OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

General Certificate of Secondary Education

SCIENCE: DOUBLE AWARD A PAPER 5 **1983/5**

PHYSICS PAPER 1 **1982/1**

FOUNDATION TIER

SPECIMEN PAPER 2003

1 hour 30 minutes

Candidates answer on the question paper.
Additional materials required:
Pencil
Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 100.
- You will be awarded marks for the quality of written communication where an answer requires a piece of extended writing.

FOR EXAMINER'S USE	
1	
2	
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12	
TOTAL	

This question paper consists of 21 printed pages and 3 blank pages.

Registered Charity Number: 1066969
[Turn over

1 This question is about the electromagnetic spectrum.

(a) The diagram shows parts of the electromagnetic spectrum in order.

Some parts have been named.

radio waves	**K**	**visible light**	**L**	**X-rays**

(i) Write down the name of part **K**. _____ [1]

(ii) Write down the name of part **L**. _____ [1]

(iii) Look at the diagram.

Which part of the spectrum has the **shortest** wavelength?

_____ [1]

(b) Finish the sentences by choosing the **best** words from this list.

The first one has been done for you.

infra-red

microwaves

radio waves

ultra-violet

visible light

Food can be cooked using _____microwaves_____ .

Thermometers can detect _____ .

Holiday photographs taken with an ordinary camera use _____ .

Skin cancer can be caused by _____ . [3]

(c) Describe **one** medical use of **gamma rays**.

_____

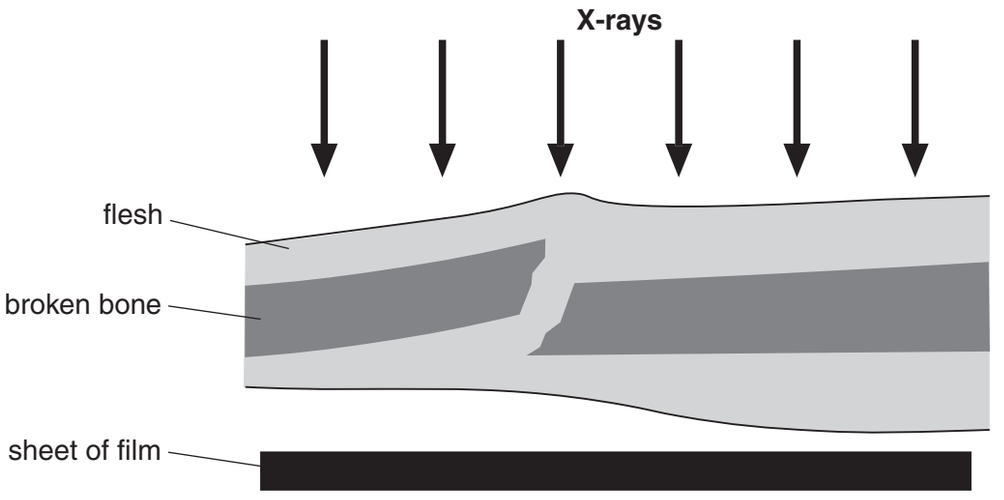
_____ [2]

(d) X-rays are used to take a photograph of a broken bone in a leg.

A sheet of film is placed under the leg.

The X-ray machine is turned on.

An image of the broken bone is produced on the film.



(i) Explain how X-rays produce an image of the bone on the film.

You will be given credit for the correct use of spelling, punctuation and grammar.

_____

_____

_____ [3]

(ii) X-rays are dangerous.

How does the X-ray machine operator protect himself from them?

_____

_____ [1]

(e) When X-rays were discovered scientists did not realise that they were dangerous. X-rays can cause similar effects on the human body as radiation from radioactive sources.

(i) Suggest some evidence about the effects of X-rays which made scientists change their mind.

_____

_____

_____ [2]

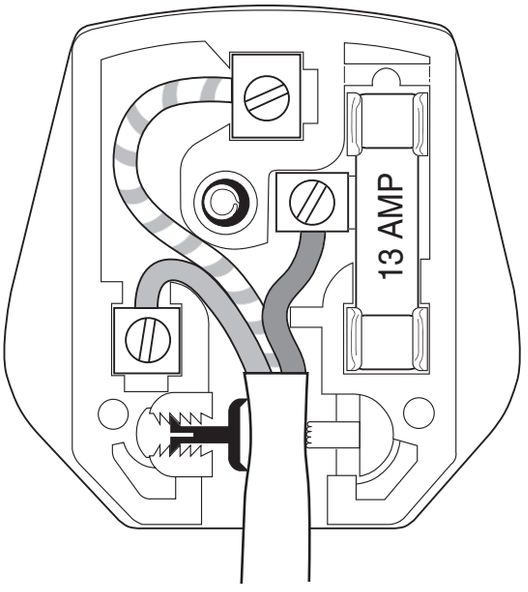
(ii) Suggest one other region of the electromagnetic spectrum which is dangerous **for the same reasons**.

_____ [1]

[Total: 15]

2 This question is about electricity in the home.

(a) The diagram shows the inside of a fused 13A plug.



(i) Write down the **names** of the three wires in the plug.

_____

_____

_____ [3]

(ii) What **colour** wire should you connect to the fuse in the plug?

Put a (ring) around the correct answer.

blue

brown

green and yellow

[1]

(iii) The fuse helps to prevent fire caused by electrical faults.
Explain how it does this.

_____

_____

_____ [2]

(b) Mr Thomas uses a kettle to boil water.

It is a 2 kW kettle.

It takes 6 minutes to boil the water.

(i) Calculate the energy transferred in **kilowatt-hours**.

Use the equation below. You **must** show how you work out your answer.

energy in kWh = power in kW × time in hours

energy = _____ kWh [2]

(ii) Electricity costs 10p per kWh.

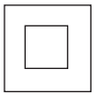
How much does it cost Mr Thomas to boil the water?

You **must** show how you work out your answer.

cost = _____ p [1]

(c) Mrs Thomas uses a 2kW electric lawn mower.

