Cambridge O Level

PHYSICS **5054/11**

Paper 1 Multiple Choice **October/November 2024**

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.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = $9.8 \, \text{m/s}^2$).

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.

This document has **16** pages.

[Turn over

1 A crane lifts a heavy load at a steady rate.

Which unit is suitable for the output power of the crane's motor?

A kN **B** kW **C** kN/s **D** kWh

2 Which statement about mass is correct?

A Mass is a scalar and its unit is the kilogram.

B Mass is a scalar and its unit is the newton.

C Mass is a vector and its unit is the kilogram.

D Mass is a vector and its unit is the newton.

3 The bob of a simple pendulum is pulled horizontally by a force that is equal to weight W of the bob.

Which diagram shows the angle between the pendulum thread and the vertical?
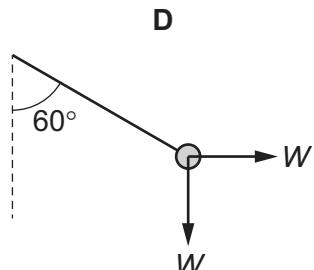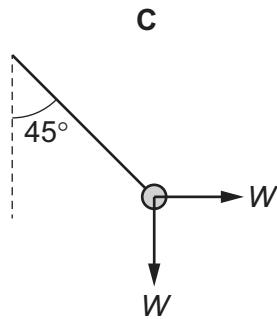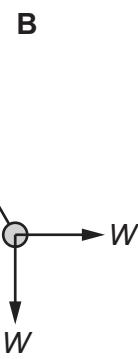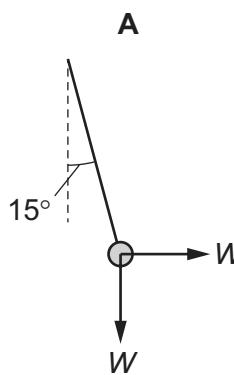
4 A student takes 20 minutes to walk from X to Y at a speed of 3.0 km/h.

She turns 90° at Y and walks at a speed of 4.0 km/h for 15 minutes to reach Z.

What is her average speed from X to Z?

A 2.4 km/h **B** 3.4 km/h **C** 3.5 km/h **D** 5.0 km/h

5 A car is at rest by a red traffic light. When the light changes to green, the car starts moving. The graph represents the motion of the car.
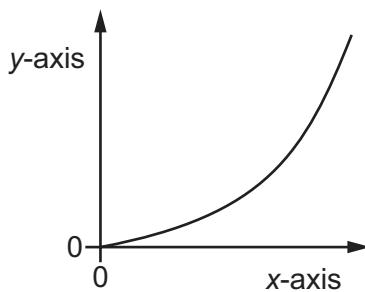

The car has a constant acceleration.

Which quantity is plotted on the *x*-axis and which quantity is plotted on the *y*-axis?

	x-axis	*y*-axis
A	distance	time
B	speed	time
C	time	distance
D	time	speed

6 An object falls without air resistance. Its position at equal time intervals is shown by a sequence of dots.

Which sequence of dots is correct?

