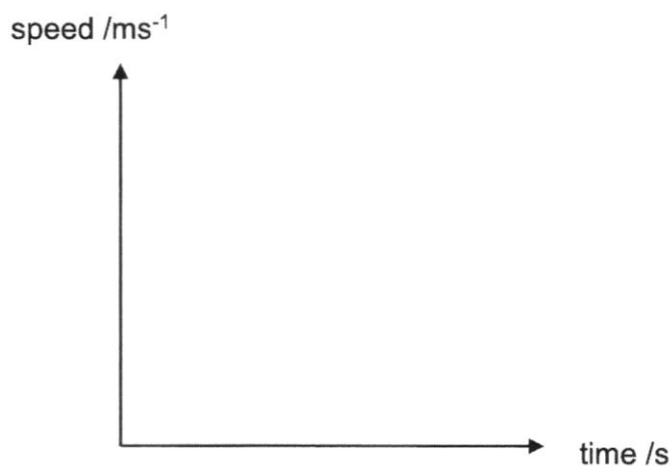
Section A [45 marks]

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

- 1 A motorcycle is travelling towards an obstacle at a constant speed of 16 m/s as shown in Fig. 1.1. The motorcyclist only sees the obstacle when he is 120 m away, and applies the brake immediately. He takes 12.0 seconds to decelerate uniformly to a stop.

**Fig. 1.1**

- (a) Sketch the speed-time graph of the motorcycle from the time when the motorcyclist first sees the obstacle to the time when the motorcycle comes to a stop. Indicate clearly the corresponding values of speed and time on the axes.



[2]

- (b) (i) Calculate the deceleration of the motorcyclist.

deceleration = m/s² [2]

3

- (ii) Showing the relevant calculations in the space below, determine whether the motorcyclist will hit the obstacle.

[2]

- (c) If the motorcyclist carries an additional passenger, suggest and explain whether it is more or less likely for the motorcycle to hit the obstacle.

.....

 [1]

- 2 A tyre which is used on a large earth-moving vehicle is shown in Fig. 2.1. The vehicle has four of these tyres. When the vehicle is loaded, its mass is 10 000 kg.

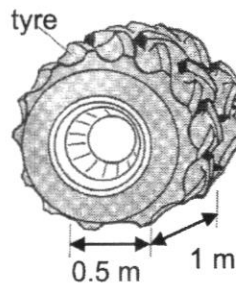


Fig. 2.1

- (a) Calculate the total area of the four tyres, in m^2 , in contact with the ground.

total area = m^2 [2]

- (b) Calculate the pressure, in Pa, exerted on the ground by the tyres.

pressure = Pa [2]

4

- 3 Fig. 3.1 below shows an object **O** being pulled by two men using two ropes. Each man exerts a force of 50 N. The ropes are kept horizontal to the ground.

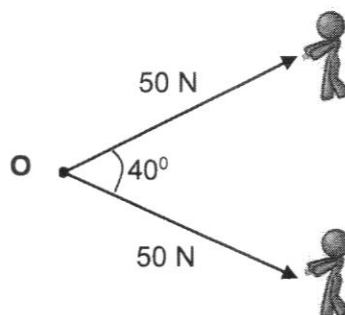


Fig. 3.1

Using a vector diagram, determine the resultant force on the object. State the scale used.

resultant force = N [3]

5

- 4 Fig. 4.1 shows a helicopter stationary in the air. Vertical lift forces are produced by the front and back rotors as shown in the figure.

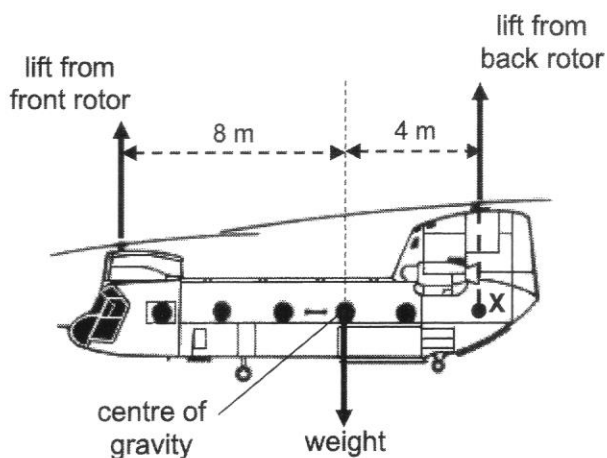


Fig. 4.1

The weight of the helicopter is 80 000 N.