The lawn mower is marked with this symbol.



This means it is double-insulated.

Explain what is meant by the term **double-insulated**.

You will be given credit for the correct use of technical terms and for correct use of spelling, punctuation and grammar.

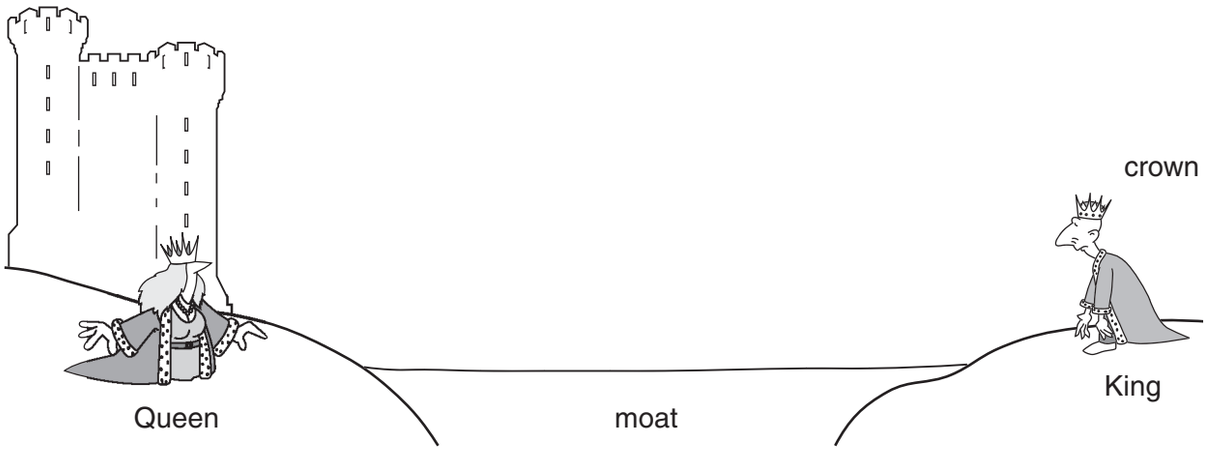
_____

_____

_____ [3]

[Total: 12]

3 Queen Matilda is looking at King Stephen across the moat. The moat is full of water.



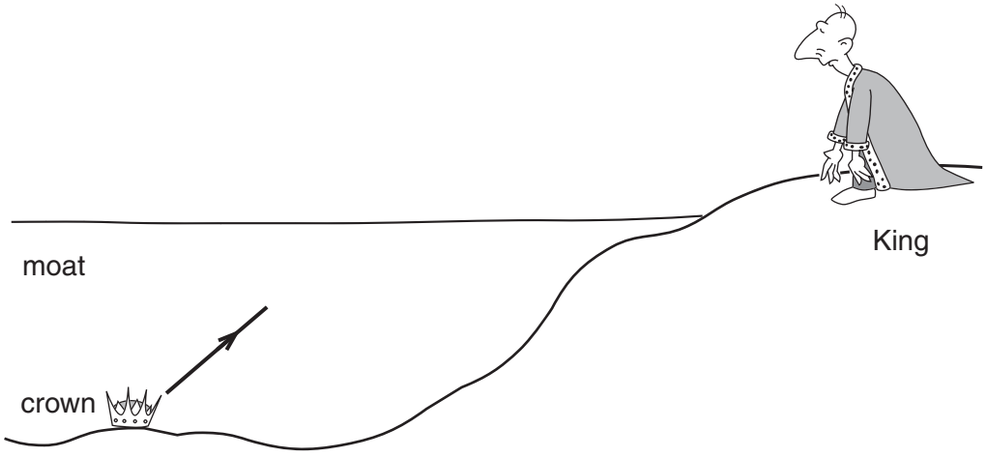
(a) The Queen sees the King's crown reflected in the water.

Draw, on the diagram, the path of a ray of light to show how this happens.

Draw an arrow, on your ray, to show the direction in which the light travels. [3]

(b) The King throws his crown into the moat.

It sinks to the bottom.



(i) Draw the path of the ray of light from the crown to his eyes.
It has been started for you. [2]

(ii) Explain what happens to light when it passes from water into air.

_____

_____

_____ [2]

[Total: 7]

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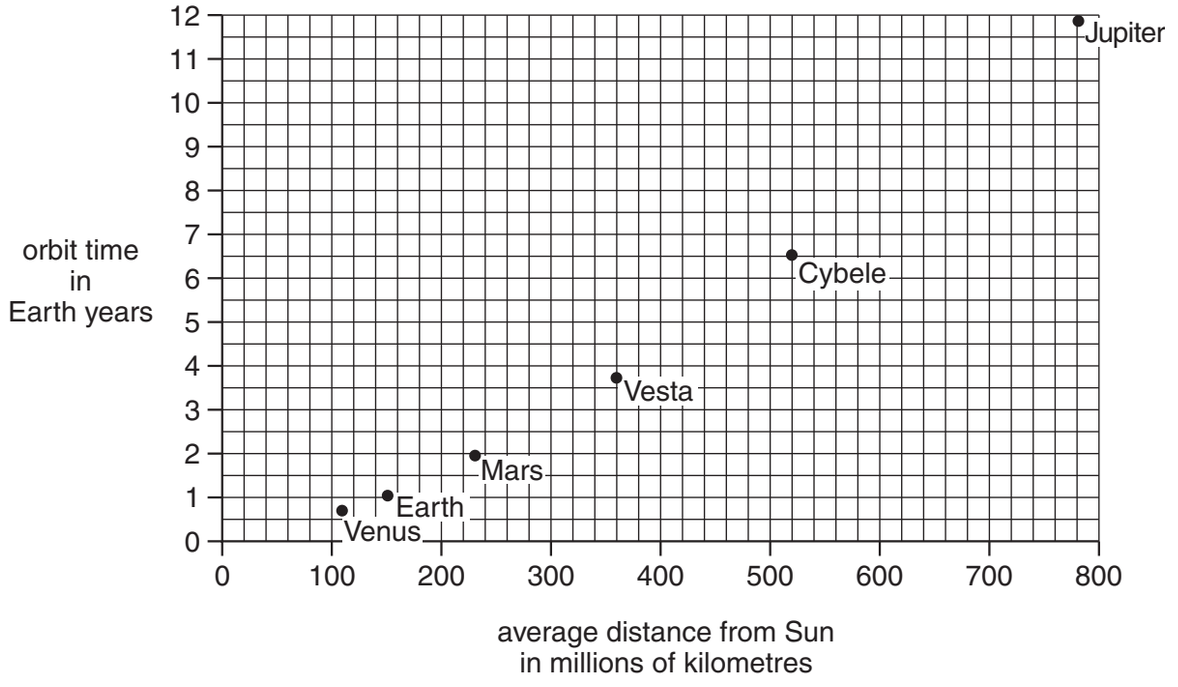
4 The graph shows the orbit time and average distance from the Sun of some planets and some asteroids.

