

FORMULAE

You may find the following formulae useful.

$$\text{power} = \frac{\text{work done}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

$$\text{power} = \frac{\text{energy transferred}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

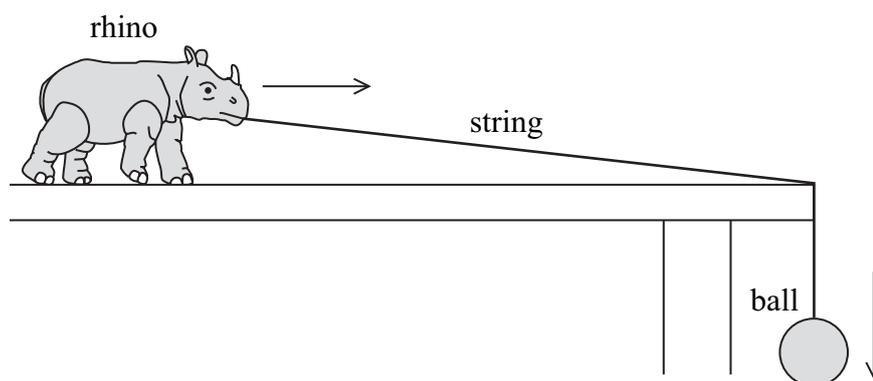
$$\text{frequency} = \frac{1}{\text{time period}}$$

$$f = \frac{1}{T}$$

Where necessary, assume the acceleration of free fall, $g = 10 \text{ m/s}^2$.



1. The diagram shows a child's toy. As the ball falls the rhino moves across a table.



(a) Name the force which opposes the motion.

..... (1)

(b) The box contains the names of different forms of energy.

Use names from the box to fill in the spaces.

chemical	elastic potential	electrical	gravitational potential
heat	kinetic	light	nuclear
			sound

Each name may be used once, more than once or not at all.

(i) The useful energy transfer for the toy is

..... energy to energy. (2)

(ii) Energy is wasted by the toy as energy

and energy. (2)

(iii) The child gets her energy from the food she eats in the form of

..... energy. (1)

(Total 6 marks)

Q1



2. A student investigates a metal spring which is 250 mm long.

The student changes the load on the spring.

He records the new length of the spring and calculates the extension.

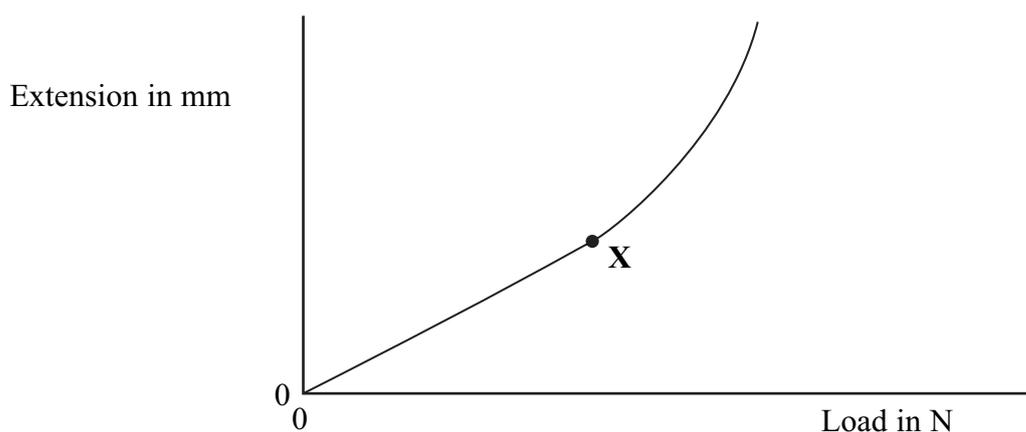
(a) Complete the space in his table of results.

Load in N	1	2	3	4	5
New length in mm	265	280	295	310	325
Extension in mm	15	30	60	75

(1)

(b) Another student carries out a similar experiment.

The sketch graph shows her results.



(i) Complete the sentence.

The first part of the graph shows that the spring obeys

..... law.

(1)



(ii) Write this law in words.

.....
.....

(1)

(iii) The graph changes shape after point X.

Use words from the box to fill in the spaces.

added	elastic	inelastic	longer	removed	shorter
--------------	----------------	------------------	---------------	----------------	----------------

Each word may be used once, more than once or not at all.

Point X shows the limit of the spring.