- (a) Calculate the mass of the helicopter. (Taking $g = 10 \text{ N/kg}$)

mass = N [1]

- (b) By taking moments about point X, calculate
(i) the moment due to the weight of the helicopter.

moment = Nm [2]

- (ii) the lift force from the front rotor.

lift force = N [2]

- (c) Using your answer in (b) (ii), calculate the lift force from the back rotor.

lift force = N [1]

6

- 5 Fig. 5.1 shows a boy doing push-up exercise. He applies a force of 400 N as he pushes up a distance of 0.45 m. He completed 40 push-ups in 1 minute.



Fig. 5.1

Calculate the

- (a) work done by the boy when he completed one push-up.

work done = J [1]

- (b) power generated by the boy in 1 minute.

power = W [2]

- 6 Fig. 6.1 shows a computer chip fitted with a heat sink with black metal fins. The function of the heat sink is to keep the computer chip cool.

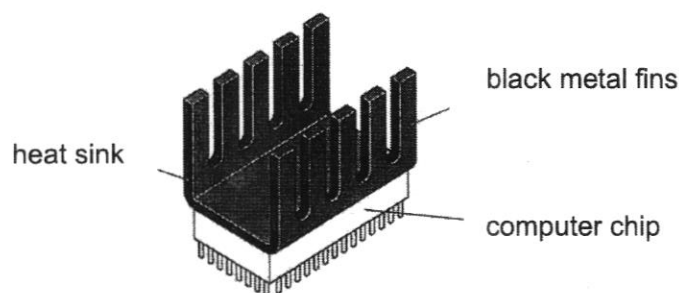


Fig. 6.1

Explain three features of the heat sink that allow the thermal energy to be transferred easily away from the chip. In your answer, state clearly the method(s) by which thermal energy is transferred.

.....

.....

.....

.....

..... [3]

7

- 7 A solid substance is placed in a beaker and heated with a 10 W heater. Fig. 7.1 shows how the temperature of the beaker and its contents changes with time.

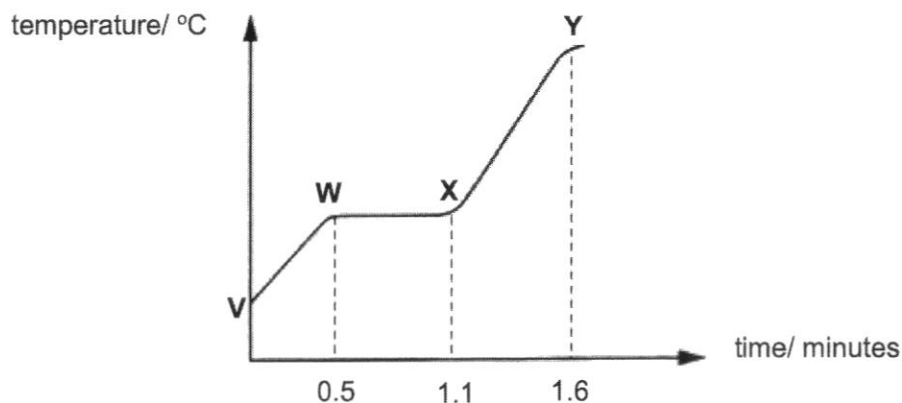


Fig. 7.1

- (a) Compare the arrangement and forces of attraction between the molecules of the substance in the segments **VW** and **XY**.

arrangement of molecules:

.....

 [1]

forces of attraction between molecules:

.....

 [1]

- (b) Explain why the temperature of the substance remains constant for the segment **WX** even when energy is continuously supplied.

.....

 [2]

8

- (c) Calculate the amount of thermal energy supplied by the heater during the segment **WX**.

energy = J [2]

- (d) Explain why the actual energy gained by the substance in the segment **WX** is less than the energy supplied by the heater calculated in part (c).

.....

 [1]

- 8 Typical wavelengths of electromagnetic waves (E.M. waves) are given in Table 8.1 below, given that $1 \text{ nm} = 1 \times 10^{-9} \text{ m}$.

E.M. wave	gamma	X-rays	ultra-violet	visible light	infra-red	microwaves	radio
typical wavelength	0.001 nm	0.1 nm	10 nm	0.6 μm	100 μm	0.03 m	3 m

Table 8.1

- (a) (i) State the speed of ultra-violet waves in a vacuum.

speed = m/s [1]

- (ii) Calculate the frequency of ultra-violet waves of wavelength 10 nm.

frequency = Hz [2]

- (b) State one use of ultra-violet waves.

