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Practice 1-foundation

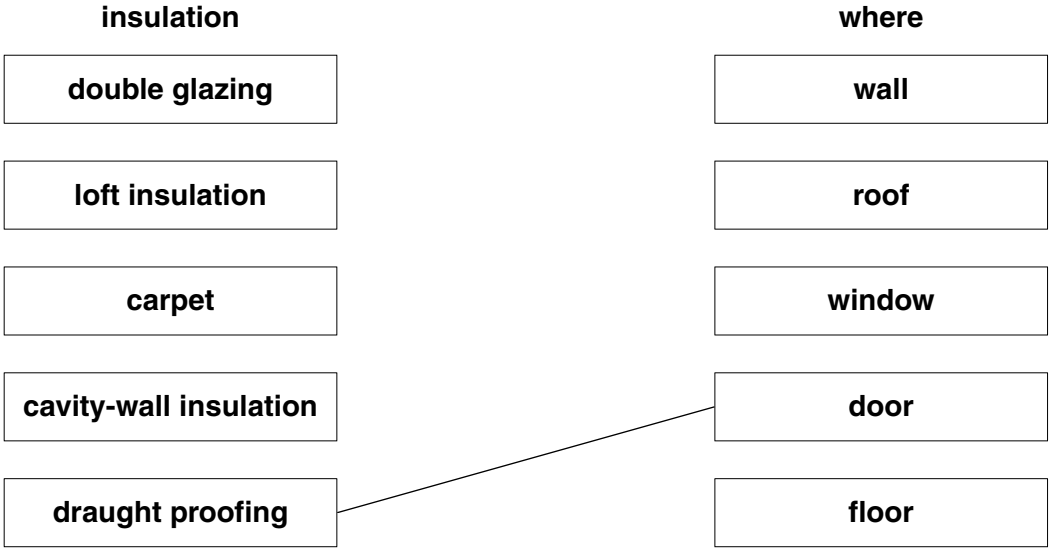
1 Mike keeps his house warm in winter.

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.



[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?

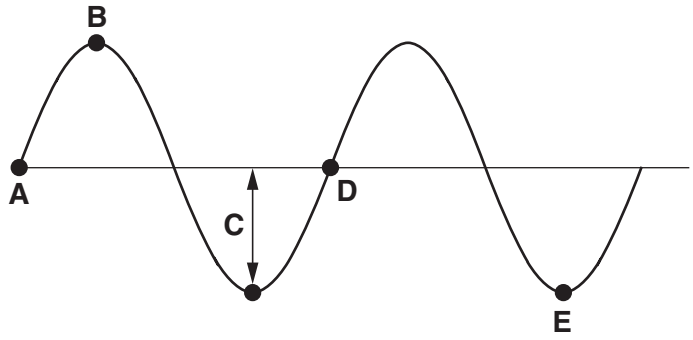
..... [1]

(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 .....

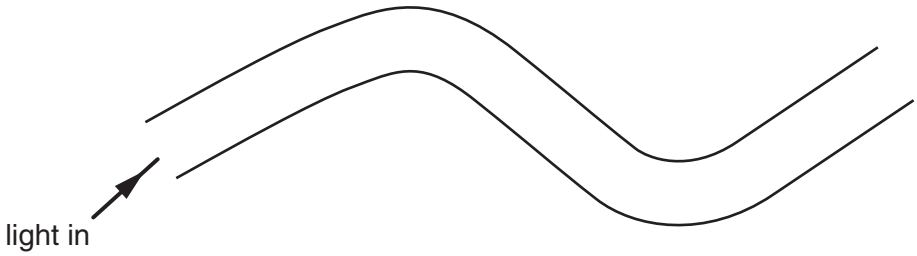
The **amplitude** is shown by letter .....

