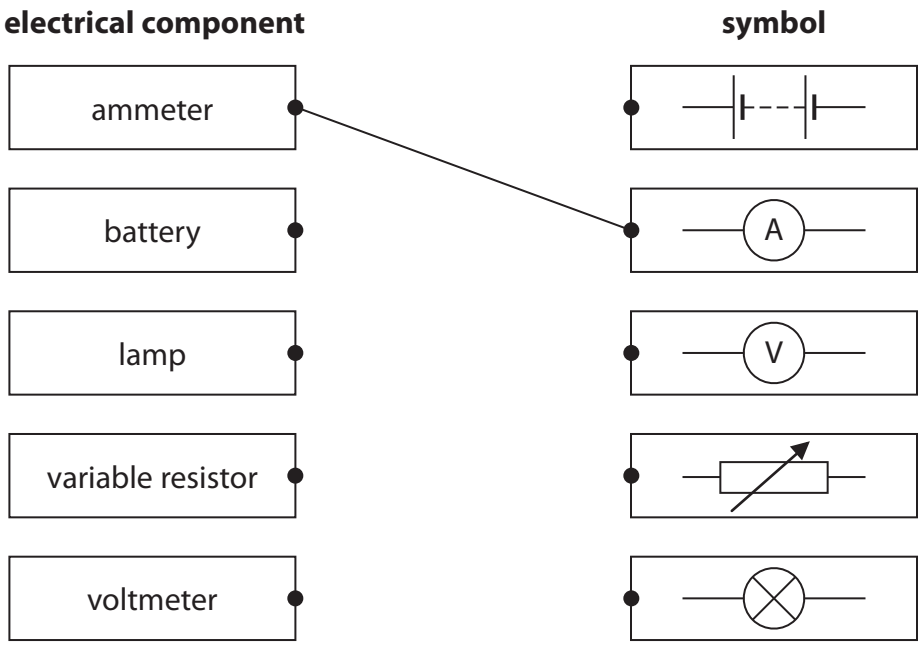
All questions are for both separate science and combined science students

1 This question is about electrical components.

(a) Draw a straight line from each electrical component to its correct symbol.

One has been done for you.

(3)



(b) (i) Name an electrical component whose resistance decreases when it is moved into brighter light.

(1)

.....

(ii) Name an electrical component whose resistance decreases as its temperature increases.

(1)

.....

(Total for Question 1 = 5 marks)

2 A kitchen has a water supply, an electricity supply and electric lighting.

There are several electrical appliances in the kitchen including a toaster, a kettle, a clothes iron, a microwave oven and a dishwasher.

Discuss three hazards of using electricity in this kitchen.

(6)

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(Total for Question 2 = 6 marks)

3 A student has two computer hard drives.

One is black and one is white.

The student places the white hard drive on top of the black one as shown in photograph A.

Photograph A

The student connects both hard drives to a computer so that they receive the same amount of electrical power. The temperature of the hard drives rises as they work.

The student then rearranges the hard drives so that the black one is on top as shown in photograph B.

Photograph B

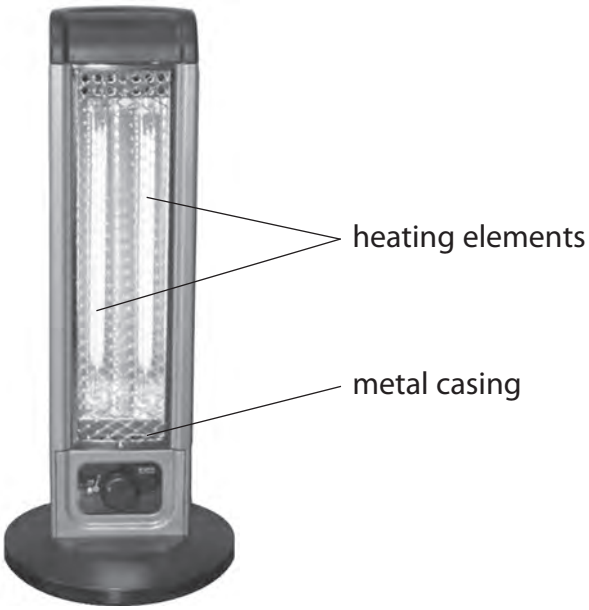
The hard drives are still working, but their temperature is lower than before.