..... [1]

- (c) State one use of infra-red waves.

..... [1]

9

- 9 Fig. 9.1 shows a circuit with three $12\ \Omega$ resistors connected in series with a battery and an ammeter. An unknown resistor X is to be connected between any two of the four points **H**, **I**, **J**, **K**.

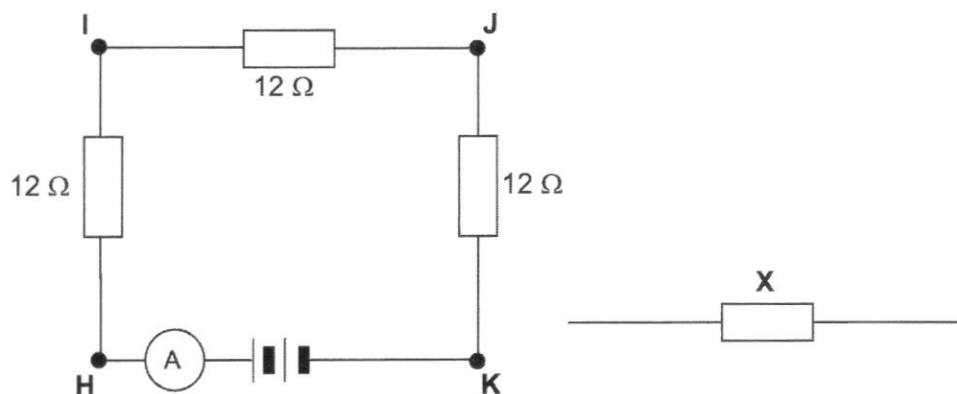


Fig. 9.1

- (a) If the ammeter reads 0.25 A before resistor X is connected, calculate the electromotive force of the battery.

$$\text{emf} = \dots\dots\dots \text{V} \quad [2]$$

- (b) If X is $9\ \Omega$ and is connected **in series** between **H** and **K**, calculate
(i) the effective resistance of the circuit,

$$\text{effective resistance} = \dots\dots\dots \Omega \quad [1]$$

- (ii) the current flowing through the ammeter

$$\text{current} = \dots\dots\dots \text{A} \quad [2]$$

- (c) State and explain what happens to the current flowing through the ammeter if a wire of negligible resistance is connected in parallel across **I** and **J**.

.....

 [2]

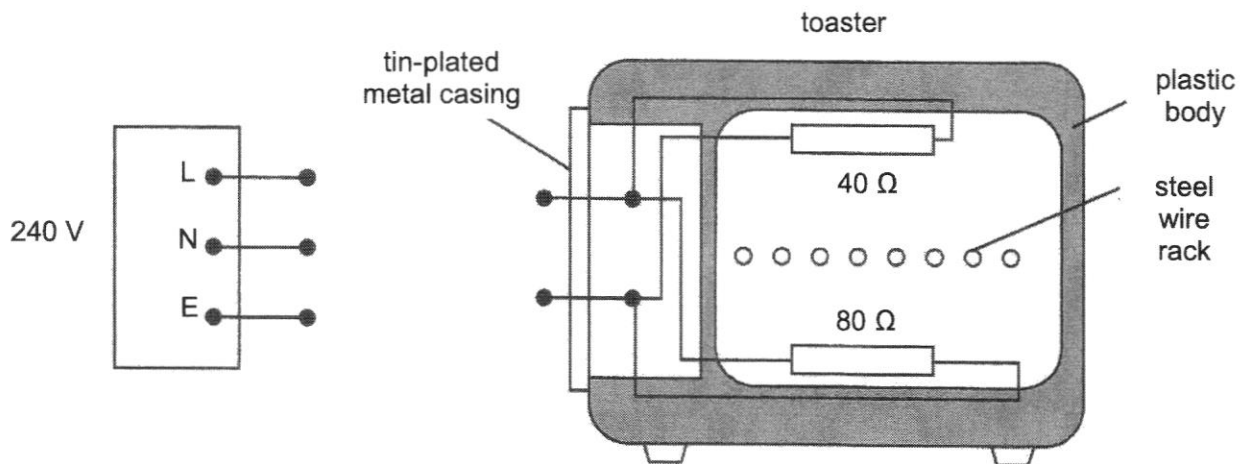
10

Section B [20 marks]Answer any **two** questions.

