Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/11**

Paper 1 Multiple Choice **October/November 2021**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

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[Turn over

1 Which quantity is a vector?

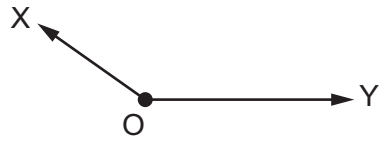
A speed

B force

C mass

D distance

2 Two forces, X and Y, act upon an object O. The arrows represent the magnitudes and directions of the forces.



Which arrow shows the direction of the resultant force?



3 Two identical objects begin to fall from rest.

One object falls from 200 m above the Earth's surface and the other falls from 200 m above the Moon's surface. One second after they have started to fall, both objects are still accelerating.

There is no atmosphere on the Moon and the weight of each object is constant.

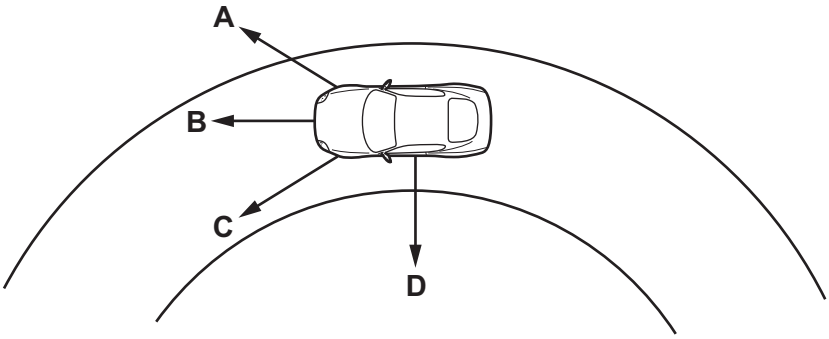
Which row describes the motion of both objects at this time?

	acceleration of object falling above the Earth's surface	acceleration of object falling above the Moon's surface
A	decreasing	constant
B	constant	constant
C	increasing	decreasing
D	increasing	increasing

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4 The diagram shows a car going around a circular track at constant speed.

Which arrow shows the direction of the resultant force on the car?



5 An electron has mass.

Where does a stationary electron experience a force?

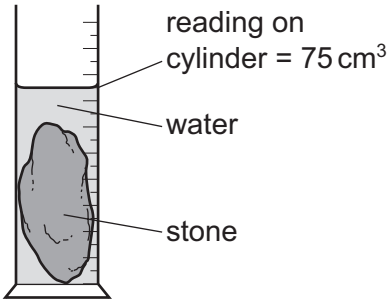
A in an electric field only

B in a gravitational field only

C in a gravitational field and an electric field only

D in a gravitational, electric and magnetic field

6 A stone is placed in a measuring cylinder of water, as shown.



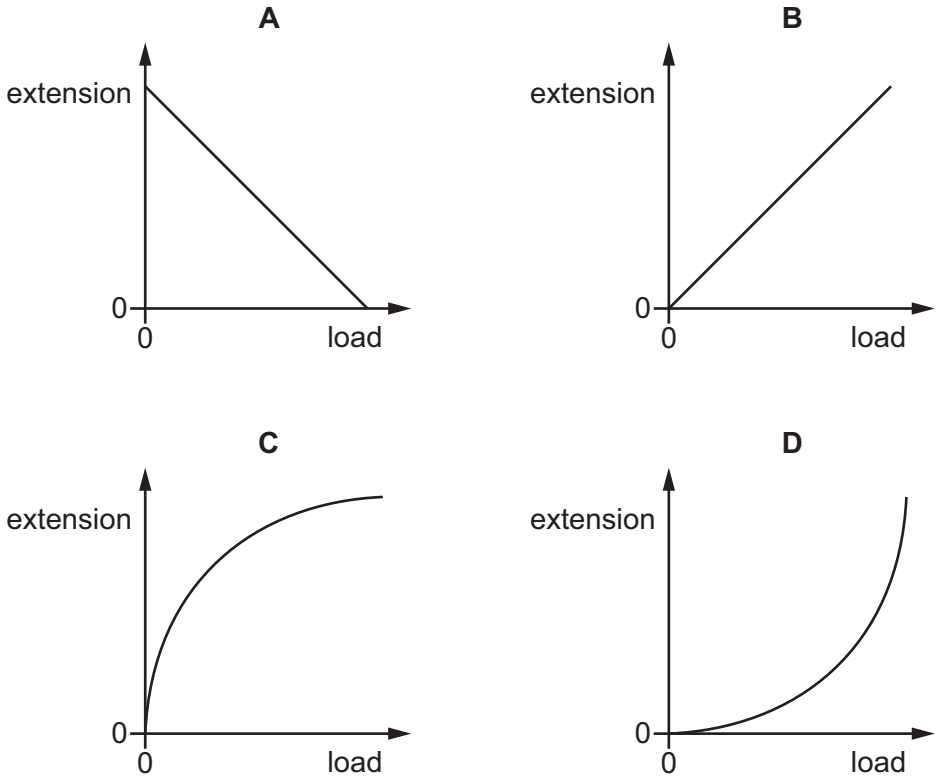
The volume of water in the cylinder before adding the stone is $15\,cm^3$ and the stone has a mass of 90 g.

