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mock papers 1-foundation

1 Mike keeps his house warm in winter.

His fuel bills are high.

He wants to save energy and reduce his fuel bills.

(a) Draw lines to show **where** he puts each type of **insulation**.

One has been done for you.

insulation	where
double glazing	wall
loft insulation	roof
carpet	window
cavity-wall insulation	door
draught proofing	floor

[3]

(b) Mike has cavity-wall insulation fitted to his house.

(i) It costs **£800** to fit.

It saves him **£200** each year in fuel bills.

Calculate the **payback time** for cavity-wall insulation.

.....

answer..... years [1]

(ii) Cavity-wall insulation contains trapped **air**.

Why is this air important?

.....

..... [1]

[Total: 5]

[Turn over

2 This question is about waves.

(a) Look at the diagram of the electromagnetic spectrum.

radio waves	microwaves	infrared waves	visible light	ultraviolet light	X-rays	gamma rays
-------------	------------	----------------	---------------	-------------------	--------	------------

(i) Which type of wave is used to **cook** food?

..... [1]

(ii) Which type of wave is used by a TV **remote** control?

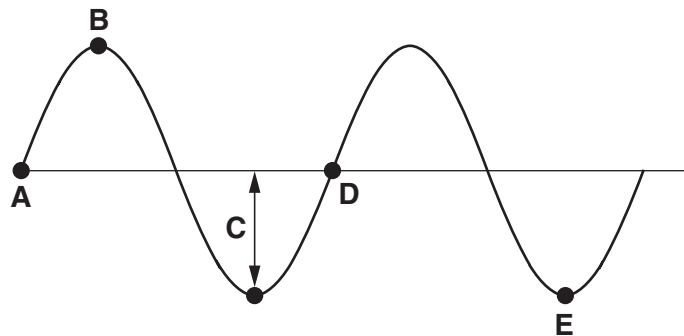
..... [1]

(iii) **Ultraviolet** waves can harm humans.

What **damage** can ultraviolet waves do to humans?

..... [1]

(b) Look at the diagram of a wave.



Complete the sentences.

The **crest** is shown by letter .....

The **amplitude** is shown by letter .....

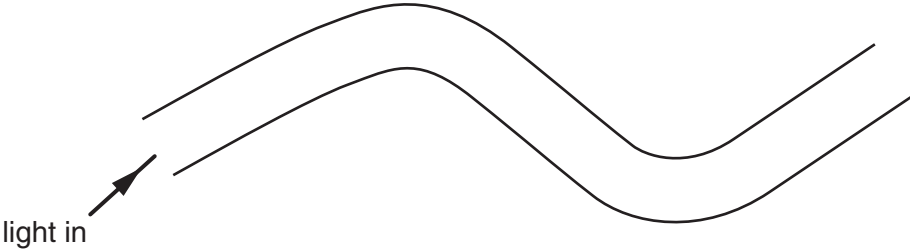
The distance between letters **A** and **D** is called the .....

[3]

[Total: 6]

3 This question is about communications.

(a) (i) Look at the diagram of an optical fibre.



A ray of light travels in the fibre.

It comes out at the other end.

Describe how the light travels through the fibre.

You may draw on the diagram to help your answer.

.....

.....

.....

..... [2]

(ii) Optical fibres are used to transmit information.

The information can be carried by **analogue** or **digital** signals.

Write down two **differences** between analogue and digital signals.

1 .....

.....

2 .....

..... [2]

[Turn over for remainder of question 3

(b) Look at the two types of telephone.



mobile phone



office phone

The mobile phone uses wireless technology.

Write about the **advantages** of using wireless technology to communicate.

.....

.....

..... [2]

[Total: 6]

4 Amrit puts three cups on the table.

They contain different materials at different temperatures.



ice at  $-15^{\circ}\text{C}$



hot tea at  $90^{\circ}\text{C}$



warm milk at  $25^{\circ}\text{C}$

The room temperature is  $20^{\circ}\text{C}$ .

(a) (i) Which one gets **warmer**?

Choose from the list.

- ice
- hot tea
- warm milk

answer..... [1]

(ii) Which one cools **quickest**?

Choose from the list.

- ice
- hot tea
- warm milk

answer..... [1]

(b) The ice melts at  $0^{\circ}\text{C}$ . It stays at  $0^{\circ}\text{C}$  for a long time.

Suggest why.

.....

..... [1]

[Total: 3]

[Turn over

5 (a) The Sun produces a lot of energy.

It transfers energy to Earth as light and heat.

Photocells absorb light energy.

(i) Complete the sentence that explains the job of a photocell.

Photocells absorb light energy from the sun and transfer it into .....  
energy. [1]

(ii) Write down **one** other way in which the Sun's energy can be harnessed.

..... [1]

(b) (i) Describe **one** advantage of using photocells.

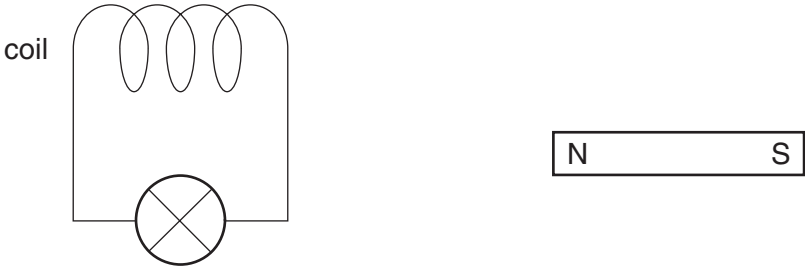
advantage .....  
..... [1]

(ii) Describe **one** disadvantage of using photocells.

disadvantage .....  
..... [1]

[Total: 4]

6 Look at the equipment in the diagram.



(a) Describe how to make electricity using the equipment in the diagram.

.....  
 .....  
 ..... [2]

(b) The amount of electricity made is very small.

Describe **two** ways in which the current produced could be made larger.

1 .....  
 .....  
 2 .....  
 ..... [2]

(c) A generator produces alternating current (ac).

What type of current does a battery produce?

..... [1]

[Total: 5]

[Turn over



7 (a) Power stations can use fossil fuels or renewable fuels.

Look at the list of fuels.

- coal**
- natural gas**
- oil**
- wood**

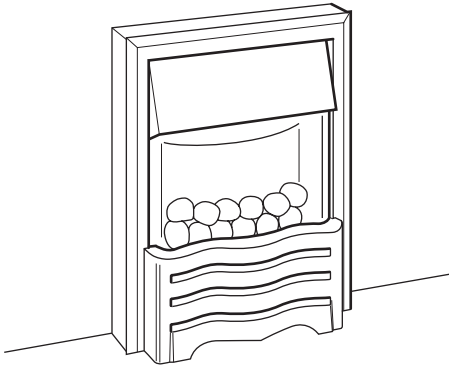
Write down a **renewable** energy source.

Choose **one** from the list.

answer ..... [1]

(b) Una has an electric fire.

Look at the diagram.



She connects it to the 230V mains and switches it on.

There is a current of 8 amps.

Calculate the **power rating** of the electric fire.

The list of equations on page 2 may help you.

.....

.....

.....

answer..... W [2]

(c) Look at the table.

It gives information about domestic appliances.

appliance	power in watts
lamp	100
microwave	850
oven	6000
television	450

Each appliance is used for 30 minutes.

Which appliance is the most expensive to use?

..... [1]

[Total: 4]

[Turn over

8 This question is about nuclear radiation.

Nuclear radiation can be harmful or useful.

(a) Write down **one** use of nuclear radiation.

.....  
..... [1]

(b) Nuclear radiation can be harmful because it damages living cells.

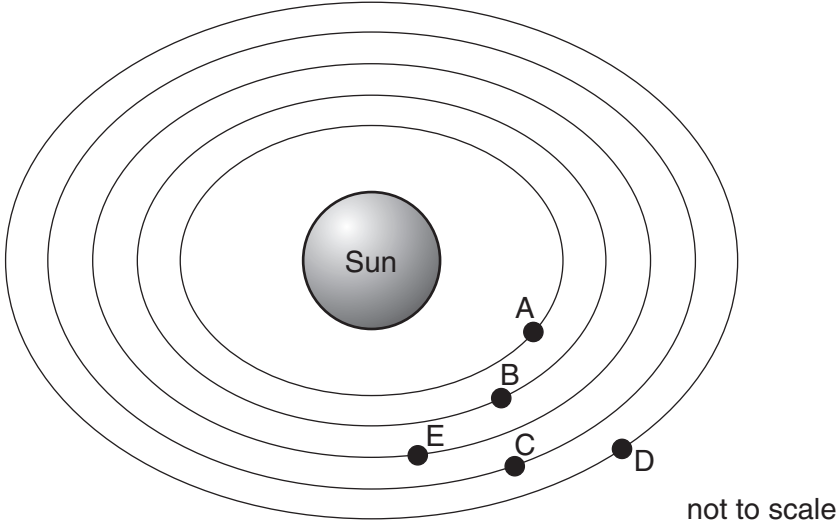
Describe how to handle radioactive materials safely so that the nuclear radiation from them does not damage living cells.

.....  
.....  
.....  
..... [2]

[Total: 3]

9 This question is about the Solar System.

Look at the diagram.



E is the Earth.

A, B, C, and D are objects that orbit (go round) the Sun.

(a) What do we call these objects?

Choose from this list.

- comets
- galaxies
- meteors
- planets
- stars

answer ..... [1]

(b) We can see stars at night, even though they are a long way off.

Suggest why.

.....