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 °C

hot tea at 90 °C

warm milk at 25 °C

The room temperature is 20 °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 °C. It stays at 0 °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]

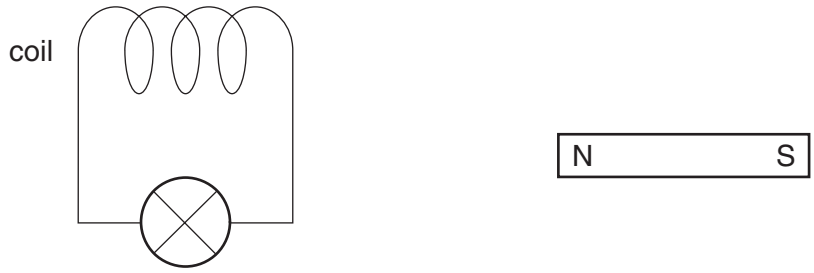
(ii) Describe **one** disadvantage of using photocells.

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**

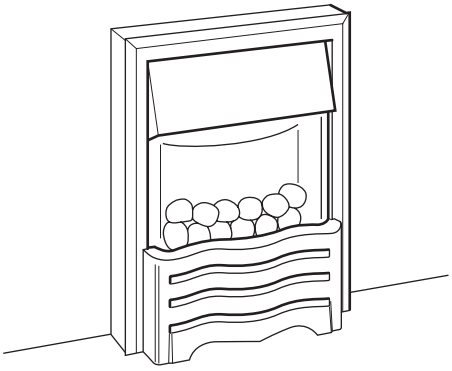
Write down a **renewable** energy source.

Choose **one** from the list.

answer ..... [1]

(b) Una has an electric fire.

Look at the diagram.



She connects it to the 230 V 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]

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.

.....

.....

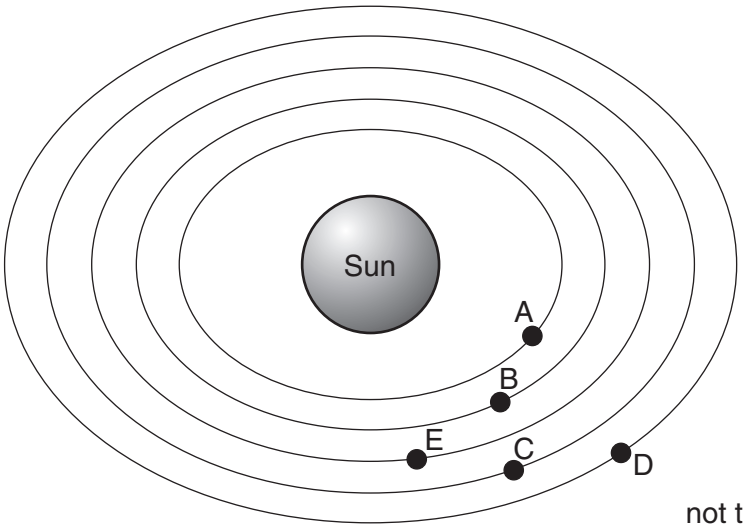
.....

..... [2]

[Total: 3]

9 This question is about the Solar System.

Look at the diagram.



not to scale

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.

.....

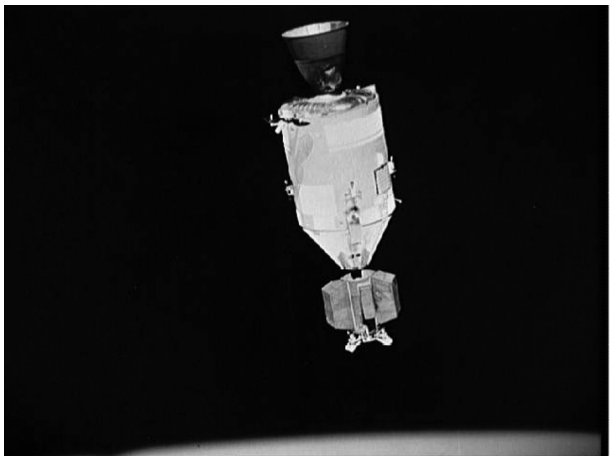
.....

..... [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.



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]

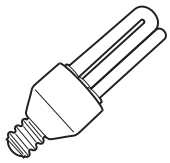
[Total: 4]

Practice 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.