What is the density of the stone?

A $1.0\,g/cm^3$ **B** $1.2\,g/cm^3$ **C** $1.5\,g/cm^3$ **D** $6.0\,g/cm^3$

7 The extension of a spring is measured for various loads. The limit of proportionality is not reached.

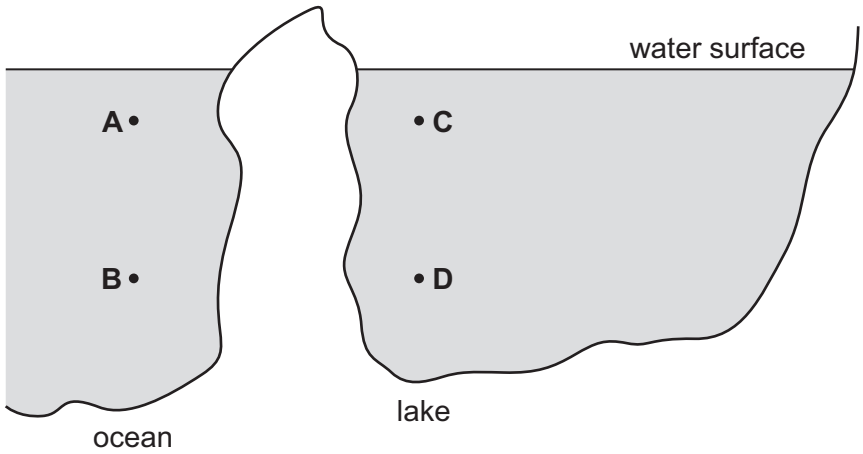
Which graph shows the extension–load graph for the spring?



8 An underwater diver moves from the ocean to a fresh water lake.

The density of water in the lake is less than in the ocean.

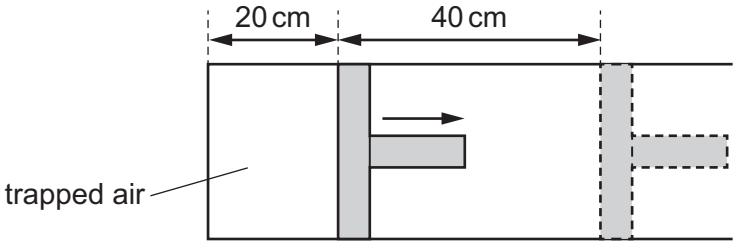
In which position does the diver experience the smallest pressure due to the water?



9 Air is trapped in a cylinder by a piston. The pressure of the air is p and the length of the air column is 20 cm.

The piston is moved outwards. The length of the air column increases by 40 cm.

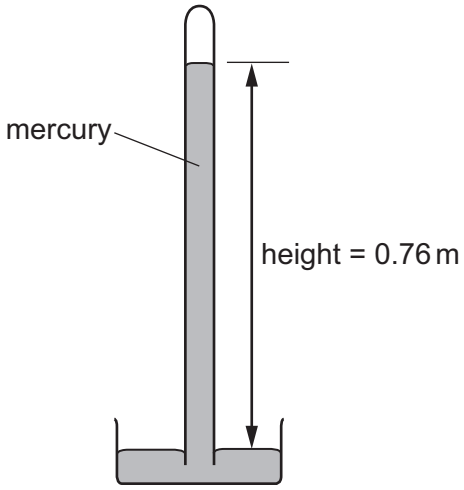
The temperature of the air remains constant.



