Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **May/June 2016**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

* 1 5 4 9 6 3 7 5 0 3 *

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Write in soft pencil.
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Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
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There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
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Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

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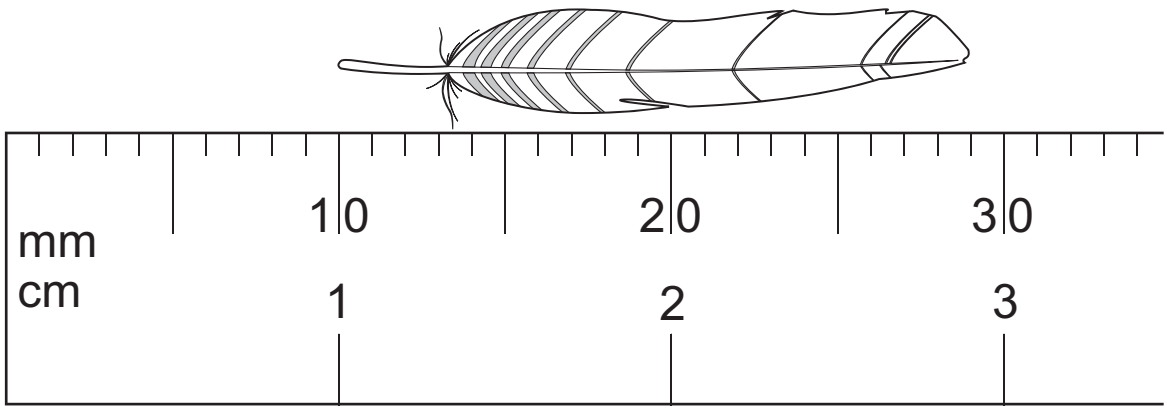
This document consists of **17** printed pages and **3** blank pages.

1 The diagram shows an enlarged drawing of the end of a metre rule. It is being used to measure the length of a small feather.



What is the length of the feather?

A 19 mm **B** 29 mm **C** 19 cm **D** 29 cm

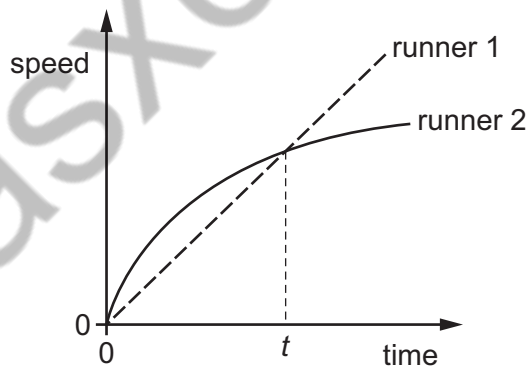
2 A train begins a journey from a station and travels 60 km in a time of 20 minutes.

What is the average speed of the train?

A 3.0 m/s **B** 5.0 m/s **C** 50 m/s **D** 60 m/s

3 Two runners take part in a race.

The graph shows how the speed of each runner changes with time.



What does the graph show about the runners at time *t*?

A Both runners are moving at the same speed.

B Runner 1 has zero acceleration.

C Runner 1 is overtaking runner 2.

D Runner 2 is slowing down.

4 A cup contains hot liquid.

Some of the liquid evaporates.

What happens to the mass and what happens to the weight of the liquid in the cup?

	mass	weight
A	decreases	decreases
B	decreases	stays the same
C	stays the same	decreases
D	stays the same	stays the same

5 An object has a mass of 50 kg.

The gravitational field strength on Earth is 10.0 N / kg.

The gravitational field strength on a distant planet is 4.0 N / kg.

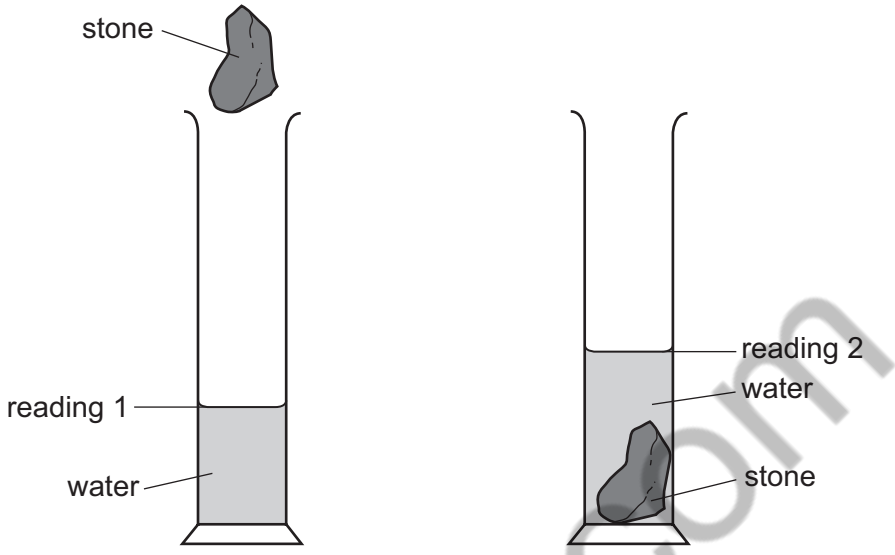
What is the weight of the object on Earth, and what is its weight on the distant planet?

	on Earth	on the distant planet
A	5.0 kg	12.5 kg
B	5.0 N	12.5 N
C	500 kg	200 kg
D	500 N	200 N

6 A student wishes to determine the density of an irregularly-shaped stone.

First he finds the mass of the stone. Next he lowers the stone into a measuring cylinder containing water.

The diagrams show the measuring cylinder before and after the stone is lowered into it.



How should the student calculate the density of the stone?

A mass of stone × reading 2

B mass of stone × (reading 2 – reading 1)

C mass of stone ÷ reading 2

D mass of stone ÷ (reading 2 – reading 1)

7 Which is an example of a force?

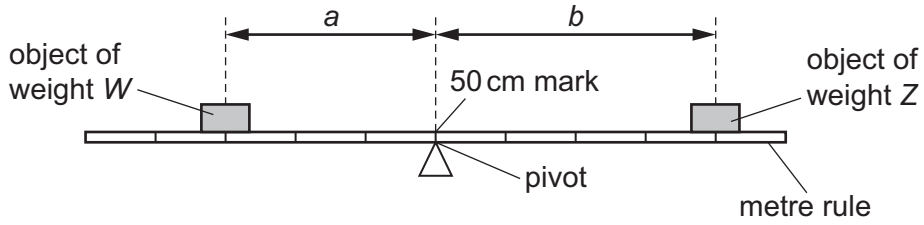
A energy

B power

C pressure

D weight

8 The diagram shows an object of weight W and an object of weight Z balanced on a uniform metre rule.



Which equation relating to W, Z, a and b is correct?

A $\frac{W}{a} = \frac{Z}{b}$

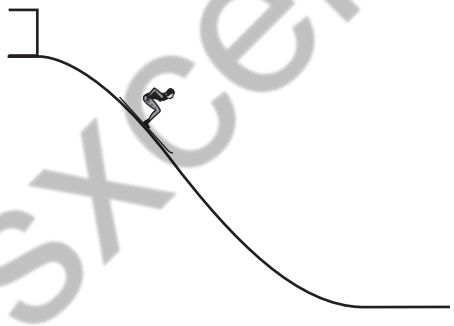
B $W \times Z = a \times b$

C $W \times a = Z \times b$

D $W \times (a + b) = Z$

9 A skier walks from the bottom of a ski slope to the top and gains 10 000 J of gravitational potential energy.

She skis down the slope. At the bottom of the slope, her kinetic energy is 2000 J.



How much energy is dissipated in overcoming friction and air resistance as the skier moves down the slope?

A 2000 J **B** 8000 J **C** 10 000 J **D** 12 000 J

10 A coal-fired power station generates electricity. Coal is burnt and the energy released is used to boil water. The steam from the water makes the generator move and this produces electricity.

Which words are used to describe the energy stored in the coal and the energy of the moving generator?

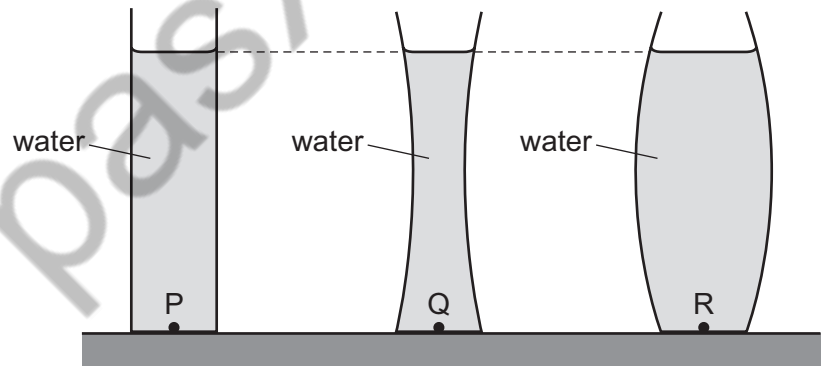
	coal	generator
A	chemical	hydroelectric
B	chemical	kinetic
C	geothermal	hydroelectric
D	geothermal	kinetic

11 Four different children run up the same set of stairs.

For which child is the useful power to climb the stairs the greatest?

	mass of child / kg	time taken / s
A	40	15
B	50	25
C	60	25
D	70	15

12 The diagram shows three vases each with the same base area. Each vase contains water of the same depth.



Which statement about the water pressures at points P, Q and R is correct?

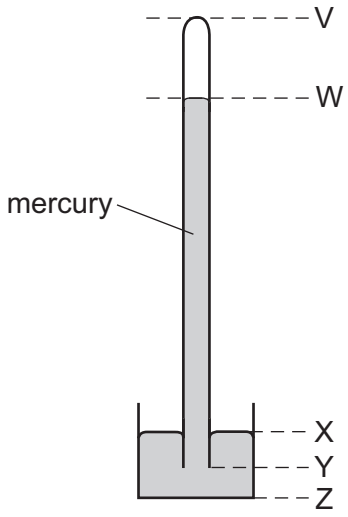
A The pressure at point P is the greatest.

B The pressure at point Q is the least.

C The pressure at point R is the greatest.

D The pressures at points P, Q and R are the same.

13 The diagram shows a simple mercury barometer.



The atmospheric pressure increases.

Which distance increases?

A VW **B** WY **C** XY **D** XZ

14 Which statement about evaporation is correct?

A Evaporation causes the temperature of the remaining liquid to decrease.

B Evaporation does not occur from a cold liquid near its freezing point.

C Evaporation does not occur from a dense liquid, such as mercury.

D Evaporation occurs from all parts of a liquid.

15 A gas is stored in a sealed container of constant volume. The temperature of the gas increases. This causes the pressure of the gas to increase.

What happens to the gas molecules during this pressure increase?

A The average kinetic energy of the molecules increases.

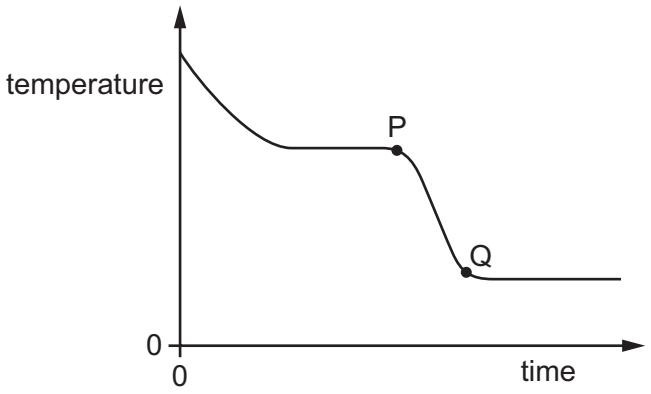
B The average separation of the molecules decreases.

C The average separation of the molecules increases.

D The volume of each molecule increases.

16 A substance loses thermal energy (heat) to the surroundings at a steady rate.

The graph shows how the temperature of the substance changes with time.



What could the portion PQ of the graph represent?

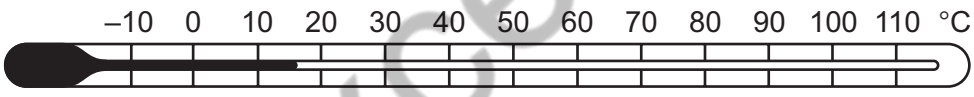
A gas condensing

B gas cooling

C liquid cooling

D liquid solidifying

17 A student wishes to check the upper and the lower fixed points on a Celsius scale thermometer.



She has four beakers P, Q, R and S.

Beaker P contains a mixture of ice and salt.

Beaker Q contains a mixture of ice and water.

Beaker R contains boiling salt solution.

Beaker S contains boiling water.

Which two beakers should she use to check the fixed points?

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

18 The same quantity of thermal energy is supplied to two solid objects X and Y. The temperature increase of object X is greater than the temperature increase of object Y.

Which statement explains this?

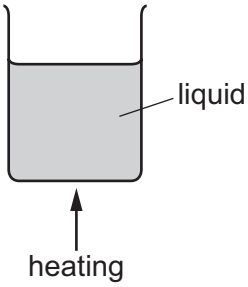
A X has a lower melting point than Y.

B X has a lower density than Y.

C X has a lower thermal capacity than Y.

D X is a better thermal conductor than Y.

19 A liquid is heated in a beaker.



The density of the liquid changes as its temperature increases. This causes energy to be transferred throughout the liquid.

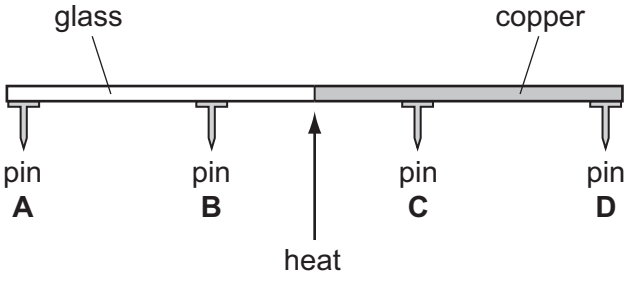
How does the density change and what is this energy transfer process?

	density	energy transfer process
A	decreases	conduction
B	decreases	convection
C	increases	conduction
D	increases	convection

20 A rod is made half of glass and half of copper. Four pins **A**, **B**, **C** and **D** are attached to the rod by wax. The rod is heated in the centre as shown.

The pins fall off when the wax melts.

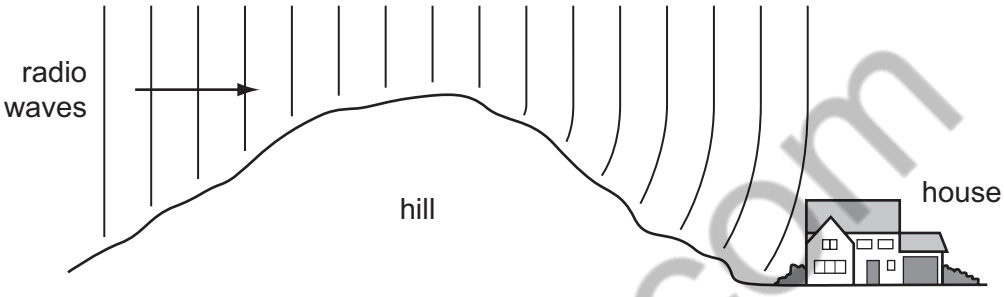
Which pin falls off first?



21 Which row shows the natures of light waves, sound waves and X-rays?

	light waves	sound waves	X-rays
A	longitudinal	longitudinal	transverse
B	longitudinal	transverse	longitudinal
C	transverse	longitudinal	transverse
D	transverse	transverse	longitudinal

22 Radio waves are received at a house at the bottom of a hill.



The waves reach the house because the hill has caused them to be

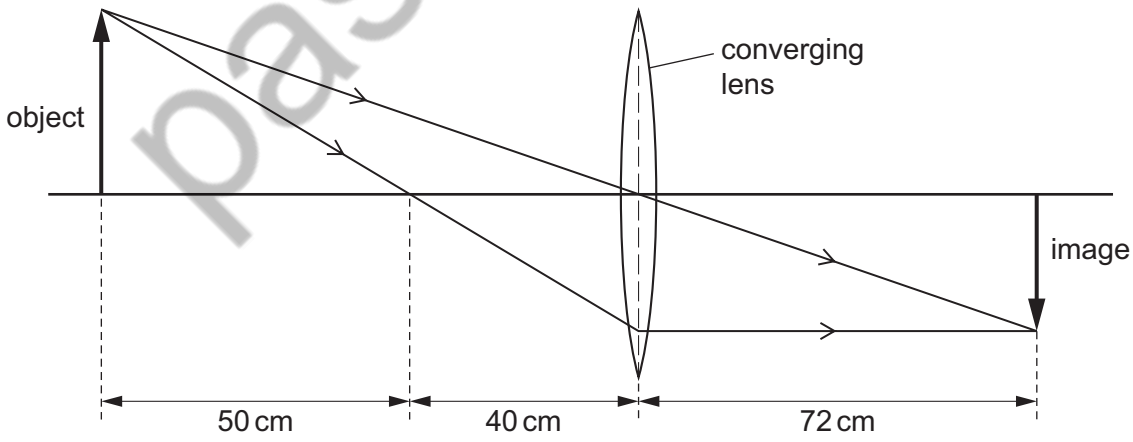
A diffracted.

B radiated.

C reflected.

D refracted.

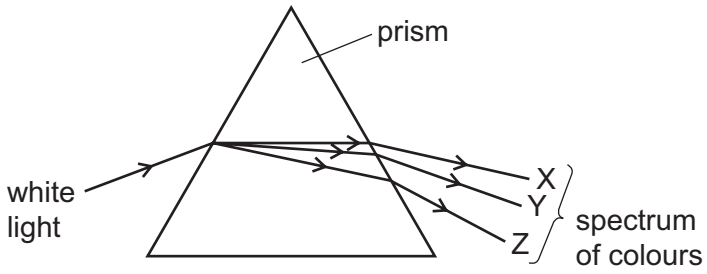
23 The ray diagram shows the image of an object formed by a converging lens.



What is the focal length of the lens?

A 40 cm **B** 50 cm **C** 72 cm **D** 90 cm

24 The diagram shows the dispersion of white light by a prism.



Which row could be correct for the colours seen at X, at Y and at Z?

	colour at X	colour at Y	colour at Z
A	red	violet	yellow
B	red	yellow	violet
C	violet	yellow	red
D	yellow	red	violet

25 Why can ultrasound **not** be heard by humans?

A The amplitude is too great.

B The frequency is too great.

C The speed is too great.

D The wavelength is too great.

26 A sound wave has a certain amplitude and a certain frequency.

A second sound wave is quieter and lower in pitch than the first sound wave.

The second wave has

A a larger amplitude and a greater frequency.

B a larger amplitude and a smaller frequency.

C a smaller amplitude and a greater frequency.

D a smaller amplitude and a smaller frequency.

27 Which statement about a magnet is correct?

A A magnet attracts a gold rod.

B A magnet does not attract a plastic rod.

C A magnet never repels another magnet.

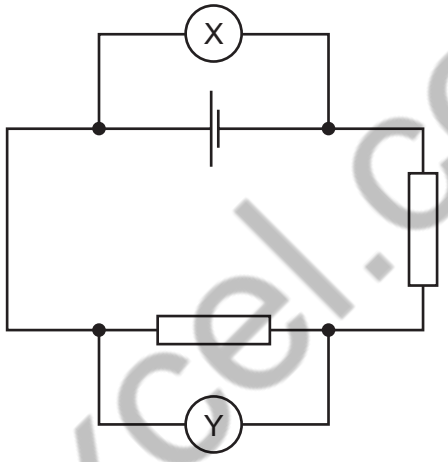
D A magnet sometimes repels an unmagnetised nickel rod.

28 A student wishes to make a permanent magnet. She has an iron rod and a steel rod.

Which rod should she use to make the permanent magnet, and is this rod a hard magnetic material or a soft magnetic material?

	rod	type of magnetic material
A	iron	hard
B	iron	soft
C	steel	hard
D	steel	soft

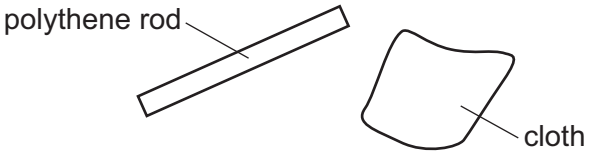
29 The circuit shown includes two meters X and Y, connected correctly.