Write our answers in the spaces provided.

- 10** An electric convection oven with a top and bottom heating elements, which is able to provide more uniform heating to food placed in the toaster, is shown in Fig. 10.1.

The top and bottom heating elements are connected in **parallel**, and have resistances of $40\ \Omega$ and $80\ \Omega$ respectively.

**Fig. 10.1**

- (a)** On the figure above, draw lines to show how the live, neutral and earth wires should be wired from the 240 V a.c. source to the toaster.

Include a fuse and a switch in your circuit diagram.

[3]

- (b)** Calculate the current that is drawn when the toaster is working normally.

current = A [2]

11

- (c) State the function of a fuse, and explain how it works in the circuit.

.....
.....
..... [2]

- (d) Given the choice of 3 A, 5 A, 13 A or 20 A, state the fuse rating that should be used,

fuse rating = A [1]

- (e) Find the cost, in cents, of using the toaster for 5 minutes if the cost is 27 cents per unit of electricity.

cost =cents [2]

- 11 (a) Fig. 11.1 shows a section of an optical fibre with the refractive index of $n = 1.46$. A ray of light from air is incident on the fibre and the angle of incidence at the air-fibre boundary is 30° .

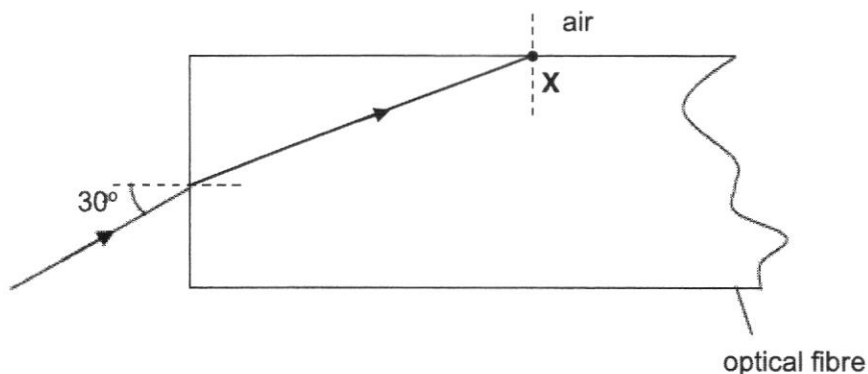


Fig. 11.1

- (i) Calculate the angle of refraction at the air-fibre boundary.

angle of refraction = $^\circ$ [2]

- (ii) Calculate the critical angle of the optical fibre.

critical angle = $^\circ$ [2]

- (iii) Calculate the angle of incidence at the fibre-air boundary at X.

angle of incidence = $^\circ$ [1]

- (iv) At the fibre-air boundary, X, will the ray of light emerge from the fibre into the air? Explain your answer.

.....

 [2]