Asteroids are sometimes called minor planets.



(a) Write down the name of the planet labelled **Z**. _____ [1]

(b) Suggest why Jupiter takes longer to orbit the Sun.

_____

_____

_____ [2]

(c) **(i)** Draw a smooth curve through the points on the graph. [1]

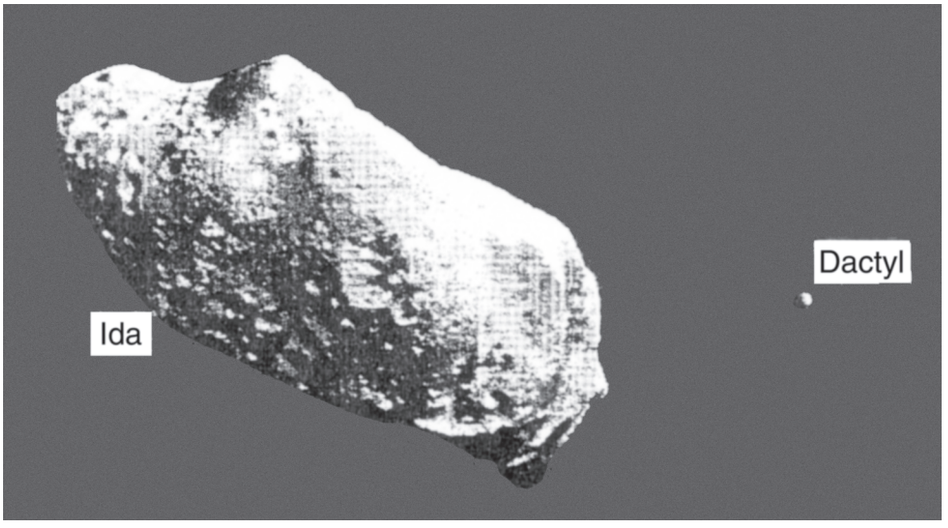
(ii) The asteroid Ida is in orbit at an average distance of 430 million km from the Sun.

Use the graph to find out how long it takes Ida to orbit the Sun.

You **must** show clearly, **on the graph**, how you got your answer.

orbit time = _____ Earth years [2]

(d) The spacecraft, Galileo, recently discovered that Ida has a tiny moon called Dactyl.



(i) Finish the sentence by choosing the **best** word from this list.

Comet **Planet** **Satellite** **Star**

Dactyl can also be called a _____ of Ida. [1]

(ii) What force keeps Dactyl in orbit around Ida?

_____ [1]

(e) Look carefully at the picture of Ida.
Scientists looking at this picture suggest that Ida has no atmosphere.

Give as much evidence as you can from your observations which supports their suggestion.
You will be given credit for the correct use of spelling, punctuation and grammar.