Which row gives the unit of the quantity measured by X and the unit of the quantity measured by Y?

	meter X	meter Y
A	ampere	ampere
B	ampere	volt
C	volt	ampere
D	volt	volt

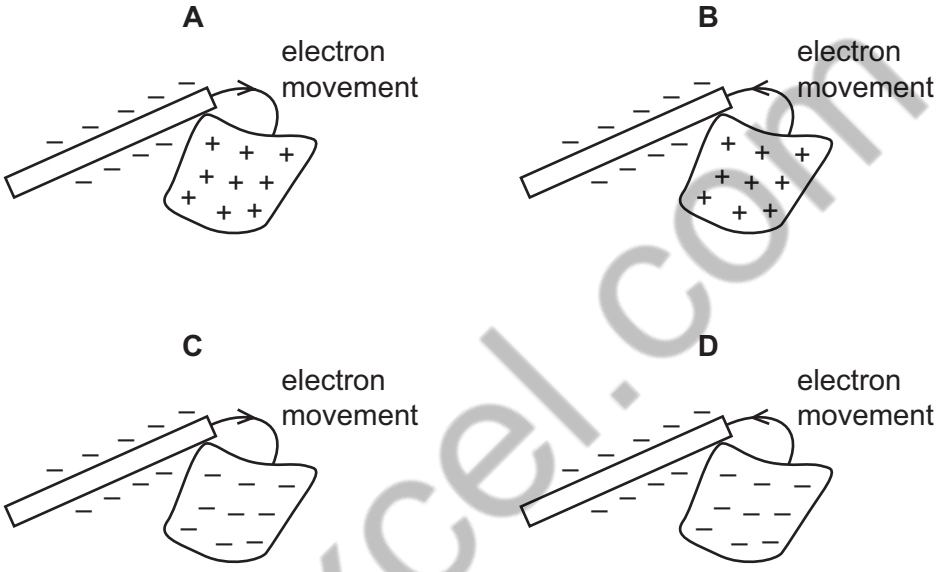
30 A polythene rod is rubbed with a cloth.



The rod and the cloth both become charged as electrons move between them.

The rod becomes negatively charged.

Which diagram shows how the rod becomes negatively charged, and the final charge on the cloth?



31 What is the function of a relay?

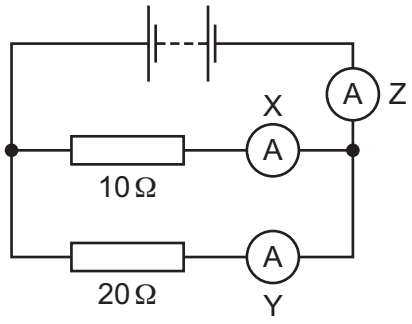
A to allow a current in one circuit to operate a switch in another circuit

B to prevent an electric shock by earthing a metal case

C to protect a circuit by melting if the current becomes too large

D to transform a d.c. voltage to a different value

32 The circuit shown contains three ammeters X, Y and Z.



Which ammeter has the largest reading?

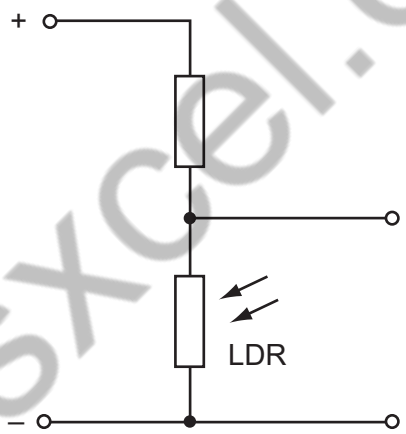
A X

B Y

C Z

D They all have the same reading.

33 The diagram shows part of a circuit used to switch street lamps on and off automatically.



In the evening it gets dark.

Which row shows the effect on the resistance of the light-dependent resistor (LDR) and on the potential difference (p.d.) across it?

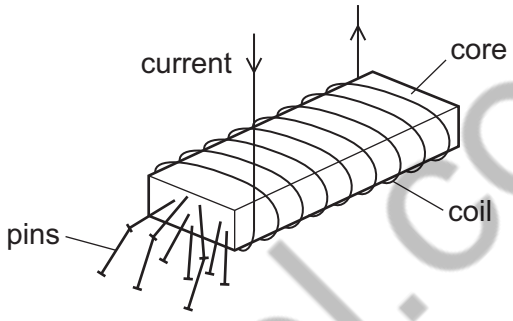
	resistance of LDR	p.d. across LDR
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

34 A domestic circuit includes a 30 A fuse. This protects the wiring if there is too much current in the circuit.

In which wire is the 30 A fuse positioned, and what does it do when it operates?

	position	operation
A	live wire	disconnects the circuit
B	live wire	reduces the current to 30 A
C	neutral wire	disconnects the circuit
D	neutral wire	reduces the current to 30 A

35 A strong electromagnet is used to attract pins.



What happens when the current in the coil is halved?

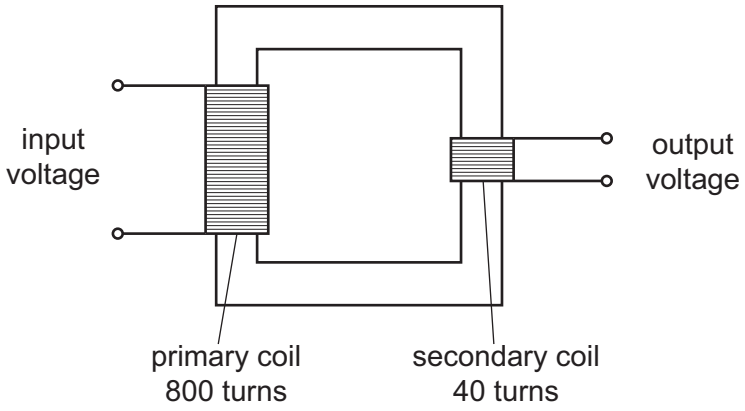
A No pins are attracted.

B Some pins are attracted, but not as many.

C The same number of pins is attracted.

D More pins are attracted.

36 The diagram shows a transformer.



The input voltage is 240 V.

What is the output voltage?

A 6.0 V **B** 12 V **C** 20 V **D** 40 V

37 How many neutrons are in a nucleus of the nuclide $^{37}_{17}Cl$?

A 17 **B** 20 **C** 37 **D** 54

38 A certain element has several isotopes.

Which statement about these isotopes is correct?

A They must have different numbers of electrons orbiting their nuclei.

B They must have the same number of neutrons in their nuclei.

C They must have the same number of nucleons in their nuclei.

D They must have the same number of protons in their nuclei.

39 A radioactive nucleus emits either an α-particle or a β-particle.

What are the products of these two types of radioactive emission?

	product after α-emission	product after β-emission
A	a nucleus of a different element	a nucleus of a different element
B	a nucleus of a different element	a nucleus of the same element
C	a nucleus of the same element	a nucleus of a different element
D	a nucleus of the same element	a nucleus of the same element

40 A reading is taken every 10 minutes of the number of emissions per second from a radioactive source. The table shows the readings.

time / min	number of emissions per second
0	800
10	560
20	400
30	280
40	200
50	140
60	100

What is the half-life of the source?

A 10 min **B** 20 min **C** 40 min **D** 60 min

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PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **May/June 2016**

45 minutes

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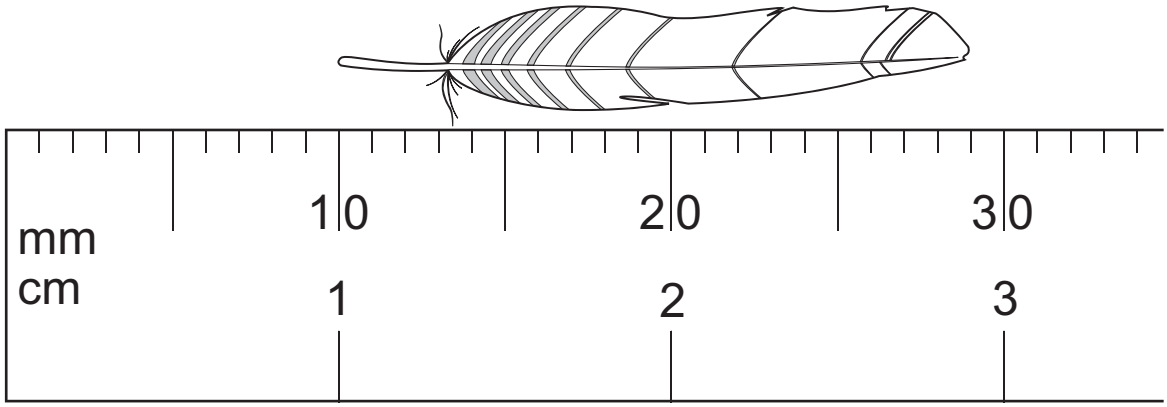
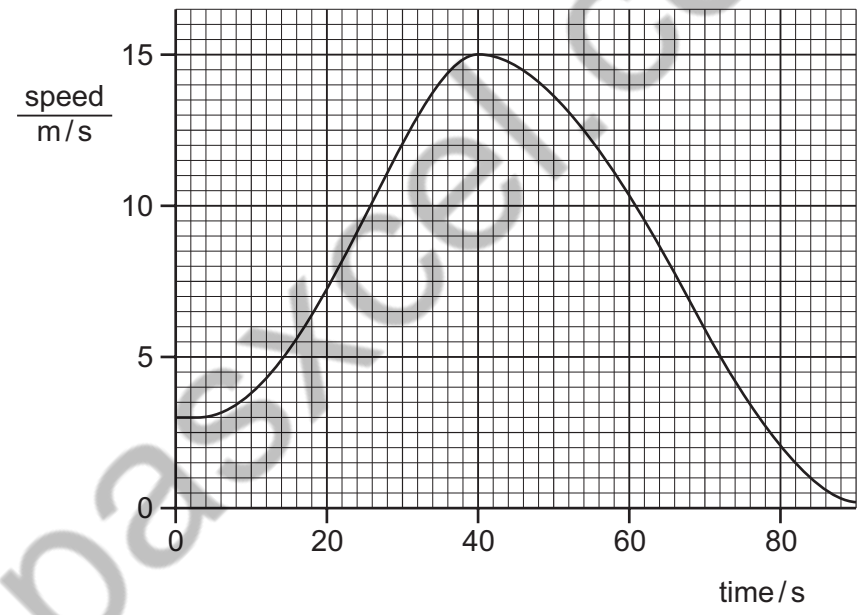


What is the length of the feather?

A 19 mm **B** 29 mm **C** 19 cm **D** 29 cm

2 The speed-time graph shown is for a car moving in a straight line.

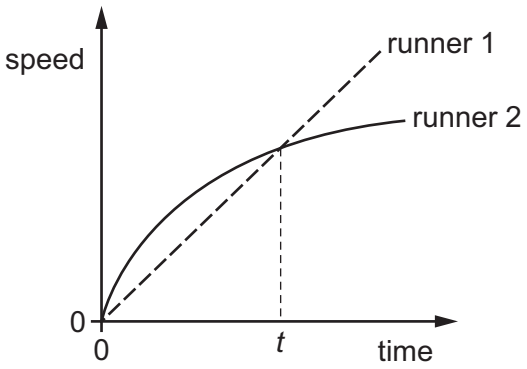


What is the acceleration of the car when the time is 40 s?

A $0\,m/s^2$ **B** $\frac{15-3}{40}\,m/s^2$ **C** $\frac{15}{40}\,m/s^2$ **D** $(15-3)\,m/s^2$

3 Two runners take part in a race.

The graph shows how the speed of each runner changes with time.



What does the graph show about the runners at time *t*?

A Both runners are moving at the same speed.

B Runner 1 has zero acceleration.

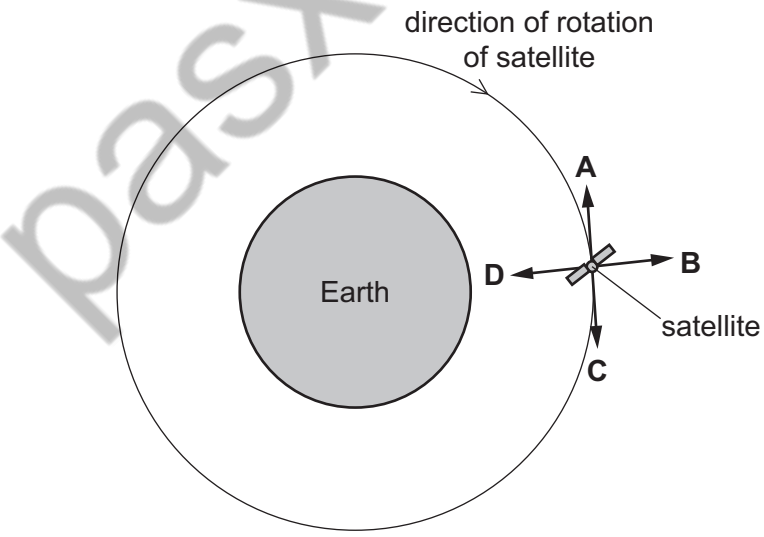
C Runner 1 is overtaking runner 2.

D Runner 2 is slowing down.

4 A satellite orbits the Earth above the atmosphere at a constant speed.

The diagram shows the satellite at one point in its circular orbit around the Earth.

Which labelled arrow shows the direction of the resultant force on the satellite at the position shown?



5 A cup contains hot liquid.

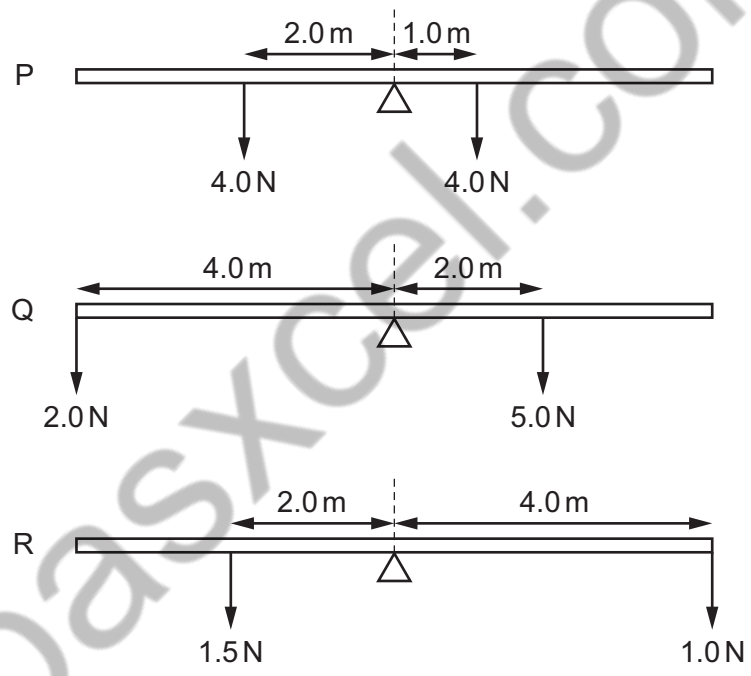
Some of the liquid evaporates.

What happens to the mass and what happens to the weight of the liquid in the cup?

	mass	weight
A	decreases	decreases
B	decreases	stays the same
C	stays the same	decreases
D	stays the same	stays the same

6 The diagrams show three uniform beams P, Q and R, each pivoted at its centre.

The two forces acting on each beam are also shown.



Which beams rotate clockwise?

A P and Q only

B P and R only

C Q and R only

D P, Q and R

7 An object of mass 50 kg accelerates from a velocity of 2.0 m / s to a velocity of 10 m / s in the same direction.

What is the impulse provided to cause this acceleration?

A 250 N s **B** 400 N s **C** 850 N s **D** 2500 N s

8 A scalar quantity has

A magnitude and direction.

B no magnitude and no direction.

C magnitude but no direction.

D direction but no magnitude.

9 Energy is released in some nuclear reactions.

Which nuclear reaction takes place in a nuclear power station, and which nuclear reaction takes place in the Sun?

	nuclear power station	the Sun
A	fission	fission
B	fission	fusion
C	fusion	fission
D	fusion	fusion

10 A lorry of mass 4000 kg is travelling at a speed of 4.0 m / s.

A car has a mass of 1000 kg. The kinetic energy of the car is equal to the kinetic energy of the lorry.

What is the speed of the car?

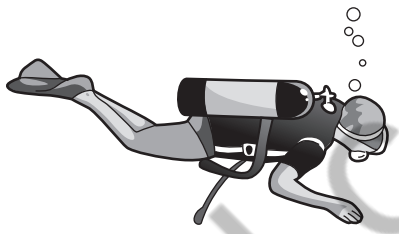
A 2.0 m / s **B** 4.0 m / s **C** 8.0 m / s **D** 16.0 m / s

11 A force acts on an object and causes the object to move a certain distance, in the same direction as the force.

Which row represents a situation in which the largest amount of work is done on the object by the force?

	force / N	distance moved / m
A	2.0	40.0
B	10.0	2.0
C	20.0	6.0
D	100.0	1.0

12 A diver under water uses breathing apparatus at a depth where the pressure is 1.25×10^5 Pa.



A bubble of gas breathed out by the diver has a volume of 20 cm^3 when it is released. The bubble moves upwards to the surface of the water.

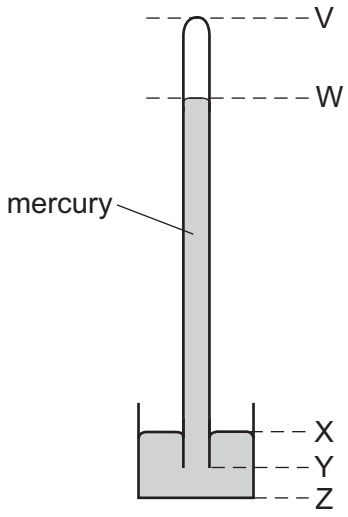
At the surface of the water, the atmospheric pressure is 1.00×10^5 Pa.

The temperature of the water is the same at all depths.

What is the volume of this bubble when it reaches the surface?

A 15 cm^3 **B** 16 cm^3 **C** 20 cm^3 **D** 25 cm^3

13 The diagram shows a simple mercury barometer.



The atmospheric pressure increases.

Which distance increases?

A VW **B** WY **C** XY **D** XZ

14 Which statement about evaporation is correct?

A Evaporation causes the temperature of the remaining liquid to decrease.

B Evaporation does not occur from a cold liquid near its freezing point.

C Evaporation does not occur from a dense liquid, such as mercury.

D Evaporation occurs from all parts of a liquid.

15 A beaker contains 0.500 kg of water at a temperature of 3.0 °C. The beaker is heated, and the internal energy of the water increases by 21.0 kJ.

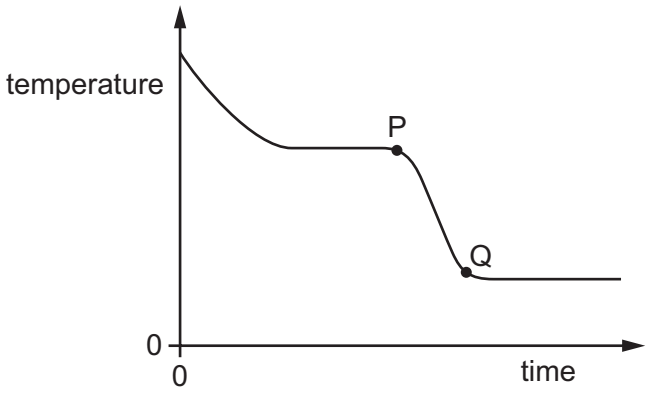
The specific heat capacity of water is 4200 J / (kg °C).

What is the temperature of the water after it has been heated?

A 5.5 °C **B** 10.0 °C **C** 13.0 °C **D** 31.5 °C

16 A substance loses thermal energy (heat) to the surroundings at a steady rate.

The graph shows how the temperature of the substance changes with time.



What could the portion PQ of the graph represent?

