Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

PHYSICS **5054/12**

Paper 1 Multiple Choice **May/June 2019**

1 hour

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

3140712138

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.

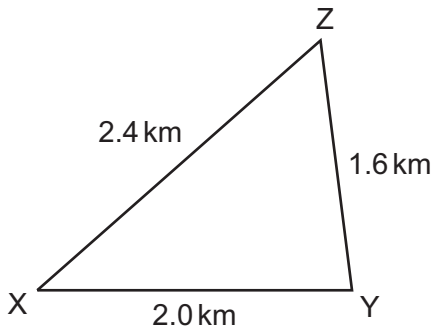
This document consists of **16** printed pages.

© UCLES 2019

1 Which reading is given to one tenth of a millimetre?

A 3.3 cm **B** 3.31 cm **C** 3.310 cm **D** 3.312 cm

2 A woman runs 2.0 km from X to Y in 20 minutes and then rests at Y for 10 minutes. She then takes 10 minutes to run 1.6 km from Y to Z.



What is the size of her average velocity for the journey from X to Z?

A 0.060 km / minute

B 0.080 km / minute

C 0.090 km / minute

D 0.130 km / minute

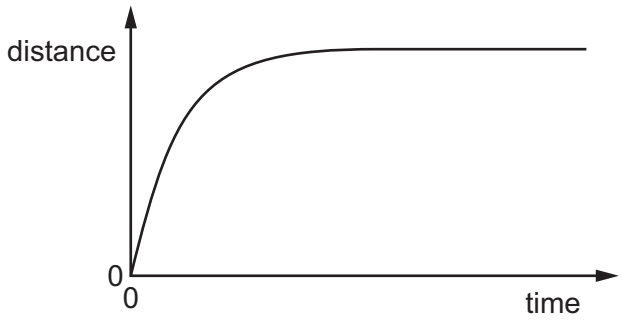
3 A cyclist travelling in a straight line at 8.0 m / s accelerates to 12 m / s in a time of 6.0 s.

Which expression gives the cyclist's acceleration?

A $\frac{6}{12-8}$ **B** $\frac{8}{12-6}$ **C** $\frac{12-6}{8}$ **D** $\frac{12-8}{6}$

© UCLES 2019

4 The diagram shows the distance–time graph for a moving object.



What is the moving object?

A a ball thrown vertically upwards and falling back to the thrower

B a car, starting from rest, speeding up as it moves away from a traffic signal

C a rock dropped from a high cliff, falling into the sea below

D a train braking to a halt as it stops at a station

5 Four of the gravitational forces that act between bodies in the Solar System are listed below.

P the force on the Moon due to the Earth

Q the force on the Earth due to the Sun

R the force on the Earth due to the Moon

S the force on the Moon due to the Sun

Which two forces are a Newton's third law pair (action and reaction)?

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

6 A parachutist of mass 60 kg falls at a steady speed of 10 m / s. The gravitational field strength g is 10 N / kg.

What is the upward force acting on the parachutist?

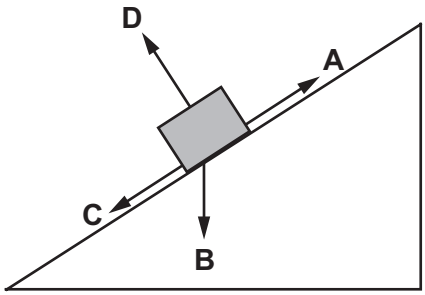
A 0 **B** 6.0 N **C** 60 N **D** 600 N

© UCLES 2019

7 A force moves a box up a rough slope.

The diagram shows four forces acting on the box.

Which is the force due to friction on the box?



8 The mass of object P is greater than the mass of object Q.

The objects contain different amounts of matter and have a different resistance to change of motion.

Which row is correct?

	greater amount of matter	greater resistance to change of motion
A	P	P
B	P	Q
C	Q	P
D	Q	Q

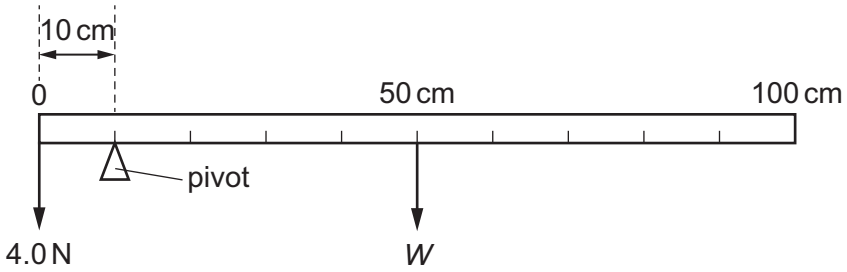
9 Four objects of different masses are situated in places with different gravitational field strengths.