_____

_____

_____

_____

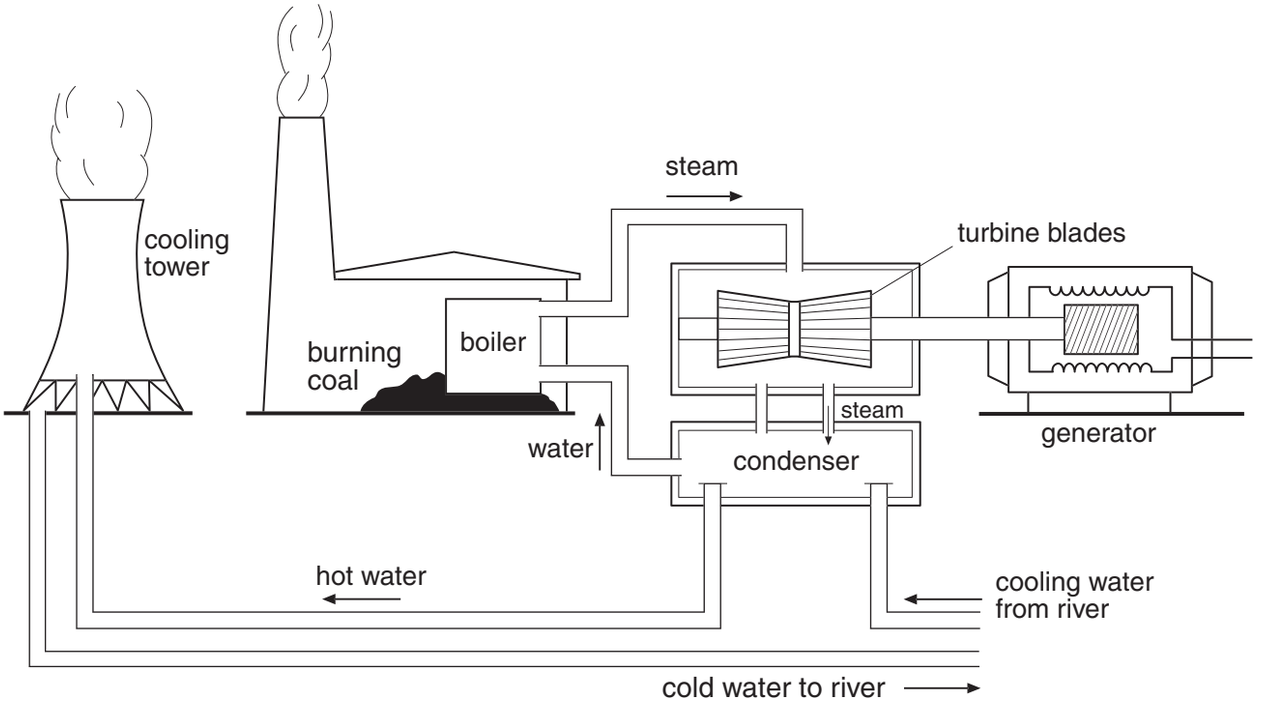
_____

_____ [4]

[Total: 12]

For Examiner's Use

5 This question is about the energy flow through a coal-fired power station.



(a) (i) Finish the sentence by choosing the **best** words from this list.

cool

electricity

heat

steam

The job of the boiler is to _____ water to produce _____ [2]

(ii) What makes the turbine blades spin?

Put a (ring) around the correct answer.

electricity

generator

heat

steam

[1]

(iii) Steam passes into the condenser.

What happens to the steam in the condenser?

_____ [1]

(b) The hot water leaving the condenser could be returned to the river without being cooled.

(i) What effect will this have on the temperature of the river?

_____ [1]

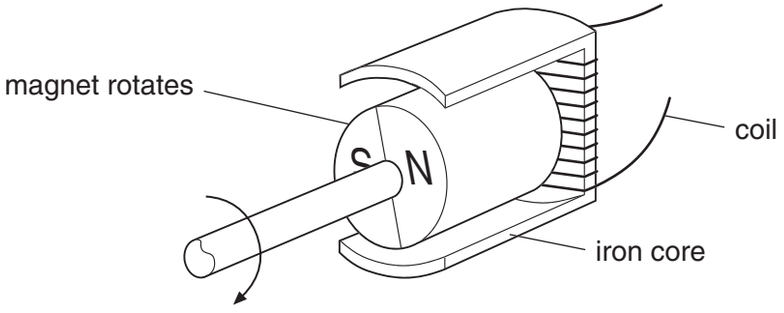
(ii) How can this affect the river environment?

_____

_____ [1]

(c) The diagram shows a model generator.

The magnet rotates. Here, the magnet is turned by hand.



(i) What happens in the coil of wire when the magnet rotates?

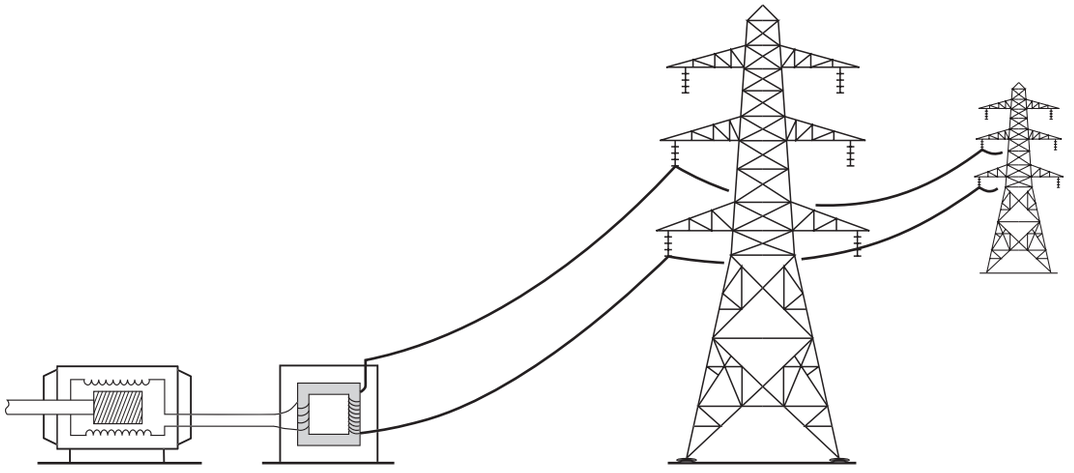
_____ [1]

(ii) Why does this happen?

_____ [1]

(d) The output from the power station generator is connected to a step-up transformer.

The transformer is connected to transmission lines.



Explain why a step-up transformer is needed. Use your ideas about power losses in transmission.
You will be given credit for the correct use of technical terms and for correct use of spelling, punctuation and grammar.

