

Name _____ Class _____ Date _____

- 1 a The diagram on the right shows a series circuit.

The diagram shows the potential difference (voltage) across the cell and across bulb A.

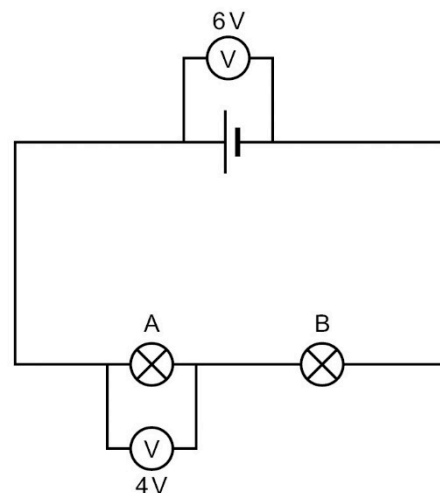
- i What is the potential difference across bulb B? Tick *one* box.

☐ A 3 V

☐ B 6 V

☐ C 4 V

☐ D 2 V



(1)

- ii The two bulbs are rearranged into a parallel circuit using the same cell. The brightness increases. Explain why.

(2)

- b An electromagnet can be used to sort different metals.

- i Name *two* metals that are attracted to electromagnets.

(1)

- ii Give *one* advantage of using an electromagnet rather than a normal magnet to sort different metals.

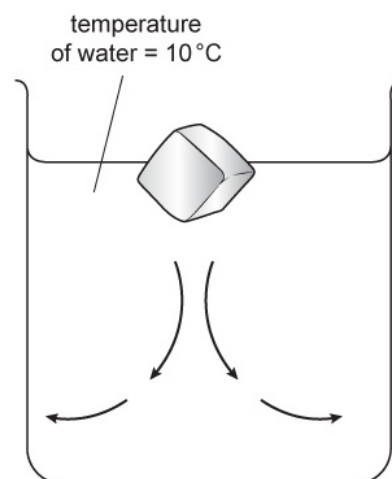
(1)

(Total for Question 1 = 5 marks)

- 2 Henna puts an ice cube made with coloured water into a beaker of colourless water.

After a few minutes she can see the coloured water moving in the directions shown in the diagram.

- a i Ice is solid water. It floats on liquid water. Explain why this is unusual compared with other materials.



(2)

- ii Which statement best explains the direction of energy transfer taking place in the investigation? Tick *one* box.

- ☐ A Energy is transferred from the ice cube to the water because the water is warmer.
- ☐ B Energy is transferred from the water to the ice cube because the water is warmer.
- ☐ C Energy is transferred from the ice cube to the water because the ice cube is warmer.
- ☐ D Energy is transferred from the water to the ice cube because the ice cube is warmer.

(1)

- b The coloured water follows the path shown in the diagram because water becomes more dense when it gets colder. Explain why this is so in terms of particles.

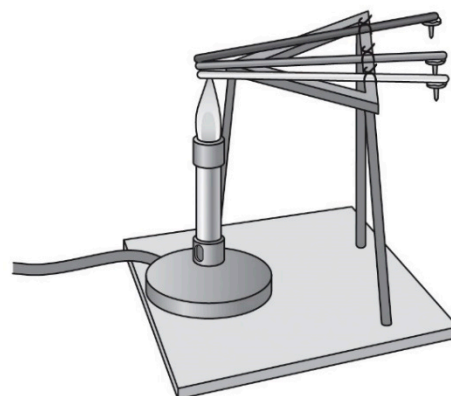
(2)

(Total for Question 2 = 5 marks)

- 3 In an investigation, a group of students use the apparatus shown in the diagram.

They use wax to stick a drawing pin to one end of each of three rods. The rods are made of different materials.

They heat the other ends of the rods using a Bunsen burner and measure the time taken for the pins to fall off.



- a** State why the pins fall off the ends of the rods.

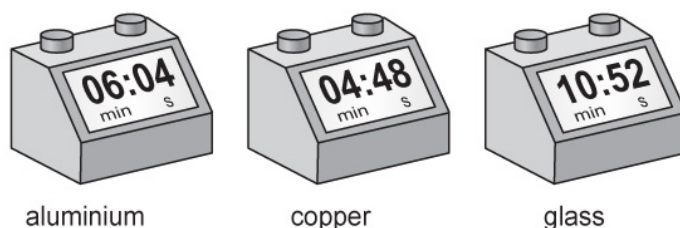
(1)

- b** How was the heat energy transferred along the rods? Tick *one* box.