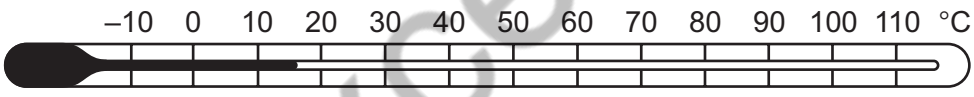
A gas condensing

B gas cooling

C liquid cooling

D liquid solidifying

17 A student wishes to check the upper and the lower fixed points on a Celsius scale thermometer.



She has four beakers P, Q, R and S.

Beaker P contains a mixture of ice and salt.

Beaker Q contains a mixture of ice and water.

Beaker R contains boiling salt solution.

Beaker S contains boiling water.

Which two beakers should she use to check the fixed points?

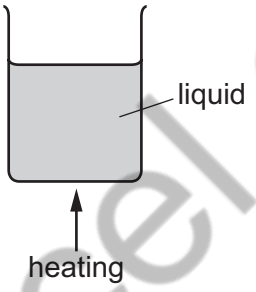
A P and R **B** P and S **C** Q and R **D** Q and S

18 Two otherwise identical cars, one black and one white, are at the same initial temperature. The cars are left in bright sunshine and their temperatures increase. During the night their temperatures decrease.

Which car shows the greater rate of temperature increase and which car shows the greater rate of temperature decrease?

	greater rate of temperature increase	greater rate of temperature decrease
A	black	black
B	black	white
C	white	black
D	white	white

19 A liquid is heated in a beaker.



The density of the liquid changes as its temperature increases. This causes energy to be transferred throughout the liquid.

How does the density change and what is this energy transfer process?

	density	energy transfer process
A	decreases	conduction
B	decreases	convection
C	increases	conduction
D	increases	convection

20 Sound waves of frequency 2.0 kHz travel through a substance at a speed of 800 m / s.

What is the wavelength of the waves?

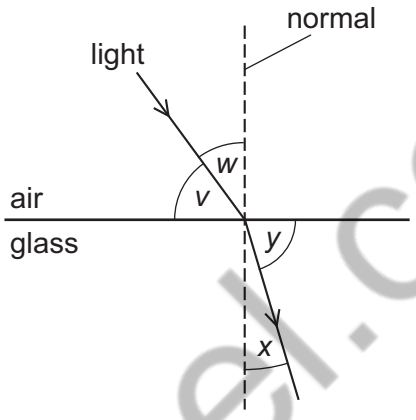
A 0.40 m **B** 2.5 m **C** 400 m **D** 1600 m

21 Which row shows the natures of light waves, sound waves and X-rays?

	light waves	sound waves	X-rays
A	longitudinal	longitudinal	transverse
B	longitudinal	transverse	longitudinal
C	transverse	longitudinal	transverse
D	transverse	transverse	longitudinal

22 The diagram shows light travelling from air into glass.

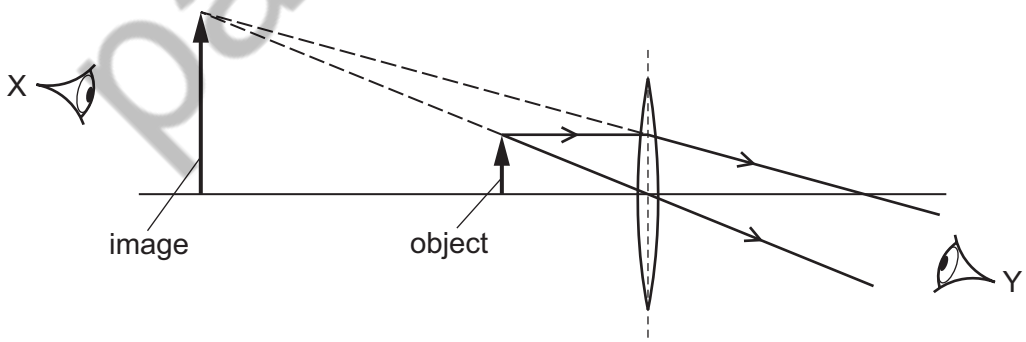
Four angles *v*, *w*, *x* and *y* are shown.



Which formula is used to calculate the refractive index *n* of the glass?

A $n = \frac{\sin v}{\sin y}$ **B** $n = \frac{\sin v}{\sin x}$ **C** $n = \frac{\sin w}{\sin y}$ **D** $n = \frac{\sin w}{\sin x}$

23 The diagram shows a converging lens forming an image of an object.



Which statement about the image is correct?

A It is real and can be seen by an eye at X.

B It is real and can be seen by an eye at Y.

C It is virtual and can be seen by an eye at X.

D It is virtual and can be seen by an eye at Y.

24 A sound wave travels through air as a series of compressions and rarefactions.

Which row correctly compares the air pressure in a compression and the air pressure in a rarefaction to the air pressure nearby where there is no sound wave?

	air pressure in a compression	air pressure in a rarefaction
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

25 A sound wave has a certain amplitude and a certain frequency.

A second sound wave is quieter and lower in pitch than the first sound wave.

The second wave has

A a larger amplitude and a greater frequency.

B a larger amplitude and a smaller frequency.

C a smaller amplitude and a greater frequency.

D a smaller amplitude and a smaller frequency.

26 What is an electric field?

A a region around a wire carrying an electric current in which a compass needle experiences a force

B a region in which an electric charge experiences a force

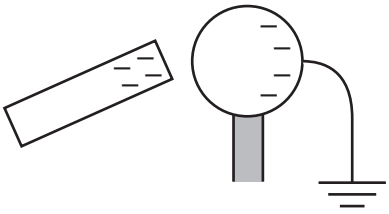
C a region in which an electric charge is attracted by the Earth's gravity

D a region through which electromagnetic radiation is passing

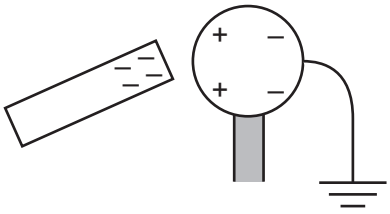
27 A negatively charged rod is held close to one side of a metal sphere. The other side of the sphere is earthed.

Which diagram shows the distribution of charge on the metal sphere?

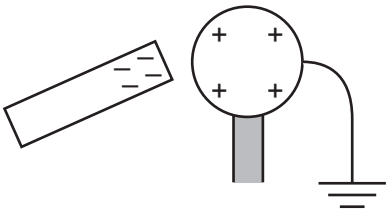
A



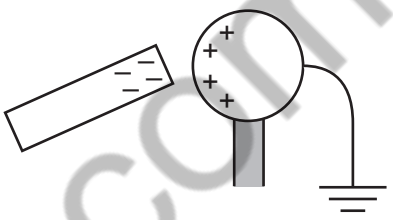
B



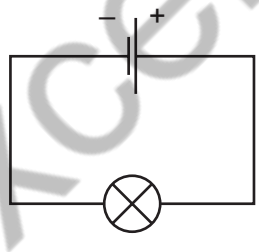
C



D



28 A cell is connected to a lamp, as shown.



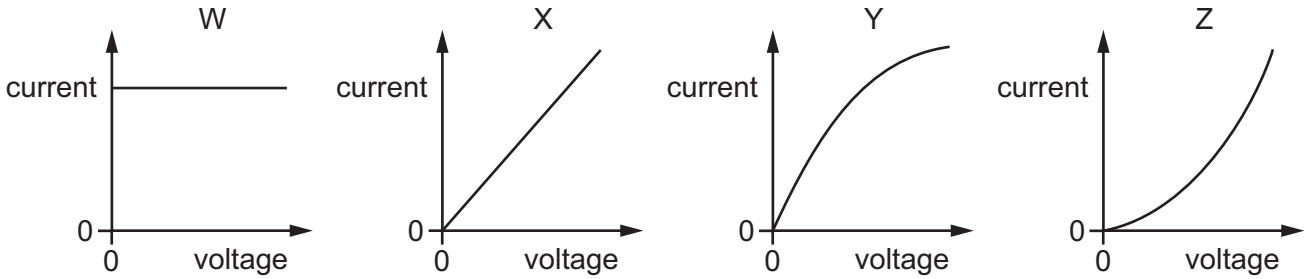
A charge of 4.0 C flows through the lamp in 2.0 s.

What is the direction of the electron flow in the lamp and what is the current in the lamp?

	direction of electron flow in lamp	current / A
A	from left to right	2.0
B	from left to right	8.0
C	from right to left	2.0
D	from right to left	8.0

29 The diagrams show four current-voltage graphs.

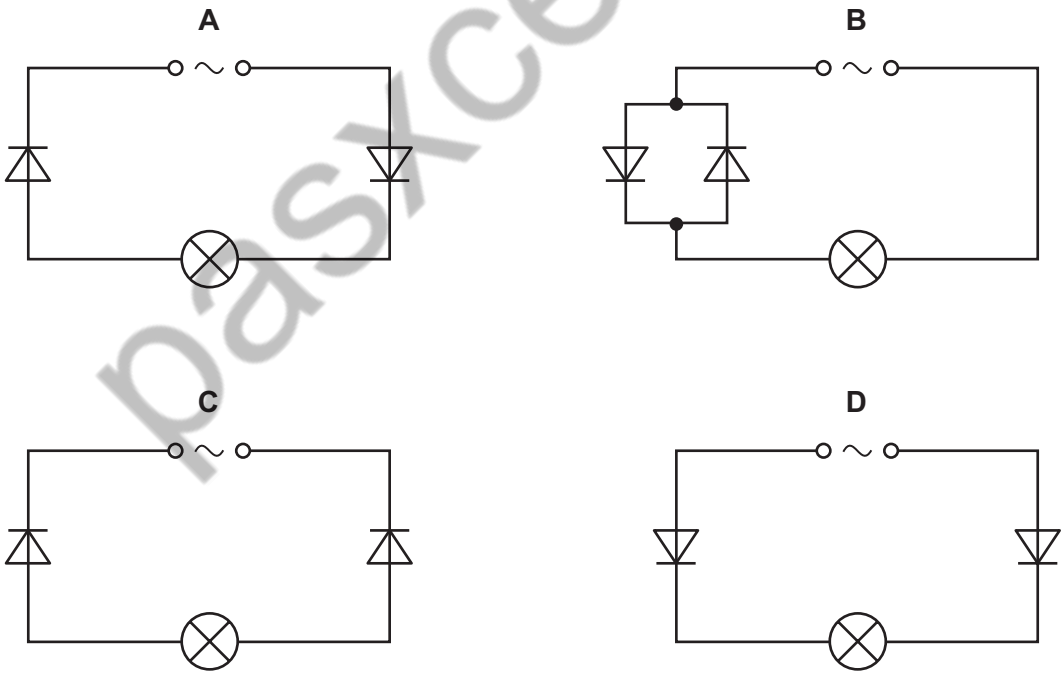
Which two graphs show the characteristics of an ohmic resistor and of a filament lamp?



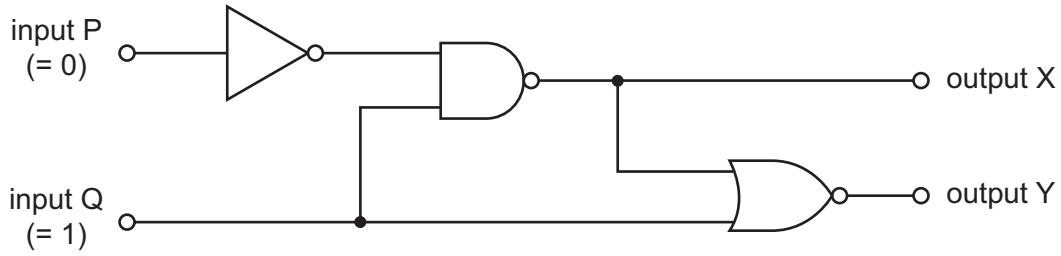
	ohmic resistor	filament lamp
A	W	Y
B	X	Y
C	W	Z
D	X	Z

30 The four circuits shown all include an a.c. power supply, two diodes and a lamp.

In which circuit is there a rectified current in the lamp?



31 The diagram shows a combination of logic gates.

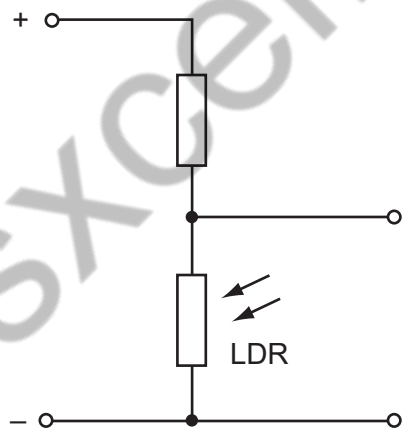


Input P is at a logic state 0 (low) and input Q is at a logic state 1 (high).

What are the logic states at output X and at output Y?

	output X	output Y
A	0	0
B	0	1
C	1	0
D	1	1

32 The diagram shows part of a circuit used to switch street lamps on and off automatically.



In the evening it gets dark.

Which row shows the effect on the resistance of the light-dependent resistor (LDR) and on the potential difference (p.d.) across it?

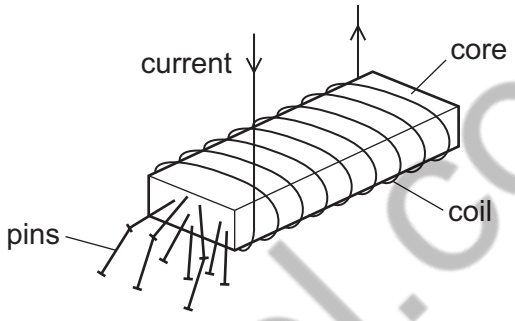
	resistance of LDR	p.d. across LDR
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

33 A domestic circuit includes a 30 A fuse. This protects the wiring if there is too much current in the circuit.

In which wire is the 30 A fuse positioned, and what does it do when it operates?

	position	operation
A	live wire	disconnects the circuit
B	live wire	reduces the current to 30 A
C	neutral wire	disconnects the circuit
D	neutral wire	reduces the current to 30 A

34 A strong electromagnet is used to attract pins.



What happens when the current in the coil is halved?

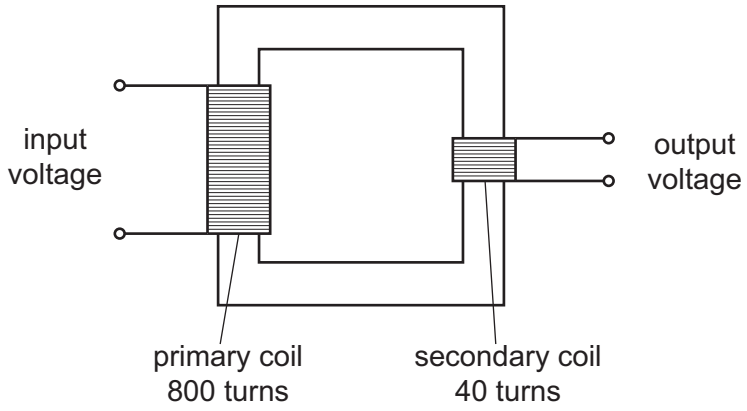
A No pins are attracted.

B Some pins are attracted, but not as many.

C The same number of pins is attracted.

D More pins are attracted.

35 The diagram shows a transformer.



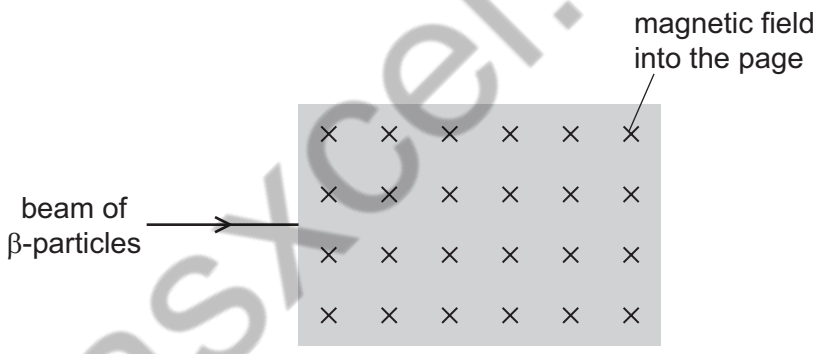
The input voltage is 240 V.

What is the output voltage?

A 6.0 V **B** 12 V **C** 20 V **D** 40 V

36 The diagram shows a shaded area where the direction of a magnetic field is into the page.

A beam of β-particles enters the field as shown.



In which direction is the beam of β-particles deflected as they enter the magnetic field?

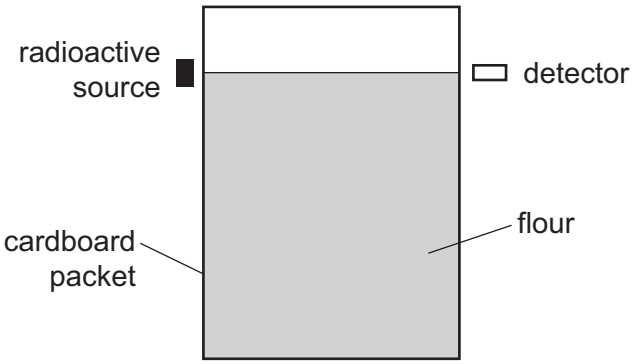
A into the page

B out of the page

C down the page

D up the page

37 The arrangement shown is used to check whether the flour inside a cardboard packet is above a certain level. If it is above this level, the flour absorbs the radiation from the source so that it doesn't reach the detector.



Which type of radiation is suitable to use?

A α-particles only

B β-particles only

C either α-particles or β-particles

D γ-rays only

38 A nucleus of americium $^{243}_{95}\text{Am}$ emits an α-particle to form a nucleus of neptunium (Np).

Which equation represents this decay?

A $^{243}_{95}\text{Am} \rightarrow {}^{247}_{97}\text{Np} + {}^{4}_{2}\alpha$

B $^{243}_{95}\text{Am} \rightarrow {}^{243}_{96}\text{Np} + {}^{0}_{-1}\alpha$

C $^{243}_{95}\text{Am} \rightarrow {}^{243}_{94}\text{Np} + {}^{0}_{-1}\alpha$

D $^{243}_{95}\text{Am} \rightarrow {}^{239}_{93}\text{Np} + {}^{4}_{2}\alpha$

39 A certain element has several isotopes.

Which statement about these isotopes is correct?

A They must have different numbers of electrons orbiting their nuclei.

B They must have the same number of neutrons in their nuclei.

C They must have the same number of nucleons in their nuclei.

D They must have the same number of protons in their nuclei.

40 A reading is taken every 10 minutes of the number of emissions per second from a radioactive source. The table shows the readings.

time / min	number of emissions per second
0	800
10	560
20	400
30	280
40	200
50	140
60	100

What is the half-life of the source?

A 10 min **B** 20 min **C** 40 min **D** 60 min

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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

PHYSICS **0625/31**

Paper 3 Theory (Core) **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **18** printed pages and **2** blank pages.