_____

_____

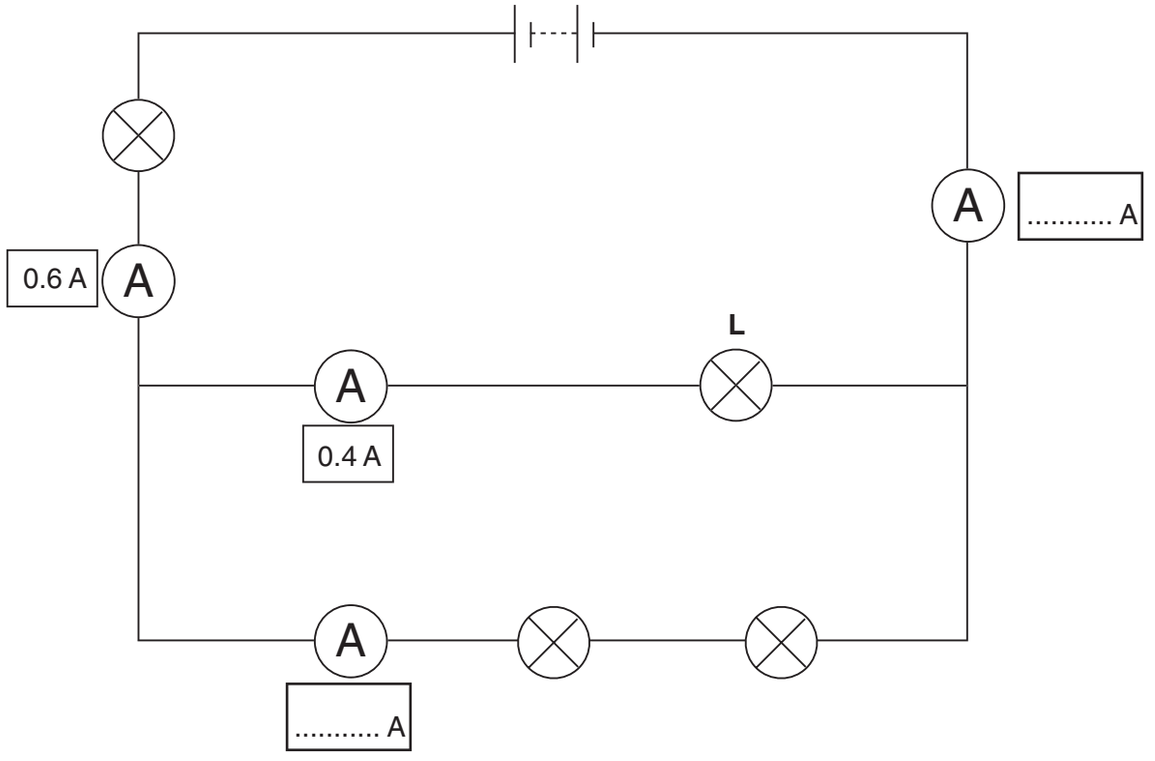
_____

_____

_____ [5]

[Total: 13]

6 Sue connects this circuit.



(a) She measures the current at four places in the circuit.

Two of her readings are shown on the diagram.

Write, in the boxes on the diagram, the readings on the other **two** ammeters. [2]

(b) Sue uses a voltmeter to measure the voltage across lamp **L**.

(i) Draw on the diagram, to show where the voltmeter should be connected.

Use the correct circuit symbol. [2]

(ii) The reading on the voltmeter is 10 V.

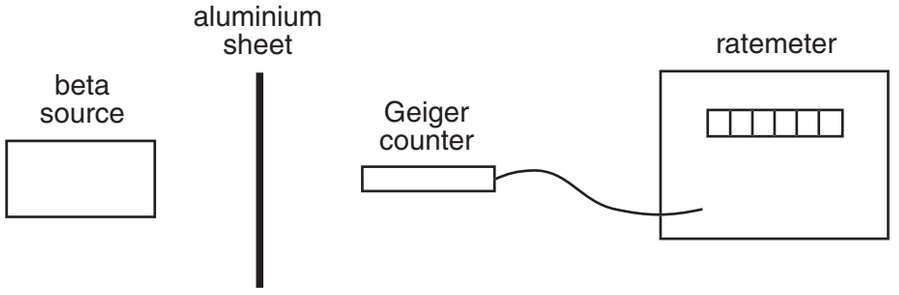
Calculate the power being transferred by lamp **L**.

You **must** show how you work out your answer.

power = _____ unit _____ [4]

[Total: 8]

7 Kate's teacher wants to find how much beta radiation passes through different thicknesses of aluminium.



First he measures background radiation.

It gives a reading of 60 counts per minute on the ratemeter.

(a) Suggest **two** possible sources of background radiation.

1 _____

2 _____ [2]

(b) Write down **two** safety precautions that he should take when using the beta source.

1 _____

2 _____ [2]

He now records the count rate for different thicknesses of aluminium.

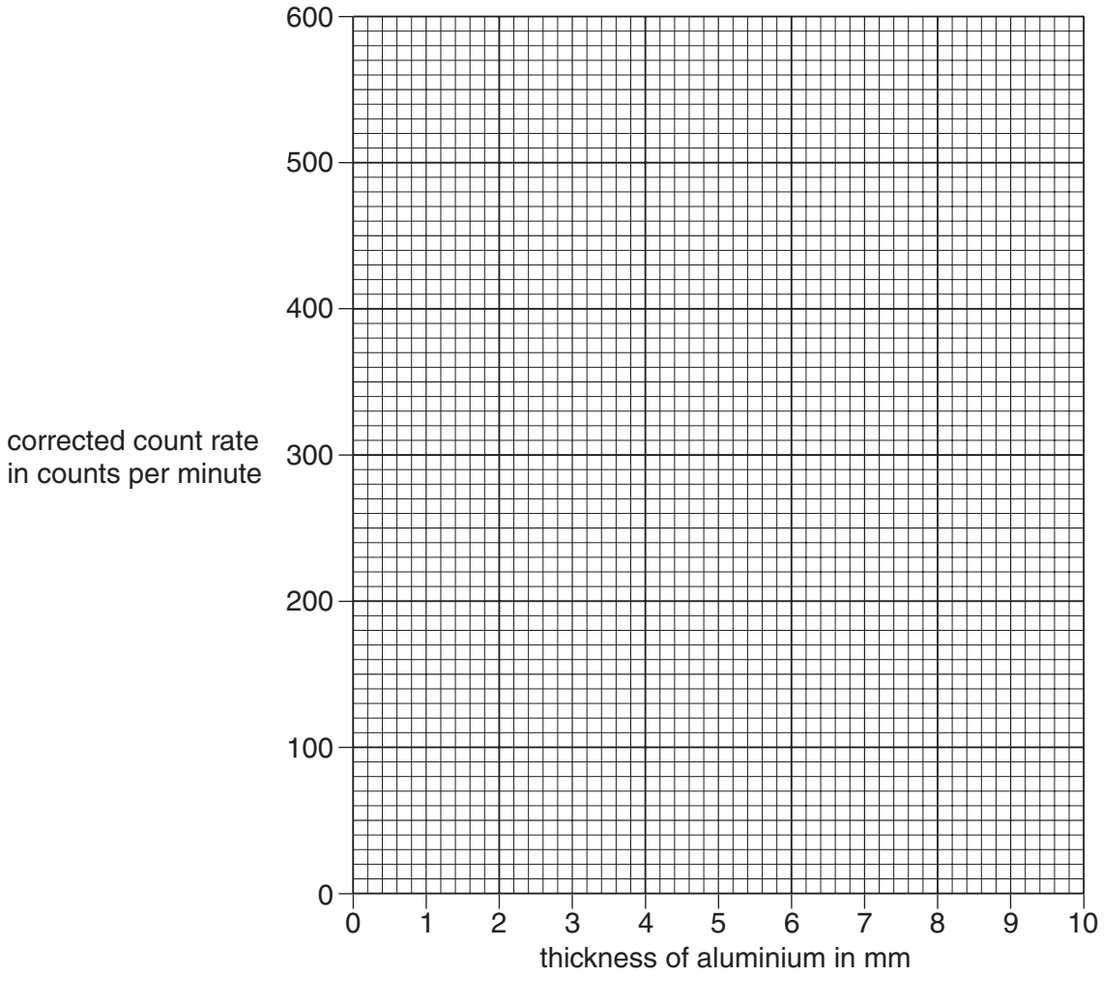
The table shows the results.