| **A** | **B** | **C** | **D** |

direction of movement (A, B, C, D)
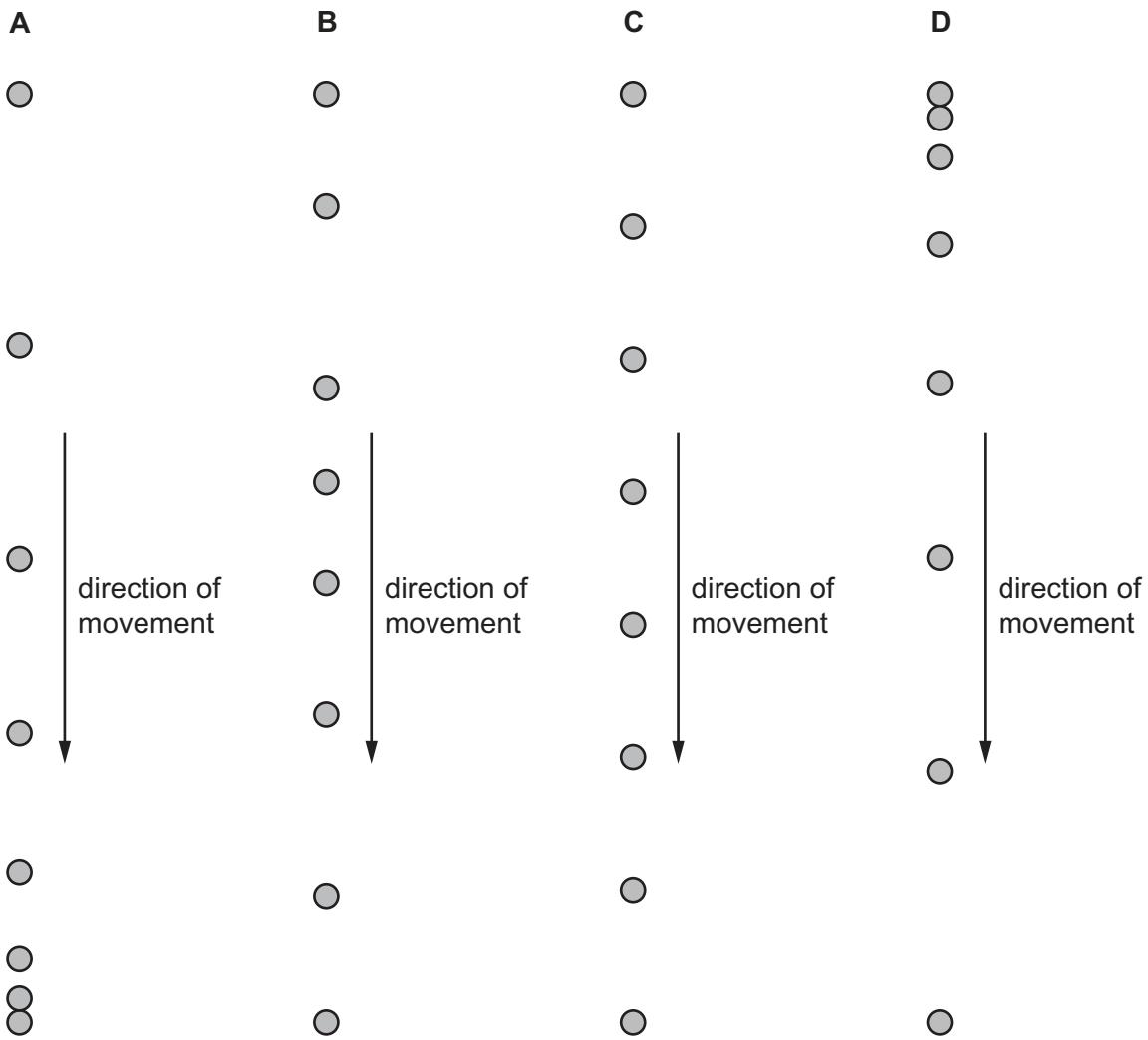
7 Some gas trapped in a container is compressed at constant temperature by a piston.

Which property of the gas does **not** change?

A pressure

B mass

C frequency of particle collision

D density

8 A car has a weight of 8000 N.

What is the mass of the car?

A 810 kg   **B** 820 kg   **C** 8000 kg   **D** 78 000 kg

9 A lorry is travelling along a straight, horizontal road. The constant driving force on the lorry is 80 kN and the total resistive force is 20 kN.

Which row describes the motion of the lorry and gives the resultant force acting on it?

	motion of lorry	resultant force / kN
A	acceleration	60
B	acceleration	100
C	deceleration	60
D	deceleration	100

10 As a cyclist uses the brakes on a bicycle, energy is transferred from the kinetic store to the thermal store.

What causes the transfer of energy?