When extended beyond point X the spring does not go back to its original length if the load is..... .

The spring ends up than it was before.

(3)

Q2

(Total 6 marks)



3. (a) The diagram shows the electrical circuit symbol for a component called a light dependent resistor.



- (i) Which three letters are used to name this component?

..... (1)

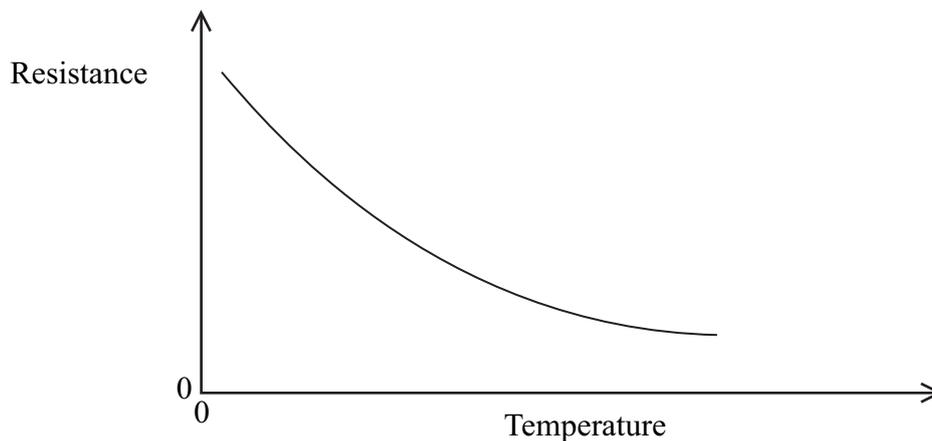
- (ii) How can you decrease the resistance of this component?

.....
 (1)

- (iii) How can you increase the resistance of this component?

.....
 (1)

- (b) The sketch graph shows how the resistance of an electrical component changes as its temperature changes.



What is this component called?

..... (1)



4. (a) Use the words in the box to complete the sentence.

energy information matter

Waves can transfer and
without transferring

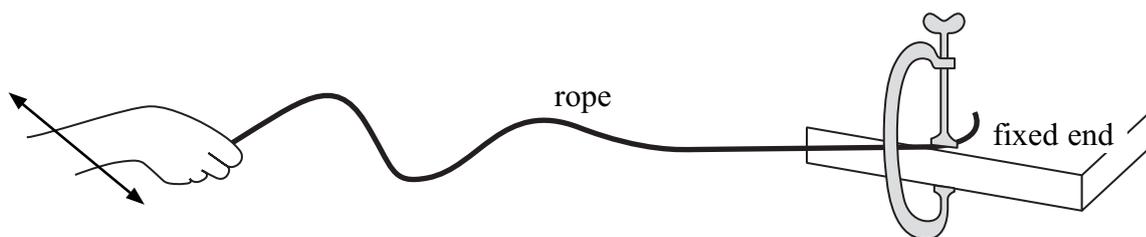
(1)

(b) One type of wave is a longitudinal wave.

Give an example of a longitudinal wave.

.....
(1)

(c) A teacher demonstrates a wave. She fixes a rope at one end. She holds the rope at the other end and shakes it from side to side.



(i) What type of wave does she demonstrate?

.....
(1)

(ii) Give another example of this type of wave.

.....
(1)

(Total 4 marks)

Q4



5. There are many different uses for the parts of the electromagnetic spectrum.

(a) Draw a line from each part to its correct use.

Part	Use
gamma rays	fluorescent lamps
infra-red rays	investigating broken bones
microwaves	night vision equipment
ultraviolet radiation	satellite transmissions
	sterilising medical equipment

(4)

(b) Complete the sentence.

All the parts of the electromagnetic spectrum have the same in free space.

(1)

(Total 5 marks)

Q5



6. (a) Electricity can be generated from several different sources.

Put a cross (☒) against **all** the resources which can be used to generate electricity.

- fossil fuels
- geothermal resources
- moving water
- nuclear power
- solar energy
- wind

(2)

(b) (i) Use the words in the box to complete the sentence.

coil	field	magnet	wire
-------------	--------------	---------------	-------------

A voltage is induced across a generator either by rotating a
..... within a
coil of or by rotating a
of wire within a magnetic

(2)

(ii) Give **two** ways which will increase the voltage induced across the generator.