What is the new air pressure?

A $\frac{p}{2}$ **B** $\frac{p}{3}$ **C** $2p$ **D** $3p$

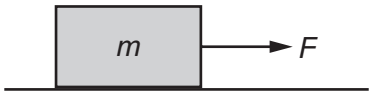
10 When the pressure exerted by the atmosphere is 0.10 MPa, the height of the mercury in a barometer is 0.76 m.



What is the pressure exerted by the atmosphere when the height of the mercury in the simple barometer is 0.57 m?

A 0.025 MPa **B** 0.075 MPa **C** 0.10 MPa **D** 0.13 MPa

11 The diagram shows a block of mass m pulled in a straight line along a horizontal surface by a force F.

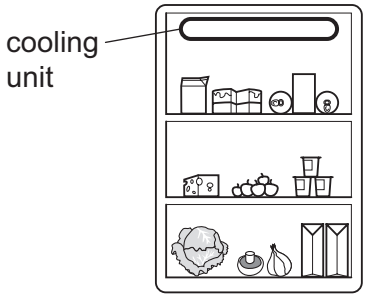


The block moves a distance d in time t. The average speed at which the block moves is v.

Which two quantities must be known to calculate the work done?

A F and d **B** F and m **C** F and t **D** F and v

12 The diagram shows the inside of a refrigerator.



When the refrigerator is first switched on, what happens to the air near the cooling unit?

	the molecules of this air	the density of this air
A	become smaller	decreases
B	become smaller	increases
C	move closer together	decreases
D	move closer together	increases

13 Less thermal energy is needed to raise the temperature of 1.0 kg of copper by 1.0 °C than is needed to raise the temperature of 1.0 kg of water by 1.0 °C.

Which statement explains this?

A Copper has a higher melting point.

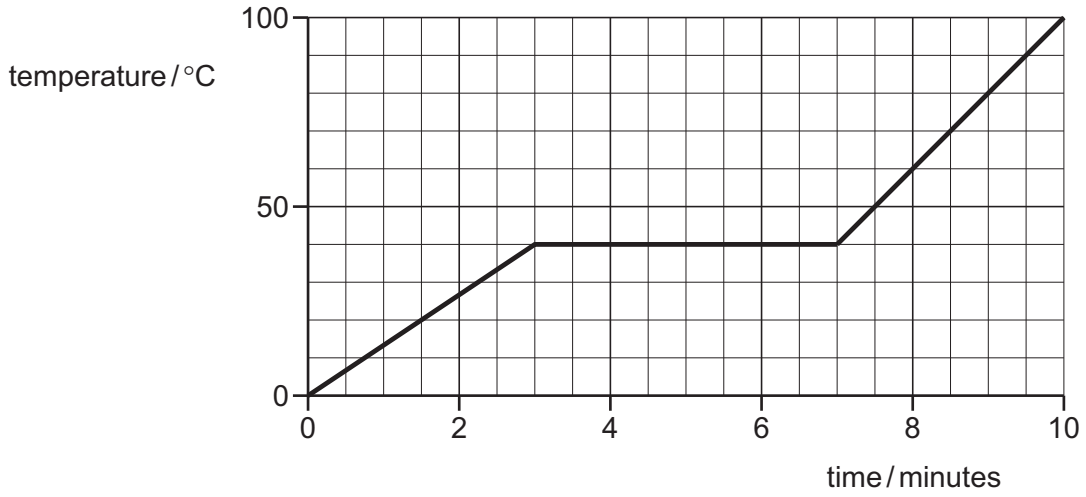
B Copper has a lower specific heat capacity.

C Copper has a smaller specific latent heat.

D Copper is a better conductor of thermal energy.

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14 The graph is the temperature–time graph for a sample of wax that is heated so that it melts.



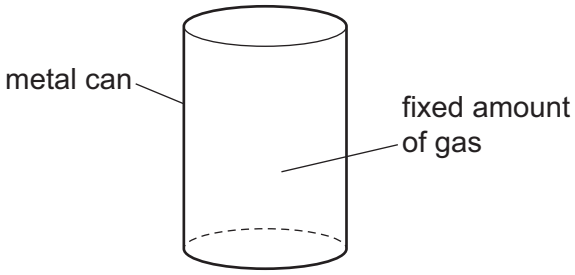
The mass of the wax is 200 g.