A friction

B mass

C thrust

D weight

11 The extension of a spring is measured as the load stretching it is increased. The graph shows the results.

Which point is the spring's limit of proportionality?
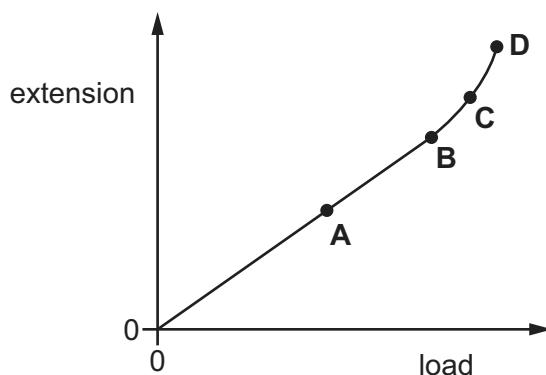
12 A satellite orbits the Earth.

What is the direction of the force on the satellite causing this circular motion?

A away from the centre of the Earth

B in the direction of motion of the satellite

C in the opposite direction to the motion of the satellite

D towards the centre of the Earth

 [Turn over

13 A uniform beam is pivoted at its centre and balanced by three weights as shown.

x   5.0 cm   30 cm

2.0 N   3.0 N   2.0 N
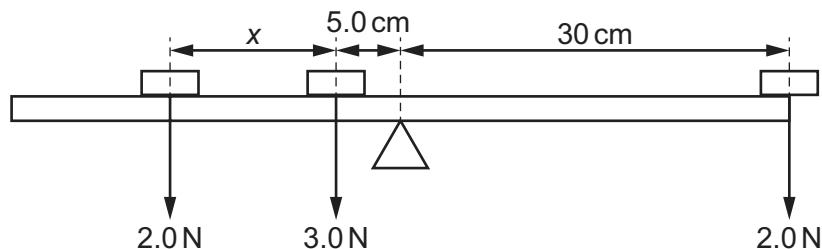
What is distance *x*?

A 17.5 cm   **B** 22.5 cm   **C** 35.0 cm   **D** 37.5 cm

14 A piece of card of uniform thickness and density is suspended freely from a horizontal pin. The diagram shows the card at rest.

Which cross is the centre of gravity of the card?

pin

× A
× B
× C
× D
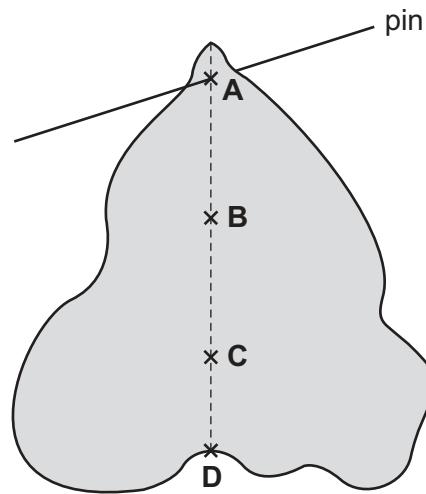
15 Trolley X of mass 2.0 kg is moving to the right at 2.0 m/s.

Trolley Y of mass 1.0 kg is moving to the left at 1.0 m/s.

The trolleys collide and stick together.

| | trolley X | trolley Y |
| | mass = 2.0 kg | mass = 1.0 kg |
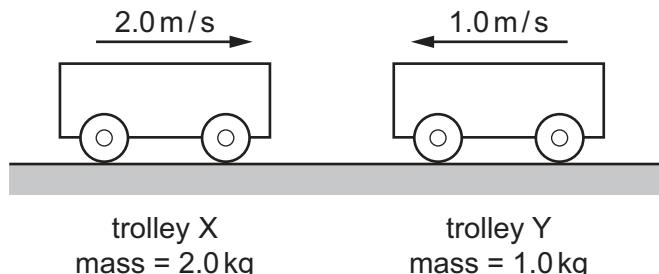
The collision takes a total time of 0.20 s.