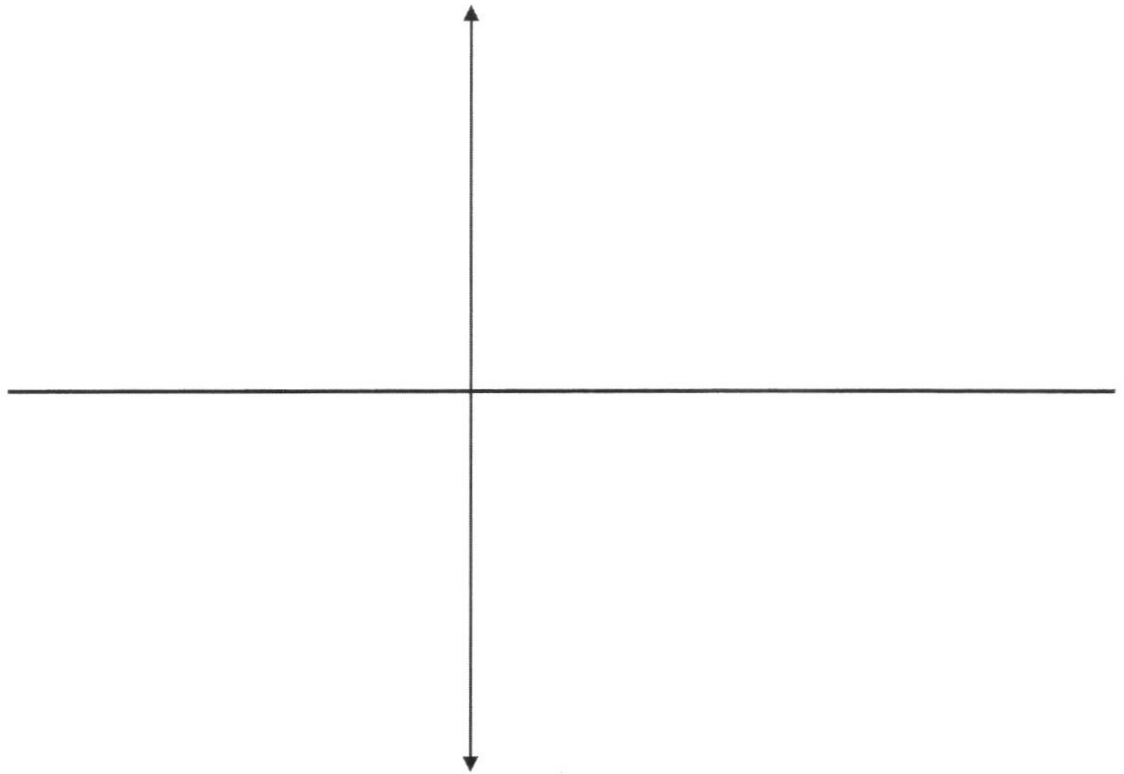
13

- (b) An object of height 2.0 cm is placed 2.8 cm in front of a converging lens. A virtual image was produced and it was magnified by 1.5 times.

(i) State another characteristics of the image.

..... [1]

- (ii) By means of a scale diagram below, determine the focal length of the lens used. The principle axis and lens have been drawn for you.



focal length = [2]

- 12 (a) Suggest a material that is used to make a permanent magnet

[1]

- (b) When there are no other magnetic fields present, the needle of a plotting compass points due North in the Earth's magnetic field. This is shown in the fig. 12.1.

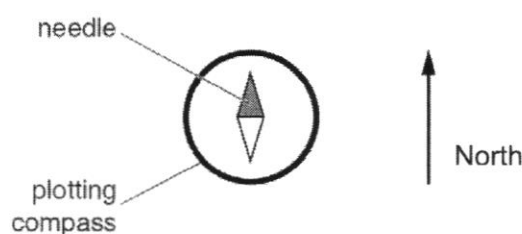


Fig. 12.1

The plotting compass is placed close to a permanent magnet, first at position A and then at position B, as shown in fig. 12.2.

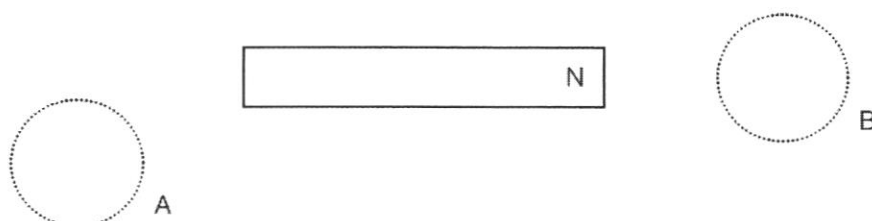


Fig. 12.2

The magnetic field close to the permanent magnet is very much larger than the magnetic field of the Earth.

Draw needles in the two circles to show the direction in which the compass needle points when the compass is at A and at B. [2]

- (c) **Figure 12.3** shows a coil which is wound on an iron core. It is placed near a permanent magnet.

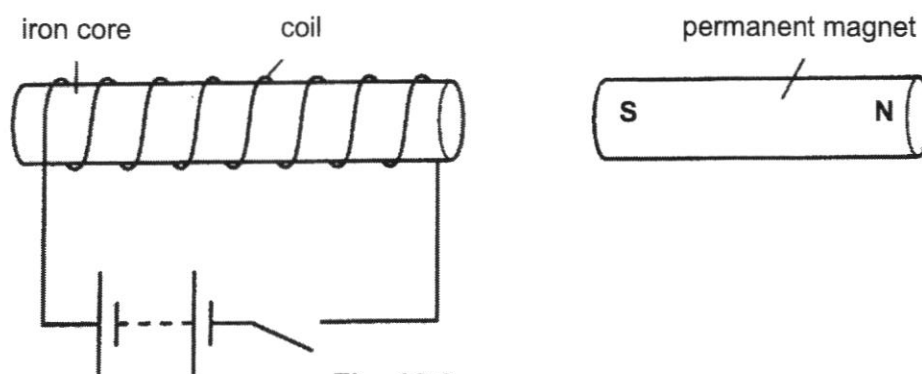


Fig. 12.3

15

- (i) On fig. 12.3, label the direction in which the current flows, and identify the North and South poles on the iron core. [2]
- (ii) What happens to the permanent magnet when it is placed near the coil? Explain your answer briefly.