Explain why the hard drives work at a lower temperature when the black one is on top.

(4)

(Total for Question 3 = 4 marks)

4 The photograph shows an electric heater.



(a) The power of the heater is 2000 W.

The heater is connected to a 230 V mains supply.

(i) State the equation linking power, current and voltage.

(1)

(ii) Calculate the current in the heater.

(2)

current = ... A

(iii) Which of these fuses should be used with the heater?

(1)

☒ **A** 1A

☒ **B** 5A

☒ **C** 7A

☒ **D** 13A

(b) The two heating elements can be connected in series or in parallel.

Describe an advantage of each method.

(2)

series .....

.....

parallel .....

.....

(c) Some electrical appliances are fitted with an earth wire.

(i) Describe how an earth wire acts as a safety feature.

(4)

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(ii) Explain why this heater should be fitted with an earth wire.

(2)

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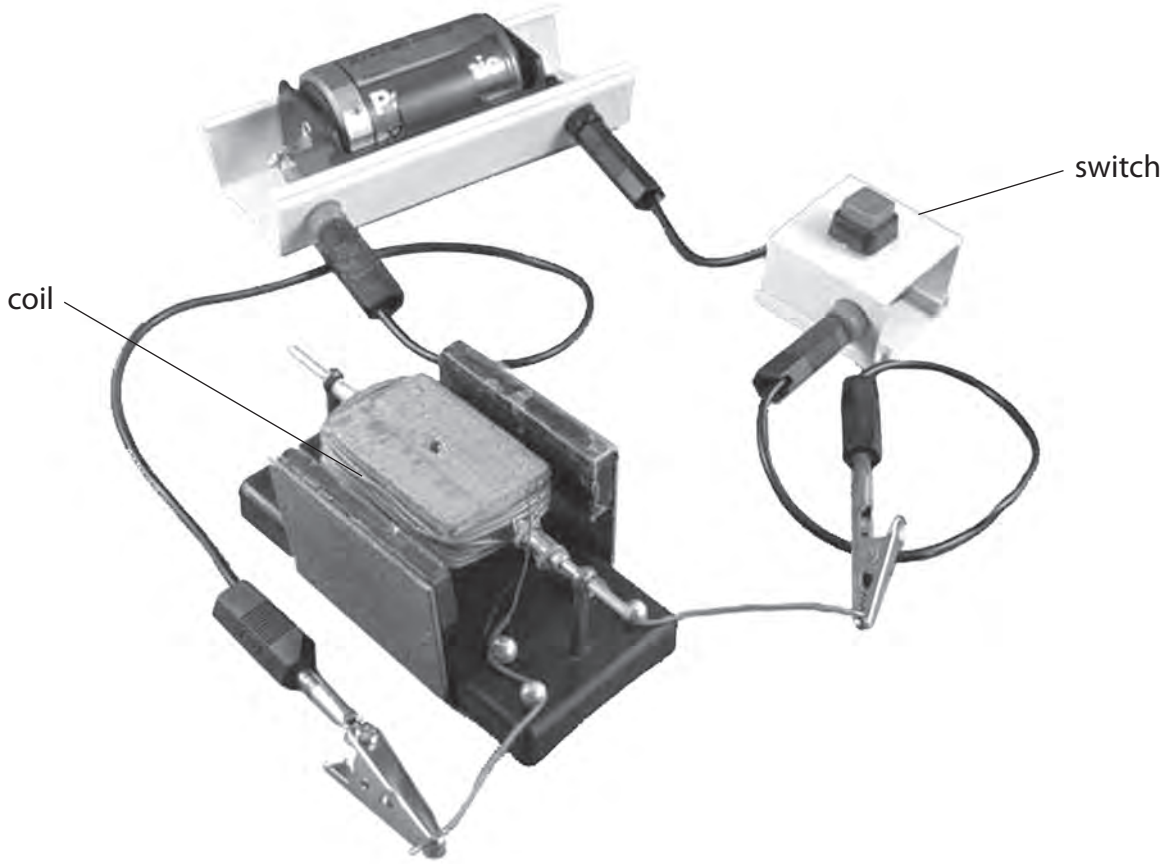
(Total for Question 4 = 12 marks)

5 The photograph shows a small electric motor.



(a) Explain why the coil starts to spin when the switch is closed.