What is the average force acting on trolley X during the collision?

A 3.3 N **B** 10 N **C** 15 N **D** 25 N

16 An object of mass 5.0 kg is moving at a constant speed. It has 10 J of kinetic energy.

What is the speed of the object?

A 0.25 m/s **B** 0.5 m/s **C** 2.0 m/s **D** 4.0 m/s

17 A wind-up radio is used in areas where mains electricity is not available.
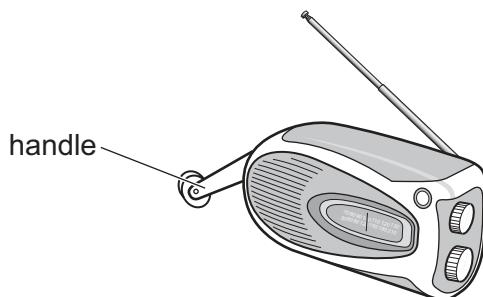
A person winds a spring in the radio using the handle. When the spring unwinds, it makes a small coil rotate in a magnetic field.

Which energy transfer is **not** useful for this radio?

A elastic potential energy → kinetic energy

B kinetic energy → thermal energy

C chemical energy → elastic potential energy

D kinetic energy → sound energy

18 Energy is transferred in a filament lamp at a rate of 60 W. The lamp wastes energy at a rate of 46 W.

Which ratio is used to calculate the efficiency of the lamp?

A $\dfrac{14}{74}$ **B** $\dfrac{14}{60}$ **C** $\dfrac{14}{46}$ **D** $\dfrac{46}{60}$

19 A liquid is held in a cylindrical container.

The diameter of the base of the cylinder is *d*.

The mass of the liquid is *m* and its depth is *h*.
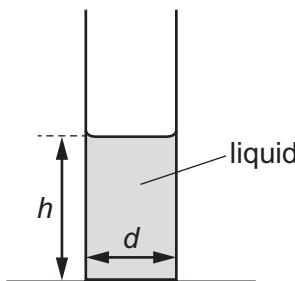
Which expression gives the pressure due to the liquid on the bottom of the cylinder?

A $\dfrac{mg}{\pi d^2}$ **B** $\dfrac{mgh}{\pi d^2}$ **C** $\dfrac{4mg}{\pi d^2}$ **D** $\dfrac{4mgh}{\pi d^2}$

**20** The diagram shows an instrument that is used to measure the atmospheric pressure.
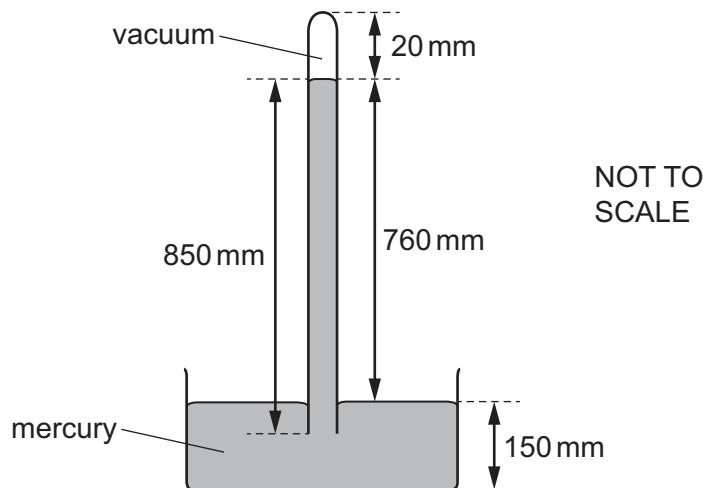
The density of mercury is $1.4 \times 10^4 \, \text{kg}/\text{m}^3$.

What is the atmospheric pressure?