Thermal energy is supplied to the wax at a constant rate of 12 000 J / minute.

What is the specific latent heat of fusion of the wax?

A 180 J / g **B** 240 J / g **C** 480 J / g **D** 600 J / g

15 A fixed amount of gas is trapped inside a metal can.



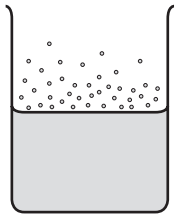
The temperature of the gas decreases but the volume does not change.

How does this change affect the kinetic energy of the gas molecules and the pressure inside the metal can?

	kinetic energy	pressure
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	stays the same	decreases

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16 The diagram shows a room temperature liquid in a beaker.



What reduces the rate of loss of liquid by evaporation?

A blowing air across the top of the beaker

B heating the liquid

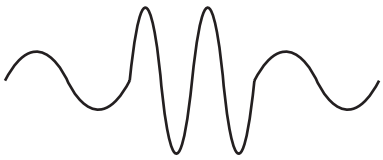
C putting a lid on the beaker

D transferring the liquid to a beaker with a larger diameter

17 A water wave on a pond passes into a region where the wave travels more slowly. It then returns to a region where it travels at the original speed. Assume that the frequency of the wave stays constant.

Which side-view of the wave is correct?

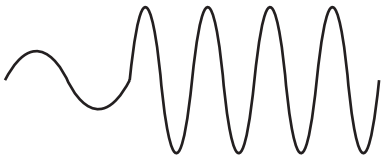
A



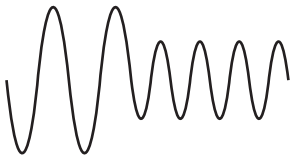
B



C



D



18 What is meant by the *amplitude* of a wave?

A the distance between the extreme points of a particle's motion

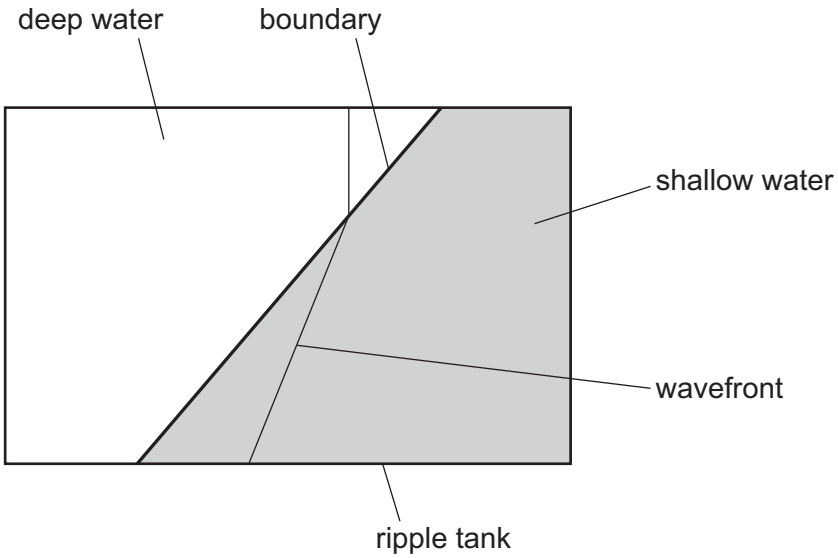
B the maximum distance a particle moves from its equilibrium position

C the maximum energy carried by the wave

D the maximum power of the vibrations carrying the wave

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19 The diagram shows one wavefront of a wave as it travels from deep water to shallow water in a ripple tank.



What happens as the wavefront moves into the shallow water?

A The speed of the wavefront increases.