CAMBRIDGE International Examinations

1 Fig. 1.1 shows part of the speed-time graphs for a cyclist and for a runner.

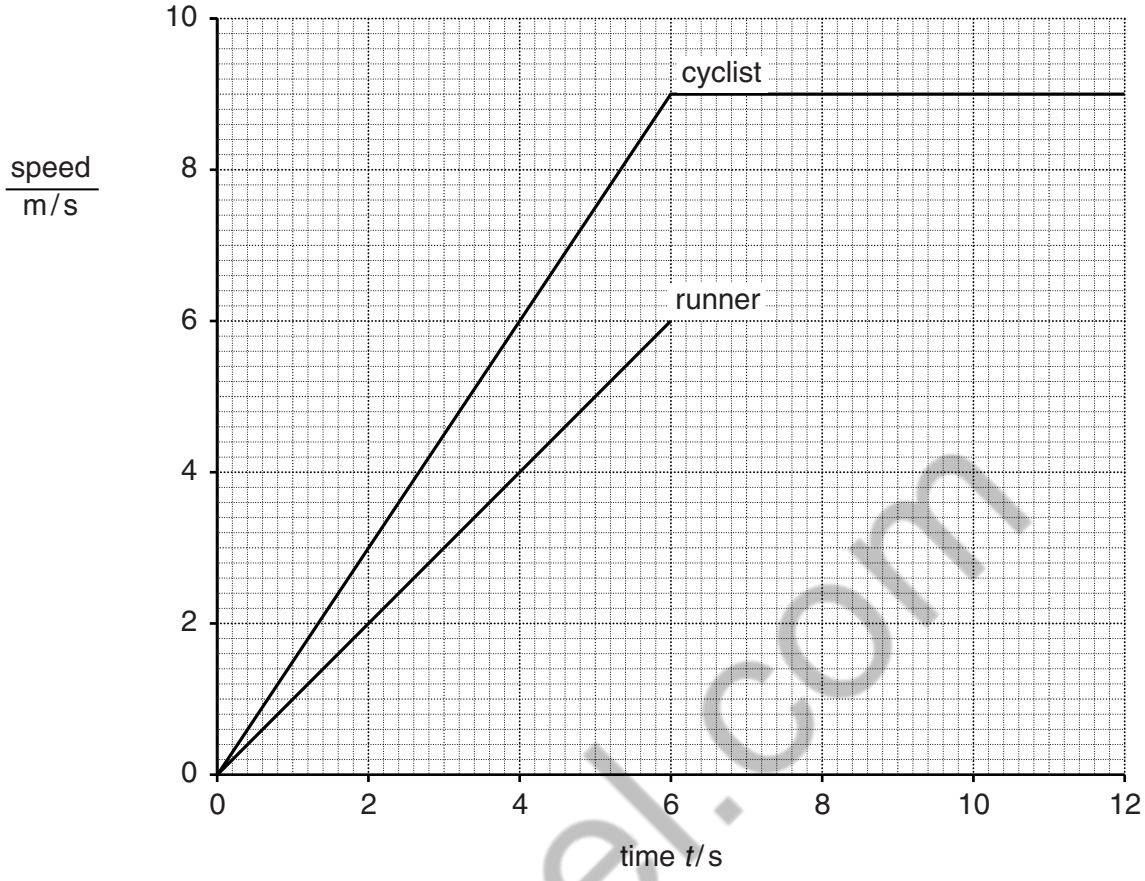

Fig. 1.1

(a) Compare the motion of the cyclist and the runner during the first 6 seconds. Explain your answer.

.....

.....

.....

.....[3]

(b) Describe the motion of the cyclist between time $t = 6.0\,s$ and time $t = 12.0\,s$.

.....[1]

(c) Calculate the total distance travelled by the cyclist between $t = 0$ and $t = 12.0\,s$.

distance travelled = ... m [4]

(d) After the first 6.0 seconds, the runner moves at constant speed for 4.0 seconds. He then slows down uniformly and stops in a further 2.0 seconds.

On Fig. 1.1, complete the graph for the runner's motion. [2]

[Total: 10]

2 A boy steps off a high board into a swimming pool.

Fig. 2.1 shows the forces acting on the boy at one point in his fall.

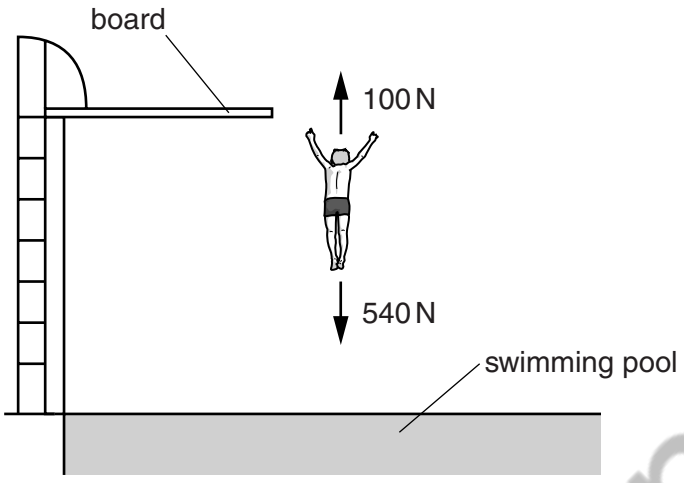

Fig. 2.1

(a) The 540 N force is caused by gravitational attraction.

State the cause of the 100 N force.

.....[1]

(b) Calculate the mass of the boy.

mass of boy = ... kg [2]

(c) Calculate the resultant force on the boy. State its direction.

resultant force = ... N

direction = ...
[2]

[Total: 5]

3 Fig. 3.1 shows a metal plate-warmer.

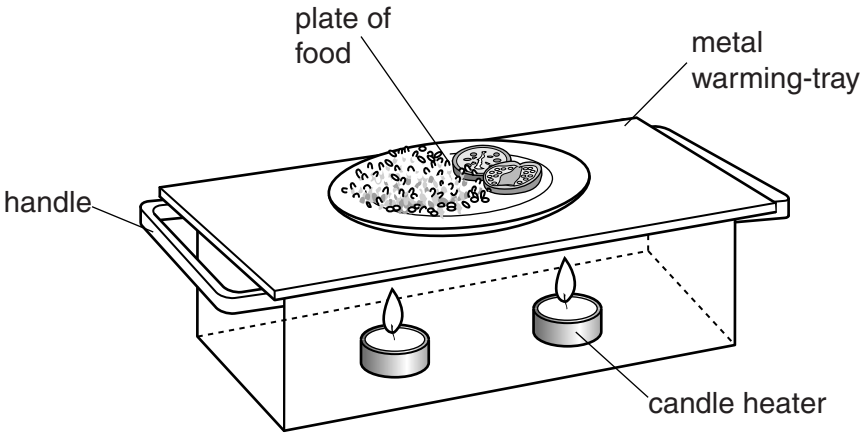

Fig. 3.1

The plate-warmer contains two small candle heaters. Plates of food are placed on top of the warming-tray.

(a) (i) State the name of a process by which the thermal energy from the candles passes to the warming-tray.

.....[1]

(ii) State the name of the process by which thermal energy moves through the warming-tray.

.....[1]

(b) The outside of the plate-warmer is shiny.

Suggest how this helps the plate-warmer to stay hot.

.....[1]

(c) The handles of the plate-warmer are made from metal.

Identify a problem with this, and suggest how the problem could be solved.

problem: .....

action: .....
[2]

[Total: 5]

4 Fig. 4.1 is a simplified diagram of a geothermal power station.

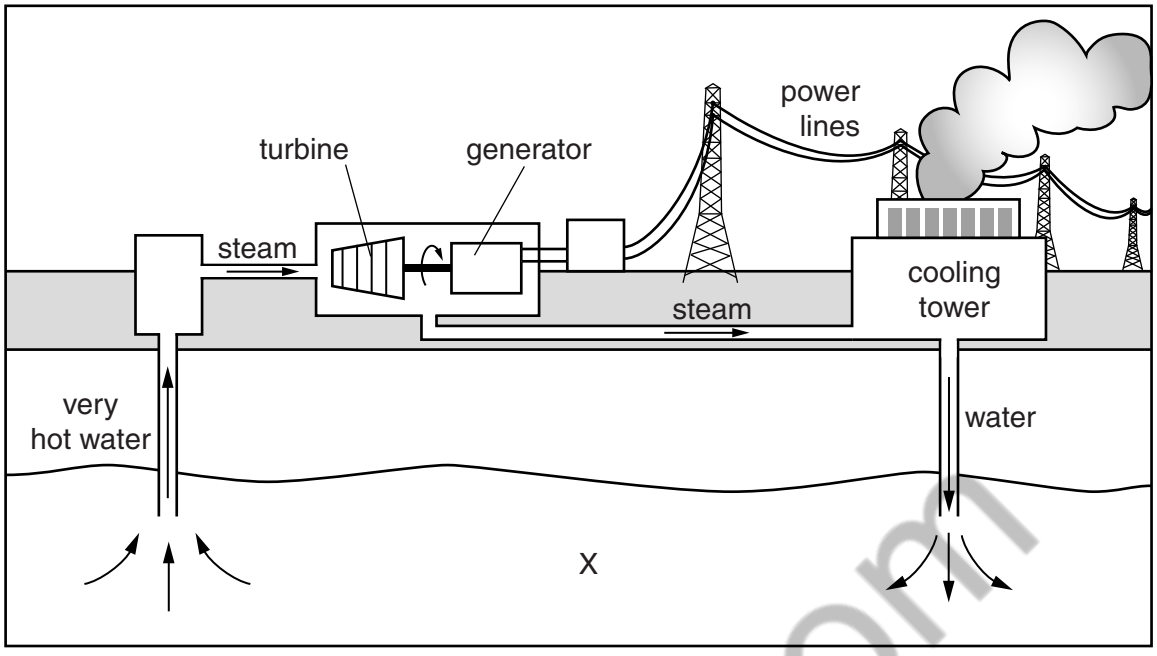

Fig. 4.1

(a) Describe the energy resource labelled X in Fig. 4.1.

.....[1]

(b) Identify the useful energy transformation that takes place in the geothermal power station. Tick **one** box in each column.

input energy		output energy	
chemical	☐	chemical	☐
electrical	☐	electrical	☐
gravitational	☐	gravitational	☐
sound	☐	sound	☐
thermal	☐	thermal	☐

[2]

(c) State **two** disadvantages of obtaining energy from fossil fuels.

1. .....

.....

2. .....

.....

[2]

[Total: 5]

5 Fig. 5.1 shows two men repairing a weak roof using a crawler-board.

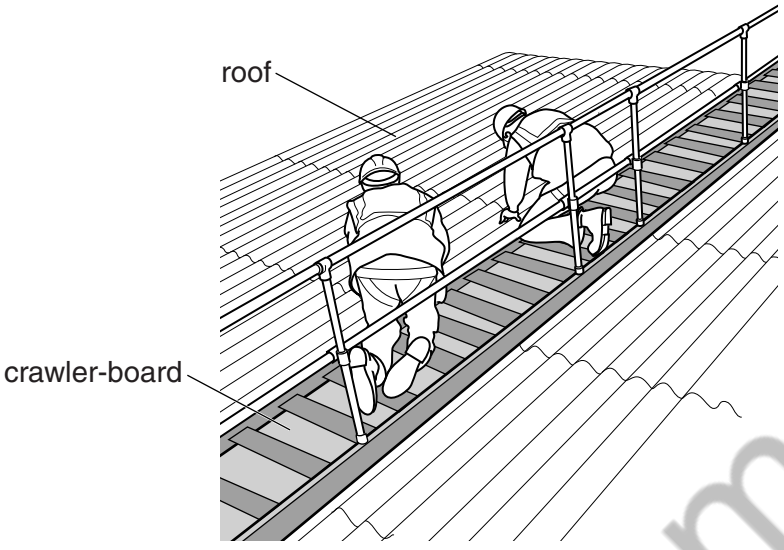

Fig. 5.1

(a) Explain why use of the crawler-board prevents the men from falling through the roof.

.....

.....

.....

.....[2]

(b) The crawler-board has a weight of 400 N. The total weight of the two men is 1600 N. The area of the crawler-board in contact with the roof is 0.8 m^2.

Calculate the pressure on the roof when the men are on the crawler-board. Include the unit.

pressure = ...[5]

[Total: 7]

6 Fig. 6.1 shows an experiment to observe the motion of smoke particles in air.

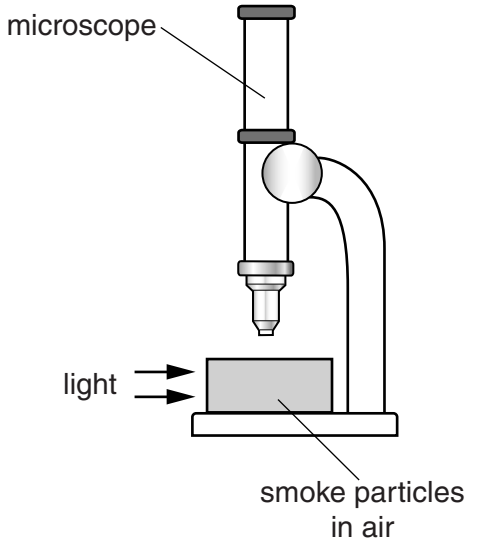

Fig. 6.1

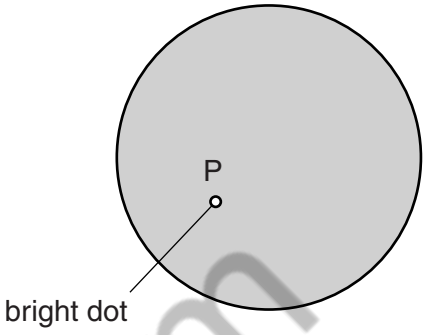

Fig. 6.2

(a) (i) Fig. 6.2 shows the view through the microscope of one smoke particle, labelled P.

On Fig. 6.2, draw 3 lines to show the movement of this particle.

[2]

(ii) Explain what causes the smoke particle to move.

.....

.....

.....

.....[2]

(b) The air containing the smoke particles becomes warmer.

Suggest how this changes the movement of the smoke particles.

.....

.....[1]

[Total: 5]

7 Fig. 7.1 shows equipment used to demonstrate thermal expansion.

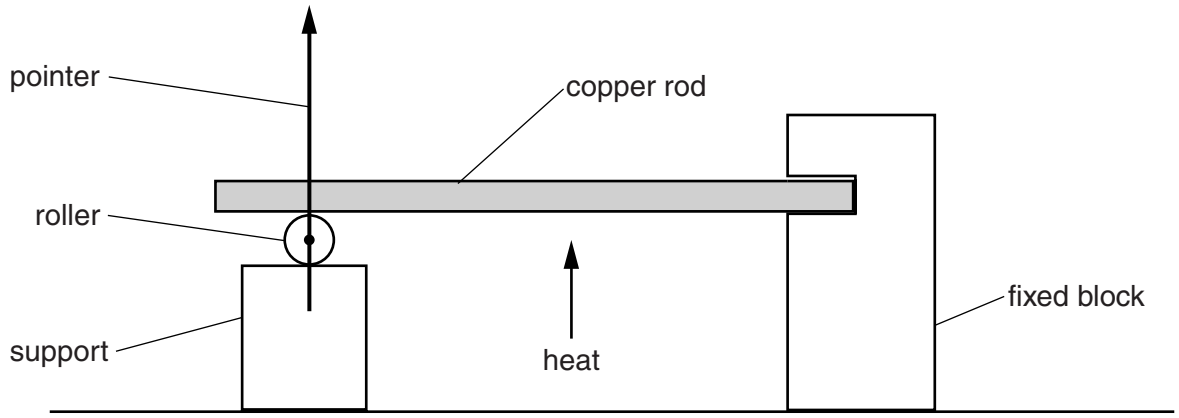

Fig. 7.1

(a) The copper rod is heated and expands. It turns the roller and moves the pointer.

On Fig. 7.1, draw the new position of the pointer.

[1]

(b) As the rod is heated, some of its properties change.

Identify how each property changes. Place **one** tick in each row of the table.

property of rod	decreases	increases	stays the same
volume			
mass			
density			

[3]

(c) Suggest **one** disadvantage of thermal expansion.

.....[1]

[Total: 5]

8 A student directs a ray of light towards a plane mirror, as shown in Fig. 8.1.

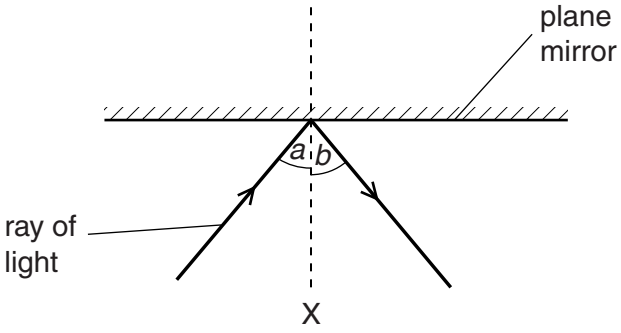

Fig. 8.1

(a) (i) Name the line labelled X.

.....[1]

(ii) When angle *a* is 45°, angle *b* is also 45°.

Angle *a* is changed to 20°.

What is the new value of angle *b*? Tick **one** box.

20° ☐ 25° ☐ 45° ☐ 65° ☐ 80° ☐

[1]

(b) The student now makes the ray of light from Fig. 8.1 pass into a glass block, as shown in Fig. 8.2.

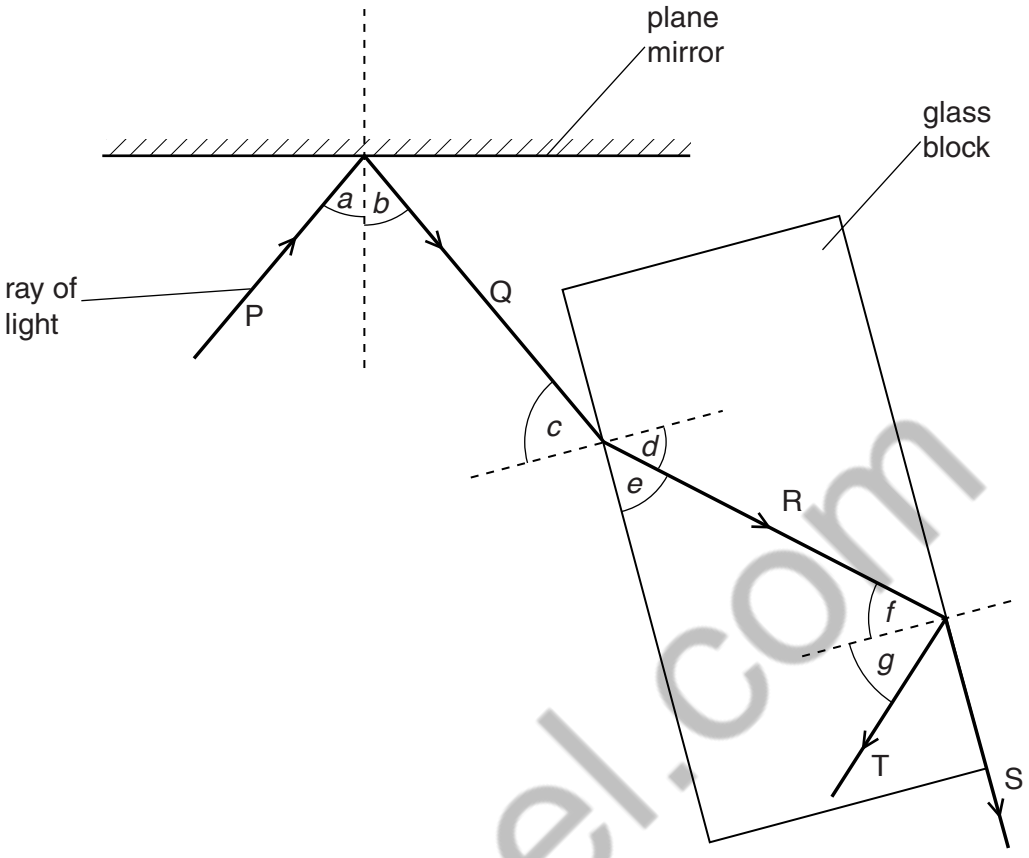

Fig. 8.2

Complete the table, using the labels from Fig. 8.2. The first label is done for you.

description	label
an angle of incidence	*a*
an angle of refraction	
an internally reflected angle	
a critical angle	
a refracted ray	

[4]

(c) The student uses a converging lens to produce an image of an object. Fig. 8.3 shows the arrangement.