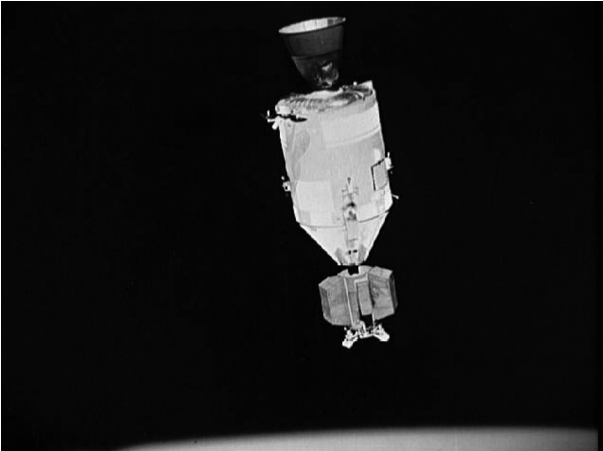
.....

..... [1]

[Turn over for remainder of question 9

(c) It takes a long time to get to other parts of our Solar System.

Look at the picture of a manned spacecraft.



© NASA Johnson Space Center, <http://images.jsc.nasa.gov/>  
Apollo spacecraft in orbit

Manned spacecraft missions need to make sure that the crew stay alive until they return to Earth.

What do the people in this spacecraft need if they are to stay alive during this long journey?

.....  
.....  
.....  
..... [2]


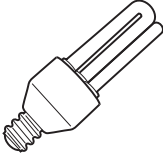
[Total: 4]

mock papers 2-higher

1 Mike tries to reduce energy costs in his house.

(a) He uses different light bulbs.

Look at the table.

type	old light bulb	new light bulb
picture		
electrical input in watts	100W	10W
light output in watts	4W	
energy efficiency	0.04 (4%)	0.50 (50%)

(i) Calculate the **light output** for the new light bulb.

.....  
 .....  
 answer ..... W [1]

(ii) Write down **two** advantages of the new type of light bulb.

advantage 1 .....  
 .....  
 advantage 2 .....  
 ..... [2]

(b) Mike has cavity-wall insulation fitted to his house.

It costs **£800** to fit.

It saves him **£200** each year in fuel bills.

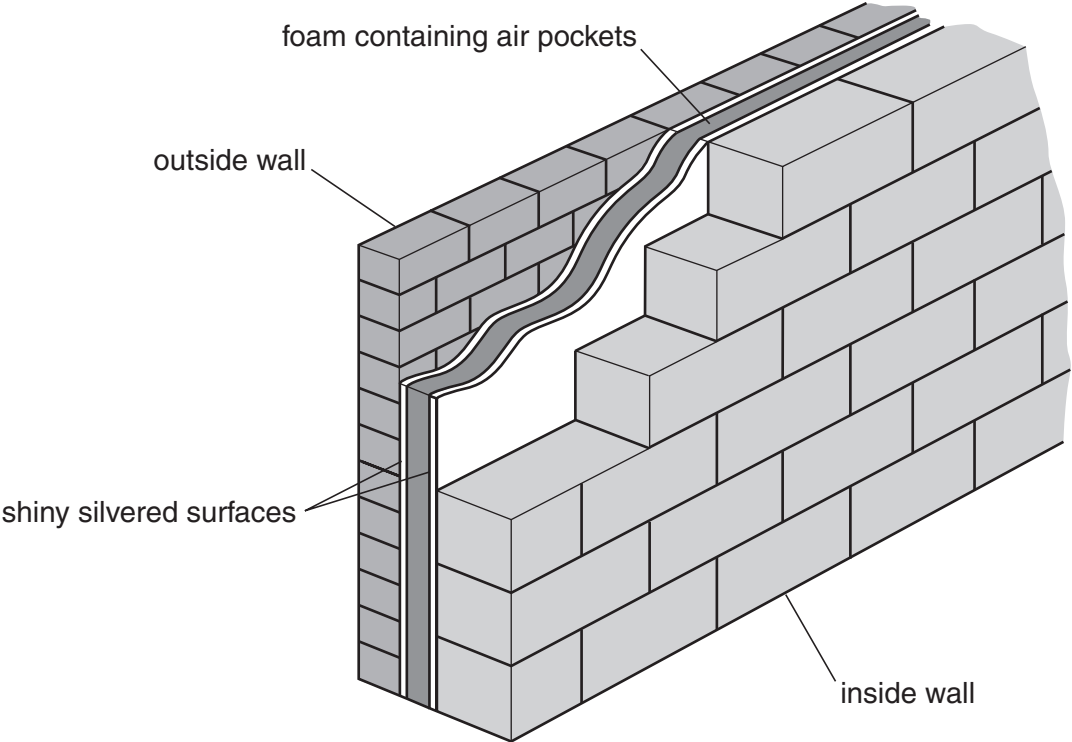
Calculate the **payback time** for cavity-wall insulation.

.....  
 answer..... years [1]

[Turn over for remainder of question 1

(c) Look at the diagram.

It shows cavity-wall insulation in a new house.



The cavity-wall insulation helps **reduce** energy transfer.

Explain how.

In your answer write about

- conduction
- convection
- radiation.

.....

.....

.....

.....

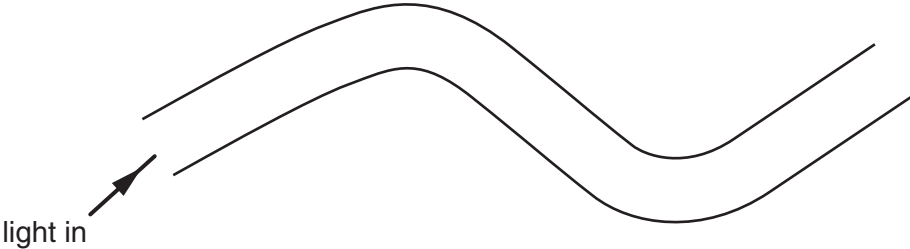
.....

..... [3]

[Total: 7]

2 This question is about communications.

(a) (i) Look at the diagram of an optical fibre.



A ray of light travels in the fibre.

It comes out at the other end.

Describe how the light travels through the fibre.

You may draw on the diagram to help your answer.

.....

.....

..... [2]

(ii) Optical fibres are used to transmit information.

The information can be carried by **analogue** or **digital** signals.

Write down two **differences** between analogue and digital signals.

1 .....

.....

2 .....

..... [2]



(b) Digital signals carry **more information** with **less interference** than analogue signals.

(i) Explain why **more information** can be carried.

.....  
..... [1]

(ii) Explain why there is **less interference**.

.....  
..... [1]

[Total: 6]

**3** John puts ice cubes in a glass.

He heats the ice cubes in his microwave oven.

The microwave has metal sides.

**(a)** The microwaves transfer energy to the ice cubes.

Explain how.

In your answer write about

- penetration
- kinetic energy
- reflection.

.....  
.....  
.....  
.....  
..... [4]

**(b)** The ice cubes melt at 0°C.

They stay at 0°C for a long time.

Suggest why.

.....  
..... [1]

[Total: 5]

[Turn over

4 CD players use **laser** light to read information from the disc.

(a) The laser produces an intense beam of light.

What is special about the waves in the beam?

.....  
..... [1]

(b) How does the laser beam read information from the disc?

.....  
..... [1]

[Total: 2]

5 The Sun produces a lot of energy.

Photocells transfer light energy from the Sun into electricity.

(a) (i) Describe one **advantage** of using photocells.

.....  
..... [1]

(ii) Describe one **disadvantage** of using photocells.

.....  
..... [1]

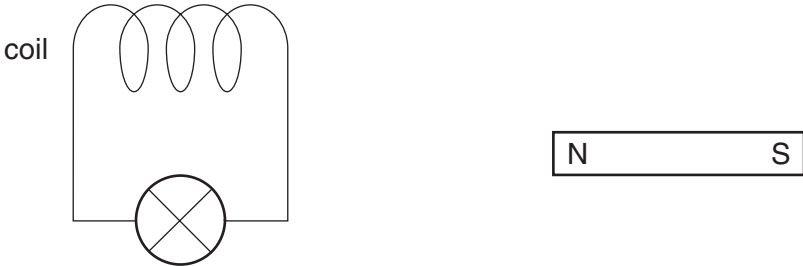
(b) Describe how homes can be kept warm by **passive** solar heating.

.....  
.....  
.....  
..... [2]

[Total: 4]

[Turn over

6 Look at the diagram.



Rob makes electricity by moving the magnet into the coil.

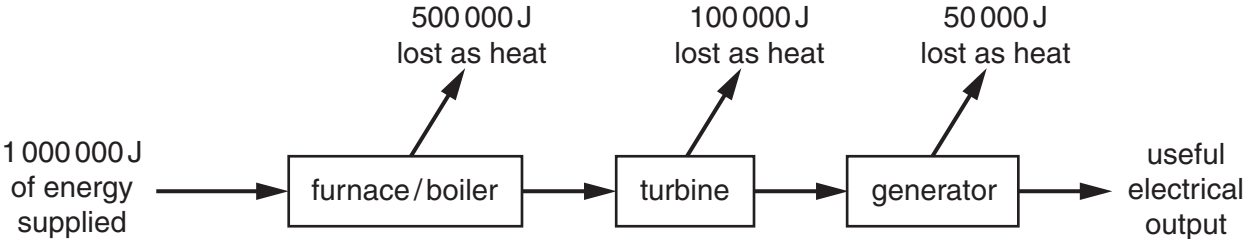
The current produced is very small.

(a) Describe **two** ways in which he can make the current bigger.

- 1 .....
- .....
- 2 .....
- ..... [2]

(b) Look at the diagram.

It shows how electricity is generated in a power station.



Calculate the efficiency of the power station.

The list of equations on page 2 may help you.

- .....
- .....
- .....
- .....
- .....
- .....
- ..... [3]

(c) Power is transmitted from the power station over large distances.

A high voltage is always used.

Explain why.