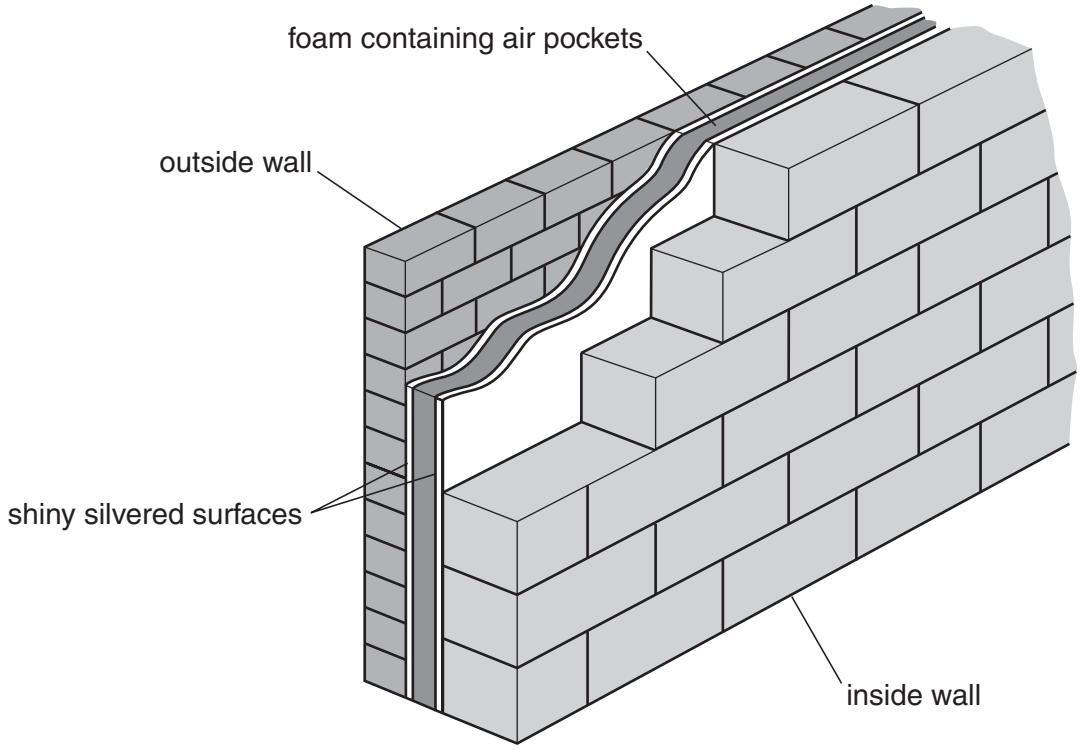
.....

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.

.....

.....

.....

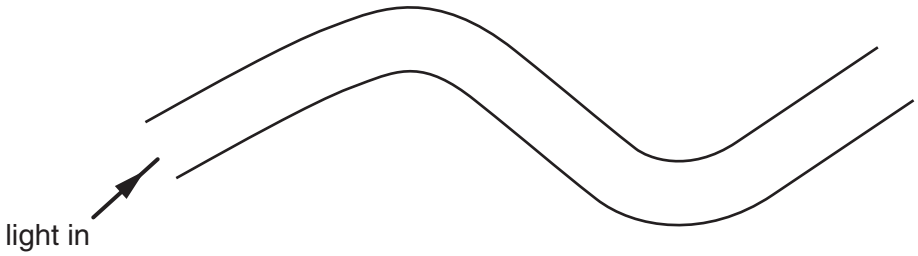
.....

..... [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]

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.

.....

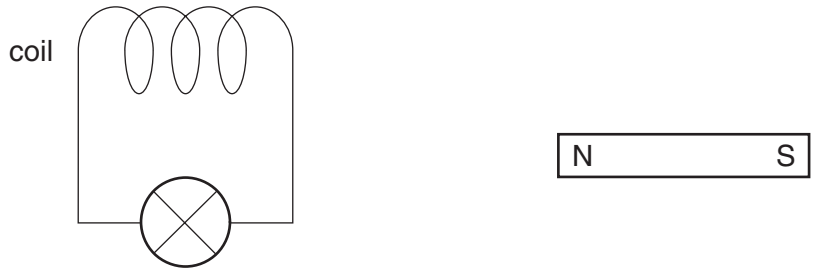
.....

.....

..... [2]

[Total: 4]

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 .....