thicknesses of aluminium in mm	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
actual ratemeter reading in counts per minute	560	310	180	120	90	75	60	60
corrected count rate in counts per minute	500	250						

(c) Finish the table. There are **six** gaps. [1]

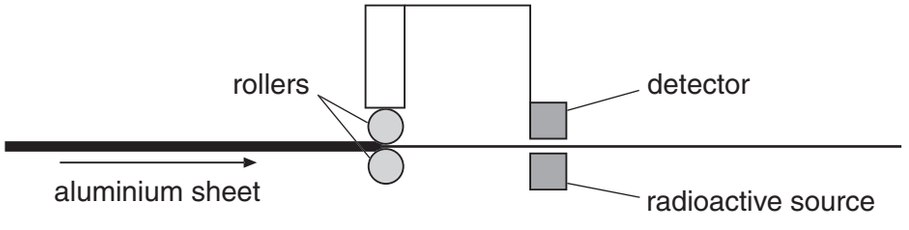
(d) **(i)** Plot the points on the grid opposite. [1]

(ii) Finish the graph by drawing the best curve. [1]



(e) Aluminium is rolled into sheets twenty millimetres thick in a rolling mill.

A radioactive source and a detector are used to check the thickness of the sheet as it leaves the rollers.



(i) Why is beta radiation **not** suitable for checking twenty millimetre sheet?

_____

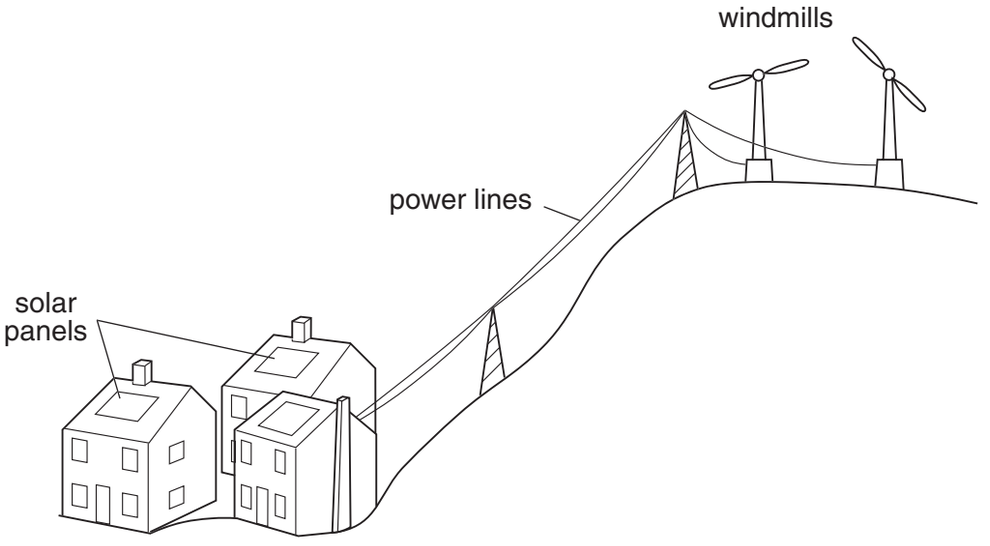
_____ [1]

(ii) Suggest **one** type of radiation which could be used to check the thickness of twenty millimetre sheet.

_____ [1]

[Total: 9]

8 A group of houses uses solar panels and windmills as alternative energy sources.



(a) (i) Write down one **advantage** of using these alternative energy sources.

_____

_____

_____ [1]

(ii) Why is it important that the surface of the solar panel has a large area?

_____

_____ [1]

(iii) Suggest one **disadvantage** of using solar panels.

_____

_____

_____ [1]

(b) Jan works out the efficiency of one of the windmills.

The energy of the air hitting the blades of the windmills is 20 000 J each second.

The energy transferred to the power lines is 5000 J each second.

Calculate the efficiency of the windmill.