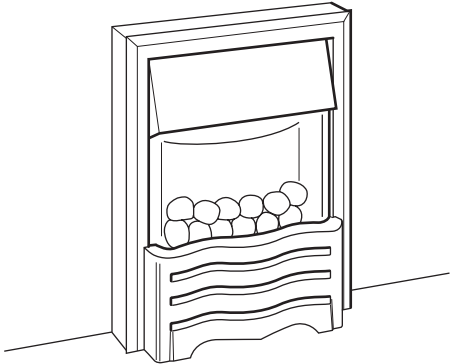
.....  
.....  
.....  
..... [2]

[Total: 7]

[Turn over

7 Una has an electric fire.

Look at the diagram.



She connects it to the 230V mains and switches on.

There is a current of 8 amps.

(a) Calculate the **power rating** of the electric fire.

The list of equations on page 2 may help you.

.....  
.....  
.....

answer ..... W [2]

(b) Most of our electricity is made from burning fossil fuels.

Some of our electricity is made from nuclear fuel.

What are the advantages and disadvantages of using nuclear fuel?

advantages .....  
.....  
.....

disadvantages .....  
.....  
..... [3]

[Total: 5]

8 This question is about the Solar System.

Asteroids orbit our sun.

(a) Complete the sentence.

The Asteroid belt is between the planet ..... and the planet ..... [1]

(b) Scientists sometimes use manned spacecraft to investigate space.

Manned spacecraft have not been used to go from Earth to other planets.



Apollo spacecraft in orbit

Describe some of the difficulties in sending **manned** space craft safely to distant planets.

.....  
.....  
.....  
..... [2]

(c) Comets move through our Solar System.

They speed up as they get near to the Sun.

Explain why.

.....  
.....  
.....  
..... [1]

[Total: 4]

[Turn over



1 Use the article on ‘**Should We Build New Nuclear Reactors?**’ to help you answer this question.

(a) Write down **two** uses of radioactive materials.

- 1 .....
- 2 ..... [2]

(b) Write down the **two** most common sources of exposure to radiation.

- 1 .....
- 2 ..... [2]

(c) Describe what is meant by ‘background radiation’.  
Give one example of a source of background radiation.

- meaning .....
- .....
- example ..... [2]

(d) Write a short letter to the government giving your views on building new nuclear power stations.

Your answer should include

- your view
- **two** reasons for your view, other than cost.

One mark will be for a clear and ordered answer.

Dear Sir,

.....

.....

.....

.....

.....

.....

.....

.....

[3+1]

[Turn over

(e) (i) The article says 'ionising radiation produced is harmful to living cells'.  
Explain how ionising radiation harms living cells.

.....  
.....  
.....[2]

(ii) Cancer cells can be killed using ionising radiation from radioactive materials.  
Suggest some benefits and risks a patient suffering from cancer should consider when  
deciding whether to have radiation treatment or not.

.....  
.....  
.....  
.....[3]

[Total: 15]

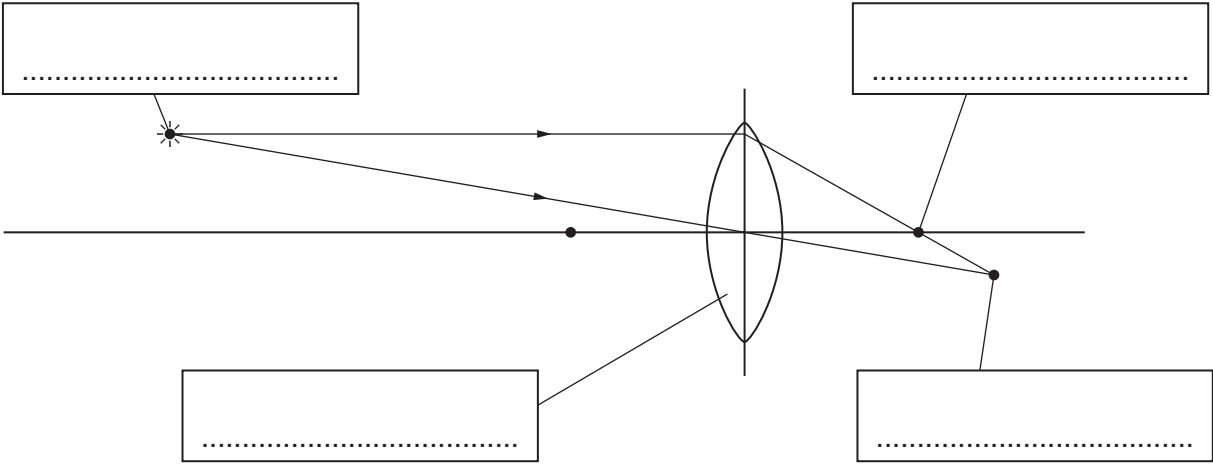
2 Billy is planning to make a telescope to look at distant stars.

He has some lenses made of glass.

(a) He draws a diagram to show how a lens can produce an image from an object.

He forgets to label the diagram with the **lens**, **object**, **image** and **focus**.

Complete the diagram by adding the missing labels.



[3]

(b) Three of Billy's lenses are made from the same glass.



A



B



C

(i) Which lens **A**, **B** or **C** is the most powerful?

Explain your answer.

most powerful lens .....

reason .....

.....[2]

[Turn over

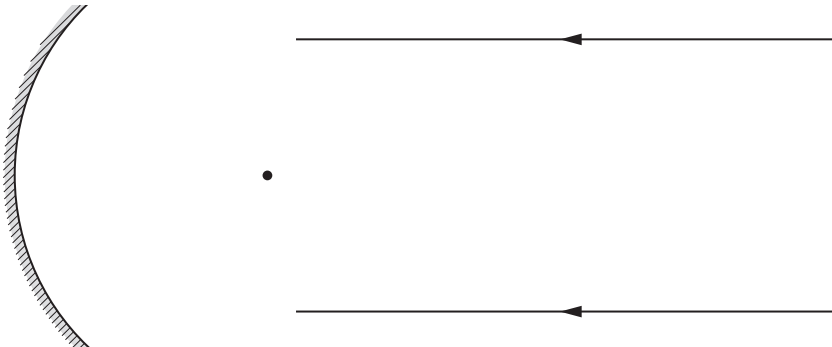
(ii) He decides to use lenses **A** and **C** for his telescope.  
Which lens should he use for the eyepiece?  
Explain why.

lens .....

reason .....[1]

(c) Sally says that most astronomical telescopes use concave mirrors.

(i) A concave mirror brings parallel light rays to a focus.  
Complete the light rays on the diagram to show this.



[2]

(ii) Mirrors are used because it is easier to make very large mirrors than very large lenses.  
Why is it important to have **large** lenses or mirrors in a telescope?

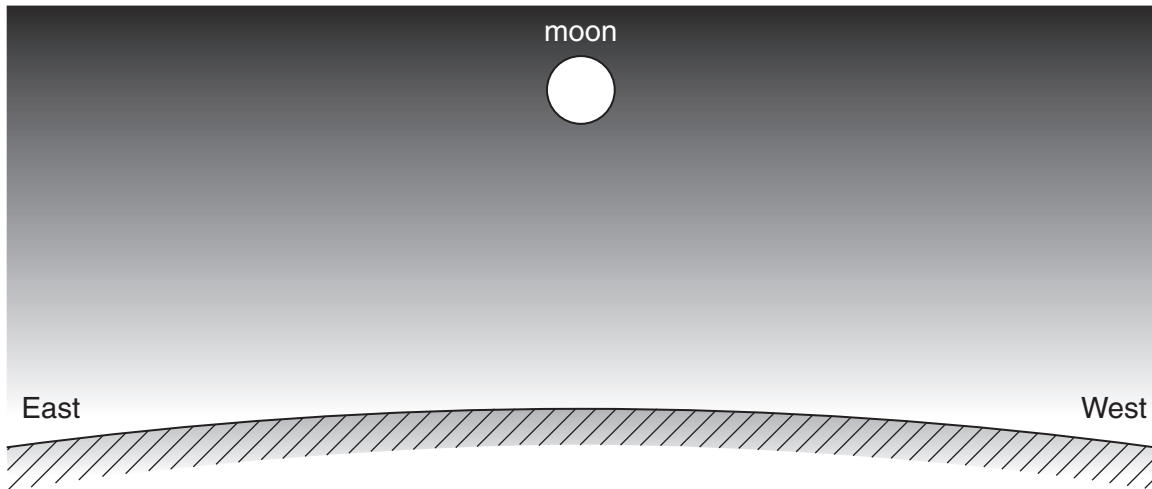
.....

.....[2]

[Total: 10]

3 (a) Sarah is making observations of the Moon.

(i) She records her observations during one night as the Moon moves across the sky. The diagram shows the Moon in the middle of the night.