Which object has the greatest weight?

	mass / kg	$\frac{\text{gravitational field strength}}{\text{N/kg}}$
A	3.0	10.4
B	3.5	9.5
C	4.0	10.2
D	4.5	9.0

© UCLES 2019

10 A uniform metre rule is balanced by a 4.0 N weight as shown.

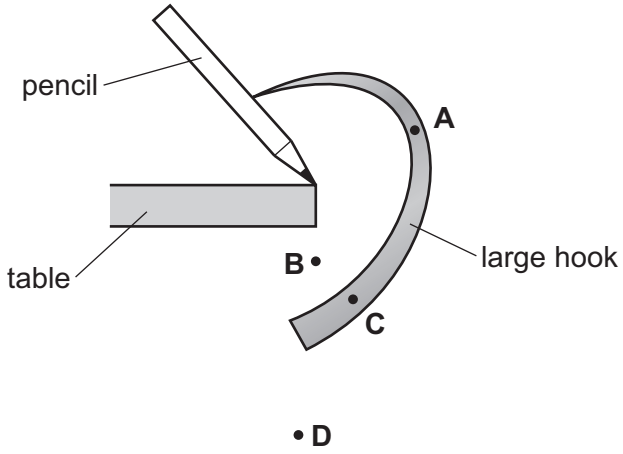


What is the weight *W* of the metre rule?

A 1.0 N **B** 4.0 N **C** 16 N **D** 40 N

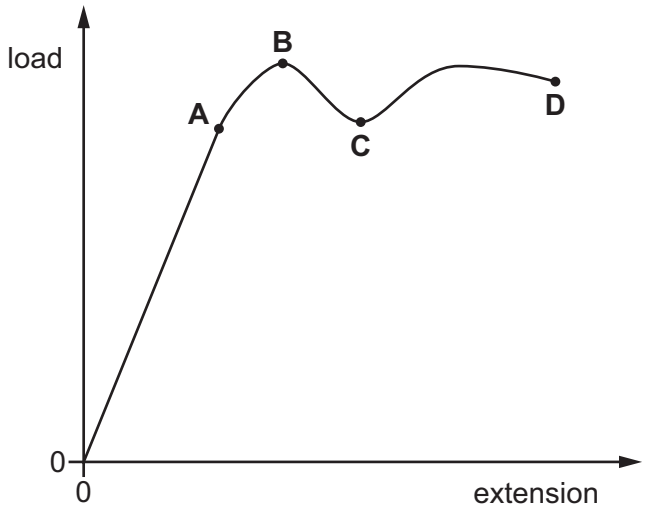
11 A large hook sticks into a pencil. The hook and pencil are balanced on the edge of a table, as shown.

Where is the centre of mass of the hook and pencil?



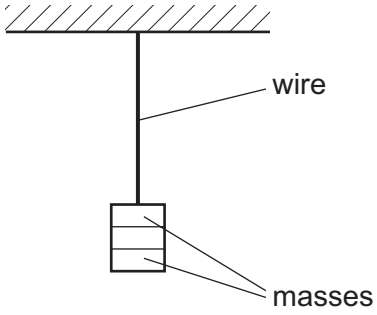
12 The diagram shows a graph of load against extension for a material.

At which point is the limit of proportionality?



13 A length of metal wire is made from a radioactive isotope of the metal.

The diagram shows masses suspended from the end of the wire.



The masses are removed from the wire.

Which property changes?

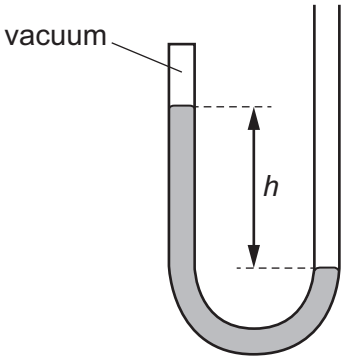
A half-life of the isotope

B length of the wire

C mass of the wire

D melting point of the metal

14 The diagram shows a manometer containing mercury that is sealed at one end.



What happens to the distance *h* when the manometer is taken higher up a mountain?