- 1
-
- 2
-

(2)

(Total 6 marks)

Q6



7. (a) The particles in an atom are called subatomic particles.

The box contains the names of three subatomic particles.

electrons neutrons protons

Use these names to complete the sentences.

Each name may be used once, more than once or not at all.

(i) The nucleus of an atom contains and
 (1)

(ii) The nuclei of different isotopes of the same element contain the same
 number of but different
 numbers of (2)

(iii) In a neutral atom the number of is equal to
 the number of (1)

(b) Some atoms are unstable. They emit ionising radiations.

Use words from this box to complete the sentence.

Each word may be used once, more than once or not at all.

neutrons particles protons rays

The nucleus of an unstable atom may emit alpha (α) ,
 beta (β) and gamma (γ) (2)

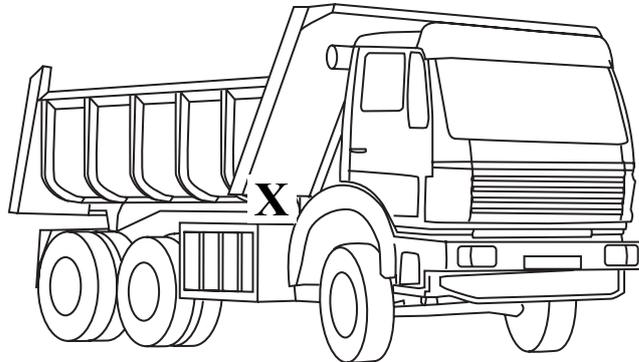
(Total 6 marks)

Q7



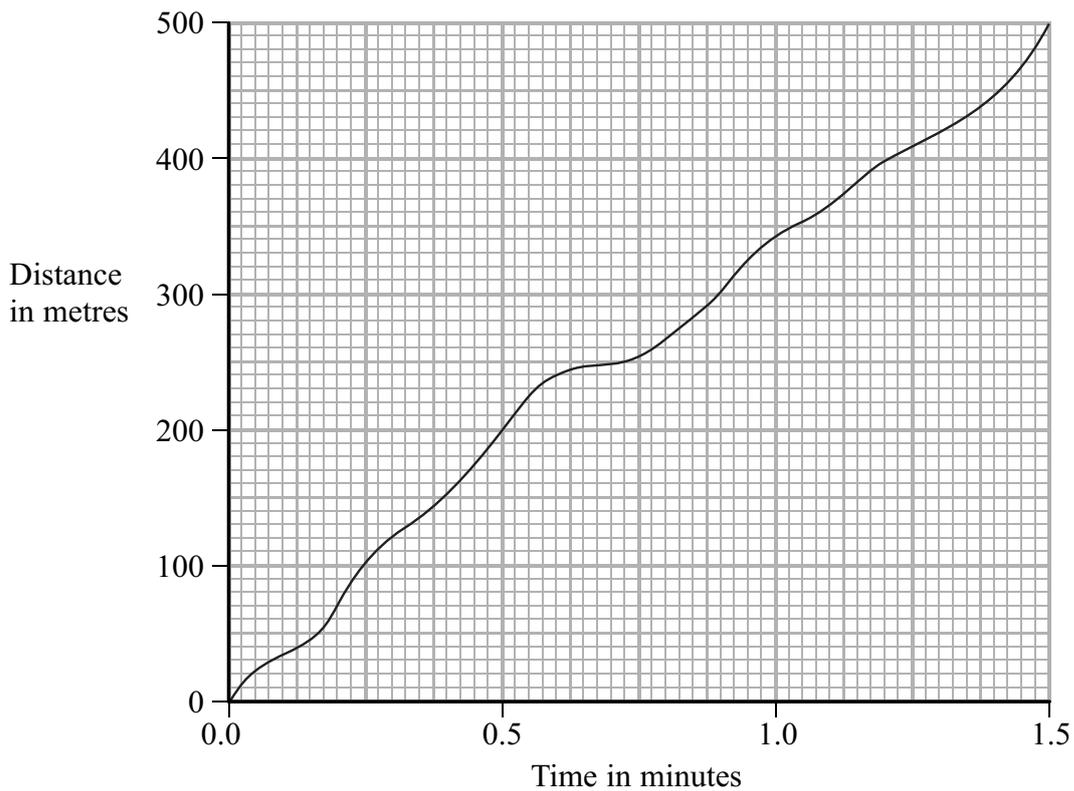
8. (a) The diagram shows a dumper truck. The X on the diagram shows the centre of gravity of the truck.