Draw a line to show the path of the Moon across the sky. Include an arrow to show the direction it is moving along your line. [2]

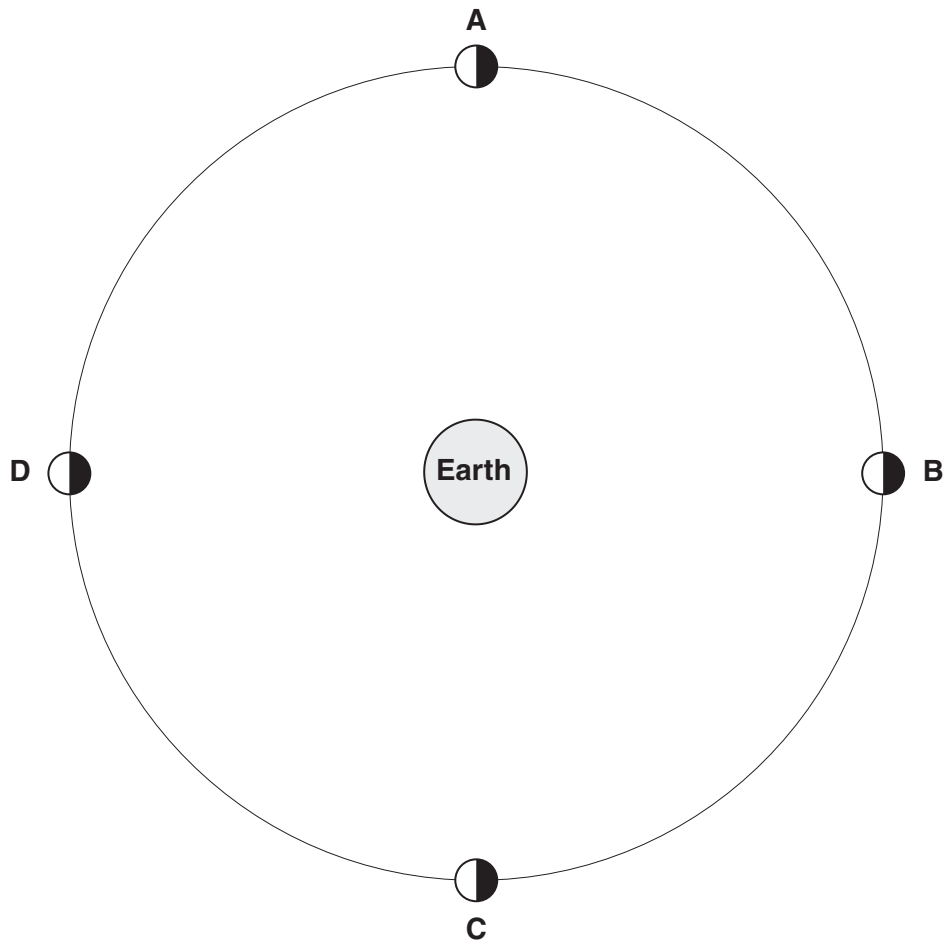
(ii) Explain why the Moon appears to move like this. ....[1]

(iii) The Sun takes 24 hours to move once around the sky. How long does it take for the Moon to go once around the sky? Put a ring around the correct answer. [1]

less than 24hrs      24hrs      more than 24hrs

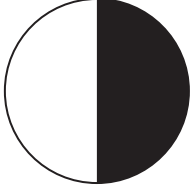
[Turn over

(b) Sarah has a diagram that shows the light and dark sides of the Moon as it orbits the Earth.



(i) Draw an arrow on Sarah's diagram to show a ray of light coming from the Sun. [1]

- (ii) During a month Sarah sees the different phases of the Moon. She draws these phases at each position **A**, **B**, **C**, and **D**. Complete Sarah's table of observations. One has been done for you.

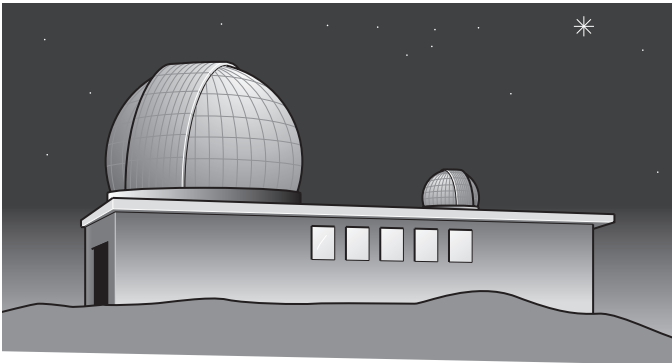
position	phase of Moon
<b>A</b>	
<b>B</b>	
<b>C</b>	
<b>D</b>	

[4]

[Total: 9]

[Turn over

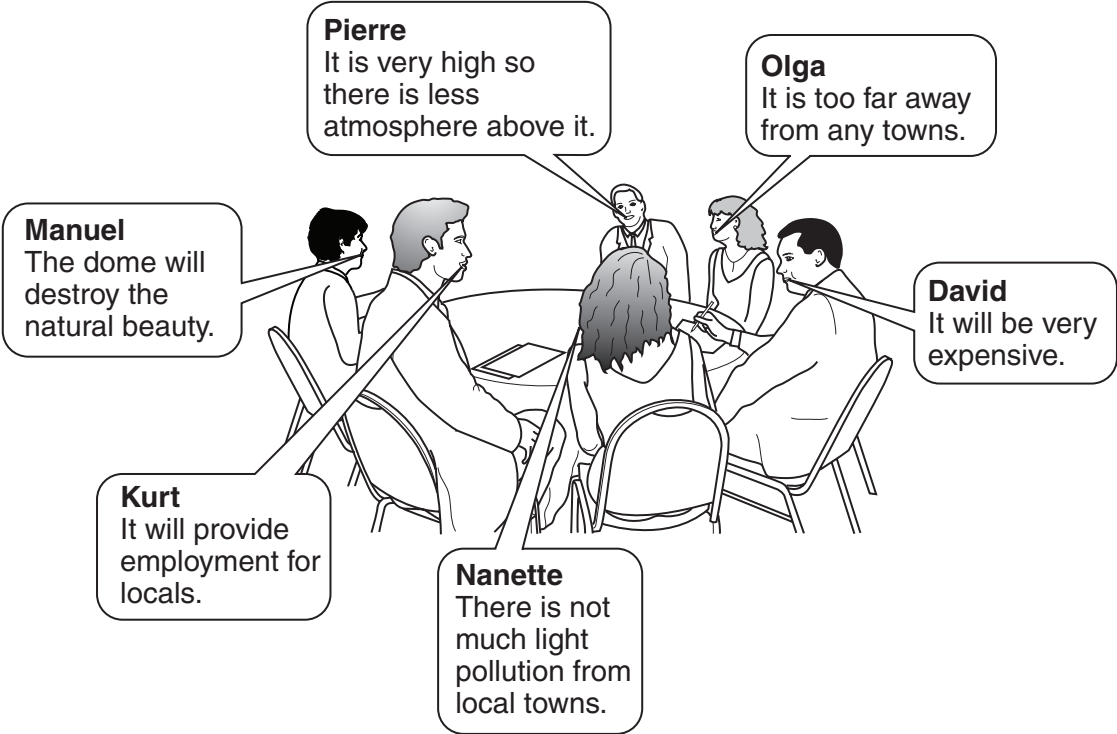
4 A group of countries are planning to build a new astronomical observatory.



(a) Write down the geographical location of a major astronomical observatory on Earth.

.....[1]

(b) At a meeting to decide where to build the new observatory several factors were discussed.



(i) Write down the names of **two** people who are talking about astronomical factors.

..... and .....[2]

(ii) Who is giving an economic argument **in favour** of building the observatory?

.....[1]



(c) One group of astronomers want the new telescope to be in space.

Give **one** advantage and **one** disadvantage of using a telescope in space.

advantage .....

.....

disadvantage .....

.....[2]

(d) Write down **one** advantage of a group of countries working together for a 'big science' project like this.

.....

.....[1]

[Total: 7]

[Turn over

5 The photograph shows stars forming in a gas cloud.



When a cloud of gas is compressed a protostar forms.

(a) What causes the gas cloud to compress?

.....[1]

(b) As the gas cloud compresses the temperature of the gas increases.

(i) As the temperature increases, the pressure in the gas cloud changes.

Explain how the pressure changes.

Your answer should include

- what happens to the pressure
- how the behaviour of the particles of the gas changes.

.....  
.....  
.....[2]

(ii) Initially the temperature of the cloud is about 3K.  
What temperature is 3K in °C?

..... °C [1]

(c) As the temperature inside the protostar increases all the electrons are removed from the atoms. This leaves positively charged nuclei.

(i) The nucleus of an atom can contain two types of particle.  
Complete the table to show the names of the particles.

name of particle	charge on particle
	positive
	none

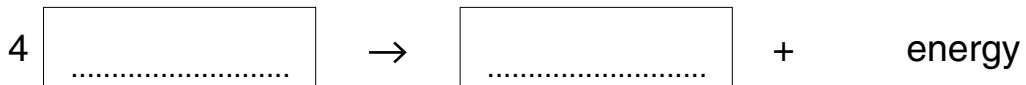
[1]

(ii) There is a strong attractive force which holds the particles together.  
Another force pushes some of the particles in the nucleus apart.  
What is this force?

.....[1]

(d) When the temperature is high enough, nuclei can fuse together to form new elements. This releases energy.

(i) Complete the equation for this fusion reaction with the names of the elements.

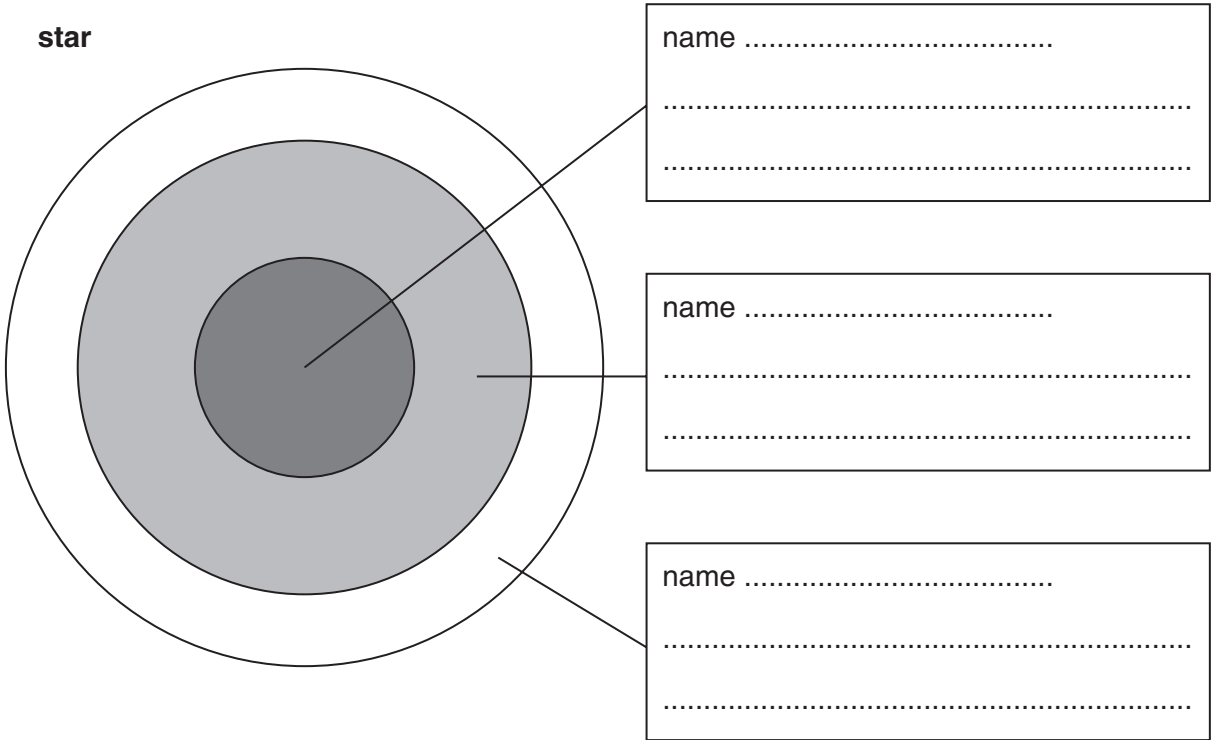


[2]

[Turn over

(ii) The energy produced by the nuclear fusion is radiated into space.