(4)

(b) (i) Suggest how to make the coil spin in the opposite direction.

(1)

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.....

(ii) Suggest how to make the coil spin more slowly.

(1)

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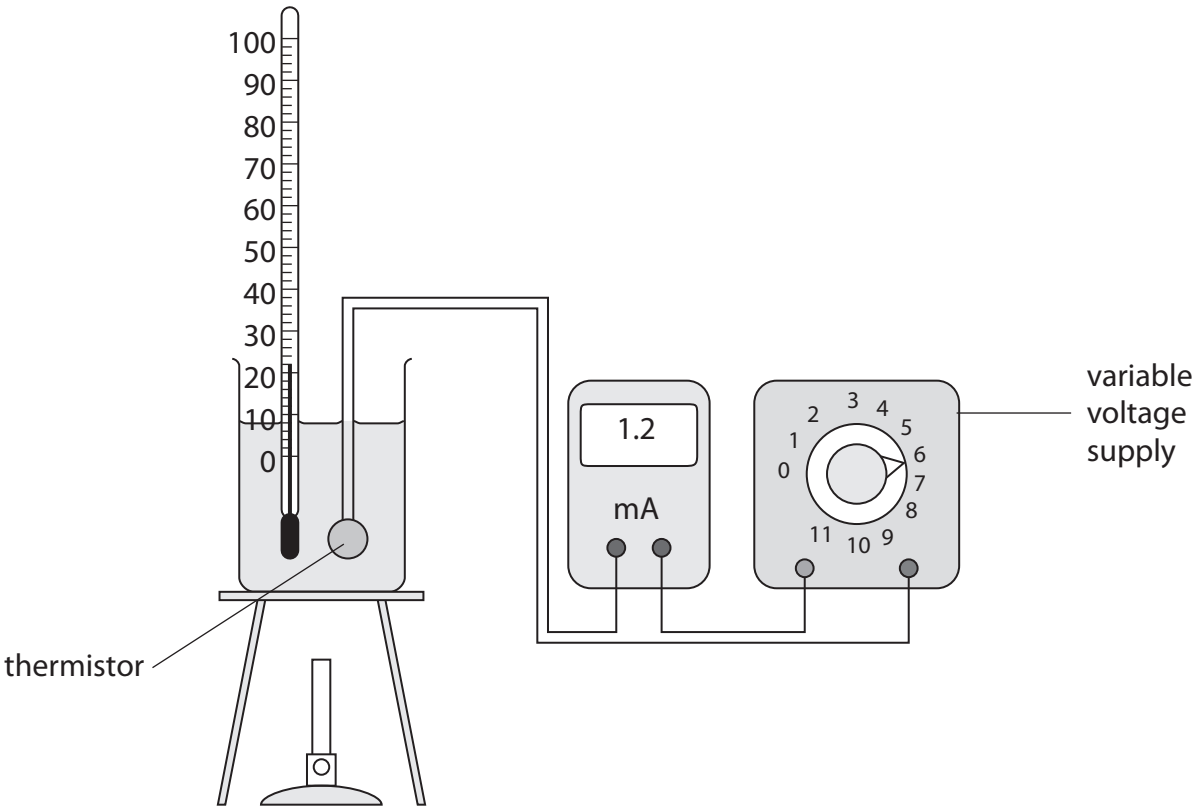
(Total for Question 5 = 6 marks)

6 (a) A student uses this apparatus to investigate how the resistance of a thermistor changes with temperature.



(i) Draw a circuit diagram for this investigation.