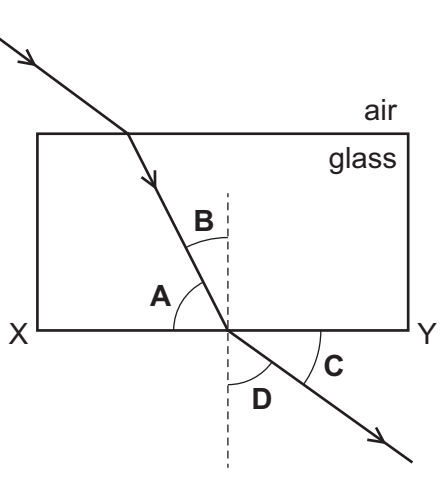
B The speed of the wavefront decreases.

C The wavelength of the wave remains constant.

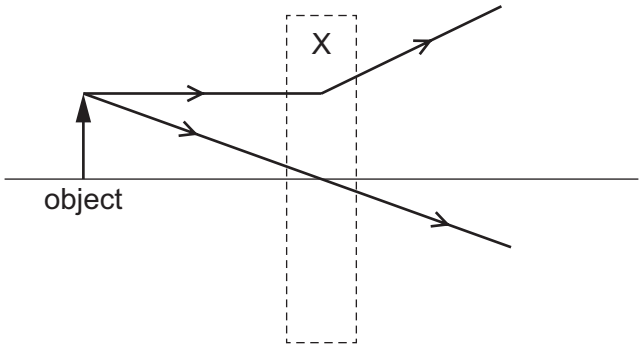
D The wavelength of the wave increases.

20 A ray of light passes into a glass block. It travels through the glass block and then emerges into the air.

Which angle is the angle of refraction at the surface XY?



21 Two rays of light pass through a lens in region X.



Which type of lens is in region X and which type of image is formed?

	type of lens	type of image
A	converging	real
B	converging	virtual
C	diverging	real
D	diverging	virtual

22 A girl is long-sighted.

Which statement is correct?

A She sees close objects less clearly than a person with normal vision.

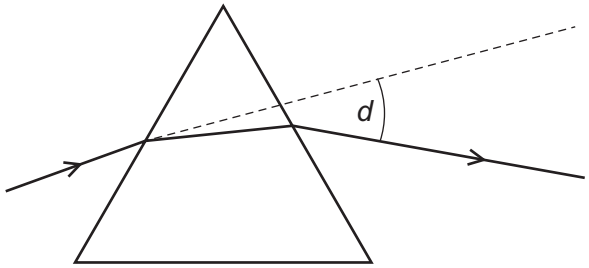
B She sees distant objects more clearly than a person with normal vision.

C The fault is corrected with a diverging lens.

D The image of a close object is formed in front of her retina.

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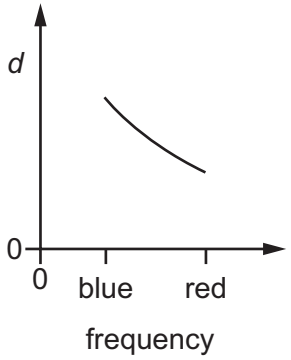
23 Light rays are deviated by a prism.



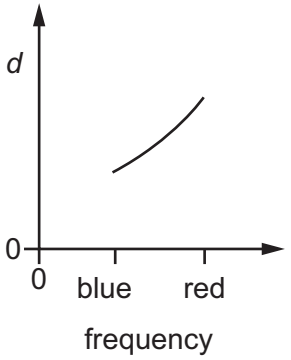
The deviation angle *d* is measured for light rays of different frequency, including blue light and red light.

Which graph of *d* against frequency is correct?