- ☐ A convection
- ☐ B conduction
- ☐ C radiation
- ☐ D reflection

(1)

- c** The students use three stop clocks to record the time each pin takes to fall off its rod, as shown in the diagram.



Complete the results table.

Material	Time for pin to fall off (seconds)

(2)

- d** Write a conclusion for this investigation.

(1)

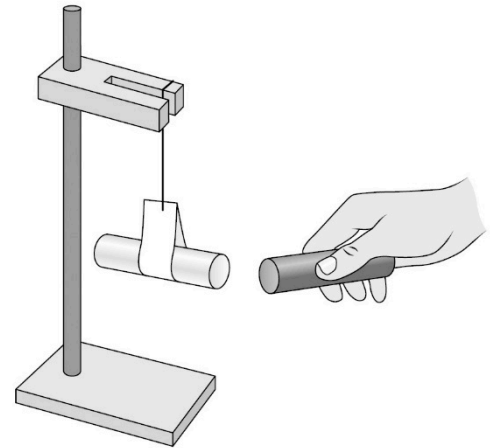
- e** Give *one* advantage of heating all the rods at once.

(1)

(Total for Question 3 = 6 marks)

- 4** Peter investigates static electricity using rods made from two different materials, as shown in the diagram.

- a** Describe the kinds of materials that can be given a charge of static electricity.



(1)

- b** The two rods in the diagram have opposite charges to each other. Describe what will happen when the two rods are close to each other.

(1)

- c** Peter charges the rods by rubbing them with a cloth.

Explain how the charge on the cloth compares with the charge on the rod that has just been rubbed.

(2)

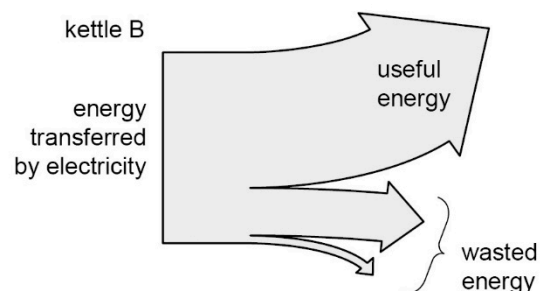
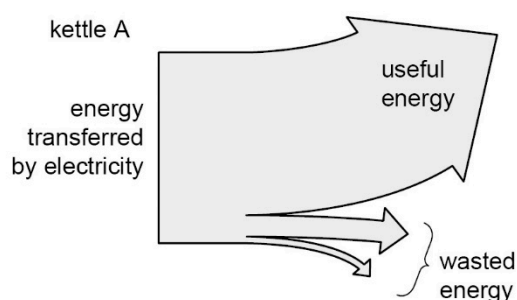
(Total for Question 4 = 4 marks)

- 5** A kettle uses electricity to heat water. Energy is transferred usefully to be stored in the hot water inside the kettle.

- a** Describe the main way that wasted energy is stored when the water in the kettle is being heated.

(1)

- b** The Sankey diagrams below show the energy transfers in two kettles. The widths of the arrows represent the amounts of energy transferred in different ways.



State why kettle A is more efficient.

(1)

- c** Cups for hot drinks can be made from different materials.

Nikhil has three cups made from different materials. The three cups are all the same size and shape.

- i** Nikhil is investigating which material is the best insulator.

Write a plan for this investigation.

(2)

- ii** Describe *two* things Nikhil must do to make sure the investigation is a fair test.

(2)

- iii** Give *one* safety precaution that Nikhil should take during this investigation.

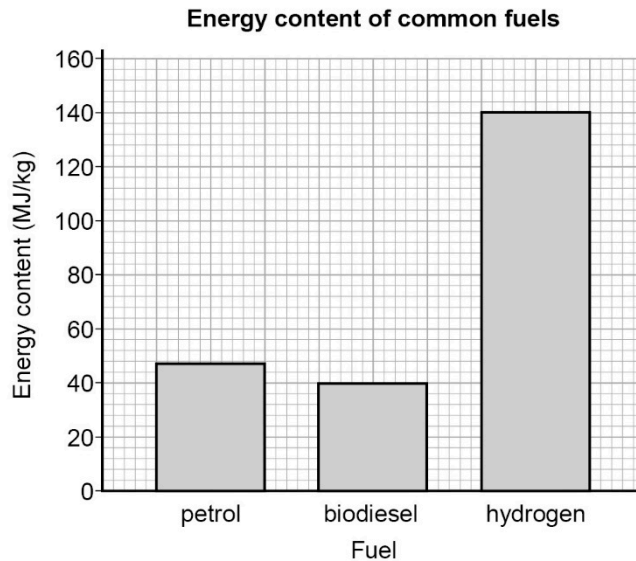
(1)

- iv** Describe how Nikhil will work out which is the best insulator from the measurements.