A 2.7 kPa   **B** 21 kPa   **C** 104 kPa   **D** 117 kPa

21 Air at atmospheric pressure and room temperature is trapped in an insulated container by a frictionless piston of negligible weight. The air can be compressed by placing masses on top of the piston.
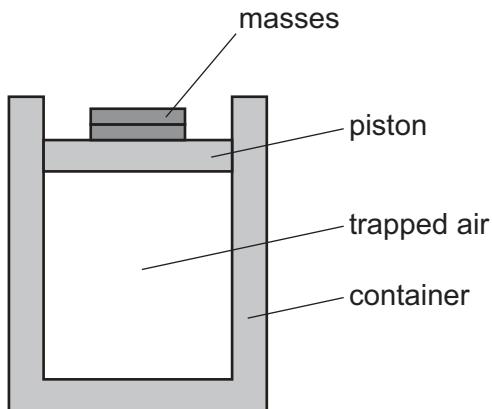
A mass of 1.0 kg is placed on the piston and the volume of the trapped air decreases from 100 cm^3 to 90 cm^3.

Which statement is correct?

A Adding another 1.0 kg mass decreases the volume of the air by less than 10 cm^3.

B Adding an additional 9.0 kg mass reduces the volume of the air to zero.

C The pressure of the trapped air is less than atmospheric pressure when its volume is 90 cm^3.

D The temperature of the air decreases as the 1.0 kg mass is added.

22 A substance has a melting temperature of –17 °C and a boiling temperature of 117 °C.

In which state does the substance exist at –10 °C and at 110 °C?

	at –10 °C	at 110 °C
A	solid	liquid
B	solid	gas
C	liquid	liquid
D	liquid	gas

23 Thermal energy is supplied at a constant rate to a fixed mass of a substance that is initially solid.

The graph shows how the temperature of the fixed mass of the substance varies with time.
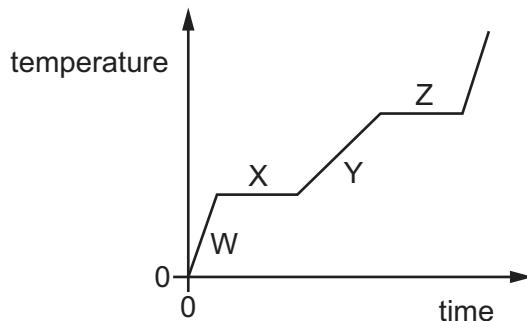
In which sections of the graph does the substance absorb latent heat?

A W and X **B** W and Y **C** X and Z **D** Y and Z

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

As the average kinetic energy of the molecules decreases, the space between them decreases and they move downwards.
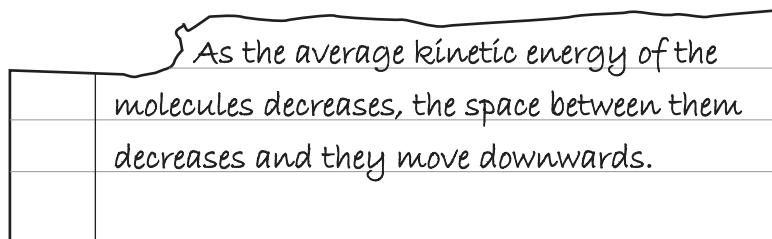
Which process is being described?

A conduction

B convection

C evaporation

D radiation

25 A ray of light passes from glass to air.

Which arrow shows the direction of the ray in air?
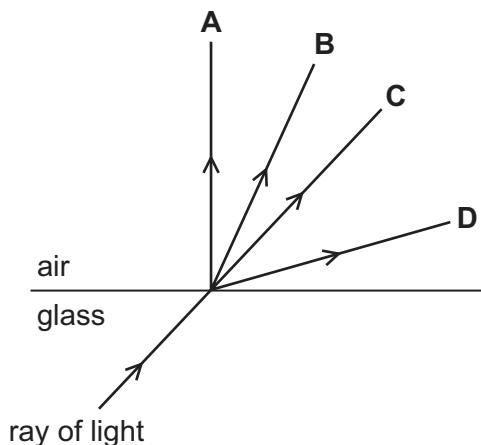
26 A short-sighted student looks at a distant object.