(2)

&gg' The student wants to measure the voltage across the thermistor.
On your diagram, add a symbol to show how she should connect the voltmeter

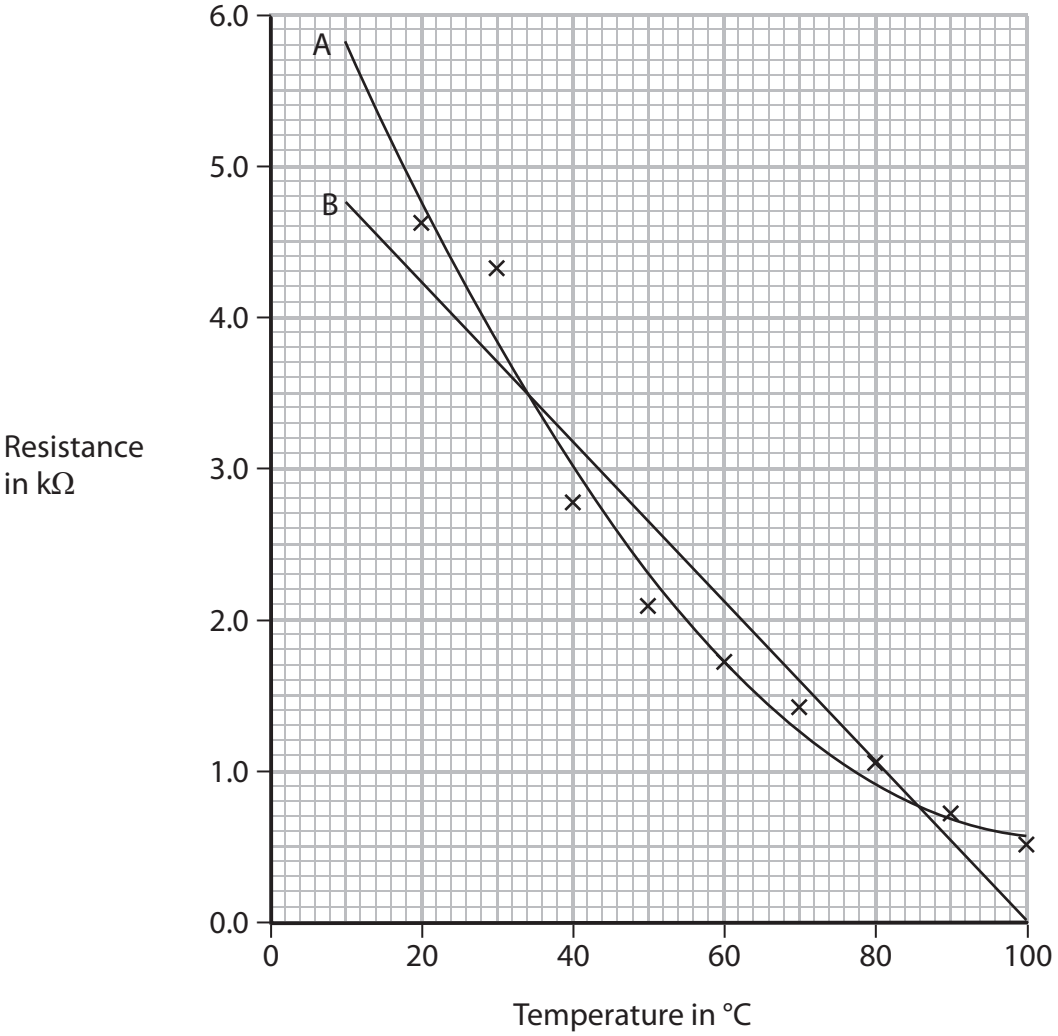
to the circuit.

(1)

(iii) Explain how the student can use the apparatus to investigate how the resistance of the thermistor varies with temperature between 0 °C and 100 °C.

(5)

(b) The graph shows the student's results.



Two students discuss the line of best fit for this graph.

One student thinks it is the curved line A.

The other student thinks that it is the straight line B.

(i) Suggest which line is better, giving a reason for your choice.

(1)

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.....

(ii) Suggest why measuring the resistance of the thermistor at 10 °C could help to decide which line is better.