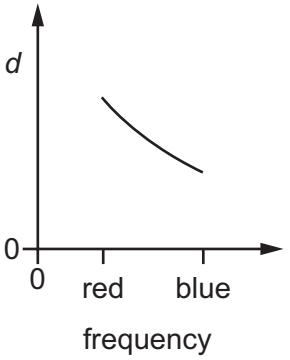
A



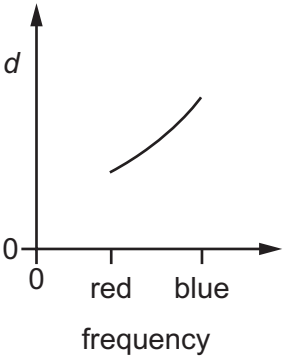
B



C



D



24 Which component of the electromagnetic spectrum is used for the remote control of a television?

A gamma rays

B infrared rays

C radio waves

D ultraviolet rays

25 A student stands a distance *x* in front of a large wall.

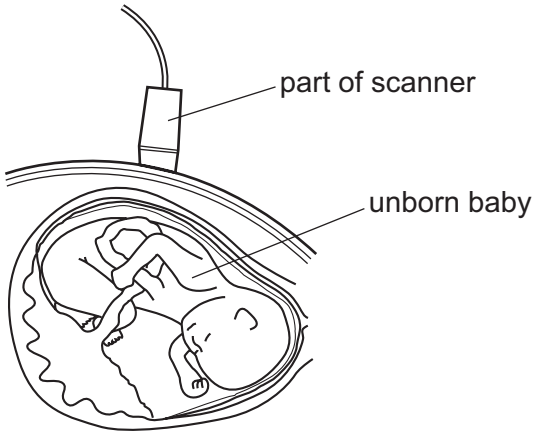
He claps his hands at a regular rate so that each clap coincides with the echo from the previous clap.

In a time *t*, he claps his hands *N* times.

Which expression is used to calculate the speed of sound in air?

A $\frac{x}{Nt}$ **B** $\frac{2x}{Nt}$ **C** $\frac{Nx}{t}$ **D** $\frac{2Nx}{t}$

26 An ultrasound scanner produces an image of an unborn baby.



What does the scanner use to form an image of the baby?

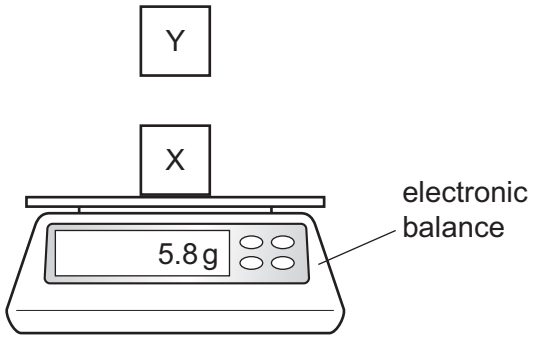
A ultrasound absorbed by the baby

B ultrasound emitted by the baby

C ultrasound reflected by the baby

D ultrasound refracted by the baby

27 Object X is on an electronic balance. Object Y is held above object X as shown.



The reading on the balance increases when Y is moved closer to X.

Why does this happen?

A X and Y are both made of iron.

B X and Y are both magnets.

C Y is a magnet and X is made of iron.

D Y is made of iron and X is a magnet.

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28 A teacher wants to demagnetise a bar magnet and tries three different methods.

1 Heat the bar magnet to a high temperature and let it cool.

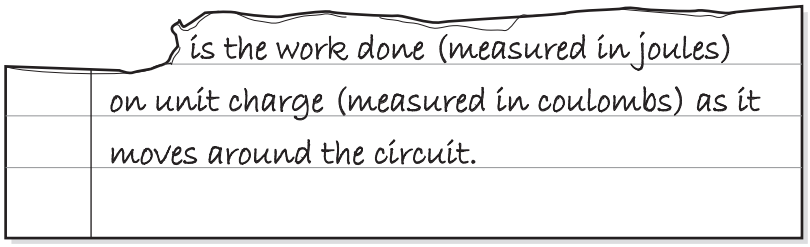
2 Place the bar magnet east to west and hammer it.

3 Place the bar magnet inside a coil that has a direct current in it and remove it from the coil slowly.

Which methods demagnetise the bar magnet?

A 1 only **B** 1 and 2 only **C** 2 and 3 only **D** 1, 2 and 3

29 A piece of paper torn out of an exercise book is shown.



What is being defined?

A electrical resistance

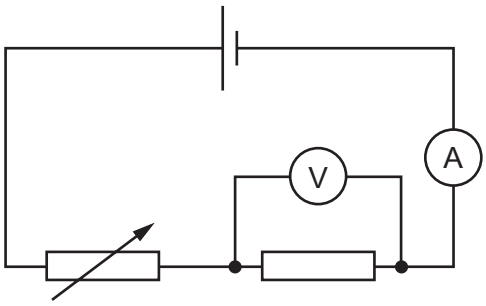
B electric current

C electrical power

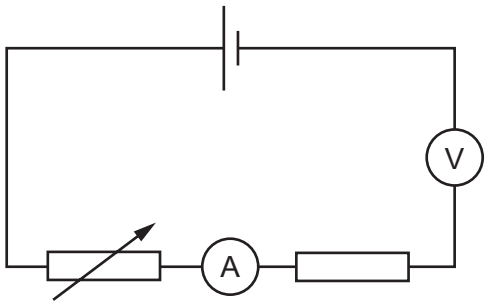
D electromotive force

30 Which circuit is connected to measure the current in the fixed resistor and the potential difference (p.d.) across the same resistor?