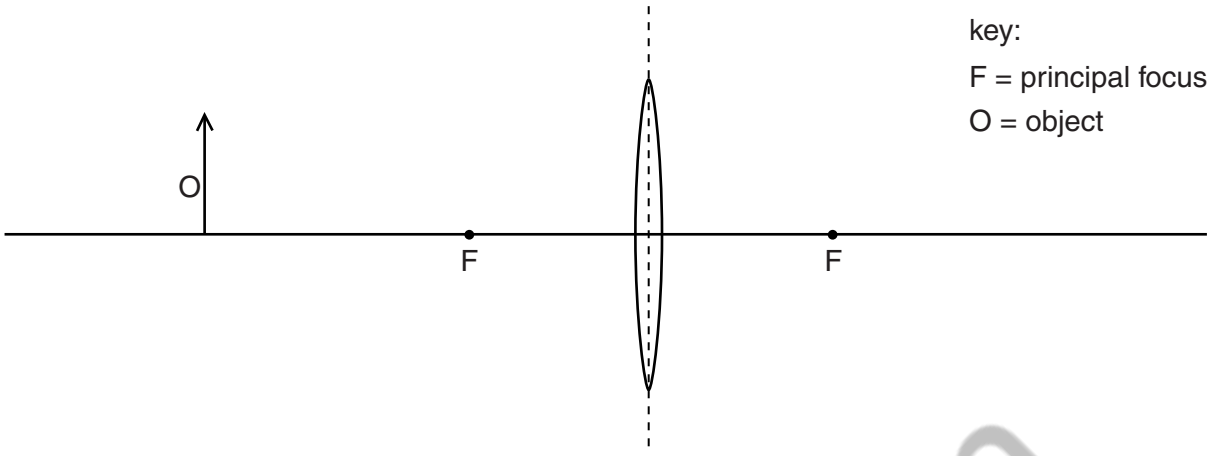

Fig. 8.3

On Fig. 8.3, using a ruler, carefully draw two rays from the object O to locate the position of the image. Use an arrow to represent the image. [3]

[Total: 9]

9 Fig. 9.1 represents the regions of the electromagnetic spectrum.

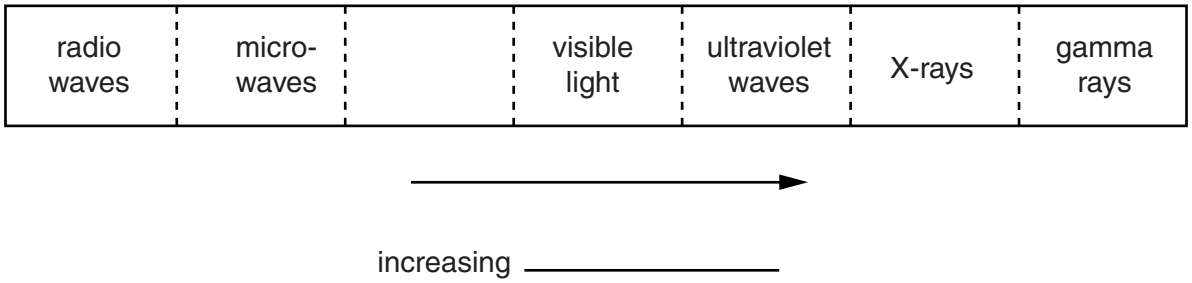

Fig. 9.1

(a) Complete Fig. 9.1:

(i) Add the label of the missing region. [1]

(ii) Complete the label under the arrow. [1]

(b) (i) State **two** uses of X-rays.

1. .....

2. .....

[2]

(ii) Describe **two** safety precautions taken by people using X-rays.

1. .....

2. .....

[2]

(iii) X-rays and light waves can both travel through a vacuum.

Identify the correct statement. Tick **one** box.

☐ X-rays travel at a slower speed than light waves.

☐ X-rays travel at the same speed as light waves.

☐ X-rays travel at a faster speed than light waves.

[1]

[Total: 7]

10 A student makes the circuit shown in Fig. 10.1 using a 12 V battery.

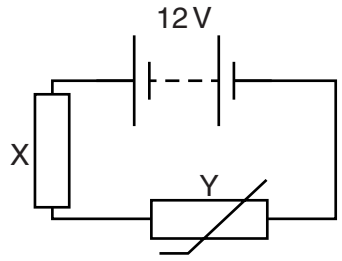

Fig. 10.1

(a) Complete the sentences about the circuit. Use words from the box.

fixed resistor	lamp	light-dependent resistor	parallel	series	thermistor

(i) Components X and Y are connected in .....[1]

(ii) The component Y is a .....[1]

(b) Fig. 10.2 shows how the resistance of Y varies with temperature.

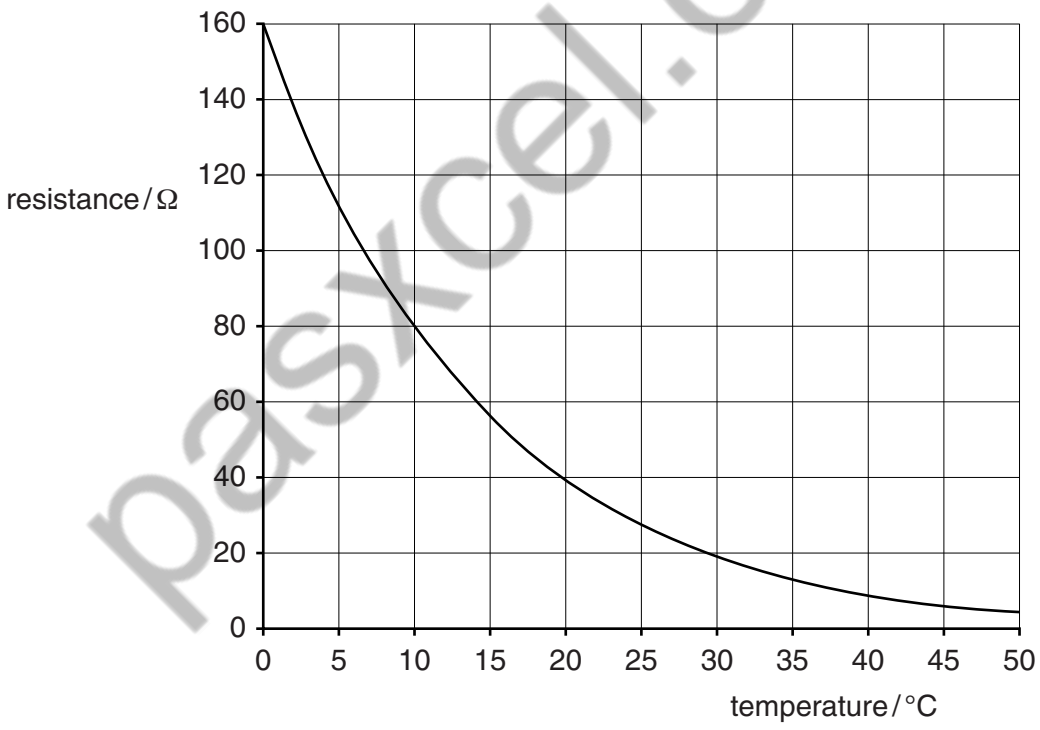

Fig. 10.2

(i) Describe how the resistance of Y varies with temperature.

.....

.....

.....[2]

(ii) The temperature of Y is 10 °C. The resistance of X is 20 Ω.

Calculate the combined resistance of Y and X.

resistance = ... Ω [3]

(iii) Calculate the current in the circuit.

current = ... A [3]

[Total: 10]

11 **(a)** Put a ring around the names of the metals which are attracted to magnets.

aluminium copper iron mercury magnesium steel tin

[2]

(b) Fig. 11.1 and Fig. 11.2 show magnetic field patterns for bar magnets.

On each diagram, correctly label the poles. Write **N** or **S**.

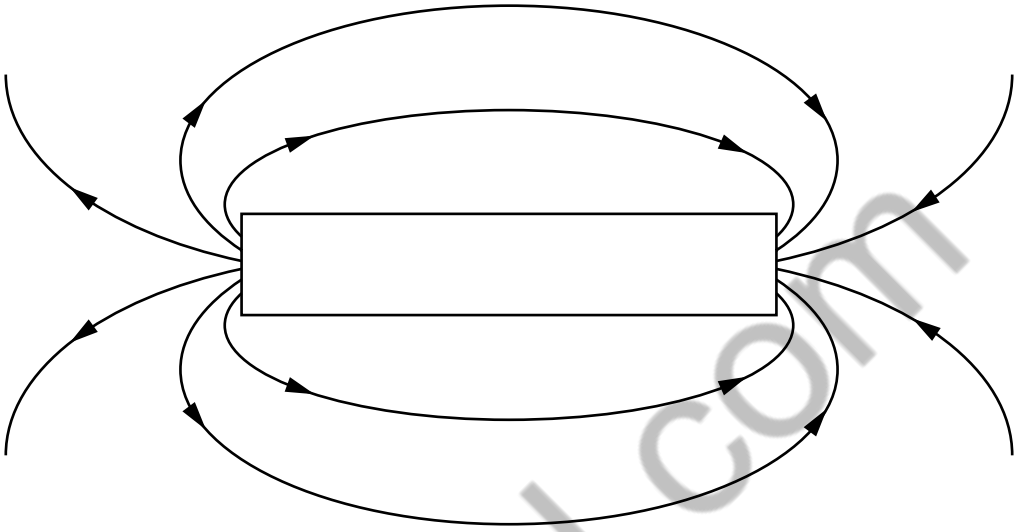

Fig. 11.1

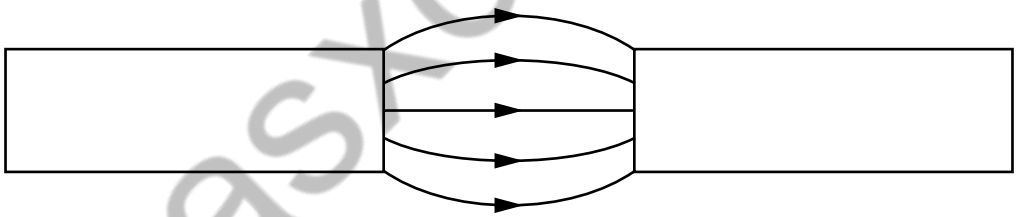

Fig. 11.2

[2]

(c) For each diagram in Fig. 11.3, describe the force acting, if any. Use the words *attraction*, *repulsion*, or *no force*.

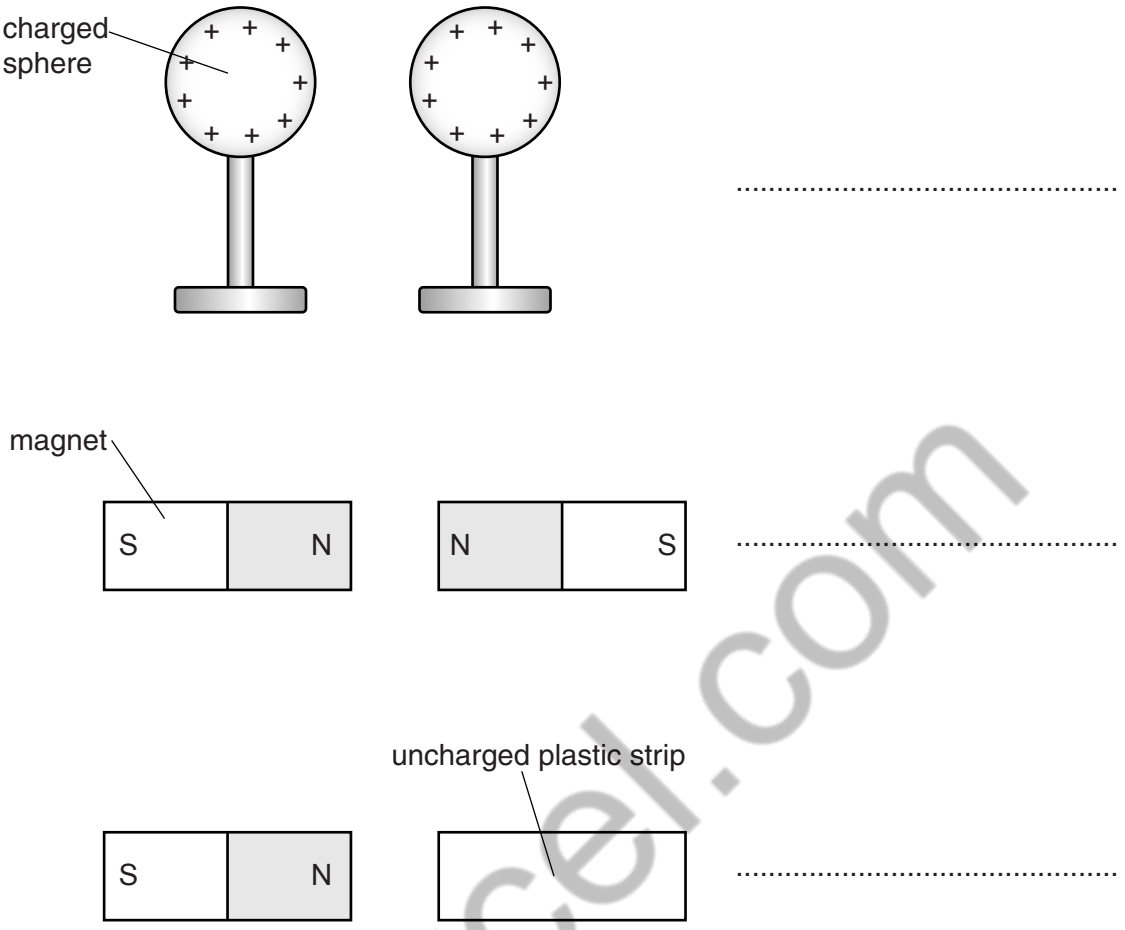

Fig. 11.3

[3]

[Total: 7]

12 Two radioactive sources are used by a teacher. One source emits only alpha particles and the other source emits only beta particles.

(a) Suggest how the sources can be identified.

.....

.....

.....

.....

.....[2]

(b) The teacher also has a source that emits gamma rays.

State **two** ways in which gamma rays are different from alpha particles.

1. .....

2. .....

[2]

(c) State an effect of ionising radiation on living things.

.....[1]

[Total: 5]

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Cambridge IGCSE

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9332191914

PHYSICS **0625/41**

Paper 4 Theory (Extended) **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

1 **(a)** A bus travels at a constant speed. It stops for a short time and then travels at a higher constant speed.

Using the axes in Fig. 1.1, draw a distance-time graph for this bus journey.

Fig. 1.1

[3]

(b) A lift (elevator) starts from rest at the ground floor of a building.

Fig. 1.2 is the speed-time graph for the motion of the lift to the top floor of the building.

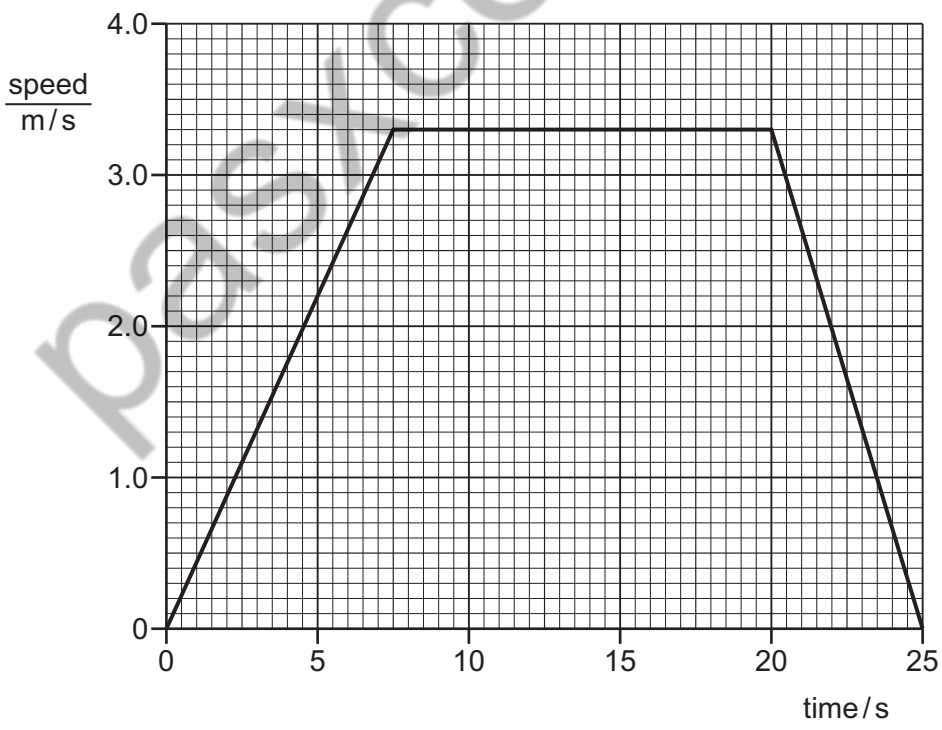

Fig. 1.2

Use the graph to determine the distance from the ground floor to the top floor of the building.

distance = ... [4]

[Total: 7]

2 Fig. 2.1 shows a dummy of mass 70 kg used in a crash test to investigate the safety of a new car.

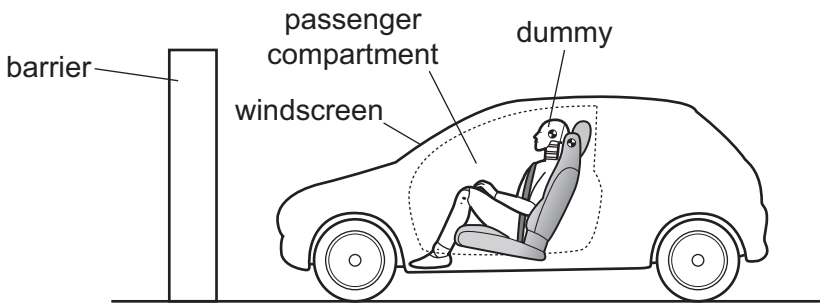

Fig. 2.1

The car approaches a solid barrier at 20 m / s. It crashes into the barrier and stops suddenly.

(a) **(i)** Calculate the momentum of the dummy immediately before the crash.

momentum = ... [2]

(ii) Determine the impulse that must be applied to the dummy to bring it to rest.

impulse = ... [1]

(b) In the crash test, the passenger compartment comes to rest in 0.20 s.

Calculate the deceleration of the passenger compartment.

deceleration = ... [2]

(c) The seat belt and air bag bring the dummy to rest so that it does not hit the windscreen. The dummy has an average deceleration of 80 m / s^2.

Calculate the average resultant force applied to the dummy, of mass 70 kg.

force = ... [2]

(d) The deceleration of the dummy is less than the deceleration of the passenger compartment.

Explain why this is of benefit for the safety of a passenger.

.....

.....

.....

.....

.....

..... [2]

[Total: 9]

3 Fig. 3.1 shows an oil tank that has a rectangular base of dimensions 2.4 m by 1.5 m.

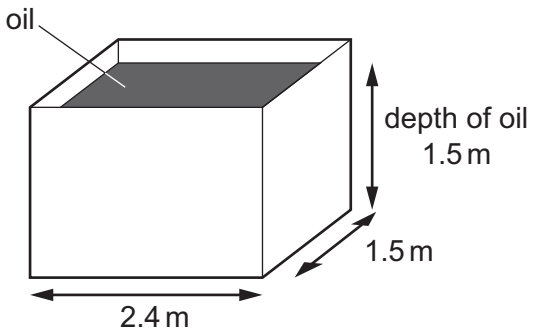

Fig. 3.1

The tank is filled with oil of density 850 kg / m^3 to a depth of 1.5 m.

(a) Calculate

(i) the pressure exerted by the oil on the base of the tank,

pressure = ... [2]

(ii) the force exerted by the oil on the base of the tank.

force = ... [2]

(b) The force calculated in **(a)(ii)** is the weight of the oil.

Calculate the mass of oil in the tank.

mass = ... [1]

(c) When he is checking the level of oil in the tank, a man drops a brass key into the oil and it sinks to the bottom of the oil.

(i) State what this shows about the density of brass.

..... [1]

(ii) Explain how attaching the key to a piece of wood could prevent the key from sinking.

.....

.....

..... [1]

[Total: 7]

4 **(a)** Explain, in terms of molecules, why it is possible to compress a gas, but not a liquid.

.....

.....

.....

..... [2]

(b) Two containers made of insulating material contain the same volume of water at room temperature. The containers do not have lids. The volume of liquid in each container gradually decreases.

(i) After a certain time, the temperature of the water has decreased to below room temperature.

Explain, in terms of molecules, why the temperature has decreased.

.....

.....

.....

..... [2]

(ii) One of the containers is wide and shallow. The other container is narrow and deep.

Predict which container has the greater rate of cooling. Explain your answer.

.....

.....

..... [2]

[Total: 6]

5 **(a)** State what happens to the molecules of a gas in a sealed container when the temperature of the gas is increased.

..... [1]

(b) A quantity of gas is contained in a sealed container of fixed volume. The temperature of the gas is increased.

State, in terms of molecules, **two** reasons why the pressure of the gas increases.

1. .....

2. .....

[2]

(c) A helium-filled weather balloon is held at ground level. The volume of the balloon is 4800 m^3. The pressure of the helium is 98 kPa.

The balloon is released and rises to a height where the volume of the balloon is 7200 m^3.

(i) Calculate the new pressure of the helium. Assume that the temperature stays constant.

pressure = ... [2]

(ii) Suggest why it may be necessary to release helium from the balloon as it rises even higher.