A It decreases, because atmospheric pressure decreases with height.

B It decreases, because atmospheric pressure increases with height.

C It increases, because atmospheric pressure decreases with height.

D It increases, because atmospheric pressure increases with height.

© UCLES 2019

15 The pressure on the gas contained in a sealed syringe is slowly doubled. The volume of the gas halves.

What **must** be true about the density and the temperature of the gas?

	density	temperature
A	decreases	increases
B	increases	decreases
C	increases	remains constant
D	remains constant	increases

16 An object is lifted.

Which expression gives the increase in gravitational potential energy of the object?

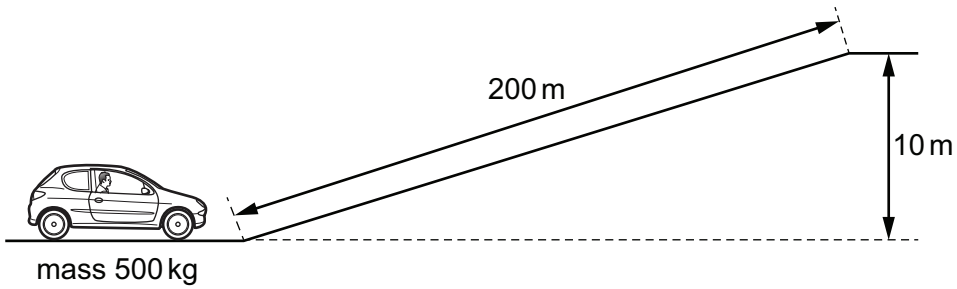
A mass multiplied by its velocity

B mass multiplied by its acceleration

C the rate at which work is done

D weight multiplied by the increase in height

17 The diagram shows a small car of mass 500 kg approaching a hill. It moves up the hill with constant speed.



The gravitational field strength g is 10 N / kg.

Ignoring friction, how much work is done in moving the car up the hill?

A 5.0×10^3 J **B** 5.0×10^4 J **C** 1.0×10^5 J **D** 1.0×10^6 J

18 Which method of producing electricity does **not** use an a.c. generator?

A geothermal power station

B solar panels

C wave-energy generators

D wind turbine

© UCLES 2019

19 Three solar panels have a total area of 7.2 m^2. Together, they produce 1.0 kW of power.

An area of 1.0 m^2 of each panel receives 0.80 kJ of energy from the Sun in 1.0 s.

What is the efficiency of the solar panels?

A 11% **B** 17% **C** 52% **D** 80%

20 A student suggests three different definitions for power.

1 energy transferred per second

2 force × distance moved

3 rate of doing work

Which definitions are correct?

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

21 Which statement is correct?

A Infrared radiation cannot travel in a vacuum.

B Infrared radiation cannot travel in solids or in gases.

C Infrared radiation can only travel in a vacuum.

D Infrared radiation can travel in a vacuum and in gases.

22 How is *latent heat* defined?

A the thermal energy absorbed or emitted by unit mass during a change of state without a temperature change

B the thermal energy absorbed or emitted by unit mass during unit temperature change

C the thermal energy absorbed or emitted during a change of state without a temperature change

D the thermal energy absorbed or emitted during unit temperature change

23 In low-pressure hydrogen, there are no forces between the molecules except during collisions with each other.

Which statement describes the motion of a molecule between one collision and the next?

A It moves with changing speed and continuously changes direction.

B It moves with changing speed in a straight line.

C It moves with constant speed and continuously changes direction.

D It moves with constant speed in a straight line.

© UCLES 2019

24 A gas is enclosed in a container of fixed volume.

The gas gains heat energy from an external source.

What happens to the molecules of the gas?

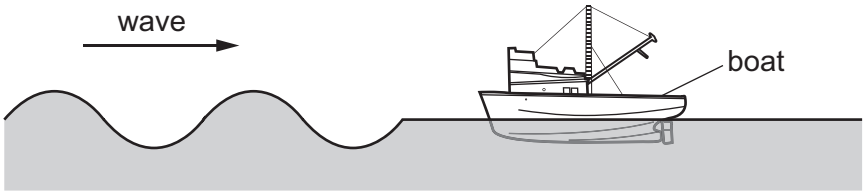
A They expand.