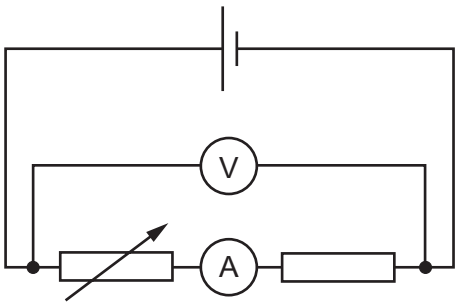
A



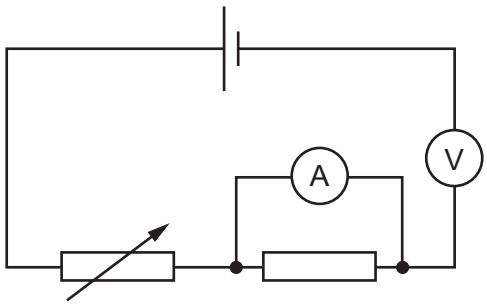
B



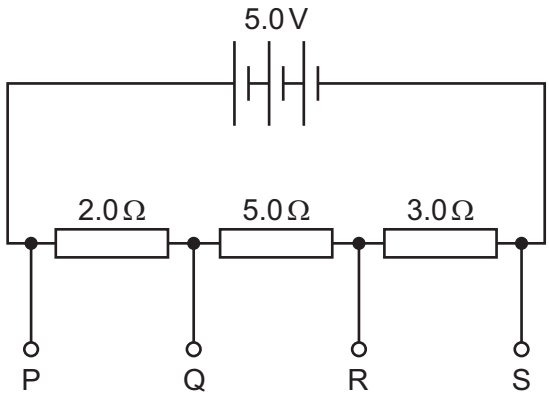
C



D



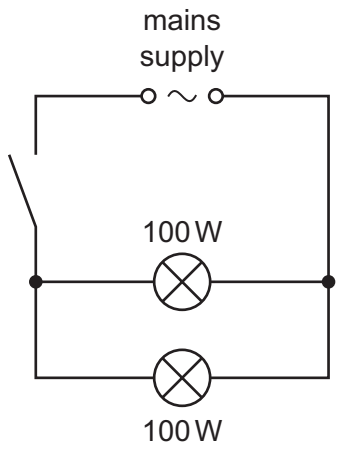
31 The diagram shows a circuit with a 5.0 V power supply, three resistors and four output terminals P, Q, R and S.



Between which pair of terminals is there a potential difference of 1.5 V?

A PQ **B** PR **C** QS **D** RS

32 Two 100 W lamps are connected in parallel to the mains supply, as shown.



How much electrical energy is supplied by the mains when the switch is closed for 36 minutes?

A 0.030 kW h **B** 0.060 kW h **C** 0.12 kW h **D** 7.2 kW h

33 The cost of electricity is 9.0 cents / kW h.

It takes 0.060 hours and costs 1.2 cents to boil the water in a kettle.

What is the power rating of the kettle?

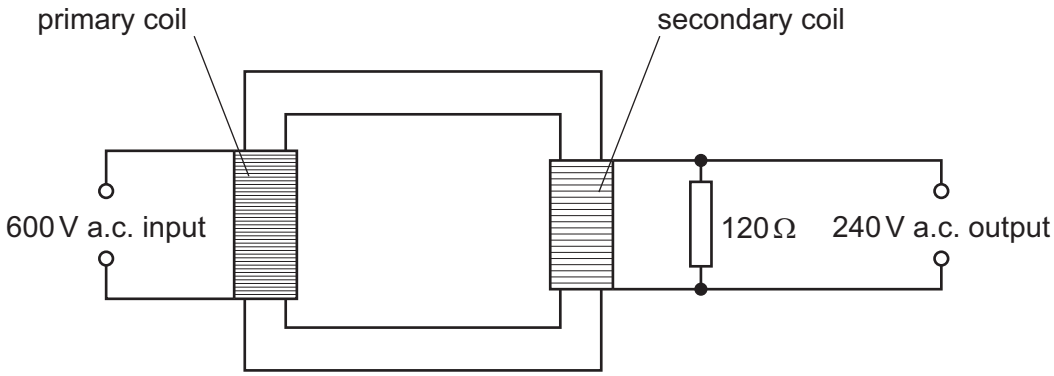
A 0.45 kW **B** 0.65 kW **C** 2.2 kW **D** 130 kW