(1)

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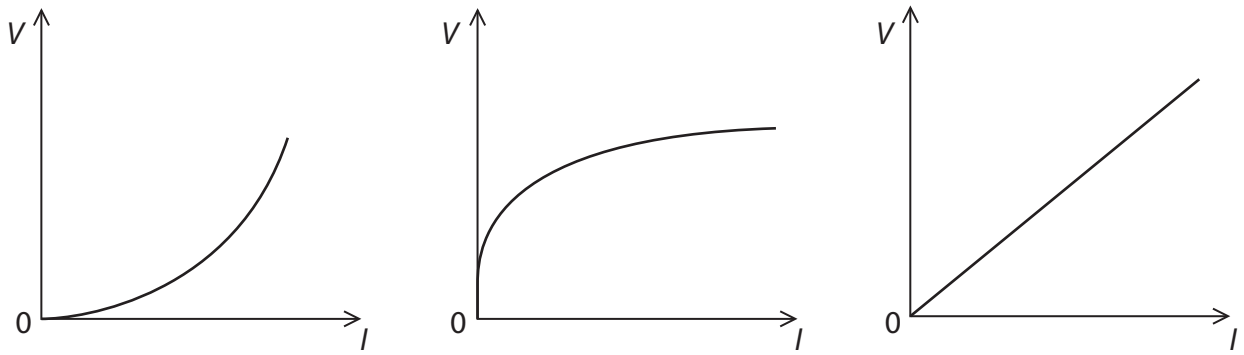
(c) These graphs show the voltage (*V*) changes with the current (*I*) for three components.



J **K** **L**

The components are a metal wire at constant temperature, a diode and a filament lamp.

Which letter represents the correct graph for each component?

(2)

metal wire at constant temperature .....

diode .....

filament lamp .....

(Total for Question 6 = 12 marks)

7 A student investigates how the resistance of a thermistor varies with temperature.

(a) Draw the circuit symbol for a thermistor.

(1)

(b) The student uses voltmeter and ammeter readings to find the resistance at each temperature.

One set of readings is shown below.

temperature in °C	voltmeter reading in V	ammeter reading in mA
80	13.2	2.60

(i) State the equation linking voltage, current and resistance.

(1)

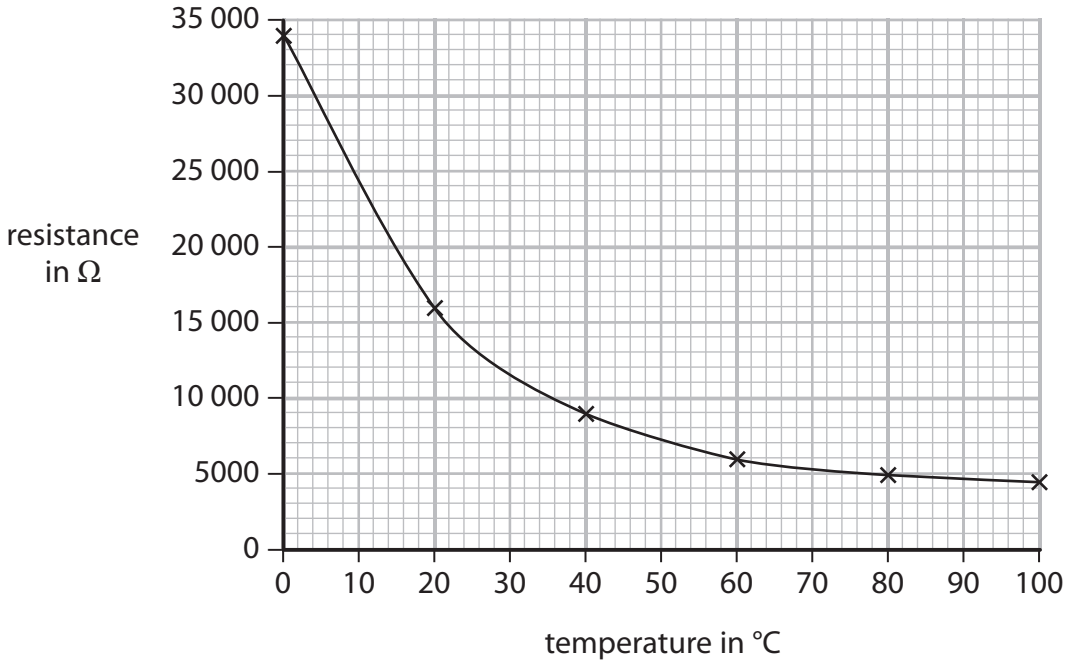
(ii) Show that the resistance of the thermistor at 80 °C is about 5000 Ω.