Draw an arrow on the diagram to show the direction of the weight of the truck.



(1)

- (b) A dumper truck crosses a building site. The graph below is the distance-time graph for the journey.



- (i) Calculate the time, in seconds, that it takes for the truck to make this journey. Show your working.

.....

Time =s

(2)



(ii) State the relationship between average speed, distance moved and time taken.

.....

.....

(1)

(iii) Calculate the average speed, in metres per second, of the truck.
Give your answer to the nearest whole number.

.....

Speed = m/s

(2)

Q8

(Total 6 marks)



9. (a) A student rubs a polythene rod with a woollen cloth. He finds that the rod gains a negative charge.

(i) Complete the sentences.

The rod is charged by

Electrons have been transferred from the to the

.....

(2)

(ii) When the student rubs a metal rod with a woollen cloth he finds that this rod does not become charged. Complete the sentence.

This is because the metal rod is a good

(1)

(b) Electrostatic charges can be dangerous when aircraft are being refuelled. Complete the sentence.

The electrostatic charges may cause a to pass and this

may result in the mixture of fuel vapour and air

(2)

Q9

(Total 5 marks)



10. (a) Complete the following sentences.

(i) A substance changing from solid to liquid, or changing from liquid to gas, is described as changing (1)

(ii) A substance can change from liquid to gas either by boiling or by (1)

(b) A student writes this statement about the particles in a substance.

The particles are in a close-packed structure and have random motion.

Use a word from the box to complete the sentence.

gas	liquid	solid	vapour
-----	--------	-------	--------

The student's statement describes the particles in a (1)

(c) Put a cross (☒) next to the correct words in the sentence.

When a sealed cylinder of gas is heated, the pressure in the cylinder

decreases	<input type="checkbox"/>
stays the same	<input type="checkbox"/>
increases	<input type="checkbox"/>

and the mass of the gas

decreases	<input type="checkbox"/>
stays the same	<input type="checkbox"/>
increases	<input type="checkbox"/>

(2)

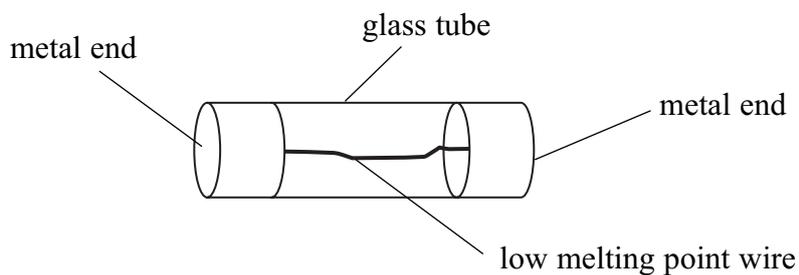
(Total 5 marks)

Q10



11. A student uses a hair dryer. The hair dryer's plug contains a fuse.

The diagram shows the fuse.



(a) Explain how the fuse prevents too large a current in the hair dryer.

.....

(2)

(b) The hair dryer is rated at 240 V, 1500 W. Calculate the current rating in amps of the hair dryer.

.....

Current =A
 (3)



(c) The fuse in the hair dryer blows and the student has to replace it.

The following fuses are available:

1 A 3 A 5 A 13 A

(i) Which fuse should the student choose? Put a cross (☒) in the correct box.

1 A

3 A

5 A

13 A

(1)

(ii) Explain your choice.

.....
.....

(1)

(d) A hair dryer heats up air.

Name one other example of electrical heating used in the home.

.....

(1)

Q11

(Total 8 marks)



12. (a) One source of background radiation is cosmic rays.

Cosmic rays are 90% protons, 9% alpha particles and 1% electrons.

(i) What does an alpha particle consist of?

.....
.....

(2)

(ii) Name a source of background radiation other than cosmic rays.

.....

(1)

(b) Experiments in a laboratory show that alpha particles from radioactive sources can only travel a few centimetres in air.

Why can they travel much further in space?

.....
.....

(1)

(c) Cosmic rays produce radioactive carbon-14 in the atmosphere. As carbon-14 decays, its activity decreases with a long half-life.

(i) What is meant by half-life?