(1)

(Total for Question 5 = 8 marks)

- 6 a The graph shows the energy content of some different fuels.



Calculate how much more energy is stored in 1 kg of hydrogen compared with 1 kg of biodiesel.

energy = _____ MJ
(2)

- b Drax power station in Yorkshire can generate electricity by burning biofuels.

i State what a biofuel is.

(1)

ii Give *one* advantage of using biofuel in a power station instead of using coal or oil.

(1)

(Total for Question 6 = 4 marks)

- 7 These instructions are from a car handbook (psi stands for pound-force per square inch and is the imperial unit for pressure).

Tyres get hotter during a journey and cool down again when the car stops.

Explain why the pressure is higher when a tyre is hot.

Car handbook data

Tyres are best checked and inflated when cold.
Recommended pressure (cold) = 30 psi
If checking when tyres are hot, pressure should be approximately 35 psi.

(2)

(Total for Question 7 = 2 marks)

- 8 a** During a thunderstorm, you see the lightning before you hear the thunder.

Light travels at 300 000 000 m/s in air, so you see the lightning almost instantly.

Sound travels at 340 m/s.

A scientist hears the sound of thunder four seconds after she sees the lightning.

Use the equation that links speed, distance and time to calculate the distance between the scientist and the thunderstorm. Show your working.

distance = _____ m
(2)

- b** A prism can be used to split white light into the different colours of the visible spectrum.

Give the reason why this happens.

- ☐ A Different colours of light travel at different speeds in the prism.
- ☐ B The prism makes the light speed up.
- ☐ C The different colours are absorbed by the prism.
- ☐ D The different colours reflect at different angles.

(1)

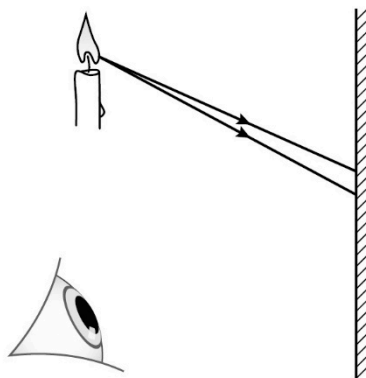
- c** Explain why a red shirt looks black when seen in blue light.

(2)

(Total for Question 8 = 5 marks)

- 9** The diagram shows someone looking at a candle in a mirror.

- a** Complete the ray diagram to show where the image of the candle would be.



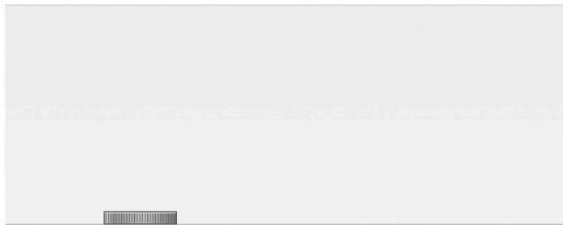
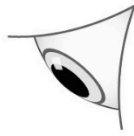
(2)

- b** Light is refracted when it passes from one medium to another. Give the reason why refraction occurs.

(1)

- c** The diagram below shows an object on the bottom of a swimming pool.

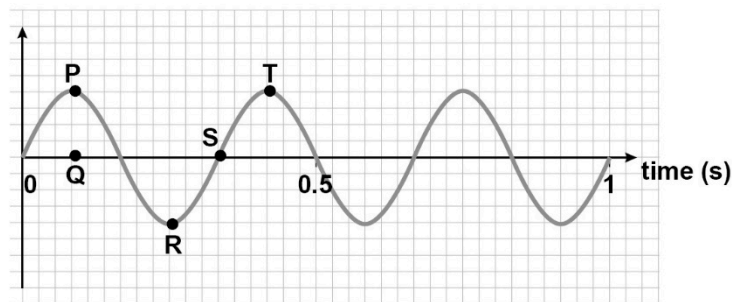
Draw light rays to show why the object appears to be closer to the observer than it really is.



(2)

(Total for Question 9 = 5 marks)

- 10 a** The diagram below shows a sound wave.



- i** Which pair of letters are one wavelength apart?