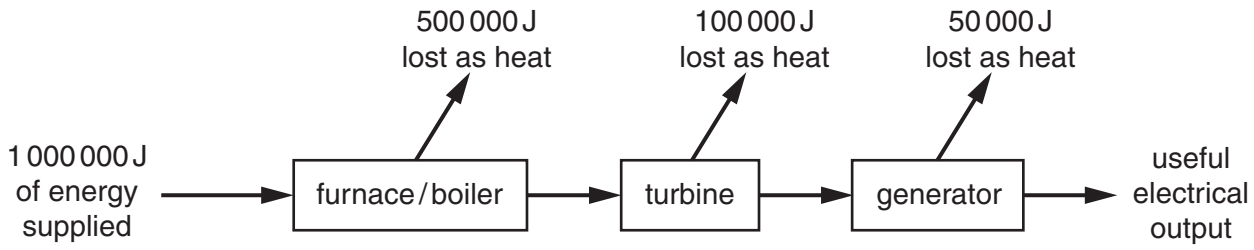
.....

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.

.....

.....

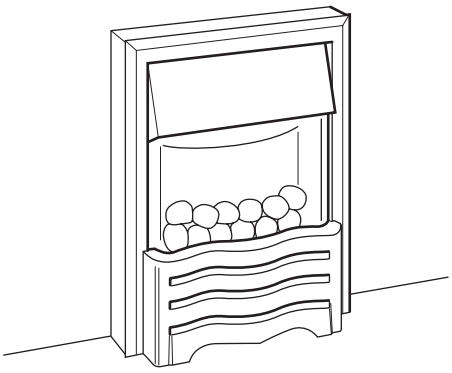
.....

..... [2]

[Total: 7]

7 Una has an electric fire.

Look at the diagram.



She connects it to the 230 V 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.

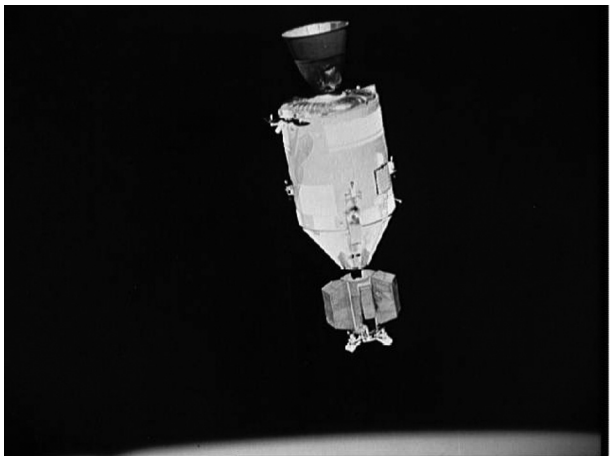
Asteroids orbit our sun.

(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]

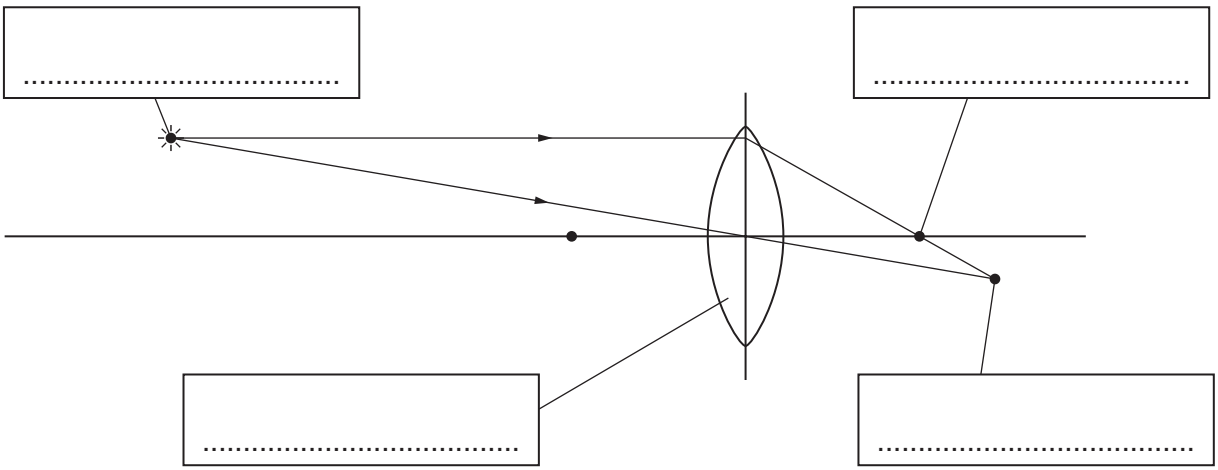
[Total: 15]

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

He has some lenses made of glass.