(3)

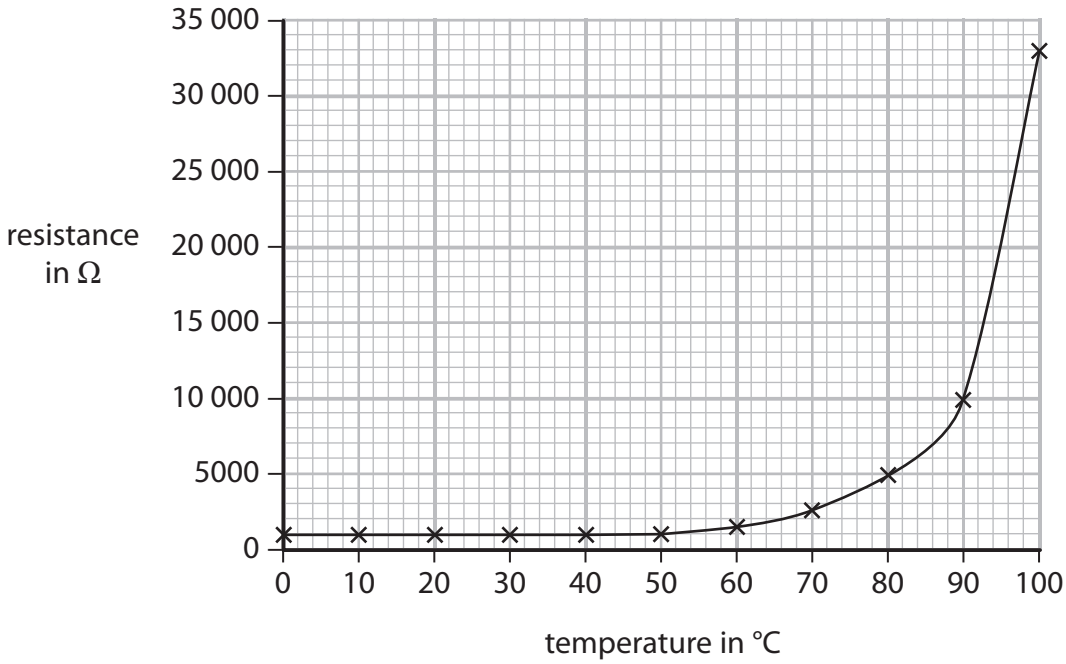
(c) Another student takes measurements for two more components, A and B.

The graphs show the results.

Component A



Component B



Compare the results for component A and component B.

(5)

(Total for Question 7 = 10 marks)

8 A light dependent resistor (LDR) can be used as a sensor to detect light intensity.

Describe how the resistance of an LDR varies as the light intensity changes.

You may sketch a graph to help your answer.

(3)

(Total for Question 8 = 3 marks)

9 The diagram shows the driving force on a sports car as it moves along a race track.

(a) Name **two** forces that oppose the driving force.

(2)

1 .....

2 .....

(b) The car has a mass of 1400 kg.

The acceleration of the car is 5.5 m/s^2.

(i) State the equation linking force, mass and acceleration.