- ☐ A P and T
- ☐ B P and Q
- ☐ C Q and S
- ☐ D R and T

(1)

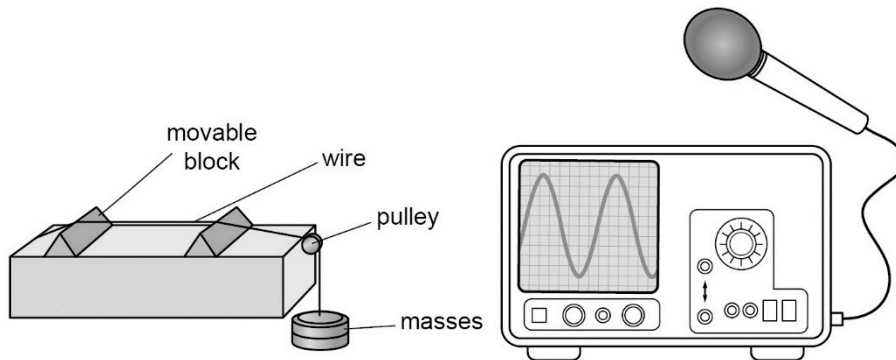
- ii Frequency is the number of waves in one second.

What is the frequency of the wave shown in the diagram? Give the units.

frequency = _____ unit _____

(2)

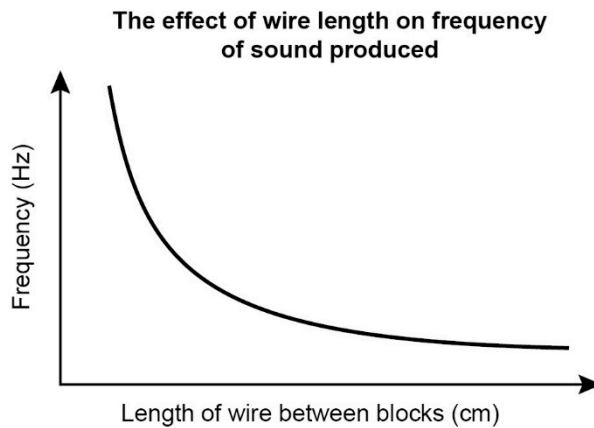
- b Jenna is investigating the different sounds that a stretched wire can make when it is plucked. She is using a sonometer to make the sounds and a microphone and oscilloscope to measure them. She is investigating how the length of the wire between the two blocks affects the frequency of the sound produced.



- i Give *two* variables Jenna should control during the investigation.

(2)

Jenna plots a graph to present her results.



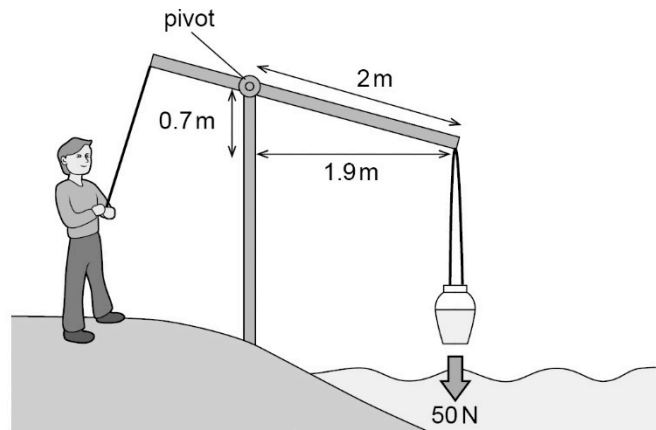
- ii Write a conclusion for this investigation.

(1)

(Total for Question 10 = 6 marks)

- 11** Asad is using the machine shown in the diagram to the right to lift buckets of water up from a river.

- a** A bucket full of water has a weight of 50 N. Calculate the work done on the bucket when it is lifted up through a distance of 2 m.



work done (J) = force (N) \times distance moved in direction of force (m)

work done = _____ J
(2)

- b** Calculate the moment caused by the full bucket about the pivot, when the bucket is in the position shown in the diagram.

moment (N m) = force (N) \times perpendicular distance from the pivot (m)

moment = _____ N m
(2)

(Total for Question 11 = 4 marks)

- 12** A car is waiting at some traffic lights. When the lights turn green it accelerates until it is travelling at 30 mph, and then maintains a constant speed.

Describe the forces on the car while it is stationary, while it is accelerating and while it is travelling at a constant speed.

(6)

(Total for Question 12 = 6 marks)

TOTAL FOR TEST = 60 MARKS