The diagram shows the different regions inside a **star**.  
Label each region with its name and say what is happening to the energy in that region.



[6]

[Total: 14]

**END OF QUESTION PAPER**

## Should We Build New Nuclear Reactors?



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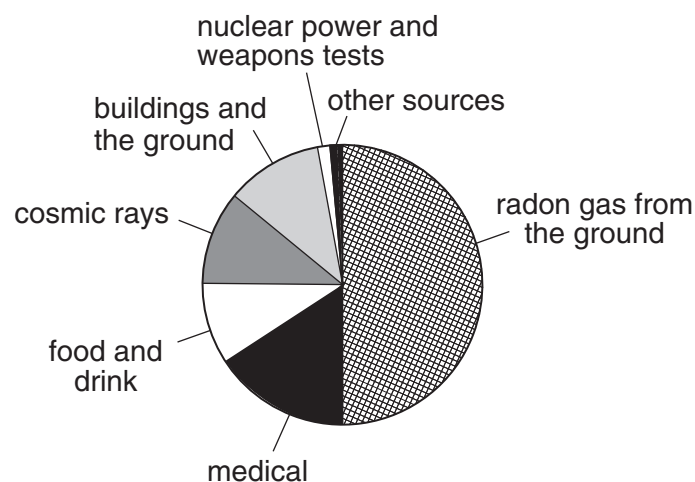
The government is considering the future of nuclear power in the UK. The UK relies on nuclear power for 20% of its electricity, but by 2023 only one of the existing power stations will still be working and will only supply about 7%.

No new reactors have been built since the 1980s because there have been problems with accidents, high decommissioning costs and the problem of nuclear waste. These problems have reduced political and public enthusiasm. But, with soaring oil and gas prices, dwindling domestic fossil fuel reserves and pressure to tackle climate change, many argue that a new generation of reactors has to be considered.

As well as producing electricity, nuclear reactors also produce radioactive materials. These are used in medicine to treat cancer, track chemicals in the body and sterilise surgical instruments. Radioactive materials are also used to sterilise food and are used in smoke detectors.

The main risk from nuclear power is exposure to radioactivity. The ionising radiation produced is harmful to living cells. This can be a hazard to health, and exposure to too much radiation is very dangerous. However, we are all exposed to 'background radiation' all the time.

### Sources of exposure to radiation



mock papers 4-higher

1 Use the article on 'Should We Build New Nuclear Reactors?' to help you answer this question.

(a) (i) The article says 'ionising radiation produced is harmful to living cells'. Explain how ionising radiation harms living cells.

.....  
.....  
.....[2]

(ii) Cancer cells can be killed using ionising radiation from radioactive materials. Suggest some benefits and risks a patient suffering from cancer should consider when deciding whether to have radiation treatment or not.

.....  
.....  
.....  
.....[3]

(b) In a nuclear reactor the fission of a uranium nucleus can give rise to a chain reaction. Explain what is meant by a chain reaction. You may use diagrams to help.

.....  
.....  
.....[3]

(c) The article mentions some new safety features of modern reactor designs. Explain how **one** of these features reduces the risk associated with a nuclear reactor.

.....  
.....  
.....[1]

[Turn over

- (d) The two types of uranium isotopes U-235 and U-238 have similarities and differences in the particles that make up their nuclei.  
Describe a similarity and a difference between the two nuclei.

.....  
.....  
.....  
.....[2]

- (e) Uranium 238 has a half life of 4.5 billion years.  
How long would it take for a sample of U-238 to lose 7/8 of its radioactivity?  
Show your working.

answer ..... years [2]

[Total: 13]

2 The photograph shows stars forming in a gas cloud.



When a cloud of gas is compressed a protostar forms.

(a) What causes the gas cloud to compress?

.....[1]

(b) As the gas cloud compresses the temperature of the gas increases.

(i) As the temperature increases, the pressure in the gas cloud changes.

Explain how the pressure changes.

Your answer should include

- what happens to the pressure
- how the behaviour of the particles of the gas changes.

.....  
.....  
.....[2]

(ii) Initially the temperature of the cloud is about 3K.

What temperature is 3K in °C?

..... °C [1]

[Turn over



(c) As the temperature inside the protostar increases all the electrons are removed from the atoms. This leaves positively charged nuclei.

(i) The nucleus of an atom can contain two types of particle.  
Complete the table to show the names of the particles.

name of particle	charge on particle
	positive
	none

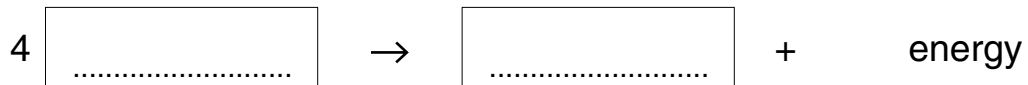
[1]

(ii) There is a strong attractive force which holds the particles together.  
Another force pushes some of the particles in the nucleus apart.  
What is this force?

.....[1]

(d) When the temperature is high enough, nuclei can fuse together to form new elements. This releases energy.

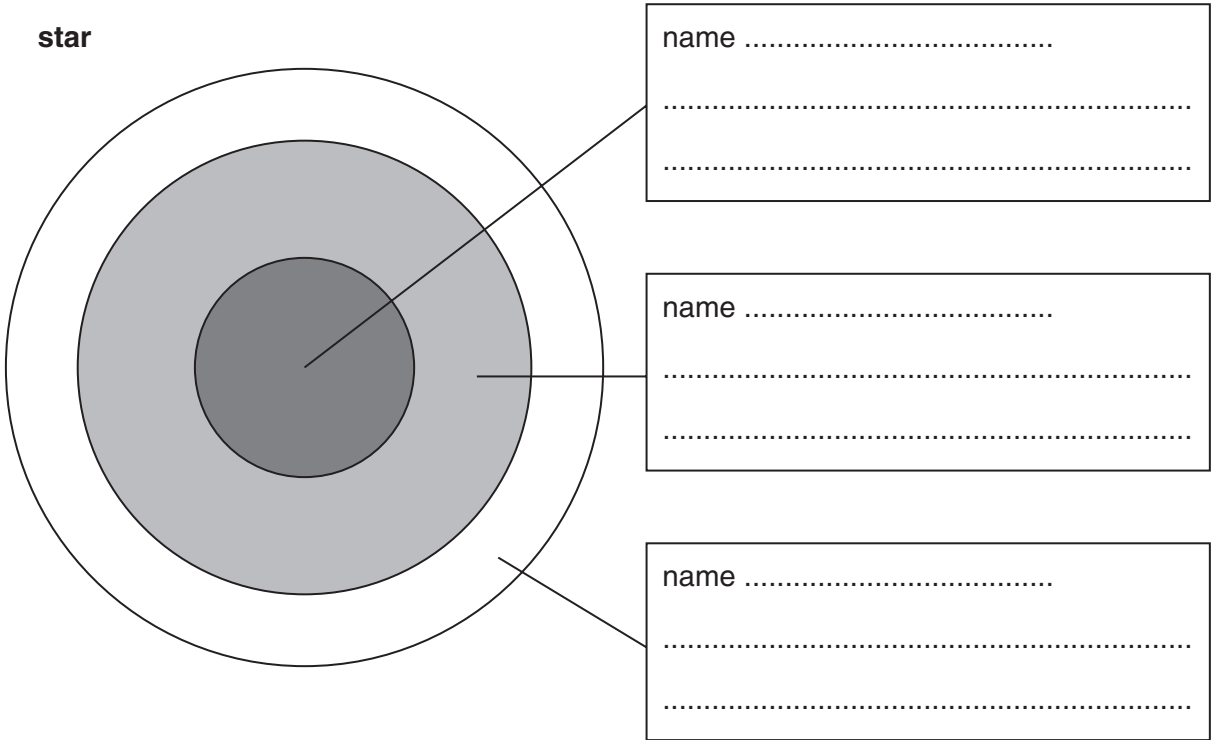
(i) Complete the equation for this fusion reaction with the names of the elements.



[2]

(ii) The energy produced by the nuclear fusion is radiated into space.

The diagram shows the different regions inside a **star**.  
Label each region with its name and say what is happening to the energy in that region.



[6]

[Total: 14]

[Turn over

3 (a) Sarah measures how long it takes the Sun and Moon to move across the sky.  
The Sun takes 24 hours to move once around the sky.  
The Moon takes **longer** than 24 hours.