.....

.....

..... [2]

- (iii) Suggest one way to increase the strength of the electromagnet.s

.....

..... [1]

- (d) Fig. 12.4 shows a permanent magnet and a current-carrying wire placed near it, with the current flowing into the plane of the paper. The wire experiences an induced force.

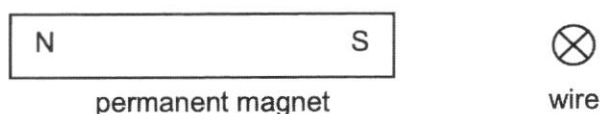


Fig. 12.4

On fig. 12.4, draw

- (i) draw the magnetic field pattern due to the current on the wire, [1]
- (ii) draw the direction of the induced force acting on the wire. [1]

END OF PAPER



CHRIST CHURCH SECONDARY SCHOOL
5076 Combined Science (Phy/Chem)
Prelim Examination, 2022
4E/5N

Marking Scheme

Section A (20 marks)

Question	Answer	Question	Answer	Question	Answer	Question	Answer
1	A	6	B	11	C	16	D
2	D	7	B	12	B	17	D
3	B	8	B	13	D	18	D
4	A	9	B	14	C	19	B
5	A	10	D	15	A	20	B

CHRIST CHURCH SECONDARY SCHOOL
Science (Physics) Prelim Exam, 2022
Secondary Four Express/Five NA



Marking Scheme

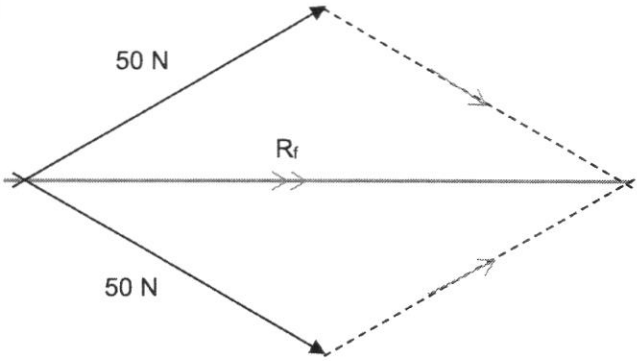
Paper 2 (65 marks)

- ½ mark awarded for correct relevant formula
- Minus ½ mark for answer with incorrect significant figures

Section A (45 marks)

Question	Answer	Marks
1 a	speed /ms⁻¹ 16 0 12 time /s	Correct shape of straight line [1] Correct label of values on axis [1]
bi	$a = (v-u)/t$ $= (0-16)/12$ $= -1.33 \text{ ms}^{-2}$ deceleration = 1.33 ms^{-2} [Do not award answer mark if answer is -1.33]	[1] [1]
bii	total distance travelled = area under graph $= (0.5 \times 12 \times 16)$ $= 96 \text{ m}$ Since distance travelled < 120 m, he will not hit the obstacle	[1] [1]
c	It is more likely for the motorcycle to hit the obstacle. With an extra passenger, there is greater mass, which means there is greater inertia. This will increase his stopping distance.	[1/2] [1/2]
		Total: 7 marks

2	a	total area = $(4)(0.50 \times 1.0)$ = 2 m^2 [Award 1m if only one tyre is calculated]	[1] [1]
	b	$P = F / A$ = $(10\,000 \times 10) / 2$ = $50\,000 \text{ Pa}$	[1] [1] allow ecf
			Total: 4 marks

3		Scale: 1 cm: 10 N  Resultant force = $9.4 \text{ cm} \times 10 \text{ N}$ = $94 \text{ N} \pm 5 \text{ N}$ [Minus 0.5 marks for no label and arrows]	Suitable scale [B1] Correct parallelogram drawn [B1] Correct value of resultant force according to parallelogram [B1]
			Total: 3 marks