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[Turn over

34 A transformer with an efficiency of 100% has a primary voltage input of 600 V and a secondary voltage output of 240 V.

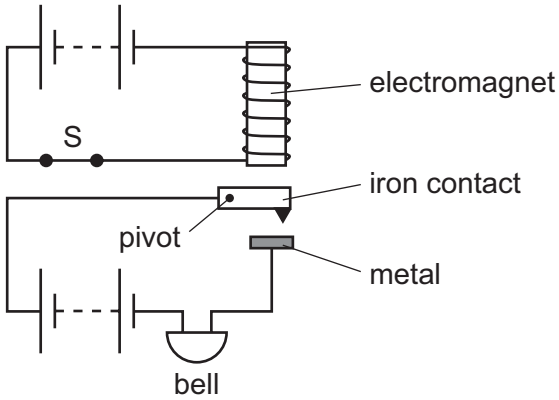
The secondary coil is attached to a resistor of resistance 120 Ω.



What is the power dissipated in the resistor and what is the current in the primary coil?

	power / W	current / A
A	120	0.20
B	120	5.0
C	480	0.80
D	480	1.3

35 The diagram shows an alarm system in which the switch S is shown closed. The top circuit is arranged so that the electromagnet is positioned over the soft iron contact.

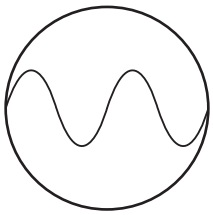


What happens when the switch S is opened?

	iron contact	bell
A	drops	rings
B	drops	stops ringing
C	moves up	rings
D	moves up	stops ringing

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36 A microphone detects a musical sound and the signal is fed into an oscilloscope. The diagram shows the trace which appears on the screen.

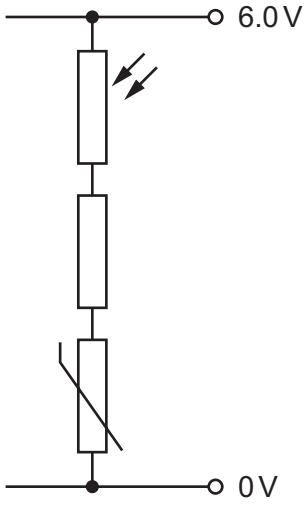


The spot of light on the oscilloscope screen takes 1.2 ms to travel across the screen.

What is the frequency of the musical sound?

A 170 Hz **B** 330 Hz **C** 1700 Hz **D** 3300 Hz

37 A student connects two components whose resistances can change and a fixed resistor across a 6.0 V supply.



Under which conditions is the voltage across the fixed resistor the greatest?

A cold and dark

B cold and bright

C warm and dark

D warm and bright

38 Technetium-99m is a radioactive isotope used in medical scanning. It is injected into the body and its emissions are detected outside the body.

Which characteristics of technetium-99m make it suitable for use in medical scanning?

A It has a long half-life and emits alpha radiation.

B It has a long half-life and emits gamma radiation.

C It has a short half-life and emits alpha radiation.

D It has a short half-life and emits gamma radiation.

39 Which statement about the production of electricity in a nuclear power station is correct?

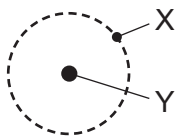
A In the reactor, the main reaction occurs when protons hit uranium nuclei.

B The process taking place in the reactor is called nuclear fusion.

C The reactor produces energy to boil water and to produce steam.

D Carbon dioxide is the major waste product from the reactor.

40 In the simple model of an atom, X orbits around Y.



What are X and Y?

	X	Y
A	electron	nucleus
B	neutron	electron
C	nucleus	proton
D	proton	neutron

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