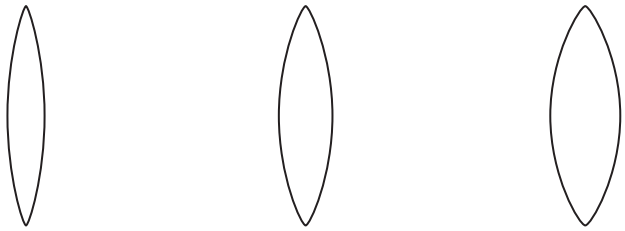
(a) He draws a diagram to show how a lens can produce an image from an object.

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

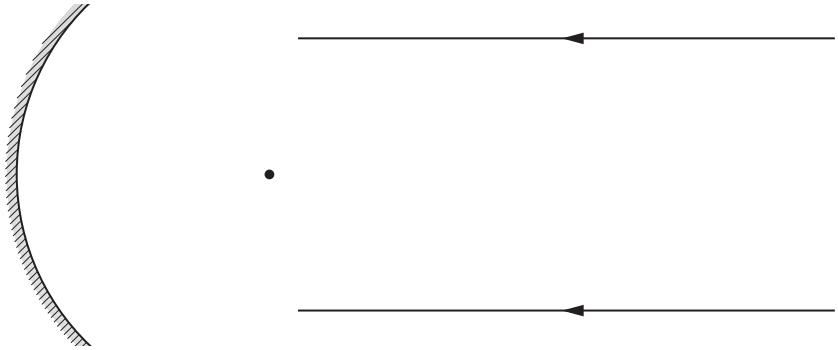
(ii) He decides to use lenses **A** and **C** for his telescope.
Which lens should he use for the eyepiece?
Explain why.

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?

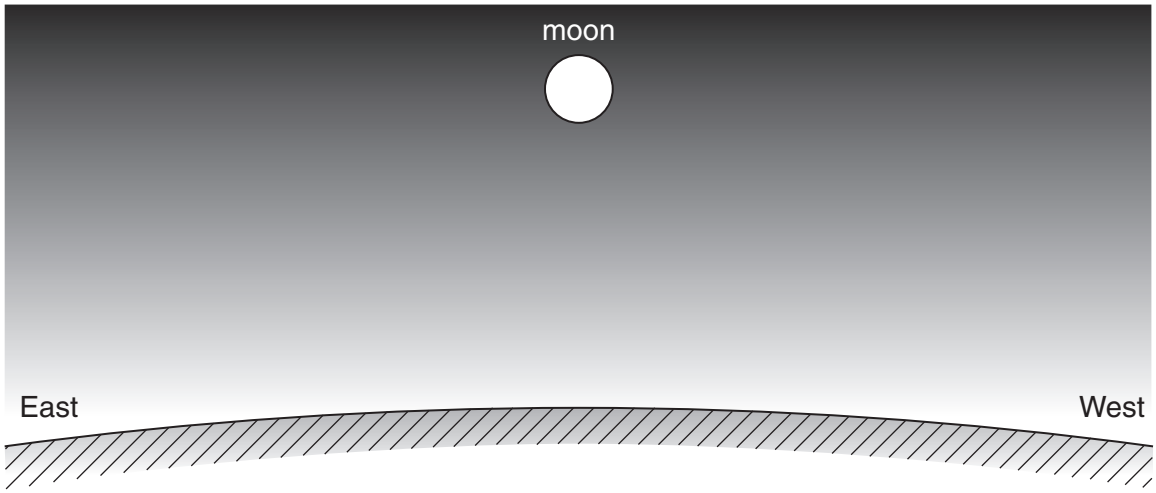
.....