Use the equation below. You **must** show how you work out your answer.

$$\text{energy efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

efficiency = _____ [2]

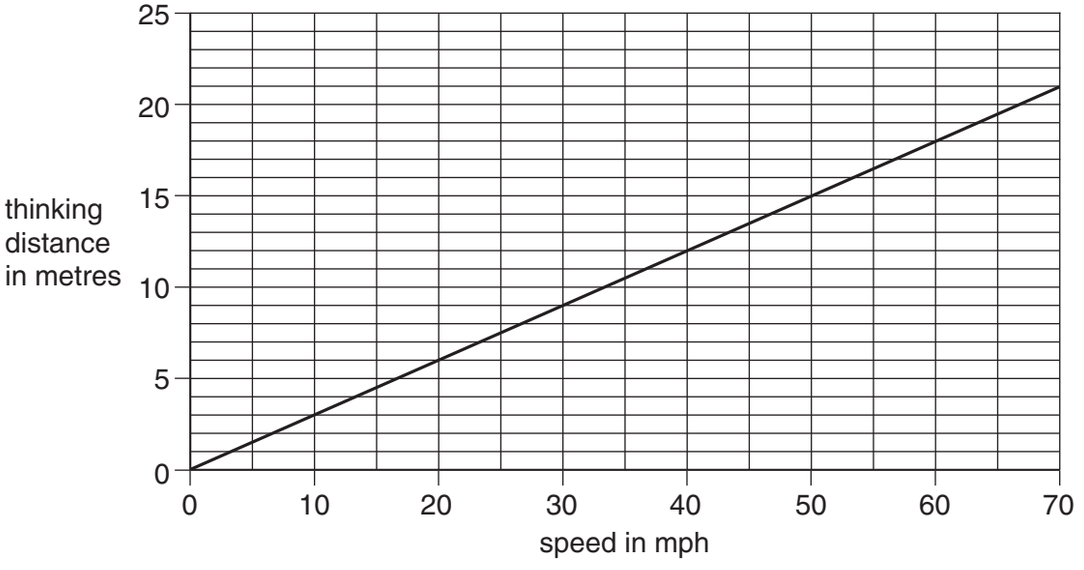
[Total: 5]

9 This is part of a table from the Highway Code.

It is about the stopping distance of cars.

speed in mph	20	30	40	50	60	70
thinking distance in metres	6	9	12		18	21
braking distance in metres	6	14	24	38		75
total stopping distance in metres	12	23				

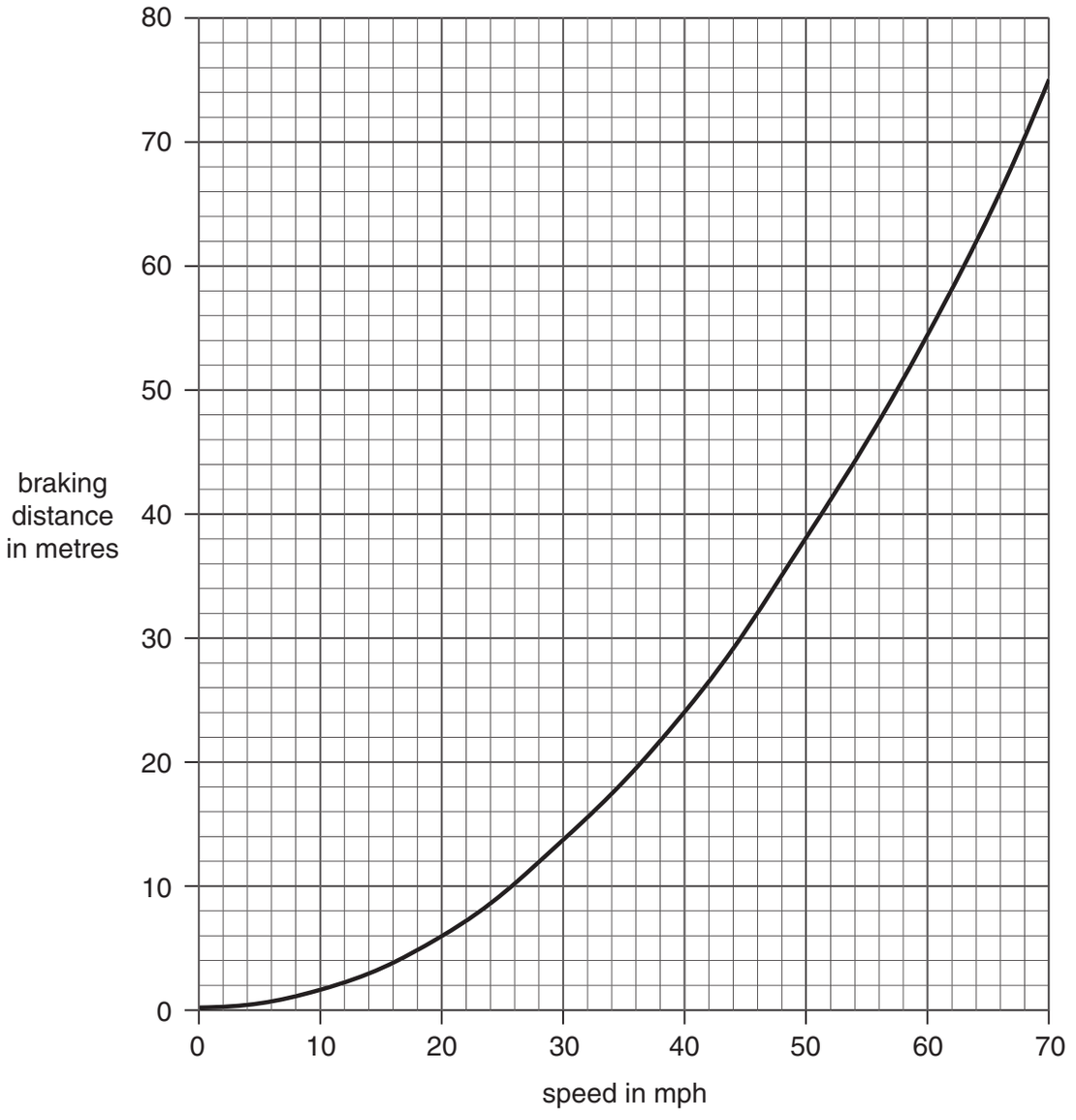
(a) This graph shows how thinking distance changes with speed.



Use the graph to find the **thinking distance** when a driver is travelling at 50mph.

Write this value in the correct place in the table. [1]

(b) This graph shows how braking distance changes with speed.



Use the graph to find the **braking distance** when a driver is travelling at 60mph.