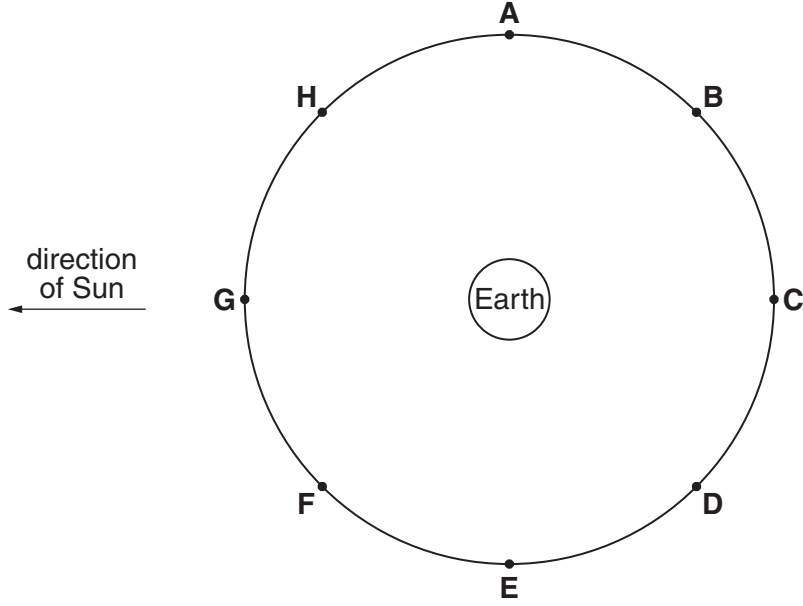
(i) How much **longer** does the Moon take to move once around the sky?

.....[1]





(ii) Explain why the Moon takes longer to move across the sky.

.....  
.....  
.....[2]

(b) The Moon orbits the Earth.  
During an orbit it shows different phases.



Sarah sketches the phase of the Moon at different positions in its orbit.  
Complete the table to show the position of the Moon in its orbit, for each phase.  
One has been done for you.

phase of Moon	letter of position in orbit
	A
	
	
	

[3]

- (c) The Moon orbits the Earth approximately once a month.  
Solar eclipses occur much less often.  
Explain what causes a solar eclipse and why they are so rare.  
You may use a diagram to help you answer.

.....

.....

.....

.....

[3]

[Total: 9]

[Turn over

- 4 Many astronomical projects now involve international cooperation.  
Describe one example of this.  
Use your example to explain why international co-operation is important for big astronomical projects.

One mark will be for a clear and ordered answer.

.....

.....

.....

.....

.....

.....

.....

.....

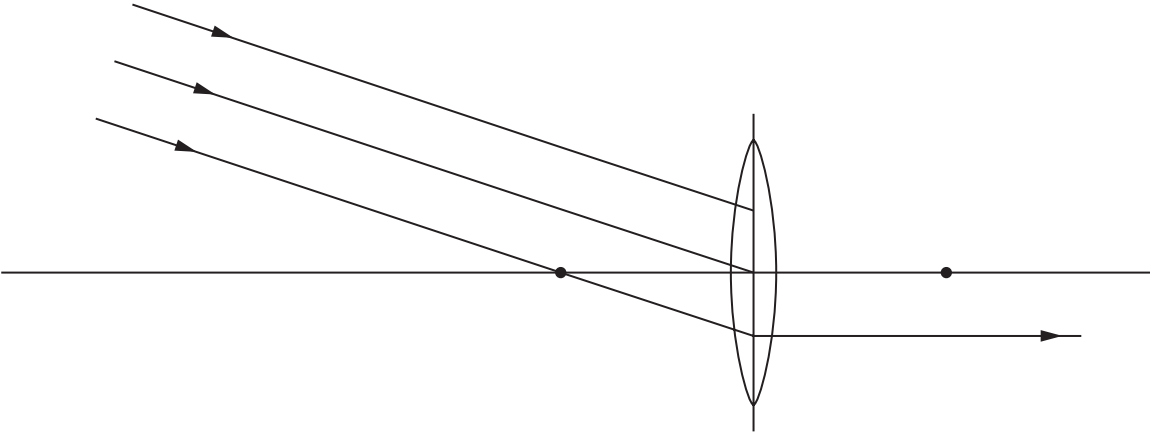
.....

.....[4+1]

[Total: 5]

5 Billy is making a simple telescope.

- (a) He draws a diagram to show how a lens can produce an image of a distant object. The focal points of the lens are shown by dots. He draws three rays coming from the distant object. Complete the diagram to show how the image is formed. Label the position of the image on the diagram.



[3]

(b) Billy does some calculations to decide which lenses to use for his telescope.

- (i) What is the focal length of a lens with power 20 dioptries? You must show your calculation.

focal length = ..... m [2]

- (ii) The lenses he chooses have focal lengths of 0.5 m and 0.01 m. What will be the magnification of the telescope? You must show your calculation.

magnification = ..... [2]

- (iii) Explain why he should **not** choose two lenses with the same focal length.

.....  
 .....[1]

[Turn over

(c) Most astronomical telescopes do not use an objective lens.

(i) What do they use instead of an objective lens?

.....[1]

(ii) Draw a diagram to show how parallel rays of light are brought to a focus by your answer to part (i).

[2]

(d) Radio waves and visible light waves have different wavelengths. Radio telescopes must have much larger apertures than visible light telescopes to produce equally sharp images. Explain why the radio telescopes need to be so much larger than optical telescopes.

.....  
.....  
.....  
.....[3]

[Total: 14]

**END OF QUESTION PAPER**

## Should We Build New Nuclear Reactors?



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The government is considering the future of nuclear power in the UK.

The UK relies on nuclear power for 20% of its electricity, but by 2023 only one of the existing power stations will still be working and will only supply about 7%.

No new reactors have been built since the 1980s because there have been problems with accidents, high decommissioning costs and the problem of nuclear waste. These problems have reduced political and public enthusiasm. But, with soaring oil and gas prices, dwindling domestic fossil fuel reserves and pressure to tackle climate change, many argue that a new generation of reactors has to be considered.

As well as producing electricity, nuclear reactors also produce radioactive materials. These are used in medicine to treat cancer, track chemicals in the body and sterilise surgical instruments. Radioactive materials are also used to sterilise food and are used in smoke detectors.

The main risk from nuclear power is exposure to radioactivity. The ionising radiation produced is harmful to living cells. This can be a hazard to health, and exposure to too much radiation is very dangerous.

The naturally occurring metal uranium (a heavy, unstable element) is most commonly used in power stations. There are several different types – called isotopes – of uranium, which produce different kinds of ionising radiation.

isotope	half life	type of radiation produced
U-235	700 million years	alpha
U-238	4.5 billion years	alpha
U-239	24 minutes	beta

The worst type of accident in a nuclear power station is a melt-down, when the nuclear chain reaction gets out of control and generates enough heat to melt down the reactor. Modern reactors are designed in such a way that they shut themselves down if left alone. Constant intervention is needed to keep them operating – in contrast to the older reactor designs, which required constant intervention to keep the reaction under control. One recent design also has water stored above the reactor, which can be readily released onto the reactor.



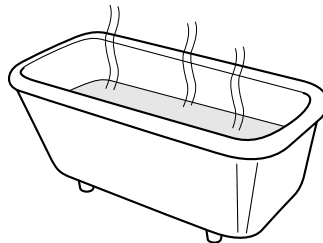
**mock papers 5-foundation**

**1 (a)** Look at the diagrams and temperatures of three objects.

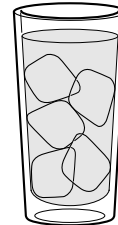
The objects are in a room at 20°C.



cup of tea at 80°C



bath of hot water at 30°C



glass of water at 0°C

Which object cools the fastest?

Choose from the list.

**cup of tea**

**bath of water**

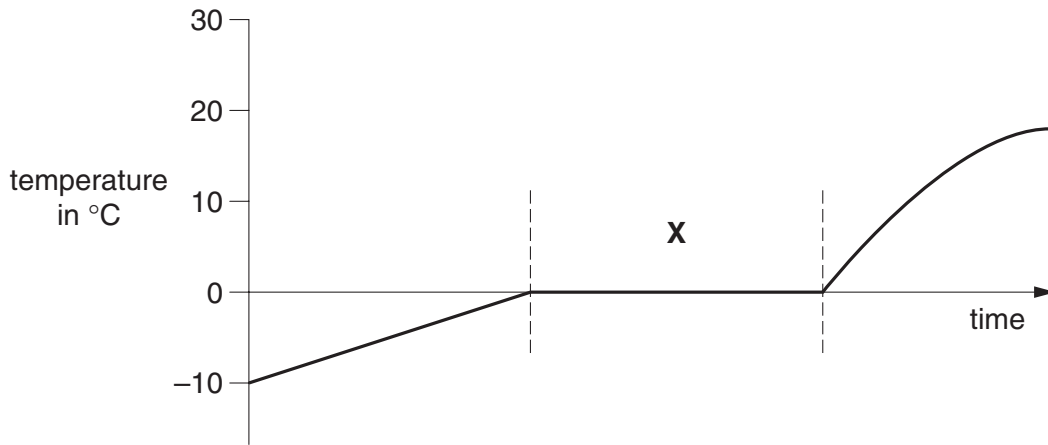
**glass of water**

answer ..... [1]

(b) Molly takes a block of ice from her freezer.

She puts it in a warm room at 20°C.

Look at her graph of how the temperature changes with time.



What is happening to the ice in the part of the graph marked X?

Choose from the list.

**boiling**

**condensing**

**evaporating**

**freezing**

**melting**

answer ..... [1]

[Total: 2]

2 (a) Look at the table of some objects in Kevin's house.

They are made from different materials.

Some materials are **good** conductors of heat.

Some materials are **bad** conductors of heat.

Put a tick (✓) in the correct box to show if the material is a good or bad conductor of heat.