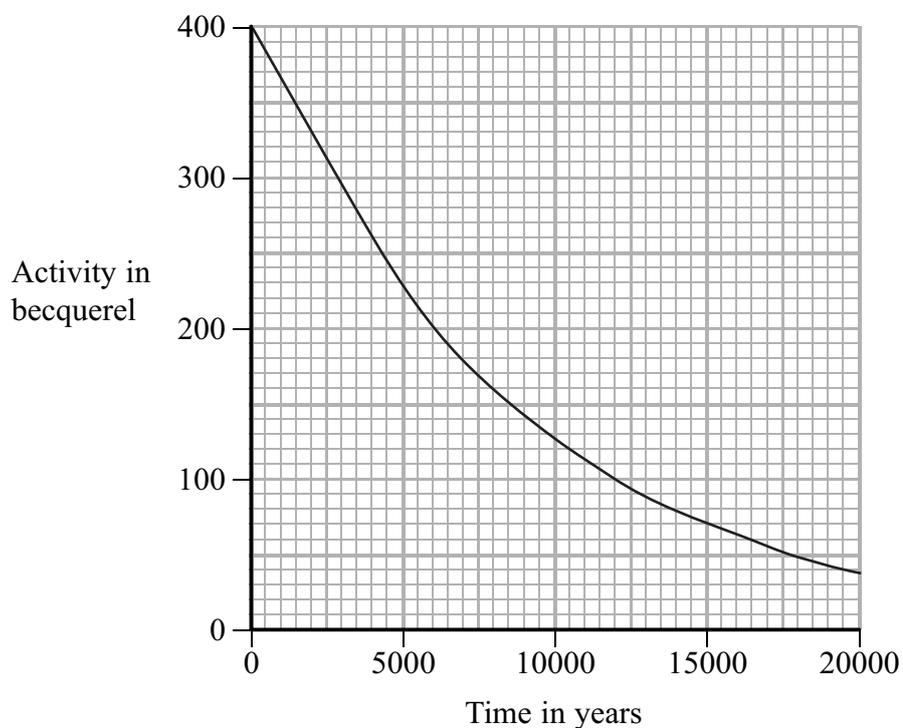
.....
.....

(1)



- (ii) The activity of the carbon-14 in a piece of wood can be used to estimate the age of the wood.

The graph shows how the activity of a sample of carbon-14 varies with time.



- 1 Use the graph to determine the half-life in years of carbon-14. You must show your method on the graph.

..... (2)

- 2 State why it is not possible to use carbon-14 to date a specimen that is more than 60 000 years old.

..... (1)

- (d) State another use of radioactivity.

..... (1)

(Total 9 marks)

Q12



13. (a) Use words from the box to complete the sentence.

acceleration	direction	distance
energy	force	velocity

Each word may be used once, more than once or not at all.

Work done is equal to times
 moved in the of the force.

(3)

(b) A machine does 2000 J of useful work in 5 s.

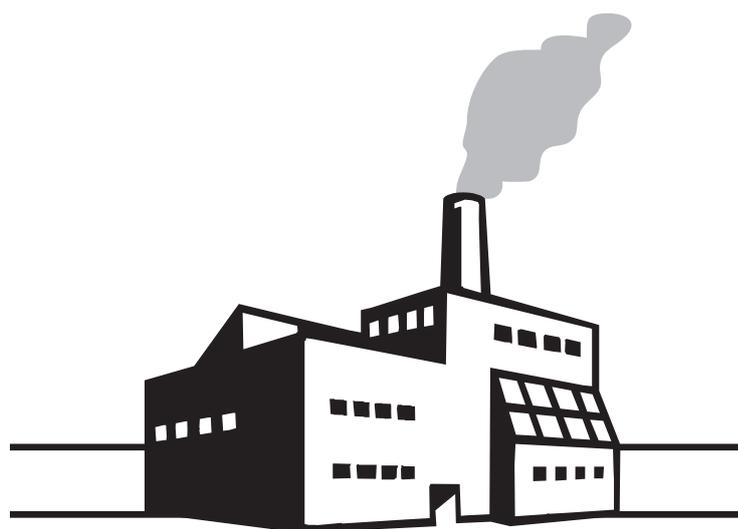
Calculate the useful output power in watts of the machine.

.....