B They move faster inside the container.

C They move further apart.

D They vibrate with greater frequency.

25 A wave on water travels towards a stationary boat.



As the wave passes, the boat starts to move up and down and gains kinetic energy from the wave.

Which property of the wave changes as the wave passes the boat?

A amplitude

B frequency

C speed

D wavelength

26 Which waves are longitudinal?

A gamma rays

B light waves

C ultrasound waves

D X-rays

27 An object is placed at a distance from a converging lens that is equal to twice the focal length of the lens.

Which statement about the image is correct?

A It is enlarged.

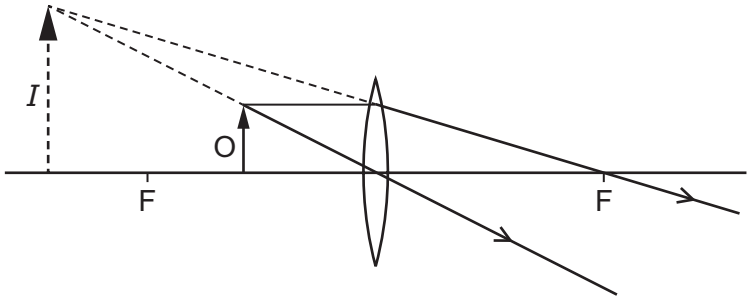
B It is inverted.

C It is on the same side of the lens as the object.

D It is virtual.

© UCLES 2019

28 The lens in the diagram produces an image I of the object O.



Why is this **not** the ray diagram for a photographic enlarger?

A The image is magnified.

B The image is virtual.

C The lens is a converging lens.

D The lens is too thin.

29 What is the approximate range of audible frequencies for a healthy human ear?

A 2.0 Hz to 2.0 kHz

B 20 Hz to 2.0 kHz

C 20 Hz to 20 kHz

D 200 Hz to 200 kHz

30 The speed of sound in air is c_a, the speed of sound in water is c_w and the speed of sound in ice is c_i.

Which relationship is correct?

A $c_a > c_i$ **B** $c_a > c_w$ **C** $c_i > c_w$ **D** $c_w = c_a$

© UCLES 2019

31 One end of each of two bars is marked with an X or a Y, as shown.



bar 1 bar 2

End X of bar 1 is brought close to the N-pole and then to the S-pole of a magnet.

End Y of bar 2 is brought close to the N-pole and then to the S-pole of the magnet.

The table shows what happens.

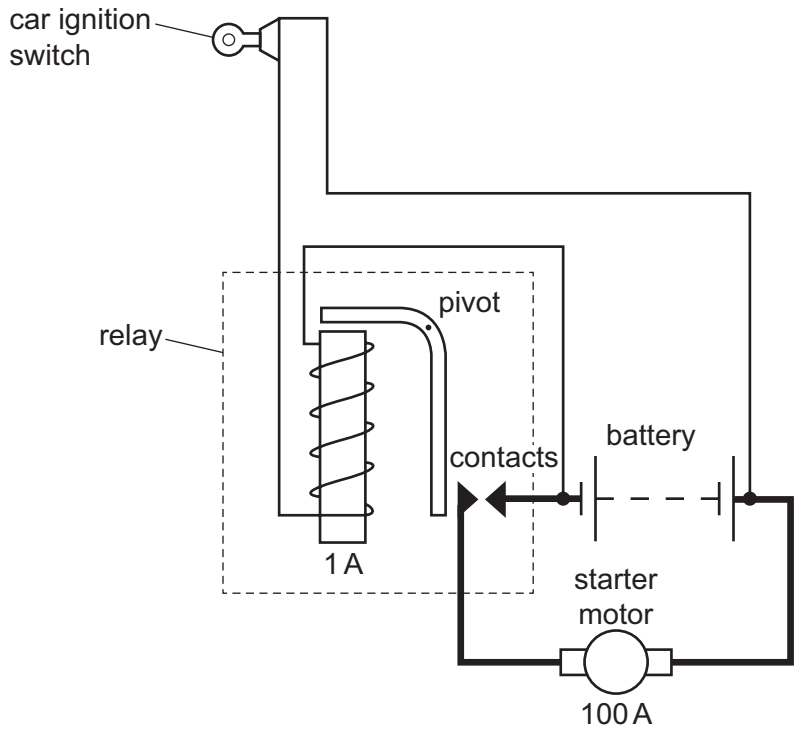
	end X of bar 1	end Y of bar 2
N-pole of magnet	attracted	attracted
S-pole of magnet	attracted	repelled