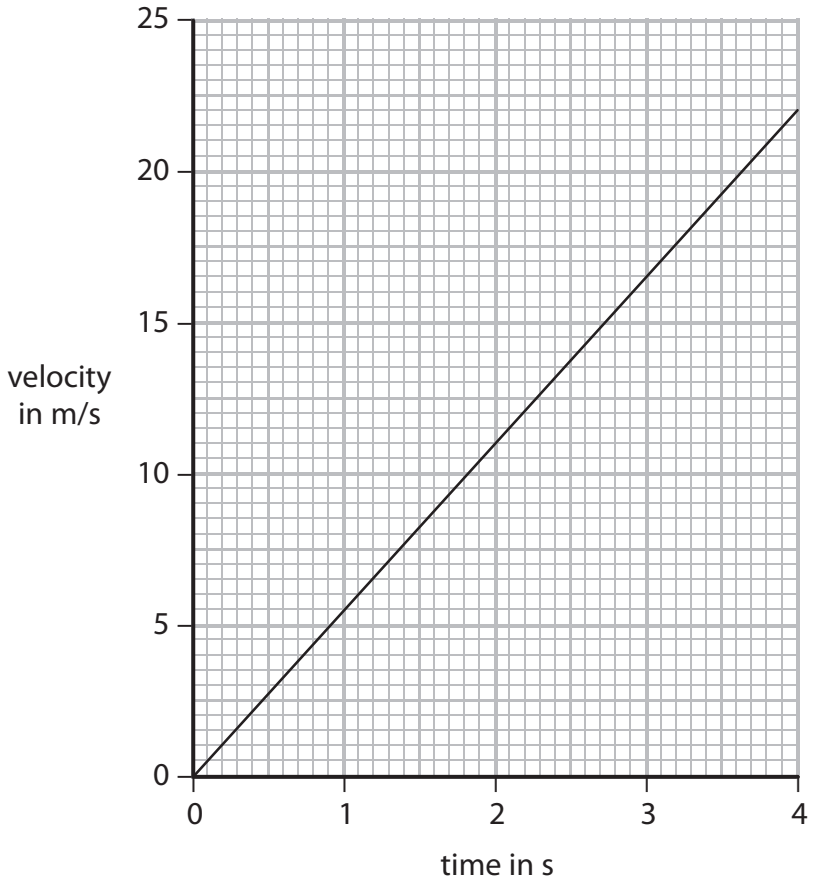
(1)

(ii) Calculate the force causing this acceleration.

(2)

Force = ... N

(c) Graph **1** shows how the velocity of the car changes with time.



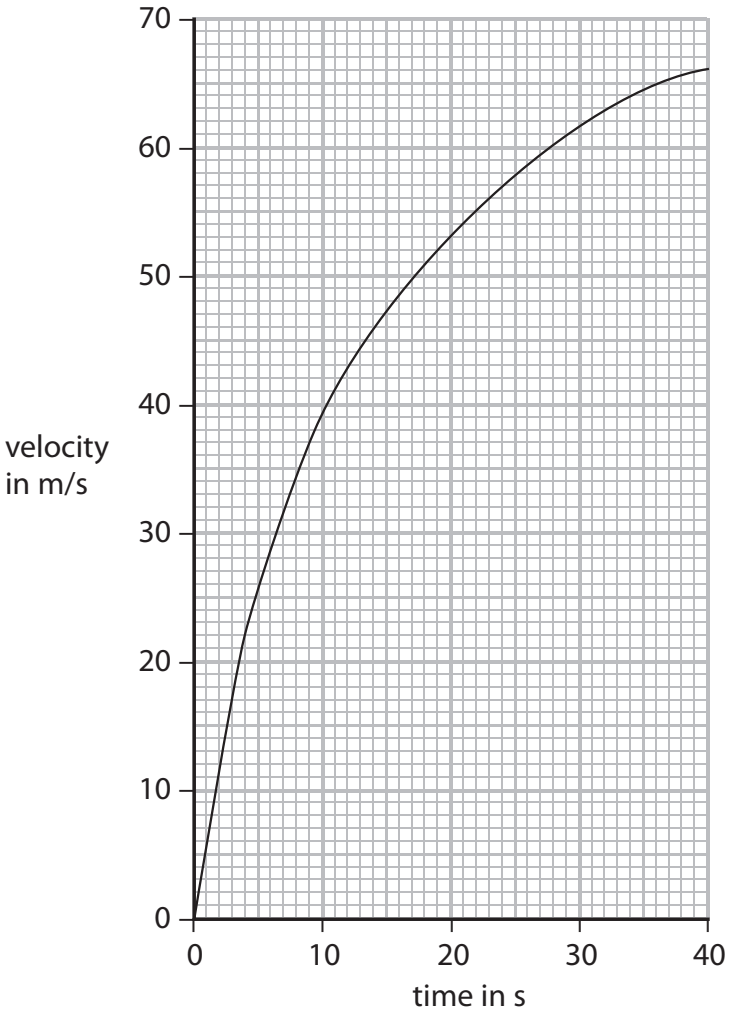
Graph **1**

Calculate the distance that the car travels in the first four seconds.