Which row shows the position of an image in a short-sighted eye and the type of lens used to correct short-sightedness?

	position of image in short-sighted eye	lens used to correct short-sightedness
A	in front of retina	diverging
B	behind retina	converging
C	on retina	converging
D	behind retina	diverging

27 A student makes four statements about infrared waves.

1   They can be seen by the human eye.

2   They travel at 330 m / s in air.

3   They are transverse waves.

4   They are used by intruder alarms.

Which statements are correct for infrared waves?

A   1 and 3   **B**   2, 3 and 4   **C**   2 only   **D**   3 and 4 only

28 Which waves are longitudinal?

    A   sound waves in water

    B   ultraviolet waves in air

    C   waves on the surface of water

    D   X-rays in a vacuum

29 A person hears an echo after a sound hits a solid cliff face.

What causes the echo?

    A   absorption

    B   dispersion

    C   reflection

    D   refraction

30 A plastic strip is rubbed with a cloth and the plastic becomes negatively charged.

Which statement explains this?

    A   Electrons are transferred from earth to the plastic.

    B   Electrons are transferred from the cloth to the plastic.

    C   Electrons move from one side of the plastic to the other side of the plastic.

   **D**   Protons are transferred from the plastic to the cloth.

31 Two parallel, conducting plates are charged. The charge on the upper plate is positive. The charge on the lower plate is equal in size but negative.

Which diagram shows the pattern and the direction of the electric field between the two plates?

A
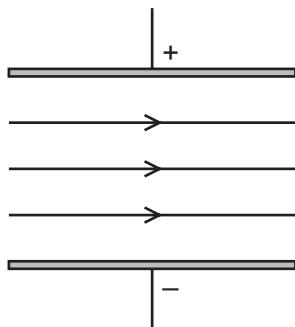
B
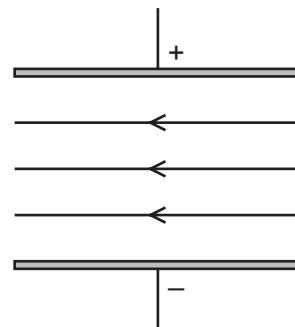
C
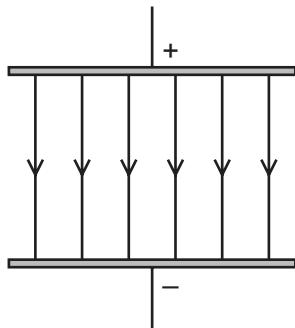
D
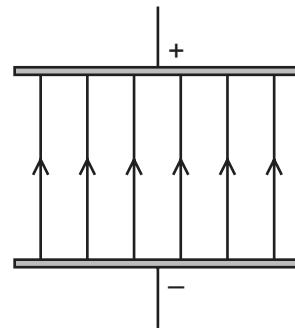
32 Which quantity is defined as the electrical work done by a source in moving a unit charge around a complete circuit?

A power

B potential difference

C electromotive force

D energy

33 Four 1.5 V cells are connected in a circuit as shown.
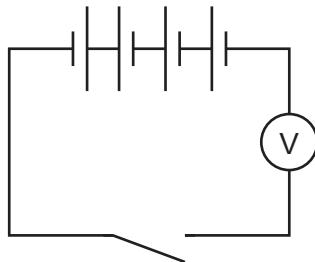
The switch is closed.

What is the reading on the voltmeter?