What materials are bar 1 and bar 2 made from?

	bar 1	bar 2
A	copper	iron
B	iron	steel
C	steel	copper
D	steel	iron

© UCLES 2019

32 The diagram shows a car ignition switch and starter motor.



The ignition switch is in a circuit with long, thin wires. The starter motor is in a circuit with short, thick wires.

What is the explanation for the choice of wires?

A Each circuit needs to contain the same total mass of wire.

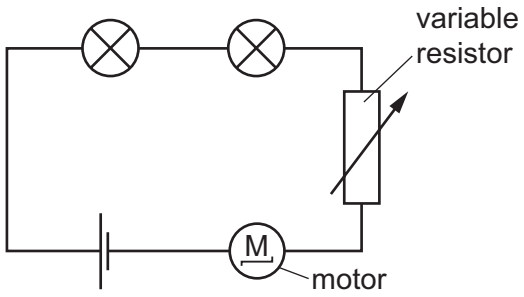
B Thicker wires heat up more quickly when the relay is switched on.

C Thin wires have lower resistances.

D The ignition switch circuit carries a smaller current than the starter motor circuit.

© UCLES 2019

33 The diagram shows a simple circuit.



What happens when the resistance of the variable resistor is increased?

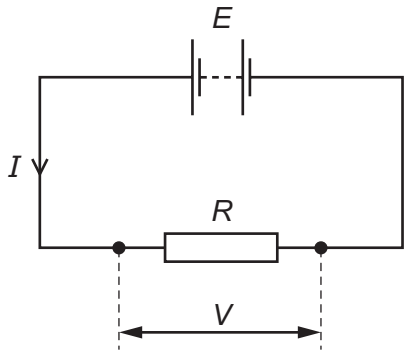
A The lamps are dimmer and the motor rotates more quickly.

B The lamps are dimmer and the motor rotates more slowly.

C The lamps have the same brightness and the motor rotates more quickly.

D The lamps have the same brightness and the motor rotates more slowly.

34 The diagram shows a simple electrical circuit.



Which statement **cannot** be correct?

A The current I is 2 A.

B The e.m.f. E is 12 J.

C The p.d. V (across the resistor) is 10 V.

D The resistance R is 5 Ω.

35 The cable to an electric cooker contains a live wire, a neutral wire and an earth wire.

When the cooker is working correctly, in which wires are the currents equal?

A the live, the neutral and the earth

B the live and the earth only

C the neutral and the earth only

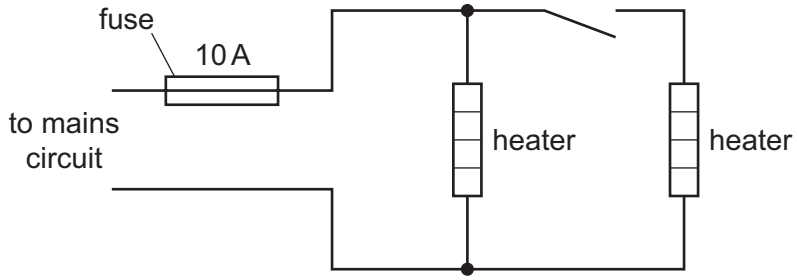
D the neutral and the live only

© UCLES 2019

36 The manufacturer of an electrical heater states that only one heater must be connected to the mains wiring through any fuse.

The current in the circuit with only one heater is 9 A. The fuse rating is 10 A.

Despite the warning, a second identical heater is added, as shown. When the switch is closed the fuse blows.



The fuse is replaced with a 20 A fuse.

What happens when the switch is closed?