(3)

Distance = ... m

(d) As the car travels further along the track, its acceleration changes as shown in graph **2**.



Graph **2**

(i) Which feature of graph **2** shows that the acceleration changes?

(1)

.....

(ii) The acceleration changes even though the driving force does **not** change.

Suggest **two** possible reasons for this change in acceleration.

(2)

1 .....

.....

2 .....

.....

(Total for Question 9 = 11 marks)

10 (a) All metals are good conductors of electricity.

Which of these non-metals can conduct electricity?

(1)

☒ **A** carbon

☒ **B** chalk

☒ **C** plastic

☒ **D** rubber

(b) The current in a metallic conductor is a flow of

(1)

☒ **A** negatively charged electrons

☒ **B** negatively charged protons

☒ **C** positively charged electrons

☒ **D** positively charged protons

(c) Some metals and alloys are magnetic.

Which of these is magnetic?

(1)

☒ **A** aluminium

☒ **B** copper

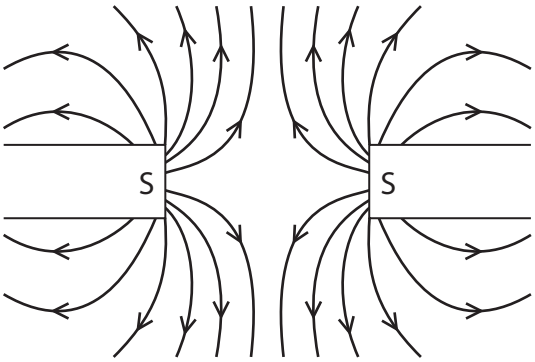
☒ **C** gold

☒ **D** steel

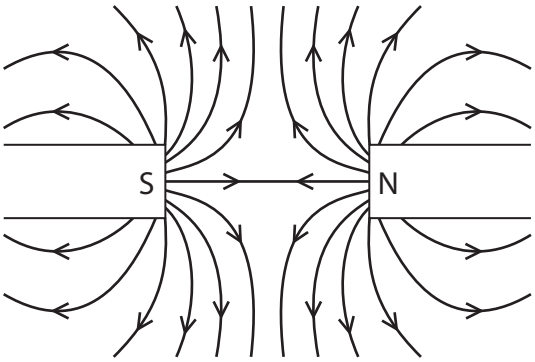
(d) Which of these field patterns is correct?

(1)

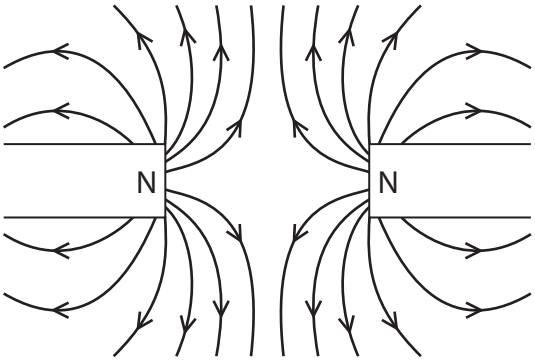
☒ **A**



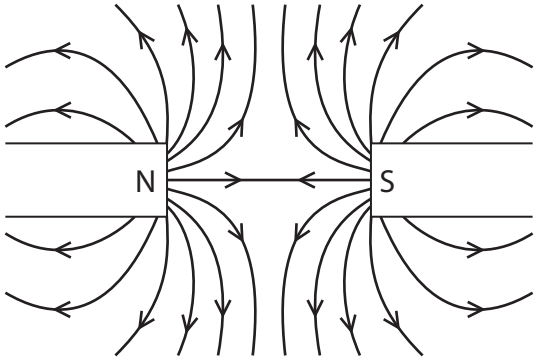
☒ **B**



☒ **C**



☒ **D**



(Total for Question 10 = 4 marks)