.....

..... [1]

[Total: 6]

6 **(a)** Two students are measuring the speed of sound.

The students are provided with a starting pistol, a stopwatch and a long measuring tape. The starting pistol, when fired, produces a loud sound and a puff of smoke at the same instant.

Describe how the students use the apparatus and how they calculate the speed. You may draw a diagram.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) A device at the bottom of the sea emits a sound wave of frequency 200 Hz.

(i) The speed of sound in sea-water is 1500 m / s.

Calculate the wavelength of the sound in sea-water.

wavelength = ... [2]

(ii) The sound wave passes from the sea-water into the air.

State what happens, if anything, to

- the frequency of the sound, ...

.....

- the speed of the sound. .....

.....

[2]

[Total: 8]

7 (a) (i) A ray of light passes through a length of curved optical fibre.

Draw a diagram showing the fibre and the path of the ray of light.

[1]

(ii) Describe one use of optical fibres in medicine. You may draw a diagram.

.....

.....

.....

.....

.....

.....

..... [3]

(b) Draw a straight line from each wave on the left to the most appropriate speed.

	90 m / s (9×10)
light in air	6000 m / s (6×10^3)
	100 000 m / s (1×10^5)
microwaves in a vacuum	
	1 000 000 m / s (1×10^6)
sound in steel	300 000 000 m / s (3×10^8)
	60 000 000 000 m / s (6×10^{10})

[3]

(c) The refractive index of a block of glass is 1.5.

Use your value for the speed of light from **(b)** to calculate the speed of light in this block.

speed = ... [2]

[Total: 9]

8 **(a)** Two straight, vertical wires X and Y pass through holes in a horizontal card.

Fig. 8.1 shows the card viewed from above.

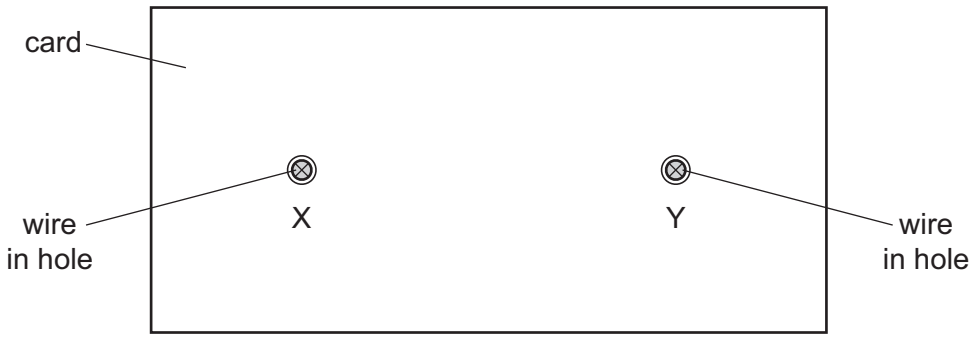

Fig. 8.1

There is a current in each wire in a downward direction (into the page).

(i) The magnetic field at Y due to the current in X produces a force on Y.

Place a tick in each blank column of the table to indicate the direction of this magnetic field and the direction of the force.

	magnetic field at Y	force on Y
towards the top of the page		
towards the bottom of the page		
to the left		
to the right		
into the page		
out of the page		

[2]

(ii) State and explain whether there is also a force on wire X.

.....

..... [1]

(b) Fig. 8.2 shows a d.c. supply connected to the input of a transformer.

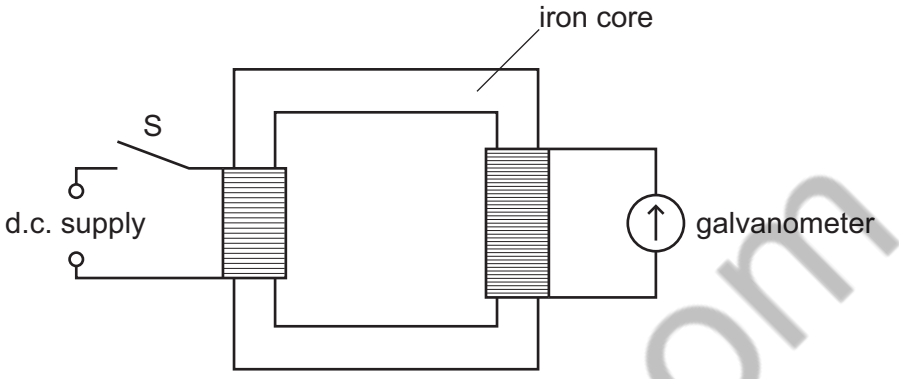

Fig. 8.2

When switch S is first closed, the needle of the galvanometer deflects briefly, then returns to zero.

Explain why the brief deflection occurs.

.....

.....

.....

.....

..... [3]

[Total: 6]

9 Fig. 9.1 shows a 12 V battery connected in a circuit containing resistors A, B, C and D. Each resistor has a resistance of 6.0 Ω.

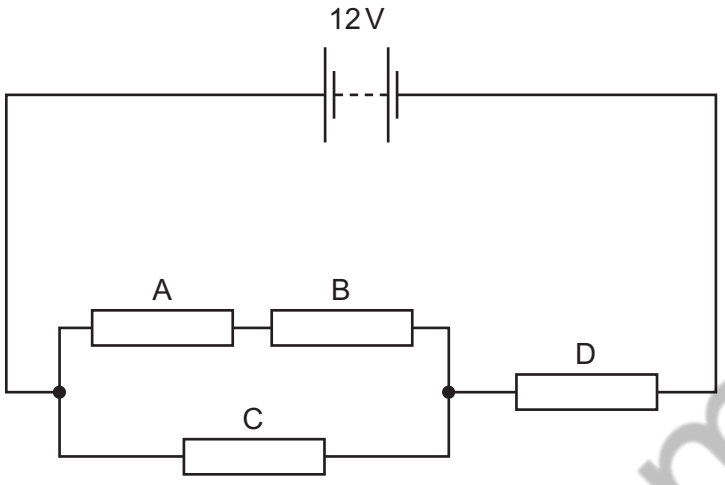

Fig. 9.1

(a) Calculate the combined resistance of

(i) resistors A and B,

resistance = ... [1]

(ii) resistors A, B and C,

resistance = ... [2]

(iii) resistors A, B, C and D.

resistance = ... [1]

(b) Calculate

(i) the current in the battery,

current = ... [1]

(ii) the energy transferred from the battery to the circuit in 50 s.

energy transferred = ... [2]

[Total: 7]

10 (a) (i) Fig. 10.1 shows the symbol for a circuit component.

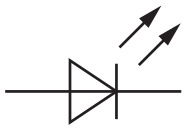

Fig. 10.1

Name this component.

..... [1]

(ii) In the space below, draw the symbol for a NOT gate.

[1]

(b) Fig. 10.2 shows a digital circuit.

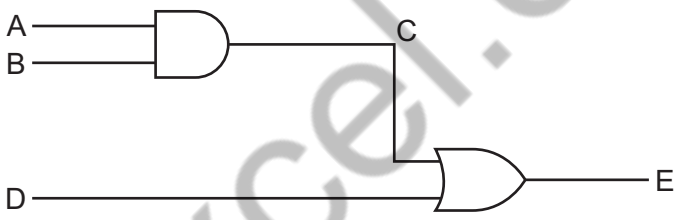

Fig. 10.2

Complete the truth table for this circuit.

input A	input B	output C	input D	output E
0	0		0	
0	0		1	
0	1		0	
0	1		1	
1	0		0	
1	0		1	
1	1		0	
1	1		1	

[3]

(c) Suggest a modification to the circuit in Fig. 10.2 to produce the output Z in the truth table below. It may help you to compare this truth table with the truth table in **(b)**.

input A	input B	input D	output Z
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

.....

..... [1]

[Total: 6]

11 Bismuth-214 is radioactive. It has a half-life of 20 minutes.

(a) The nuclide notation for bismuth-214 is $^{214}_{83}Bi$.

State the composition of the nucleus of bismuth-214.

.....

..... [2]

(b) Bismuth-214 decays by β-decay to an isotope of polonium, Po.

Complete the equation for the decay of bismuth-214.

$$^{214}_{83}Bi \rightarrow \begin{matrix}\cdots\cdots\\ \cdots\cdots\end{matrix}\beta + \begin{matrix}\cdots\cdots\\ \cdots\cdots\end{matrix}Po$$

[3]

(c) The count rate from a sample of bismuth-214 is 360 counts / s.

Predict the count rate from the sample after 60 minutes.

count rate = ... [2]

(d) State **two** of the social, economic or environmental issues involved in the storage of radioactive materials with very long half-lives.

.....

.....

.....

..... [2]

[Total: 9]

Cambridge IGCSE

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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	
1	
2	
3	
4	
Total	

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **10** printed pages and **2** blank pages.

CAMBRIDGE International Examinations

1 In this experiment, you will determine the weight of a metre rule using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

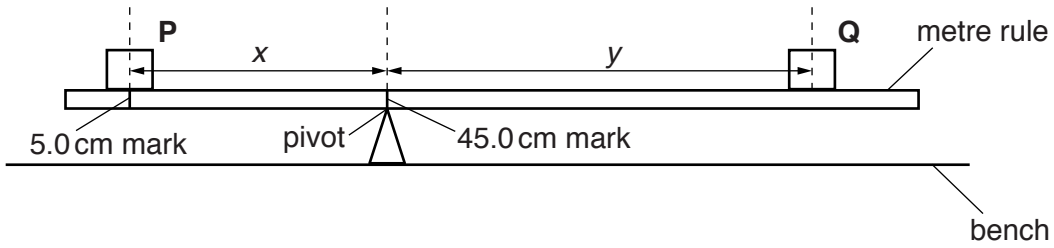


Fig. 1.1

(a)

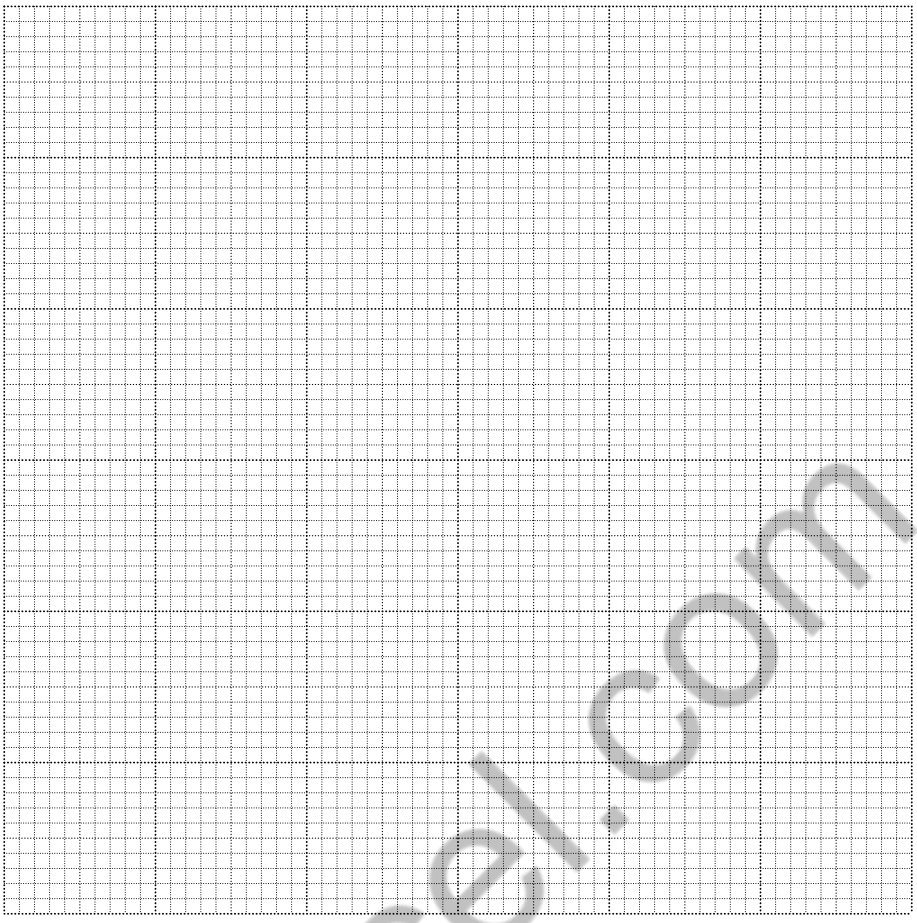
- Place load **P** on the metre rule at the 5.0 cm mark. Place the metre rule on the pivot at the 45.0 cm mark. Place load **Q** on the rule and adjust its position so that the metre rule is as near as possible to being balanced.
- Record, in Table 1.1, the distance *x* between the centre of load **P** and the pivot.
- Measure, and record in the table, the distance *y* from the centre of load **Q** to the pivot.
- Calculate $A = Px$, where $P = 1.00$ N. Record the value in the table. *P* is the weight of load **P**.
- Calculate $B = Qy$, where $Q = 0.80$ N. Record the value in the table. *Q* is the weight of load **Q**.
- Repeat the steps above, placing the load **P** at the 10.0 cm mark, 15.0 cm mark, 20.0 cm mark and 25.0 cm mark. **Keep the pivot at the 45.0 cm mark each time.** Record all the readings and values of *A* and *B* in the table.

Table 1.1

x/cm	*y*/cm	*A*/N cm	*B*/N cm

[3]

(b) Plot a graph of A/N cm (y-axis) against B/N cm (x-axis). Start both axes at the origin (0,0).



[4]

(c) Use the graph to determine the vertical intercept Y, the value of A when $B = 0$ N cm. Show clearly on the graph how you obtained this value.

$Y =$ ..... [1]

(d) Calculate the weight W of the metre rule using the equation $W = \frac{Y}{z}$, where $z = 5.0$ cm.

$W =$ ..... [1]

(e) Suggest one practical reason why it is difficult to obtain exact results with this experiment.

.....

..... [1]

(f) Use the balance provided to measure the mass of the metre rule.

mass = ... [1]

[Total: 11]

2 In this experiment, you will investigate the resistance of a lamp filament.

Carry out the following instructions, referring to Fig. 2.1. The circuit is set up for you.

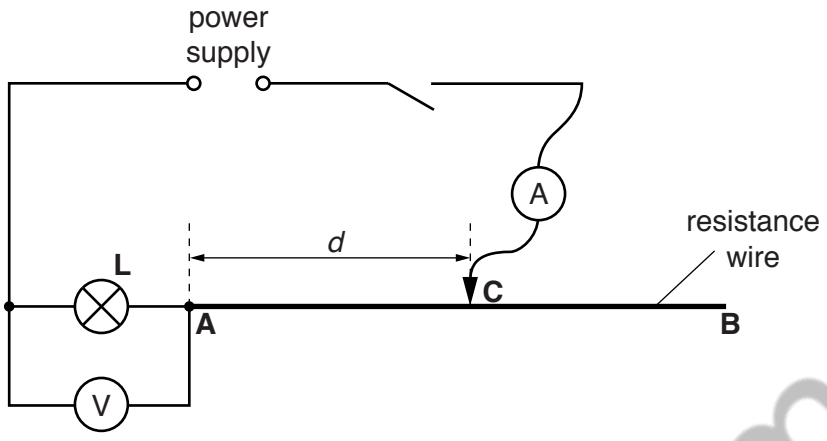


Fig. 2.1

(a)
- Switch on. Place the sliding contact **C** on the resistance wire at a distance $d = 0.200\,\text{m}$ from point **A**.
- Measure and record in Table 2.1 the current I in the circuit and the p.d. V across the lamp **L**. Switch off.
- Calculate the resistance R of the lamp filament, using the equation $R = \frac{V}{I}$.
- Repeat the procedure using values for d of 0.400 m, 0.600 m and 0.800 m.
- Complete the column headings in the table.

Table 2.1

d/	V/	I/	R/
0.200			
0.400			
0.600			
0.800			

[4]

(b) A student suggests that the resistance R of the lamp filament should be constant.

State and explain whether your results show that R is constant within the limits of experimental accuracy.

statement .....

explanation .....

.....

.....

[2]

(c) Suggest, referring to a practical observation, a reason why the resistance R may not be constant in this experiment.

.....

.....

..... [2]

(d) **(i)** Name an electrical component that could be used, in place of the resistance wire **AB** and sliding contact, to vary the current I.

..... [1]

(ii) Draw a diagram of the circuit including this component in place of the resistance wire and sliding contact.

[2]

[Total: 11]

3 In this experiment, you will determine the focal length of a lens by two different methods.

Method 1

(a) Set up the apparatus as shown in Fig. 3.1.

Fig. 3.1

(i)
- Place the lens at a distance $u = 50.0$ cm from the illuminated object.
- Move the screen until a sharply focused image of the object is seen on the screen.
- Measure and record the distance v from the screen to the centre of the lens.

$v =$ ..... cm [1]

(ii) Calculate a value f_1 for the focal length of the lens, using the equation $f_1 = \frac{uv}{(u + v)}$.

$f_1 =$ ..... [1]

(b) (i)
- Place the lens at a distance $u = 60.0$ cm from the illuminated object. Move the screen until a sharply focused image of the object is seen on the screen.
- Measure and record the distance v from the screen to the centre of the lens.

$v =$ ..... cm [1]

(ii) Calculate a value f_2 for the focal length of the lens using the equation $f_2 = \frac{uv}{(u + v)}$.

$f_2 =$ ..... [1]

(c) Calculate the average value f_A for the focal length of the lens. Show your working.

f_A = ... [1]

Method 2

(d)
- Remove the screen.
- Place the lens about 25 cm from the object.
- Place the mirror close to the lens, as shown in Fig. 3.2.

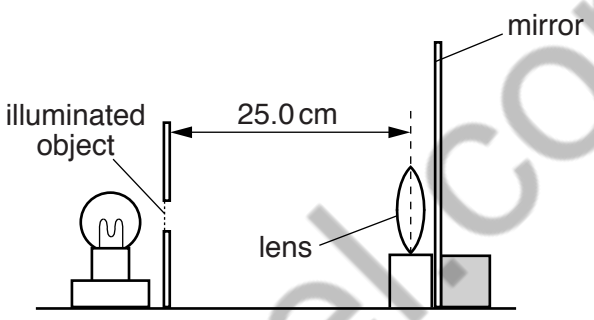


Fig. 3.2

- Move the lens slowly towards the object until a sharply focused image is obtained close to the object, as shown in Fig. 3.3.

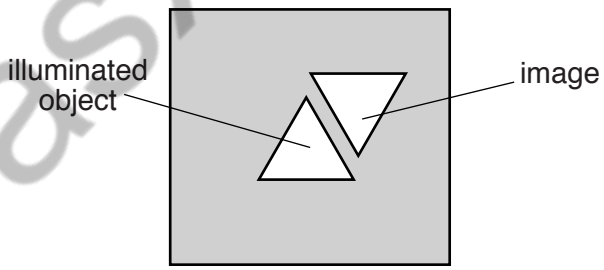


Fig. 3.3

- Measure the distance f_3 between the lens and the object. This is the focal length of the lens.

f_3 = ... [2]

(e) (i)

- Remove the mirror.
- Place the lens a distance $x = 2f_3$ from the illuminated object. Record the value of x.

$x =$ .....

- Place the screen the same distance $x = 2f_3$ from the centre of the lens. The lens must be between the illuminated object and the screen.
- Carefully adjust the position of the screen until a sharply focused image of the object is seen on the screen.
- Measure the distance y between the centre of the lens and the screen.

$y =$ .....
[1]

(ii) Calculate the difference $x - y$.

$x - y =$ ..... [1]

(f) State two precautions that should be taken in this experiment to obtain reliable results.

1. .....

.....

2. .....

.....
[2]

[Total: 11]

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4 A student is investigating the effect of insulation on the rate of cooling of hot water in a 250 cm^3 container.

The student can choose from the following apparatus:

thermometer
250 cm^3 glass beaker
250 cm^3 plastic beaker
250 cm^3 copper can
250 cm^3 measuring cylinder
three different insulating materials
clamp, boss and stand
stopwatch.

Plan an experiment to investigate the effectiveness of the three insulating materials. You are **not** required to carry out this investigation.

You should

- explain briefly how you would carry out the investigation,
- state the key variables that you would control,
- draw a table or tables, with column headings, to show how you would display your readings. You are not required to enter any readings in the table,
- explain how you would use your readings to reach a conclusion.