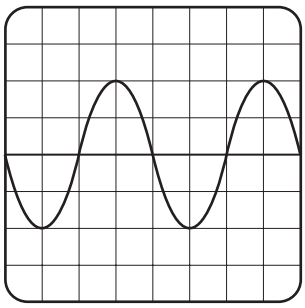
A Each heater only receives half the correct current.

B Each heater receives twice the correct current.

C The circuit wiring connecting the heaters to the mains may overheat.

D The fuse melts when the heaters are switched on.

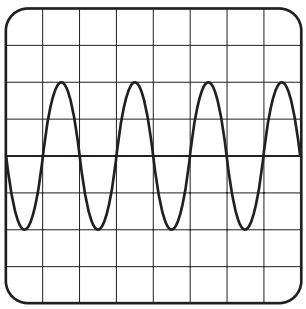
37 A coil is rotating in a magnetic field. The coil is connected to an oscilloscope. The diagram shows the trace on the screen of the oscilloscope.



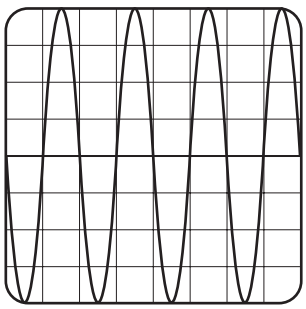
The coil now speeds up and rotates twice as fast.

Which diagram shows the new trace?

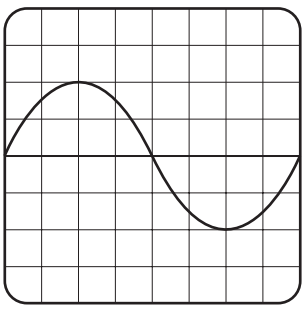
A



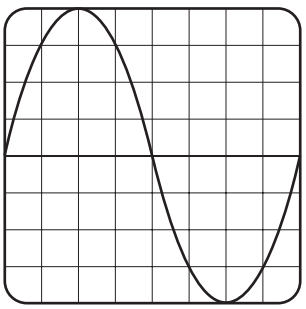
B



C



D



38 A teacher uses the circuit shown.



The identical lamps X and Y are connected to a low voltage a.c. power supply by high resistance transmission wires. Both lamps are switched on.

Lamp X is then switched off. Lamp Y stays switched on.

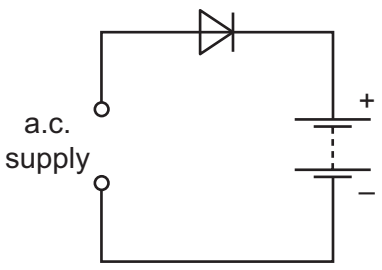
What happens to the voltage and the power supplied to lamp Y?

	the voltage supplied to lamp Y	the power supplied to lamp Y
A	decreases	decreases
B	decreases	stays the same
C	increases	increases
D	increases	stays the same

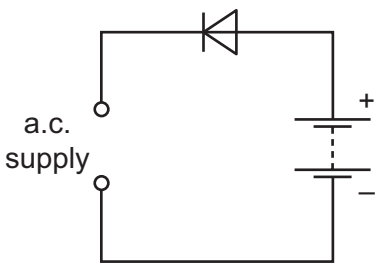
39 A car battery supplies a current in one direction. A current in the opposite direction recharges the battery.

Which circuit recharges the battery, using an alternating current (a.c.) supply and a diode?

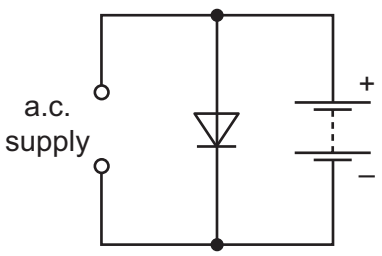
A



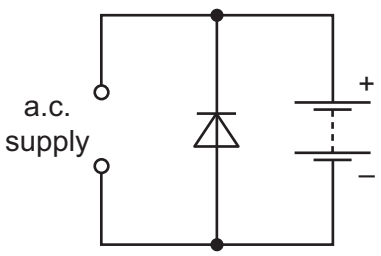
B



C



D



40 A proton has charge q and mass m.

What is the charge and what is the mass of an alpha-particle?

	charge	mass
A	q	$2m$
B	$2q$	$2m$
C	$2q$	$4m$
D	$4q$	$2m$

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

© UCLES 2019