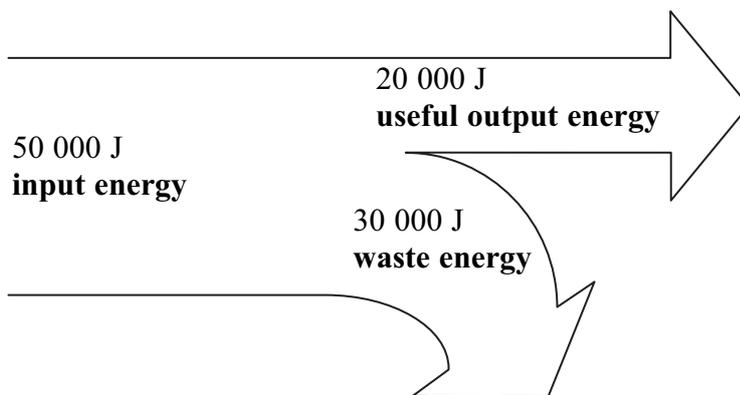
Power = W
(2)

(c) An industrialist takes his daughter on a visit to his factory.

He tells her that the factory is 100% efficient because it is working all the time.



She asks to see a flow diagram for a process that takes place within the factory. The flow diagram is shown below.



(i) Write down a formula for efficiency using two of the three terms in bold type in the diagram.

.....
.....
(1)

(ii) Calculate the efficiency of the process shown in the diagram.

.....
.....

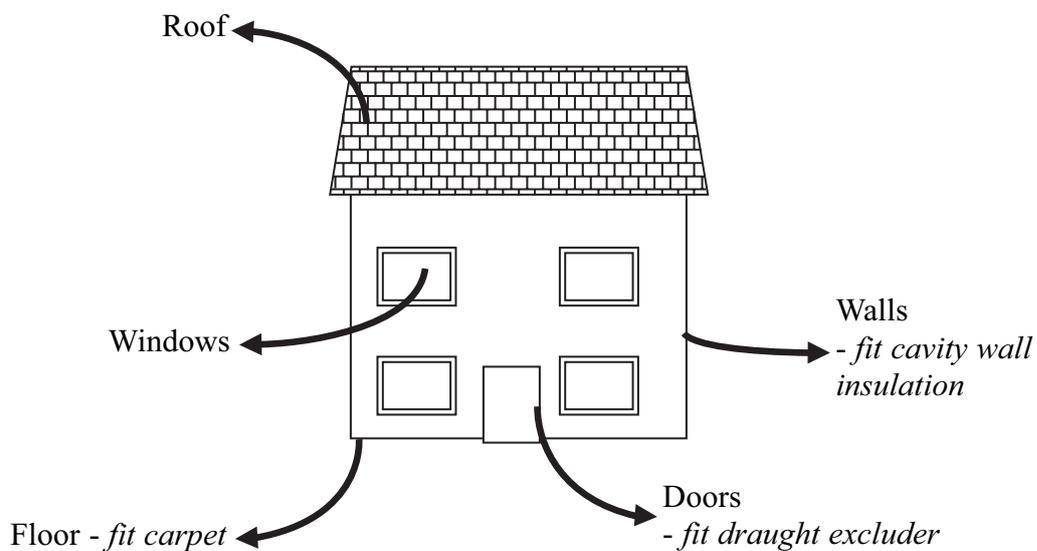
Efficiency =
(2)

(Total 8 marks)

Q13



14. (a) The diagram shows heat losses from a house in a cold climate and ways of reducing some of these losses.



State a way of reducing the heat losses from

(i) the roof,

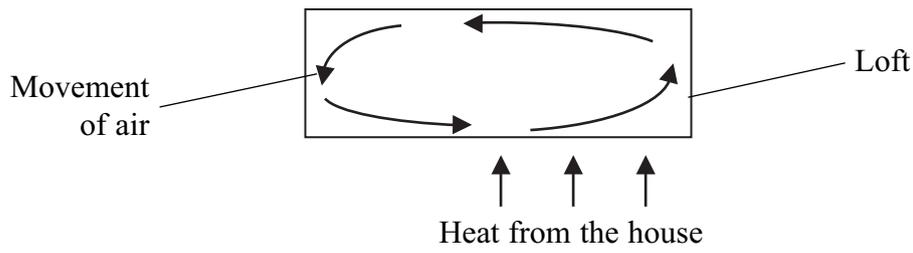
..... (1)

(ii) the windows.

..... (1)



(b) The movement of air in part of the loft forms a convection current.



Explain the movement of air during convection.

.....

.....

.....