4	a	mass = $80\,000 / 10$ = $8\,000 \text{ kg}$	[1]
	bi	moment due to the weight = $80\,000 \times 4$ = $320\,000 \text{ Nm}$	[1] [1]
	bii	lift force from the front rotor = $320\,000 / 12$ = $26\,700 \text{ N}$ (corrected to 3 s.f.)	[1] [1]
	c	lift force from the back rotor = $80\,000 - 26\,700$ = $53\,300 \text{ N}$	[1] allow ecf
			Total: 6 marks

5	a	work done = 400×0.45 = 180 J	[1]
	b	power = $(180 \times 40) / 60$ = 120 W [No method mark awarded if the time used is in min]	[1] [1]
			Total: 3 marks

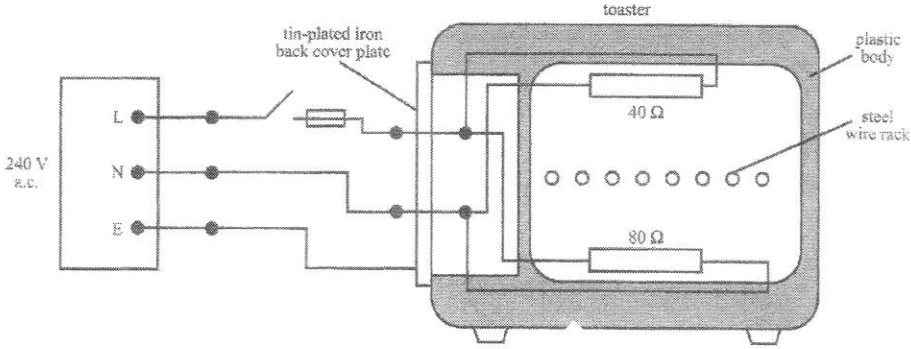
6		The heat sink is designed with fins so that it has large surface area. This feature helps to radiate thermal energy much faster as compared to a flat surface. (or increase thermal energy lost by radiation) The heat sink is made of metal which is a good thermal conductor. This increases transfer of thermal energy by conduction The heat sink is black in colour. Black is a good radiator of thermal energy.	[1] [1] [1]
			Total: 3 marks

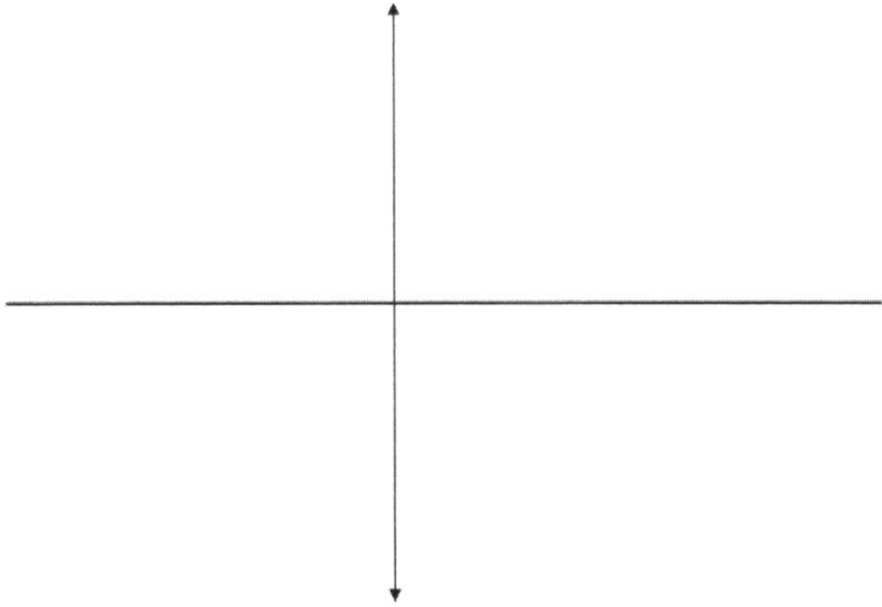
7	a	Arrangement of molecules: Molecules in VW are arranged in an orderly manner, while molecules in XY are arranged in a disorderly manner. [Also accept Arrangement of molecules: Molecules in VW are close together, while molecules in XY are further apart. or Arrangement of molecules: Molecules in VW are arranged in a regular pattern, while molecules in XY are arranged in an irregular pattern.] Forces of attraction between the molecules: Forces of attraction between molecules in VW is stronger than that in XY.	[1] [1]
	b	Heat is absorbed to break/weaken bonds. The energy supplied is not to increase the K.E of the particles. Hence, temperature remains constant.	[1] [1]
	c	$E = Pt$ $= 10 \times [(1.1 - 0.50) \times 60]$ $= 360 \text{ J}$	[1] [1]
	d	Some energy produced by the heater is lost to the surroundings / beaker.	[1]
			Total: 7 marks