The first one has been done for you.

material	good conductor	bad conductor
steel radiator	✓	
copper pan		
wooden handle		
glass dish		
aluminium kettle		
polystyrene foam		

[2]

(b) Kevin wants to save money by insulating his house.

He wants to reduce the energy lost by conduction.

Suggest **one** way he could reduce the energy lost by **conduction**.

.....  
..... [1]

(c) To save more money Kevin replaces the light bulbs in his house with 'low-energy bulbs'.

One of the light bulbs uses 40 000 joules of electrical energy in one hour.

It gives out 10 000 joules of light energy in one hour.

Calculate the **efficiency** of the bulb.

The equations on page 2 may help you.

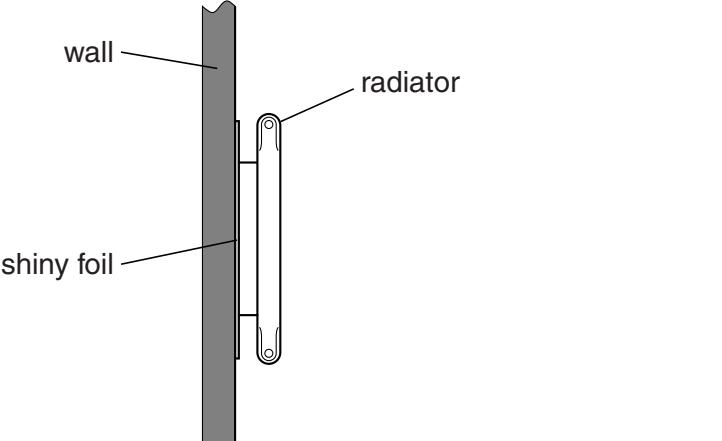
.....  
.....  
.....

answer ..... [2]

[Total: 5]

3 This question is about radiation.

Look at the diagram of a radiator.



(a) The air touching the radiator is heated and moves away.

Draw an **arrow** on the diagram to show the **direction** of the air as it moves away. [1]

(b) The radiator gives out infrared radiation.

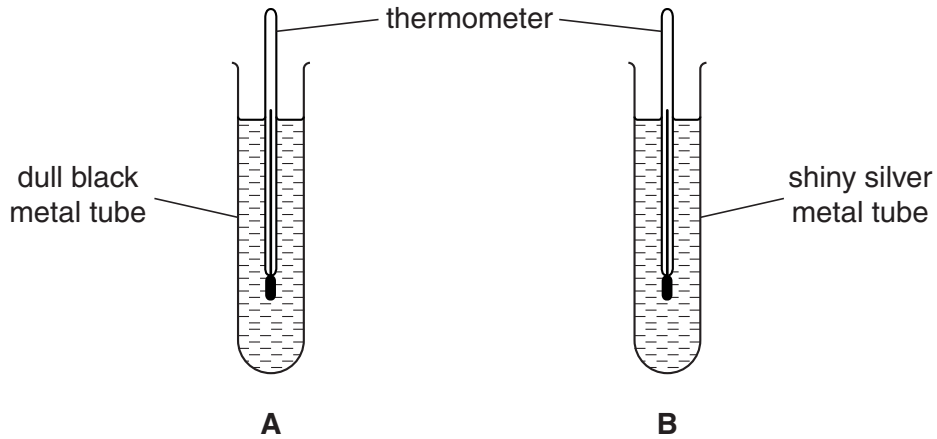
Shiny foil stops the radiation going through the wall.

Explain how.

.....  
..... [1]

(c) Rob investigates heat loss by radiation.

Look at the apparatus.



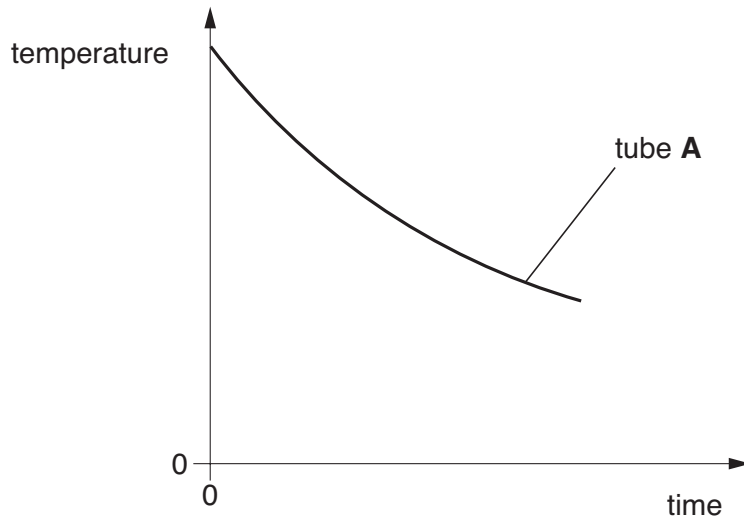
He puts the same amount of hot water into each tube.

Both tubes start at the same temperature.

He takes the temperature in each tube every minute.

Look at the graph of his results.

Look at the line for tube **A**.



On the graph, draw the line that you would expect for tube **B**.

[2]

[Total: 4]

Turn over

4 This question is about different electromagnetic waves.

(a) (i) Louis cooks a large potato.

The middle of the potato gets hot more quickly if he uses a microwave oven instead of a conventional oven.

Explain why.

.....  
..... [1]

(ii) Microwaves are used for cooking.

Write down one **other** use of microwaves.

..... [1]

(b) (i) The Sun gives out ultraviolet rays.

These rays affect the human body.

Write down **two** ways in which ultraviolet rays affect humans.

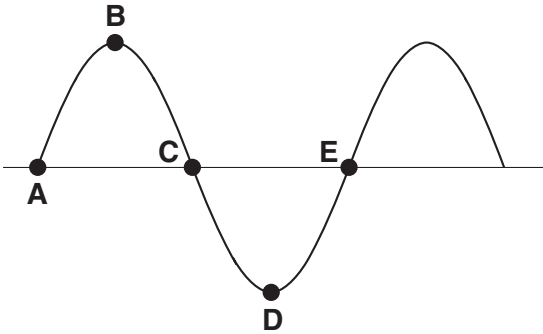
1 .....  
2 ..... [2]

(ii) Explain how we can reduce the effects of ultraviolet rays on the human body.

.....  
.....  
.....  
..... [2]

[Total: 6]

5 Look at the diagram of a wave.



(a) Complete the following sentences by using letters from the diagram.

(i) A **crest** is shown by letter ..... [1]

(ii) The **wavelength** is the distance between letter .....and letter ..... [1]

(b) CD players use laser beams.

The light is reflected from a shiny surface.

This produces a digital signal.

What is a digital signal?

.....  
..... [1]

[Total: 3]

Turn over

6 Some road signs have lights.

These lights are powered by photocells.

The picture shows one of these signs.



(a) Complete these sentences about **photocells**.

Photocells transfer ..... energy into ..... energy.

Photocells produce the same **type** of current as batteries.

This is ..... current. [3]

(b) Using photocells has **advantages** and **disadvantages**.

Describe **one** advantage and **one** disadvantage of using photocells.

advantage .....

.....

disadvantage .....

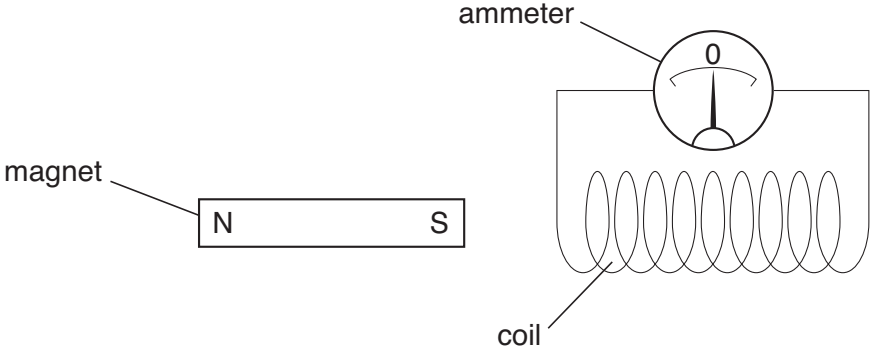
..... [2]

[Total: 5]



7 Lloyd does an experiment to investigate the **dynamo effect**.

Look at the diagram of the equipment Lloyd uses.



Electricity can be generated using this equipment.

Describe two **different** things that Lloyd can do to generate electricity.

- 1 .....
- 2 ..... [2]

[Total: 2]

Turn over

8 This question is about electrical power.

Sam has many electrical appliances in his house.

The table shows some of them. Look at the table.

appliance	power in watts
deep fat fryer	2000
electric cooker	5000
kettle	3000
microwave	1000
radio	50

(a) Sam uses each appliance for three minutes.

(i) Which appliance costs **exactly** twice as much to run as the microwave?

..... [1]

(ii) Explain your answer.

..... [1]

(b) The electric cooker has a power of 5 kW (5000 watts).

It is switched on and used for 3 hours.

Electricity costs 12p for each unit.

Calculate the **cost** of using the electric cooker for 3 hours.

The equations on page 2 may help you.

.....  
.....  
.....

answer = .....pence [2]

[Total: 4]

9 This question is about the Earth, the Moon and other objects in the Universe.

This is a photograph of the Earth-Moon system.



(a) The Earth is a planet.

Astronomers have found other planets and moons in the Universe.

Name two **other** types of object that they have found in the Universe.

1 .....

2 ..... [2]

(b) Some scientists think that our Earth-Moon system was formed after a collision.

They think that billions of years ago something hit the Earth.

Describe how our Earth-Moon system could have been formed in this way.

.....

.....

..... [2]

[Total: 4]

Turn over

10 This question is about space.

Draw lines to connect each **object / event** to the correct **statement** about it.