A diagram is not required but you may draw a diagram if it helps your explanation.

.....

.....

[7]

[Total: 7]

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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	CANDIDATE NUMBER

PHYSICS **0625/61**

Paper 6 Alternative to Practical **May/June 2016**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages.

1 A student is determining the weight of a metre rule using a balancing method.

The apparatus is shown in Fig. 1.1.

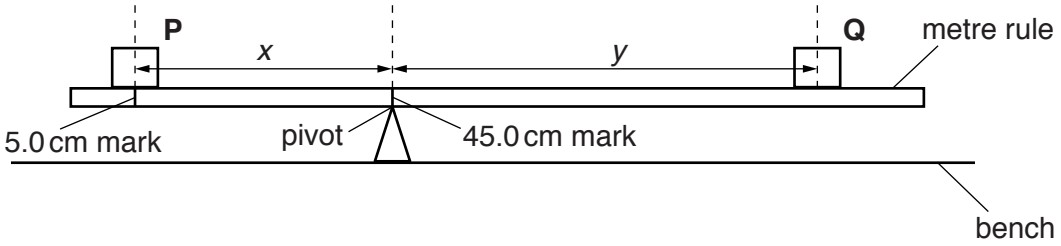


Fig. 1.1 (not to scale)

(a)
- The student places the load **P** on the metre rule at the 5.0 cm mark.
- She places the metre rule on the pivot at the 45.0 cm mark.
- She places load **Q** on the rule and adjusts its position so that the metre rule is as near as possible to being balanced.
- She measures the distance *x* between the centre of load **P** and the pivot and the distance *y* from the centre of load **Q** to the pivot.
- She repeats the procedure, placing the load **P** at the 10.0 cm mark, at the 15.0 cm mark, at the 20.0 cm mark and at the 25.0 cm mark. The readings are shown in Table 1.1.

Table 1.1

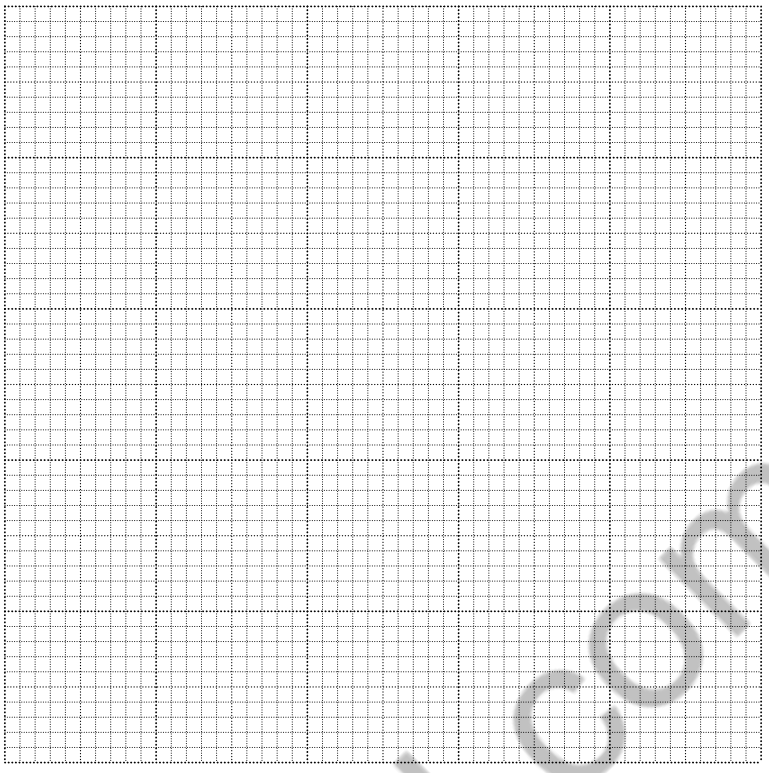
x/	*y*/	*A*/	*B*/
40.0	42.5		
35.0	36.0		
30.0	30.0		
25.0	24.0		
20.0	17.5		

(i)
- For each value of *x*, calculate $A = Px$, where $P = 1.00$ N. Record the values in the table. *P* is the weight of load **P**.
- For each value of *y*, calculate $B = Qy$, where $Q = 0.80$ N. Record the values in the table. *Q* is the weight of load **Q**.

[1]

(ii) Complete the column headings in the table. [1]

(b) Plot a graph of A/N cm (y-axis) against B/N cm (x-axis). Start both axes at the origin (0,0).



[4]

(c) Using the graph, determine the vertical intercept Y (the value of A when $B = 0$ N cm). Show clearly on the graph how you obtained this value.

$Y =$ ..... [1]

(d) Calculate the weight W of the metre rule using the equation $W = \frac{Y}{z}$, where $z = 5.0$ cm.

$W =$ ..... [1]

(e) Suggest one practical reason why it is difficult to obtain exact results with this experiment.

.....

..... [1]

(f) The student uses an accurate electronic balance to obtain a second value for the weight of the metre rule.

weight obtained on the balance = ... 1.24 N .....

State and explain whether the two values for the weight agree within the limits of experimental accuracy.

statement .....

justification .....

.....

[1]

[Total: 10]

2 A student is heating water in a beaker using an electrical heater.

(a) He measures the potential difference V across the heater and the current I in the heater.

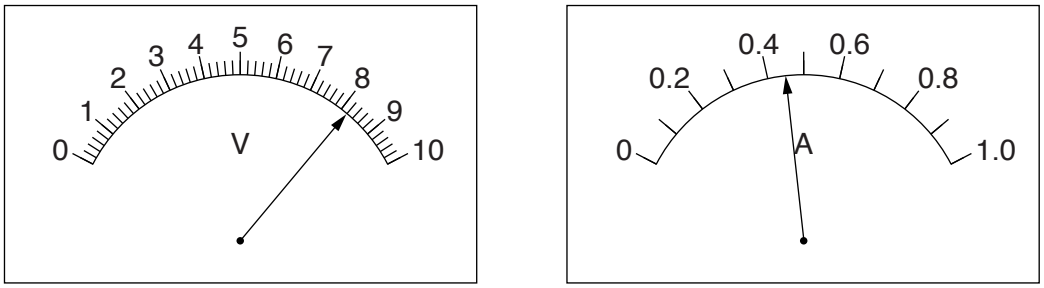


Fig. 2.1

Write down the readings shown on the meters in Fig. 2.1.

V = ...

I = ...
[3]

(b) He measures the temperature of the water before heating.

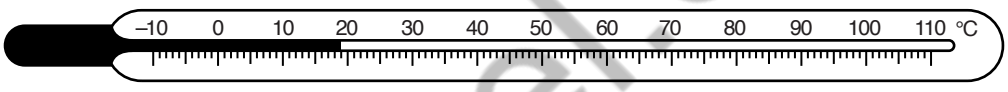
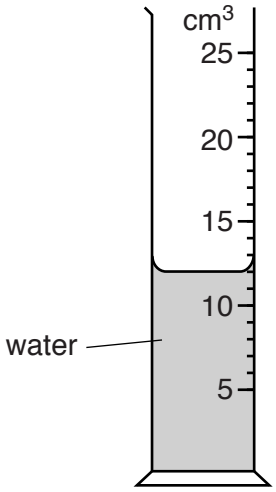


Fig. 2.2

Write down the temperature reading θ shown in Fig. 2.2.

θ = ... [1]

(c) On Fig. 2.3, draw a line and an eye to show clearly the line of sight required to read the volume of water in the measuring cylinder.



[1]

Fig. 2.3

[Total: 5]

3 A student is investigating the resistance of a lamp filament.

The circuit is shown in Fig. 3.1.

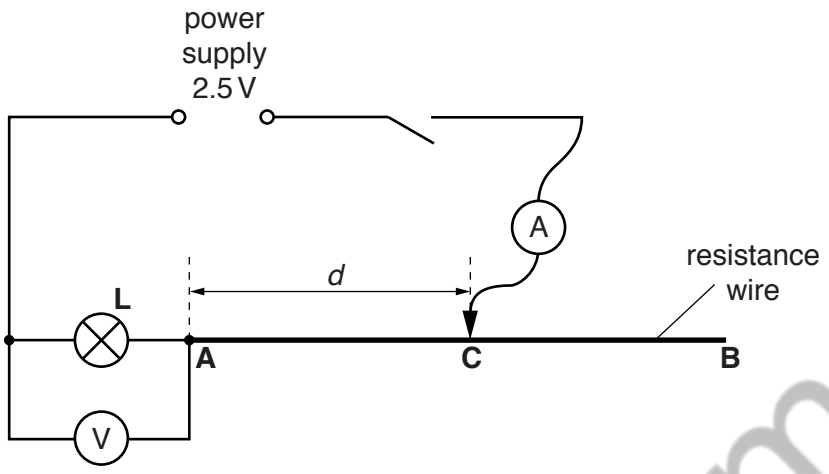


Fig. 3.1

(a) The student places a sliding contact **C** on the resistance wire at a distance d = 0.200 m from point **A**. He measures the current I in the circuit and the p.d. V across the lamp **L**.

He repeats the procedure using values for d of 0.400 m, 0.600 m and 0.800 m. The readings are shown in Table 3.1.

(i) Calculate the resistance R of the lamp filament for each set of readings. Use the equation $R = \frac{V}{I}$. [2]

(ii) Complete the column headings in the table. [1]

Table 3.1

d /	V /	I /	R /	appearance of lamp filament
0.200	1.6	1.00		very bright
0.400	1.3	0.86		bright
0.600	1.0	0.74		dim
0.800	0.8	0.66		does not glow

(b) The student notices that the lamp does not glow when he takes the final set of readings. He thinks that the filament has broken.

State whether the student is correct and give a reason for your answer.

statement .....

reason .....

.....

[1]

(c) A student suggests that the resistance *R* of the lamp filament should be constant.

Suggest, referring to the observations, a reason why the resistance *R* may not be constant in this experiment.

.....

.....

.....

..... [2]

(d) **(i)** Name an electrical component that could be used, instead of the resistance wire **AB** and sliding contact, to vary the current *I*.

..... [1]

(ii) Draw a diagram of the circuit including this component instead of the resistance wire and sliding contact.

[2]

[Total: 9]

4 A student is investigating the effect of insulation on the rate of cooling of hot water in a 250 cm^3 container.

The student can choose from the following apparatus:

thermometer
250 cm^3 glass beaker
250 cm^3 plastic beaker
250 cm^3 copper can
250 cm^3 measuring cylinder
three different insulating materials
clamp, boss and stand
stopwatch.

Plan an experiment to investigate the effectiveness of the three insulating materials.

You should

- explain briefly how you would carry out the investigation,
- state the key variables that you would control,
- draw a table, or tables, with column headings, to show how you would display your readings. You are not required to enter any readings in the table,
- explain how you would use your readings to reach a conclusion.

A diagram is not required but you may draw a diagram if it helps your explanation.

.....

.....

[7]

[Total: 7]

5 A student determines the focal length of a lens.

The apparatus is shown in Fig. 5.1.

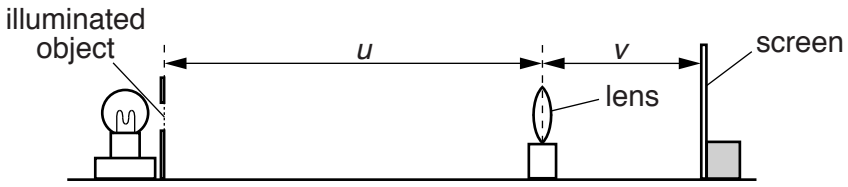


Fig. 5.1

(a) The student places the lens at a distance *u* from the illuminated object. He moves the screen until a sharply focused image of the object is seen on the screen.

On Fig. 5.1,

- measure the distance *u* from the illuminated object to the centre of the lens,

u = ... mm

- measure the distance *v* from the screen to the centre of the lens.

v = ... mm
[1]

(b) Fig. 5.1 is drawn 1/10th actual size.

(i) • Calculate the actual distance *U* from the illuminated object to the centre of the lens.

U = ... mm

- Calculate the actual distance *V* from the screen to the centre of the lens.

V = ... mm
[1]

(ii) Calculate a value f_1 for the focal length of the lens using the equation $f_1 = \frac{UV}{(U+V)}$.

f_1 = ... mm
[2]

(c) A second student repeats the experiment three times using a different lens. His values for the focal length of his lens are shown in Table 5.1.

Table 5.1

	1	2	3
focal length/mm	132	141	135

Calculate the average value f_2 for the focal length of this student's lens.

f_2 = ... mm [1]

(d) A third student, using the same method, finds that the focal length f of her lens is 200 mm.

She reads in a book that when $u = 2f$, the distances u and v, as shown in Fig. 5.1, are equal.

- Calculate $2f$ for this student's lens.

$2f$ = ... mm

The student sets up the apparatus as shown in Fig. 5.2. She adjusts both x and y to be 400 mm.

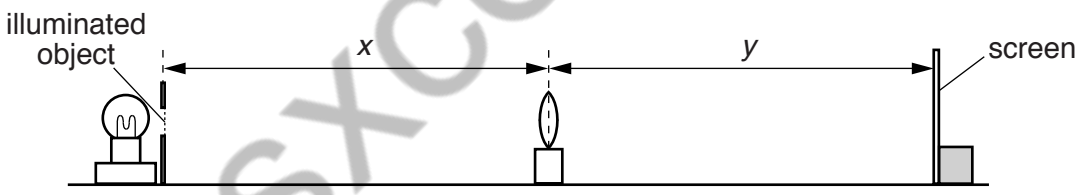


Fig. 5.2

She observes that the image is blurred. The student slowly increases the distance y, and obtains a sharply focused image when $y = 406$ mm.

Discuss whether the student's results confirm the statement in the book.

.....

.....

.....
[2]

(e) Suggest two precautions that you would take in this investigation in order to obtain reliable results.

1. .....

.....

2. .....

.....

[2]

[Total: 9]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **May/June 2016**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **May/June 2016**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/31**

Paper 3 Core Theory **May/June 2016**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

B marks — are independent marks, which do not depend on other marks. For a B mark to scored, the point to which it refers must be seen specifically in the candidate's answers.

M marks — are method marks upon which accuracy marks (A marks) depend. For an M mark to be scored, the point to which it refers **must** be seen in a candidate's answer. If a candidate fails to score a particular M mark, then none of the dependent marks can be scored.

C marks — are compensatory method marks which can be scored even if the points to which they refer are not written down by the candidate, **provided subsequent working gives evidence that they must have known it.** For example, if an equation carries a C mark and the candidate does not write down the actual equation but does correct substitution or working which shows that they knew the equation, then the C mark is scored. A C mark is not awarded if a candidate makes two points which contradict each other. Points which are wrong but irrelevant are ignored.

A marks — are accuracy or answer marks which either depend on an M mark, or which are one of the ways which allow a C mark to be scored.

Brackets ( ) — around words or units in the mark scheme are intended to indicate wording used to clarify the mark scheme, but the marks do not depend on seeing the words or units in brackets e.g. 10 (J) means that the mark is scored for 10, regardless of the unit given.

c.a.o. — means "correct answer only"

Underlining — indicates that this must be seen in the answer offered, or something very similar.

OR / or — indicates alternative answers, any one of which is satisfactory for scoring the marks.

e.e.o.o. — means "each error or omission".

o.w.t.t.e. — means "or words to that effect".

Ignore — indicates that something which is not correct or irrelevant is to be disregarded and does not cause a right plus wrong penalty.

Spelling — Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit. However, beware of and do not allow ambiguities: e.g. spelling which suggests confusion between reflection / refraction / diffraction or thermistor / transistor / transformer.

Not / NOT — indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate i.e. right plus wrong penalty applies.

e.c.f. means “error carried forward” . This is mainly applicable to numerical questions, but may occasionally be applied in non-numerical questions if specified in the mark scheme.

This indicates that if a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by e.c.f. may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate from being penalised more than once for a particular mistake, but **only** applies to marks annotated “e.c.f”.

Significant figures On this paper, answers are generally acceptable to any number of significant figures $\geqslant 2$, except where the mark scheme specifies otherwise or gives an answer to only 1 significant figure.

Units On this paper, incorrect units are not penalised, except where specified. More commonly, marks are awarded for specific units.

Arithmetic errors Deduct only one mark if the **only** error in arriving at a final answer is clearly an arithmetic one. Regard a power-of-ten error as an arithmetic one.

Fractions Fractions are only acceptable where specified.

Crossed out work Work which has been crossed out **and not replaced but can easily be read**, should be marked as if it had not been crossed out.

Use of **NR** (# key on the keyboard) Use this if the answer space for a question is completely blank or contains no readable words, figures or symbols.

Question	Answer	Marks
1(a)	cyclist accelerating **OR** moving faster **OR** cyclist has higher speed	**B1**
	both (cyclist and runner) accelerating	**B1**
	cyclists gradient steeper **OR** acceleration values calculated	**B1**
1(b)	Constant **OR** steady **OR** uniform (speed or motion)	**B1**
1(c)	indication of an area calculated	**C1**
	$6 \times 9 = 54$(m)	**C1**
	$½ (6 \times 9) = 27$(m)	**C1**
	81(m)	**A1**
1(d)	horizontal line finishes at 10 seconds	**B1**
	straight line to time zero in two seconds	**B1**
		Total: 10

Question	Answer	Marks
2(a)	air resistance	**B1**
2(b)	$W = m \times g$ in any form	**B1**
	54(kg)	**B1**
2(c)	(540 – 100) = 440(N)	**B1**
	downwards	**B1**
		Total: 5

Question	Answer	Marks
3(a)(i)	convection **OR** radiation	**B1**
3(a)(ii)	conduction	**B1**
3(b)	poor emitter **OR** poor radiator (of thermal energy)	**B1**
3(c)	(handles) become hot	**B1**
	use an insulator	**B1**
		Total: 5

Question	Answer	Marks
4(a)	<u>hot rocks</u>	**B1**
4(b)	input: thermal	**B1**
	output: electrical	**B1**
4(c)	**any two from:** air pollution **OR** atmospheric pollution climate change **OR** global warming **OR** greenhouse gases use up diminishing resources **OR** non-renewable	**B2**
		Total: 5

Question	Answer	Marks
5(a)	**any two from:** larger area (in contact with roof) weight **OR** force spread out lower pressure (on roof)	**B2**
5(b)	400 + 1600 seen **OR** 2000(N) P = F / A stated 2000 / 0.8 2500 N/m^2 **OR** Pa	**B1** **C1** **C1** **A1** **B1**
		Total: 7

Question	Answer	Marks
6(a)(i)	three straight lines, joined end to end at least two changes of direction	**B1** **B1**
6(a)(ii)	collisions **OR** bumps **OR** bounces off (with moving) air molecules	**B1** **B1**
6(b)	more collisions **OR** changes of direction	**B1**
		Total: 5

Question	Answer	Marks
7(a)	to the left **OR** anticlockwise	**B1**
7(b)	row 1 – increases	**B1**
	row 2 – stays the same	**B1**
	row 3 – decreases	**B1**
7(c)	electric cables lower to ground **OR** telephone lines in summer **OR** buckling tracks	**B1**
		Total: 5

Question	Answer	Marks
8(a)(i)	<u>normal</u>	**B1**
8(a)(ii)	20°	**B1**
8(b)	d	**B1**
	g	**B1**
	f	**B1**
	R **OR** S	**B1**
8(c)	any two rays correctly drawn from top of O: ray parallel to axis, through lens, and beyond F ray undeviated through centre of lens and beyond ray through F, through lens, then parallel to axis	**M2**
	inverted image correctly drawn and positioned at intersection of two rays	**A1**
		Total: 9

Question	Answer	Marks
9(a)(i)	infra-red	**B1**
9(a)(ii)	frequency	**B1**
9(b)(i)	any two different applications from: • (medical) imaging **OR** detecting fractures in bone **OR** specific example e.g. CT scan / imaging teeth at dentist • detecting faults in metal • security imaging e.g. airport security checks of bags • cancer treatment	**B2**
9(b)(ii)	any two from: • behind a screen **OR** lead apron • large distance from X-ray beam • monitoring of **OR** restricting exposure • low dosage **OR** limit exposure time • monitor frequency of x-ray sessions • other people not allowed in room when X-ray being taken • avoid when pregnant	**B2**
9(b)(iii)	same speed	**B1**
		Total: 7

Question	Answer	Marks
10(a)(i)	series	B1
10(a)(ii)	thermistor	B1
10(b)(i)	resistance decreases as temp increases	B1
	at decreasing rate **OR** not proportional **OR** not linear	B1
10(b)(ii)	resistance of Y = 80 Ω	C1
	$R_t = R_1 + R_2$ in any form	C1
	100(Ω)	A1
10(b)(iii)	$V = IR$ in any form	C1
	12 ÷ 100 **OR** 12 ÷ candidates **(b)(ii)**	C1
	0.12 (A) **OR** ECF from **(b)(ii)**	A1
		Total: 10

Question	Answer	Marks
11(a)	iron, steel	B2
11(b)	N and S correctly labelled on Fig. 11.1	B1
	N and S correctly labelled on Fig. 11.2	B1
11(c)(i)	repulsion	B1
11(c)(ii)	repulsion	B1
11(c)(iii)	No force	B1
		Total: 7

Question	Answer	Marks
12(a)	idea of paper between source and detector **OR** measuring range (in air) **OR** pass through an electric or magnetic field	**B1**
	alpha stopped by paper **OR** larger range in air for beta **OR** identify deflection when in field	**B1**
12(b)	**any two from:** gamma travel at the speed of light gamma rays have no charge gamma rays have no mass gamma is a wave **OR** part of the electromagnetic spectrum gamma less ionising greater penetration not deflected by electric or magnetic fields	**B2**
12(c)	damages cells / tissues / DNA **OR** causes (cell) mutations **OR** radiation sickness	**B1**
		Total: 5

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/41**

Paper 4 Extended Theory **May/June 2016**

MARK SCHEME

Maximum Mark: 80

Published

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NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

M marks — are method marks upon which further marks depend. For an M mark to be scored, the point to which it refers **must** be seen in a candidate's answer. If a candidate fails to score a particular M mark, then none of the dependent marks can be scored.