Write this value in the correct place in the table. [1]

(c) Finish the bottom row of the table by writing in the **total stopping distances**. [1]

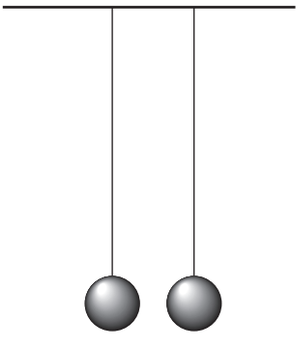
(d) Suggest **two** factors, other than speed and type of car, which affect the **total stopping distance**.

1. _____

2 _____ [2]

[Total: 5]

10 **(a)** Ben hangs two small, light plastic balls on nylon threads.



He rubs a strip of polythene with a cloth.
The strip becomes negatively charged.

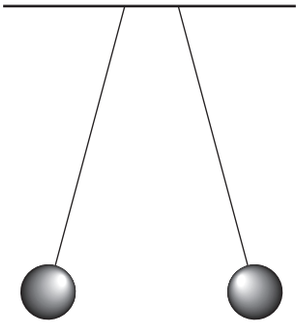
(i) Put a tick (✔) in the box next to the correct statement below:

When the strip is charged electrons transfer from the strip to the cloth. ☐

When the strip is charged electrons transfer from the cloth to the strip. ☐

When the strip is charged electrons are transferred both to the strip and the cloth. ☐ [1]

(ii) He touches **each** ball with the strip.



Why do the balls repel each other?

_____

_____

_____ [2]

(b) Frank does the same experiment, but this time he touches one ball with the **strip** and the other ball with the **cloth**.

(i) What would you expect to happen?

_____ [1]

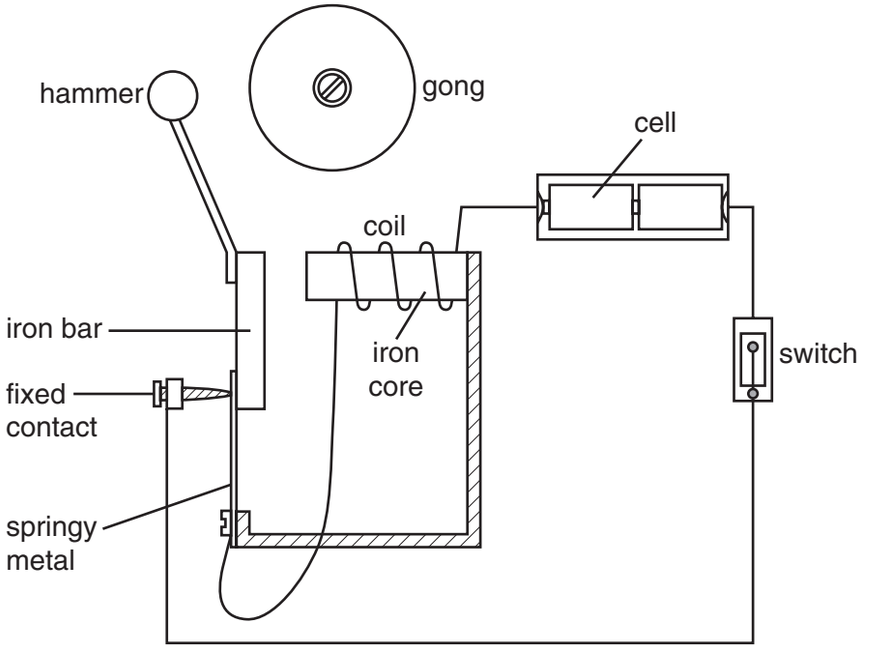
(ii) Explain your answer.

_____ [1]

[Total: 5]

11 This question is about electromagnetism.

(a) Graham makes a simple electric bell.



He closes the switch.

(i) The hammer moves to the right and hits the gong.

Explain why.

_____

_____

_____ [2]

(ii) The hammer now moves back to the left.

Explain why.

_____

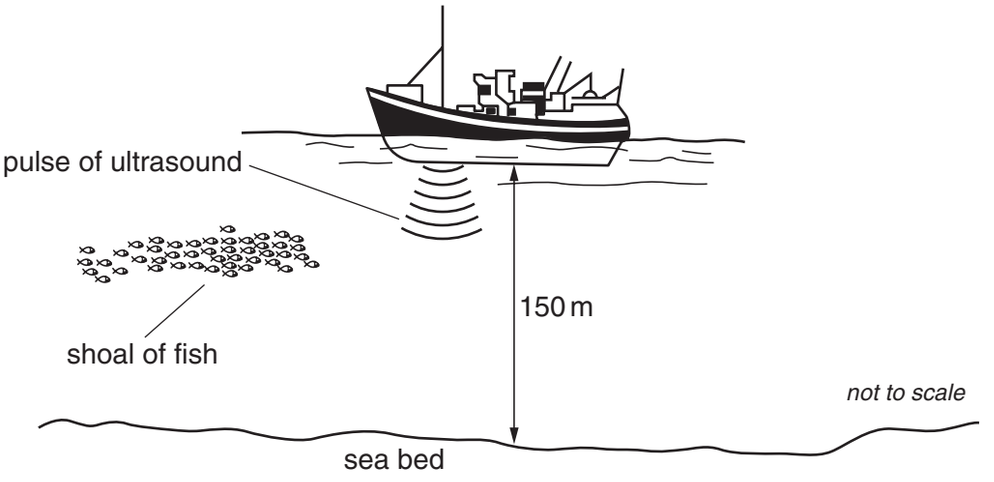
_____

_____ [2]

[Total: 5]

For Examiner's Use

12 A fishing trawler is using pulses of ultrasound (sonar) to find a shoal of fish.



(a) A pulse of ultrasound is sent into the water.

It is reflected back off the sea bed.

The echo of the pulse arrives back at the trawler 0.2s later.

Calculate the speed of ultrasound in sea water.

Show how you work out your answer.

Speed = _____ m/s [2]

(b) The shoal of fish moves under the trawler.

How will this change the time taken for the echo to return?

Explain your answer.

_____

_____

_____

_____[2]

[Total: 4]

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