(3)

Q14

(Total 5 marks)



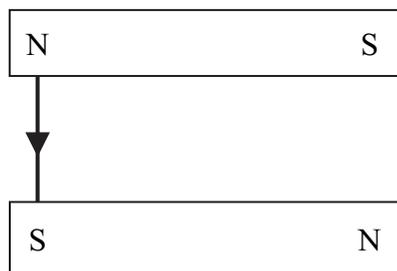
15. (a) A student writes a list of descriptions of magnetic field lines.

One of the boxes below has been completed to show that the description is correct. Complete **two** other boxes which have correct descriptions of magnetic field lines. Put a cross (☒) in the correct boxes.

their direction is from North to South	<input checked="" type="checkbox"/>
they show the shape of a magnetic field	<input type="checkbox"/>
they only appear near hard magnetic materials	<input type="checkbox"/>
they show attraction but not repulsion	<input type="checkbox"/>
they can show the strength of a magnetic field	<input type="checkbox"/>

(2)

(b) Two bar magnets are held near to each other on a horizontal surface. A magnetic field line is shown.



(i) Draw **two** more magnetic field lines on the diagram.

(2)

(ii) The magnets are released. In which direction will they move?

.....

(1)

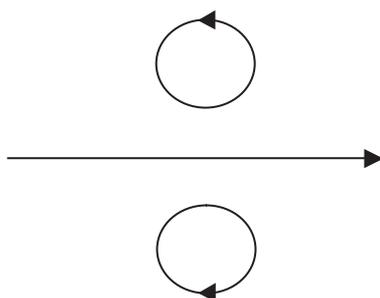
(iii) Explain your answer to part (ii).

.....

(1)



(c) A magnetic field pattern is shown below.



(i) Put a cross (☒) next to the correct words to complete the sentence.

a flat circular coil

This pattern is produced by a straight wire when it is carrying a current.

a solenoid

(1)

(ii) A student claims that this is a uniform magnetic field pattern.

Do you agree? Explain your answer.

.....
.....

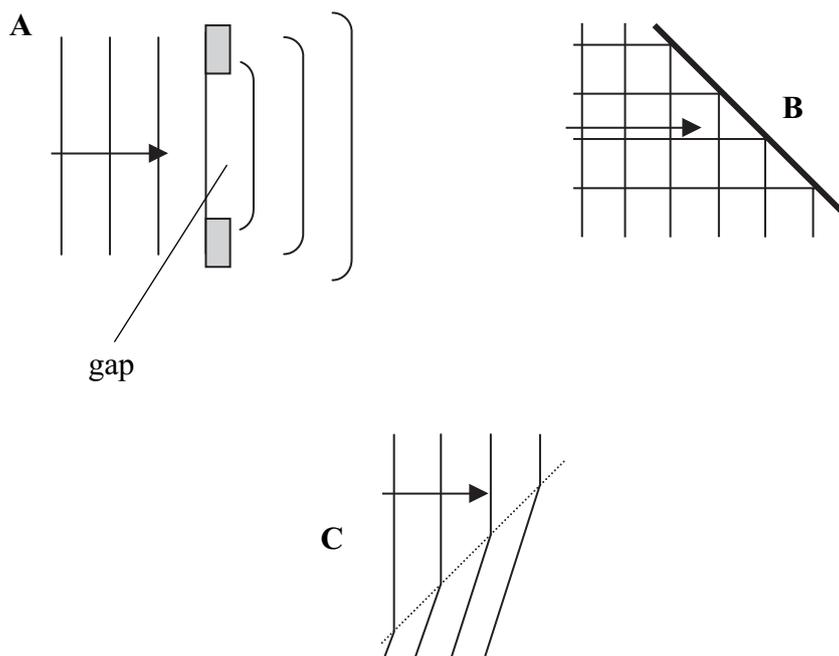
(1)

(Total 8 marks)

Q15



16. (a) Diagrams **A**, **B** and **C** show the behaviour of waves.



Use a word from the box to name each behaviour.

diffraction	interference	reflection
refraction	wavefront	wavelength

A

B

C

(3)



(b) Diagram C shows a reduction in the speed of the waves.

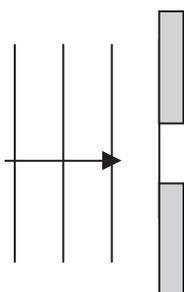
Explain how.

.....

.....

(2)

(c) The gap in A is made smaller, as shown below. Draw three waves after the gap.



(2)

Q16

(Total 7 marks)

TOTAL FOR PAPER: 100 MARKS

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