B marks: — are independent marks, which do not depend on other marks. For a B mark to scored, the point to which it refers must be seen specifically in the candidate's answers.

A marks — In general A marks are awarded for final answers to numerical questions.
If a final numerical answer, eligible for A marks, is correct, with the correct unit and an acceptable number of significant figures, all the marks for that question are normally awarded.

It is very occasionally possible to arrive at a correct answer by an entirely wrong approach. In these rare circumstances, do not award the A marks, but award C marks on their merits. However, correct numerical answers with no working shown gain all the marks available.

C marks — are compensatory marks in general applicable to numerical questions. These can be scored even if the point to which they refer are not written down by the candidate, **provided subsequent working gives evidence that they must have known it.** For example, if an equation carries a C mark and the candidate does not write down the actual equation but does correct substitution or working which shows he knew the equation, then the C mark is scored
A C marks is not awarded if a candidate makes two points which contradict each other. Points which are wrong but irrelevant are ignored.

brackets ( ) — around words or units in the mark scheme are intended to indicate wording used to clarify the mark scheme, but the marks do not depend on seeing the words or units in brackets. e.g. 10 (J) means that the mark is scored for 10, regardless of the unit given.

underlining — indicates that this must be seen in the answer offered, or something very similar.

OR / or — indicates alternative answers, any one of which is satisfactory for scoring the marks.

e.e.o.o. — means "each error or omission".

o.w.t.t.e. — means "or words to that effect".

Spelling — Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit. However, beware of and do not allow ambiguities, accidental or deliberate: e.g. spelling which suggests confusion between reflection / refraction / diffraction / thermistor / transistor / transformer.

Not/NOT — Indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate i.e. right plus wrong penalty applies.

Ignore — Indicates that something which is not correct or irrelevant is to be disregarded and does not cause a right plus wrong penalty.

ecf	meaning "error carried forward" is mainly applicable to numerical questions, but may in particular circumstances be applied in non-numerical questions. This indicates that if a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by ecf may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate being penalised more than once for a particular mistake, but **only** applies to marks annotated ecf.
Significant Figures	Answers are normally acceptable to any number of significant figures ≥ 2. Any exceptions to this general rule will be specified in the mark scheme.
Units	Deduct one mark for each incorrect or missing unit from **an answer that would otherwise gain all the marks available for that answer: maximum 1 per question.** No deduction is incurred if the unit is missing from the final answer but is shown correctly in the working.
Arithmetic errors	Deduct one mark if the **only** error in arriving at a final answer is clearly an arithmetic one.
Transcription errors	Deduct one mark if the only error in arriving at a final answer is because given or previously calculated data has clearly been misread but used correctly..
Fractions	(e.g. ½) Allow these only where specified in the mark scheme.
Crossed out work	Work which has been crossed out **and not replaced but can easily be read,** should be marked as if it had not been crossed out.
Use of **NR**	(# key on the keyboard) Use this if the answer space for a question is completely blank or contains no readable words, figures or symbols.

Question	Answer	Mark
1(a)	From time zero, line of constant positive gradient, not necessarily from origin Horizontal line from end of sloping line Line of steeper positive gradient from end of horizontal line	**B1** **B1** **B1**
1(b)	(distance =) area under graph stated $0.5 \times 7.5 \times 3.3$ (= 12.375) + 12.5×3.3 (= 41.25) + $0.5 \times 5 \times 3.3$ (= 8.25) OR ½ (a + b)h = $0.5 \times (25 + 12.5) \times 3.3$ OR $(25 \times 3.3) – (0.5 \times 12.5 \times 3.3)$ 62 m	**C1** **C2** **(C1)** **(C1)** **(C2)** **A1**
		Total: 7

Question	Answer	Mark
2(a)(i)	(momentum =) mv OR 70×20 = 1400 kg m / s OR N s	**C1** **A1**
2(a)(ii)	same numerical answer as **(a)(i)** with either unit OR 1400 kg m / s	**B1**
2(b)	(a =) change of velocity / time OR (v – u) / t OR 20 / 0.2 100 m / s^2	**C1** **A1**
2(c)	(F =) ma OR 70×80 5600 N	**C1** **A1**
2(d)	Force / impact on passenger or dummy less (than without seat belt / airbag) Passenger less likely to be injured / hurt / damaged	**M1** **A1**

Question	Answer	Mark
		Total: 9

Question	Answer	Mark
3(a)(i)	(P =) hdg OR 1.5 × 850 × 10 OR mg / area of base OR 850 × 2.4 × 1.5 × 1.5 × 10 / (2.4 × 1.5) 13 000 Pa or N/m^2	C1 (C1) A1
3(a)(ii)	P = F/A OR (F =) PA OR 12 750 × 1.5 × 2.4 OR 12 750 × 3.6 46 000 N OR (Force =) weight of oil = mg = 2.4 × 1.5 × 1.5 × 850 × 10 46 000 N	C1 A1 (C1) (A1)
3(b)	(46000 / 10 =) 4600 kg OR m = Vd = (2.4 × 1.5 × 1.5) × 850 = 4600 kg	 B1
3(c)(i)	(density of brass) greater than that of oil / 850 kg / m^3 OR brass denser <u>than oil</u>	 B1
3(c)(ii)	(It won't sink as average) density of wood + key less than density of oil	B1
		Total: 7

Question	Answer	Mark
4(a)	Gas molecules (very) far apart OR empty space between gas molecules Molecules of liquid (very) close together / compact OR are touching (each other)	**B1** **B1**
4(b)(i)	Faster / more energetic water molecules evaporate / escape / leave Slower / less energetic molecules remain (so temperature is lower)	**B1** **B1**
4(b)(ii)	Water in wide container AND has water with larger surface (area) Rate of evaporation higher / faster / quicker OR higher chance of evaporation	**B1** **B1**
		Total: 6

Question	Answer	Mark
5(a)	One of 1, 2 or 3: 1 Molecules move faster OR have more k.e. / momentum 2 Molecules hit walls more often / more frequently 3 Molecules hit walls with greater force / impulse / harder	**B1**
5(b)	1 mark for each of 1, 2 and 3 in **(a)** not given as answer to **(a)**	**B2**
5(c)(i)	PV = constant OR $P_1V_1 = P_2V_2$ OR $98 \times 4800 = P \times 7200$ 65 kPa	**C1** **A1**
5(c)(ii)	To prevent the balloon bursting (as its volume increases) OR to reduce the pressure inside the balloon OR pressure difference between inside and outside balloon rises	**B1**
		Total: 6

Question	Answer	Mark
6(a)	Method 1: Long distance / distance in field measured with the tape One student fires pistol at one end (of this distance) Student at other end starts stop-watch on seeing smoke / light from pistol and st / ops stop-watch on hearing sound of pistol speed = (measured) distance / (measured) time Method 2: Distance of 50 m or more from a vertical wall measured with the tape Student 1 fires pistol at this distance from the wall Student 2 standing next to student 1 starts stop-watch on hearing pistol and stops stop-watch on hearing echo speed = 2 × (measured) distance / (measured) time	 B1 B1 B1 B1 (B1) (B1) (B1) (B1)
6(b)(i)	v = fλ OR (λ =) v / f OR 1500 / 200 7.5 m	C1 A1
6(b)(ii)	1 (frequency) does not change 2 (speed) decreases	B1 B1
		Total: 8

Question	Answer	Mark
7(a)((i)	Sketch of curved optic fibre with light ray undergoing at least one total internal reflection	B1
7(a)(ii)	Light travels down (optic) fibres into or out of body	B1
	To examine internal organ / part	B1
	Light travels both ways into and out of body	B1
	OR	
	To destroy (cancerous) cells	(B1)
	by heating	(B1)
	OR	
	Endoscope / fibre bundle inserted into body	(B1)
	To view internal organ body part OR for keyhole surgery	(B1)
7(b)	Light in air: 3×10^8 m / s	B1
	Microwaves in vacuum: 3×10^8 m / s	B1
	Sound in steel: 6000 m / s	B1
7(c)	n = speed in air / speed in glass (or rearranged)	C1
	OR $1.5 = 3 \times 10^8$ / speed in glass (or rearranged)	
	2.0×10^8 m / s	A1
		Total: 9

Question	Answer	Mark
8(a)(i)	Magnetic field at Y: 'towards the bottom of the page' ticked Force at Y: 'to the left' ticked	**B1** **B1**
8(a)(ii)	There is a force on X because of the (magnetic) field caused by Y OR due to the (magnetic) field around / of Y OR the (magnetic) fields due to X and Y interacting	**B1**
8(b)	Change in current / field is brief / for short time / occurs as switch closes Changing magnetic field / flux links with secondary coil / other coil / core OR field / flux lines cut coil Causes induced voltage / current	**B1** **B1** **B1**
		Total: 6

Question	Answer	Mark
9(a)(i)	12 Ω	**B1**
9(a)(ii)	$1/R = 1/R_1 + 1/R_2$ OR $1/R = 1/12 + 1/6$ OR $(R =) R_1R_2/(R_1 + R_2)$ OR $(12 \times 6)/(12 + 6)$ 4 Ω	**C1** **A1**
9(a)(iii)	4 + 6 = 10 Ω	**B1**
9(b)(i)	(I = 12 / 10 =) 1.2 A	**B1**
9(b)(ii)	(E =) IVt OR $1.2 \times 12 \times 50$ OR I^2Rt OR $1.2^2 \times 10 \times 50$ OR V^2t/R OR $12^2 \times 50/10$ 720 J	**C1** **A1**
		Total: 7

Question	Answer	Mark
10(a)(i)	Light emitting diode OR LED	**B1**
10(a)(ii)		**B1**
10(b)	column C / column E 0 / 0 0 / 1 0 / 0 0 / 1 0 / 0 0 / 1 1 / 1 1 / 1	**B3**
10(c)	Replace the OR gate with an AND gate	**B1**
		Total: 6

Question	Answer	Mark
11(a)	83 protons 131 neutrons	**B2**
11(b)	$^{0}_{-1}\beta$ Superscript 0 Subscript –1 $^{214}_{84}Po$	**B1** **B1** **B1**
11(c)	(After 20 min count rate is) 360 / 2 or 180 (count / s) (After 40 min count rate is) 180 / 2 or 90 (counts / s) (After 60 min count rate is) 90 / 2 OR new count-rate = 360/(2 × 2 × 2) or 360 / 8 or 3 half-lives 45 (counts / s)	**C1** **A1**

Question	Answer	Mark
11(d)	Any two points chosen from the lists below: (economic): high cost of storage / shielding / guarding / need to store for a long time OR reduction in tourism OR loss of farming produce / land OR reduction of land / property values (social): fear of cancer / causes cancer / genetic mutations / radiation sickness in people / animals OR local objections OR cause people to move away (environmental): crop mutations OR leakage into water supplies OR pollution of atmosphere / water supply	**B2**
		Total: 9

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2016**

MARK SCHEME

Maximum Mark: 40

Published

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Underlining	Underlining indicates that this must be seen in the answer offered, or something very similar.
OR / or	This indicates alternative answers or words, any one of which is satisfactory for scoring the marks.
AND	Both answers or words must be given for credit to be awarded.
e.e.o.o.	This means "each error or omission".
o.w.t.t.e.	This means “or words to that effect”.
c.a.o.	This means “correct answer only”.
NOT	This indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate, i.e. right plus wrong penalty applies.
e.c.f.	This means "error carried forward". If a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by e.c.f. may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate from being penalised more than once for a particular mistake, but **only** applies to marks annotated e.c.f.

Question	Answer	Marks
1(a)	correct *x* values in table 40, 35, 30, 25, 20 *y* values in table, between 5 cm and 50 cm, decreasing *A* and *B* values correct	**1** **1** **1**
1(b)	Graph: Axes correctly labelled with quantity and unit, right way round and starts at origin Appropriate scales All plots correct to ½ small square Good line judgement, thin, continuous line, with neat plots	 **1** **1** **1** **1**
1(c)	method clearly shown on graph	**1**
1(d)	*Y* value correct to ½ small square and *W* correct	**1**
1(e)	Difficulty of achieving balance or other sensible suggestion	**1**
1(f)	m in kg × g = *W* within tolerance with correct m unit (g or kg)	**1**
		Total 11

Question	Answer	Marks
2(a)	All V to at least 1 d.p. and < 4 V	1
	All I to at least 2 d.p. and < 1 A	1
	R values calculated correctly	1
	Column headings m, V, A, Ω	1
2(b)	Expect 'No'. (ecf allowed)	1
	Reference to values and idea of difference between them being too large to be explained by experimental inaccuracy (ecf allowed)	1
2(c)	filament glows / dims, or lamp hot to touch	1
	increase / decrease in temperature of filament changes resistance	1
2(d)(i)	Variable resistor (rheostat) OR potentiometer OR potential divider	1
2(d)(ii)	Correct symbol for variable resistor	1
	Correct diagram, with variable resistor / potentiometer in series with power supply	1
		Total 11

Question	Answer	Marks
3(a)(i)	v = 20.0 – 22.5	1
3(a)(ii)	f_1 correctly calculated using candidate's v	1
3(b)(i)	v = 19.0 – 21.0 and less than value in (a)	1
3(b)(ii)	f_2 correct. Both values 14–16 cm	1
3(c)	Correct method for average	1
3(d)	f value 14–16 cm Correct unit for focal length	1 1
3(e)(i)	y value 29–31 cm	1
3(e)(ii)	(x – y) no greater than 2 cm	1
3(f)	Any two from: Use of darkened room / brighter lamp Mark position of centre of lens on holder Place metre rule on bench (or clamp in position) Ensure object and (centre of) lens are same height from the bench Object and lens and screen perpendicular to bench Move screen slowly back and forth to obtain best image (owtte) Repeat with different u value	2
		Total 11

Question	Answer	Marks
4	Uses same container throughout	1
	Hot water in container (any) and takes temperatures at intervals or at start and after a fixed time OR Hot water in container (any) and takes time for a fixed temperature fall.	1
	Repeats with different insulators (all three used)	1
	Any two from: Constant room temperature Same starting temperatures (clearly stated) Same volumes of hot water (clearly stated) Same thickness / amount of insulation Use container without insulation Use of a lid Insulates bottom of container Uses the copper can	2
	Table or tables: Temperatures with unit ºC OR time with unit s (or min) as appropriate to method and different insulators shown	1
	Use of readings: graph of temperature against time OR compare results and comment that longest time to cool = best insulator or smallest drop in temperature in fixed time = best insulator (or reverse arguments)	1
		Total 7

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/61**

Paper 6 Alternative to Practical **May/June 2016**

MARK SCHEME

Maximum Mark: 40

Published

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OR / or	This indicates alternative answers or words, any one of which is satisfactory for scoring the marks.
AND	Both answers or words must be given for credit to be awarded.
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NOT	This indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate, i.e. right plus wrong penalty applies.
e.c.f.	This means “error carried forward”. If a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by e.c.f. may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate from being penalised more than once for a particular mistake, but **only** applies to marks annotated e.c.f.

Question	Answer	Marks
1(a)(i)	*A* and *B* values correct *A:40.0, 35.0, 30.0, 25.0, 20.0* *B:34.0, 28.8, 24.0, 19.2, 14.0*	1
1(a)(ii)	cm, cm, N cm, N cm	1
1(b)	Graph:	
	Axes correctly labelled with quantity, right way round	1
	Appropriate scales, starting at origin (0,0)	1
	All plots correct to ½ small square	1
	Good line judgement, thin, continuous, single line through the plots; with neat plots	1
1(c)	Method shown on graph and Y correct to ½ small square.	1
1(d)	*W* = 1.0–1.4. No ecf	1
1(e)	Difficulty of achieving balance or other sensible suggestion	1
1(f)	Expect agree; allow ecf. Explanation includes idea of close enough (or, ecf, too different)	1
		Total 10

Question	Answer	Marks
2(a)	8.2 0.44–0.45 Units V and A	1 1 1
2(b)	19(°C)	1
2(c)	Perpendicular to scale and at bottom of meniscus	1
		Total 5

Question	Answer	Marks
3(a)(i)	*R* values 1.60, 1.51, 1.35, 1.21 *R* values all to 2 significant figures or all to 3 significant figures.	1 1
3(a)(ii)	Column headings m, V, A, Ω	1
3(b)	No; there is a current reading	1
3(c)	filament changes brightness, owtte increase / decrease / change in temperature of filament / lamp	1 1
3(d)(i)	Variable resistor (rheostat)	1
3(d)(ii)	Correct symbol for variable resistor Correct diagram, with variable resistor in series with power supply	1 1
		Total 9

Question	Answer	Marks
4	**MP1** Uses same container throughout	**1**
	MP2 Hot water in container (any) and takes temperatures at intervals or at start and after a fixed time OR Hot water in container (any) and takes time for a fixed temperature fall.	**1**
	MP3 Repeats with different insulators (all three used)	**1**
	MP 4&5 Any two from: Constant room temperature Same starting temperatures (clearly stated) Same volumes of hot water (clearly stated) Same thickness/amount of insulator Use container without insulation Use of a lid Insulates bottom of container Uses the copper can only	**2**
	MP6 Table or tables as appropriate to method: Temperatures with unit °C and time with unit s (or min) and different insulators shown	**1**
	MP7 Use of readings: graph of temperature against time OR compare results and comment that longest time to cool = best insulator or smallest drop in temperature in fixed time = best insulator (or reverse arguments)	**1**
		Total 7

Question	Answer	Marks
5(a)	u = 50, v = 21	**1**
5(b)(i)	U = 500, V = 210 ecf from **(a)**	**1**
5(b)(ii)	f_1 = 148 or 150 or 147.9 (mm) ecf from **(i)** 2 or 3 significant figures	**1** **1**
5(c)	f_2 136 (mm) c.a.o.	**1**
5(d)	Yes / statement is correct, owtte (6 mm) difference is very small / within limits of experimental error / Difference explained by uncertainty in her focal length measurement	**1** **1**
5(e)	Any two from: Use of darkened room / brighter lamp Mark position of centre of lens on holder Place metre rule on bench (or clamp in position) Ensure object and (centre of) lens are same height (from the bench) Object and lens and screen perpendicular to bench Move screen (slowly) back and forth to obtain best image (owtte) Ensure rule is touching object / lens / holder / screen or look perpendicular to ruler	**2**
		Total 9