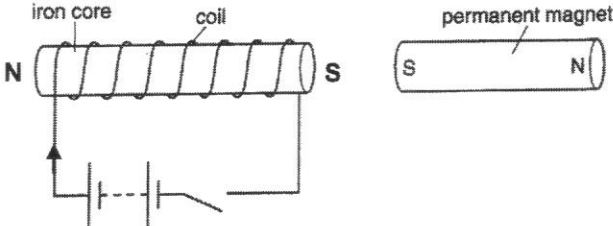
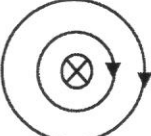
8	ai	speed = 3×10^8 m/s	[1]
	aii	$f = v/\lambda$ $= (3 \times 10^8) / (10 \times 10^{-9})$ $= 3 \times 10^{16}$ Hz	[1] [1] allow ecf
	b	detection for forgery of fake notes [accept any possible answers]	[1]
	c	TV remote controller [accept any possible answers]	[1]
			Total: 5 marks

9	a	$V = IR$ $= 0.25 \times 36$ $= 9$ V	[1] [1]
	bi	$12 + 12 + 12 + 9$ $= 45 \Omega$	[1]
	bii	$I = V/R$ $= 9/45$ $= 0.2$ A	[1] [1]
	c	The current will increase as total resistance drops to 24Ω instead of 36Ω due to short circuit.	[1] [1]
			Total: 7 marks

Section B (10 marks, 3 choose 2)

Question	Answer	Marks
10 a		
	Live, neutral and earth wires corrected wired [1 mark for 2 correct answers] [crossing of wires not allowed] Fuse and switch connected to live wire	[2] [1]
b	$\frac{1}{R} = \frac{1}{40} + \frac{1}{80}$ $\frac{1}{R} = \frac{3}{80}$ $R = 26.7 \, \Omega$ $I = V / R$ $= 240 / 26.7$ $= 8.99 \, \text{A}$ [Award 1m if current is calculated based on incorrect resistance values] [Accept 2 or 3 s.f.]	[1] [1]
c	If the current exceeds the fuse rating, the fuse will become hot, melt and break the circuit. This stops the current from flowing in the circuit and hence protecting the appliance from damage.	[1/2] [1/2] [1/2] [1/2]
d	fuse rating = 13 A	[1] allow ecf
e	$P = VI$ $= (240)(8.99)$ $= 2160 \, \text{W}$ $= 2.16 \, \text{kW}$ $E = Pt$ $= (2.16)(5 / 60)$ $= 0.18 \, \text{kWh}$ $\text{Cost} = (0.180)(27)$ $= 4.86 \, \text{cents (accept 5 cents)}$	[1/2] [1/2] [1] allow ecf
		Total: 10 marks

Question		Answer	Marks
11	ai	$n = \frac{\sin i}{\sin r}$ $\sin r = \frac{\sin 30}{1.46}$ $= 0.342$ $r = 20^\circ$	 [1] [1]
	aii	$n = \frac{1}{\sin c}$ $1.46 = \frac{1}{\sin c}$ $\sin c = \frac{1}{1.46}$ $c = 43.2^\circ$	 [1] [1] accept 43°
	aiii	$i = 90 - 20 = 70^\circ$	[1]
	aiv	No. Because the angle of incidence is greater than critical angle.	 [1] [1]
	bi	Upright	[1]
	bii		
		Correct ray diagram drawn, showing both object and image. Accurate dimension according to question. [Minus max 0.5 mark for following Bold or dotted lines not according to answer above, Missing arrows, etc.] Focal length = 7.5 cm (± 1.0)	 [1] [1] allow ecf
			Total: 10 marks

Question	Answer	Marks
12 a	steel	[1]
b	compass A points towards S-pole of magnet compass B points right, away from N-pole of magnet	[1] [1]
ci	 Direction of current flow Label both N and S	[1] [1]
cii	The permanent magnet will be repelled by the electromagnet because two like poles (South poles) are facing each other.	[1] [1]
ciii	Any one of the following: Increase the current, Increases the number of turns of the solenoid,	[1]
di	 Correct shape and direction.	[1]
dii	 Downward force acting on wire.	[1]

THE END