A   0 V   **B**   1.5 V   **C**   3.0 V   **D**   4.5 V

34 Two resistors are connected in series with a battery, as shown. The readings on three voltmeters V_0, V_1 and V_2 and the currents I_0, I_1 and I_2 are also shown.
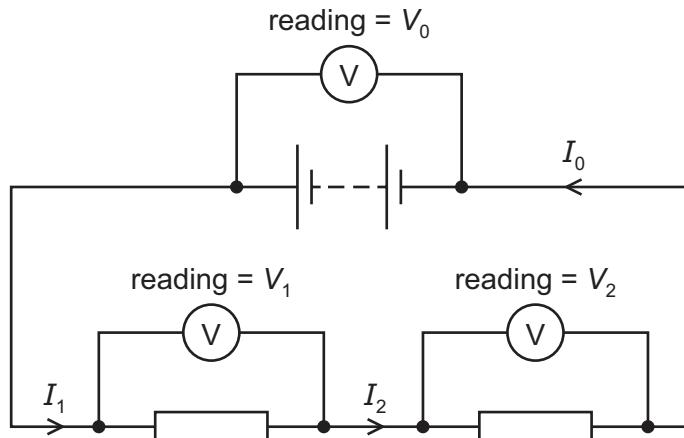
Which row gives values for the current I_0 and the potential difference V_0?

	I_0 is equal to	V_0 is equal to
A	I_1	V_2
B	I_2	the sum of V_1 and V_2
C	the sum of I_1 and I_2	V_1
D	the sum of I_1 and I_2	the sum of V_1 and V_2

35 The current in a home computer varies between 0.40 A and 1.2 A when the computer is connected to the mains supply.

What is the rating of the **most** suitable fuse to use to protect the computer?

A   0.5 A   **B**   1.2 A   **C**   1.5 A   **D**   13 A

36 Students are asked to draw the pattern and direction of the magnetic field due to a direct current (d.c.) in a straight wire.

Diagrams 1, 2 and 3 are three of their answers.

The students do not know the direction of the current in the wire.

straight wire
carrying direct current
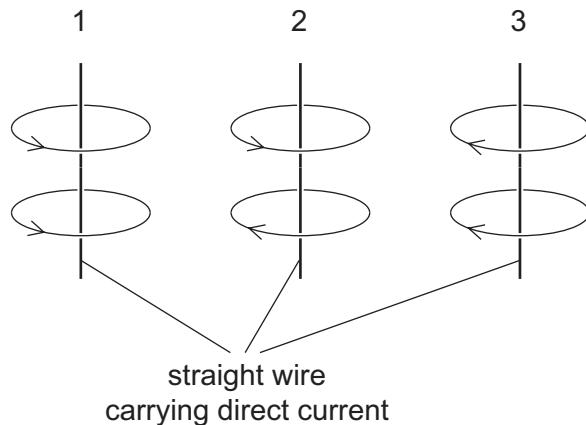
Which diagrams show possible patterns and directions for the magnetic field due to the current in the wire?

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

37 Which row identifies the positive and negative particles in the atom?

	positive particle	negative particle
A	proton	electron
B	electron	proton
C	proton	neutron
D	neutron	proton

38 The nuclide notation of a certain isotope of element Q is $^{R}_{Z}Q$.

What is the total number of protons, neutrons and electrons in a neutral atom of this isotope?

A Z B R C $Z + R$ D $2Z + R$

39 Which list shows the planets in order of increasing distance from the Sun?

A   Venus, Mercury, Earth, Mars, Saturn, Jupiter, Uranus, Neptune

B   Mercury, Mars, Earth, Venus, Jupiter, Saturn, Uranus, Neptune

C   Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune

D   Mercury, Mars, Earth, Venus, Uranus, Saturn, Jupiter, Neptune

40 A student spills ink on the page in a textbook that defines redshift. The ink covers the three important words 1, 2 and 3.

> Redshift is ......1...... in the observed ......2...... of electromagnetic radiation emitted from ......3...... stars and galaxies.

What are words 1, 2 and 3?

	1	2	3
A	an increase	frequency	receding
B	a decrease	frequency	approaching
C	an increase	wavelength	receding
D	an increase	wavelength	approaching