<b>object / event</b>	<b>statement</b>
artificial satellites	Universe began with an explosion
cosmic rays	causes solar flares
Sun	ionising radiation from space
Big Bang	used for weather forecasting

[3]

[Total: 3]

11 Charlotte's teacher shows her class an experiment with nuclear radiations.

There are **three** types of **nuclear** radiation.

Complete the following statement.

Choose from the list.

- protons
- x-rays
- gamma rays
- radio waves
- beta particles
- alpha particles

The **three** types of nuclear radiation are

- 1 .....
- 2 .....
- 3 ..... [2]

[Total: 2]

mock papers 6-higher

1 (a) Doctors use thermometers to measure a patient’s temperature.

They sometimes take a picture called a **thermogram**.

The thermogram shows the temperatures of different parts of the skin.

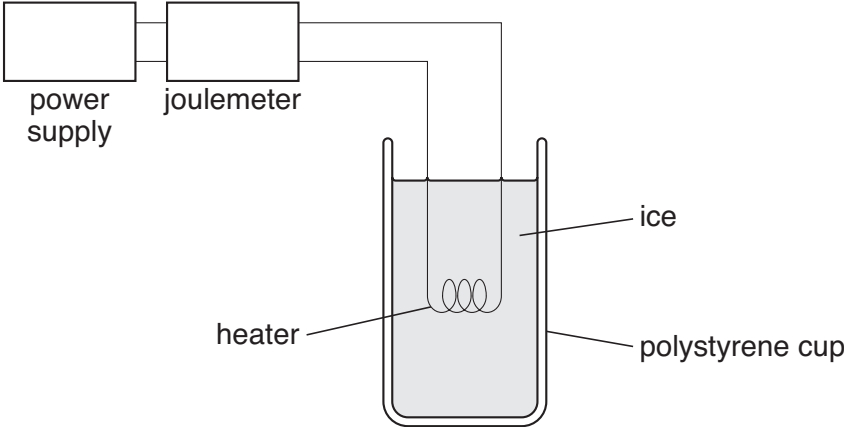
How does a thermogram show **different** temperatures?

..... [1]

(b) Jasmine investigates how much heat is needed to melt ice.

She uses the following equipment.

Look at the diagram.



The heater melts 4.2g of ice.

This takes 1500 joules of energy.

Calculate the **specific latent heat** of ice.

The equations on page 2 may help you.

.....  
.....  
.....

answer ..... J/g [2]

[Total: 3]

Turn over

2 (a) Kevin wants to save money by insulating his house.

He wants to reduce the energy lost by conduction.

Suggest **one** way he could reduce the energy lost by **conduction**.

.....  
..... [1]

(b) To save more money Kevin replaces the light bulbs in his house with 'low-energy bulbs'.

One of the light bulbs uses 40 000 joules of electrical energy in one hour.

It gives out 10 000 joules of light energy in one hour.

Calculate the **efficiency** of the bulb.

The equations on page 2 may help you.

.....  
.....  
.....  
answer ..... [2]

(c) Energy from Kevin's central heating radiator warms his room by **convection**.

Explain how a convection current is produced and how it warms his room.

In your answer write about

- the movement of air particles
- changes in density
- transfer of energy.

.....  
.....  
.....  
.....  
..... [3]

[Total: 6]

3 This question is about electromagnetic waves.

(a) A laser produces an intense beam of light waves.

All the waves have the same frequency and are in phase with each other.

(i) Explain what is meant by an **intense** beam of light.

.....  
..... [1]

(ii) Explain what is meant by **in phase** with each other.

.....  
..... [1]

(iii) CD players use laser beams.

The light is reflected from a shiny surface.

This produces a digital signal.

What is a digital signal?

.....  
..... [1]

(b) (i) Louis cooks a large potato.

The middle of the potato gets hot more quickly if he uses a microwave oven instead of a conventional oven.

Explain why.

.....  
..... [1]

(ii) The walls of his microwave oven are made of **shiny metal**.

The shiny metal walls do **not** get hot.

Explain why.

.....  
..... [1]

(iii) Microwaves are used for cooking.

Write down one **other** use of microwaves.

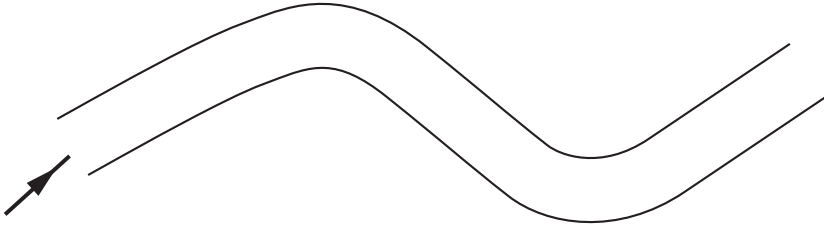
..... [1]

[Total: 6]

4 Mirrors reflect light.

Light can also be reflected along optical fibres without mirrors.

(a) Complete the diagram to show a ray of light passing along the optical fibre and out the other end.



[1]

(b) Certain conditions are needed for total internal reflection.

Complete the sentences.

Light is reflected at the boundary between ..... and .....

The angle of incidence must be ..... than the critical angle. [2]

[Total: 3]



5 There is an ozone layer in the Earth's upper atmosphere.

A 'hole' has appeared in this layer.

(a) Suggest what causes the hole in the ozone layer.

.....  
..... [1]

(b) Why is the hole in the ozone layer harmful to humans?

.....  
..... [1]

[Total: 2]

Turn over

6 Some road signs have lights.

These lights are powered by photocells.

The picture shows one of these signs.



(a) Using photocells has **advantages** and **disadvantages**.

Describe **one** advantage and **one** disadvantage of using photocells.

advantage .....

.....

disadvantage .....

..... [2]

(b) The power output of photocells can vary.

The power output of the photocells on the street sign **decreases**.

Suggest **two** different causes for this.

1 .....

.....

2 .....

..... [2]

[Total: 4]

7 This question is about electrical power.

Sam has many electrical appliances in his house. One of them is an electric cooker.

The electric cooker has a power of 5 kW (5000 watts).

It is switched on and used for 3 hours.

Electricity costs 12p for each unit.

Calculate the **cost** of using the electric cooker for 3 hours.

The equations on page 2 may help you.

.....  
.....  
.....

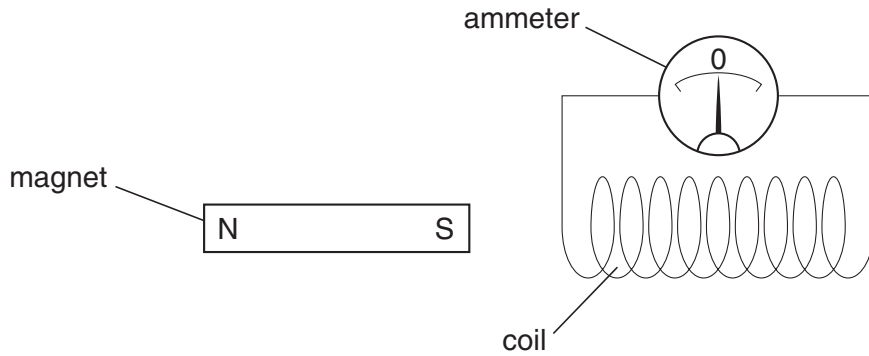
answer = ..... pence [2]

**[Total: 2]**

Turn over

8 This question is about the **dynamo effect**.

Look at the diagram.



The ammeter shows that a current is produced if

- the magnet is moved
- the coil is moved.

(a) Describe two things that would **increase** the current.

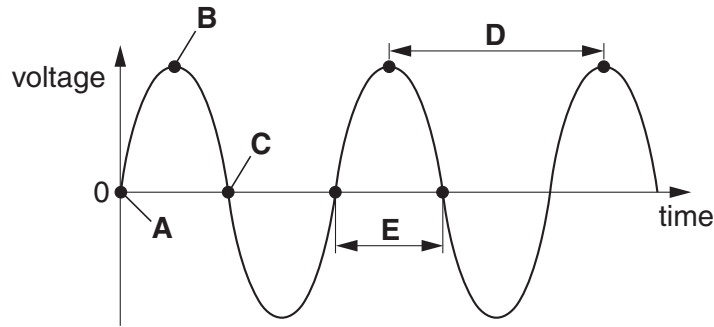
- 1 .....
- 2 ..... [2]

(b) The ammeter is replaced by a cathode ray oscilloscope (CRO).

The magnet is moved steadily towards and away from the coil.

Alternating current (AC) is produced.

The pattern on the screen of the CRO looks like this:



(i) Where does the current change direction?

Choose from:    **A**    **B**    **C**    **D**    **E**

answer ..... [1]

(ii) Which letter represents **one cycle** of AC?

Choose from:    **A**    **B**    **C**    **D**    **E**

answer ..... [1]

(iii) The AC produced has a frequency of 4 hertz (Hz).

Explain what the term **frequency of 4 Hz** means.

.....  
..... [2]

[Total: 6]

Turn over

9 This question is about the Earth, the Moon and other objects in the Universe.

This is a photograph of the Earth-Moon system.



(a) Some scientists think that our Earth-Moon system was formed after a collision. They think that billions of years ago something hit the Earth.

Describe how our Earth-Moon system could have been formed in this way.

.....  
.....  
..... [2]

(b) Describe **one** piece of evidence for this explanation of how our Moon was formed.

.....  
.....  
..... [2]

[Total: 4]

10 This question is about space.

Draw **one** line from each **object** to the best **statement** about it.

object	statement
galaxy	ends its life as a white dwarf
black hole	can produce a supernova
heavy-weight star	does not allow light to escape from it
medium-weight star	moves away from us if distant

[2]

[Total: 2]

11 Dealing with nuclear waste is a difficult problem.

One problem is that it is very expensive to reprocess the nuclear waste.

Write down one other problem of dealing with nuclear waste.

.....

.....

Explain why this is a problem.

.....

..... [2]

[Total: 2]

Turn over