.....[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.

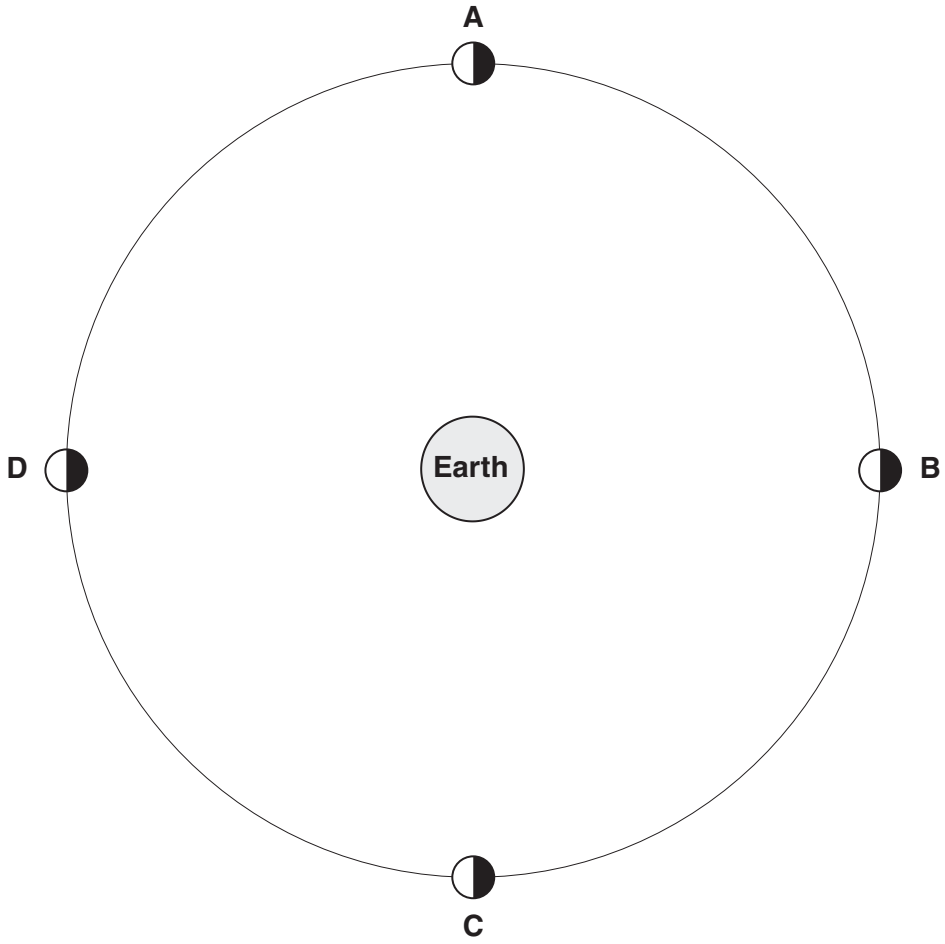
.....[1]

(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.

less than 24hrs **24hrs** **more than 24hrs** [1]

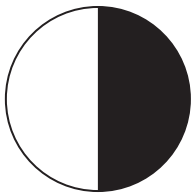
[Turn over

(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.

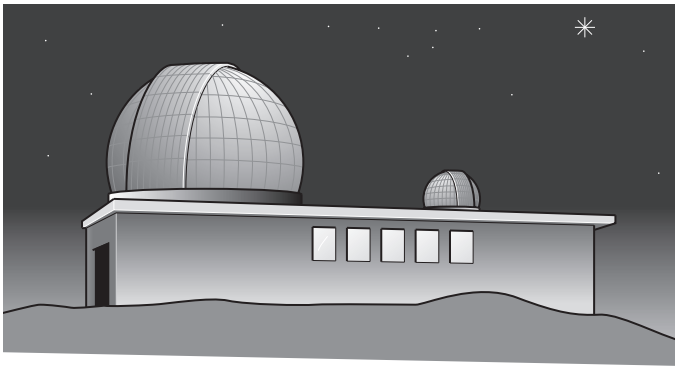
position	phase of Moon
A	
B	
C	
D	

[4]

[Total: 9]

[Turn over

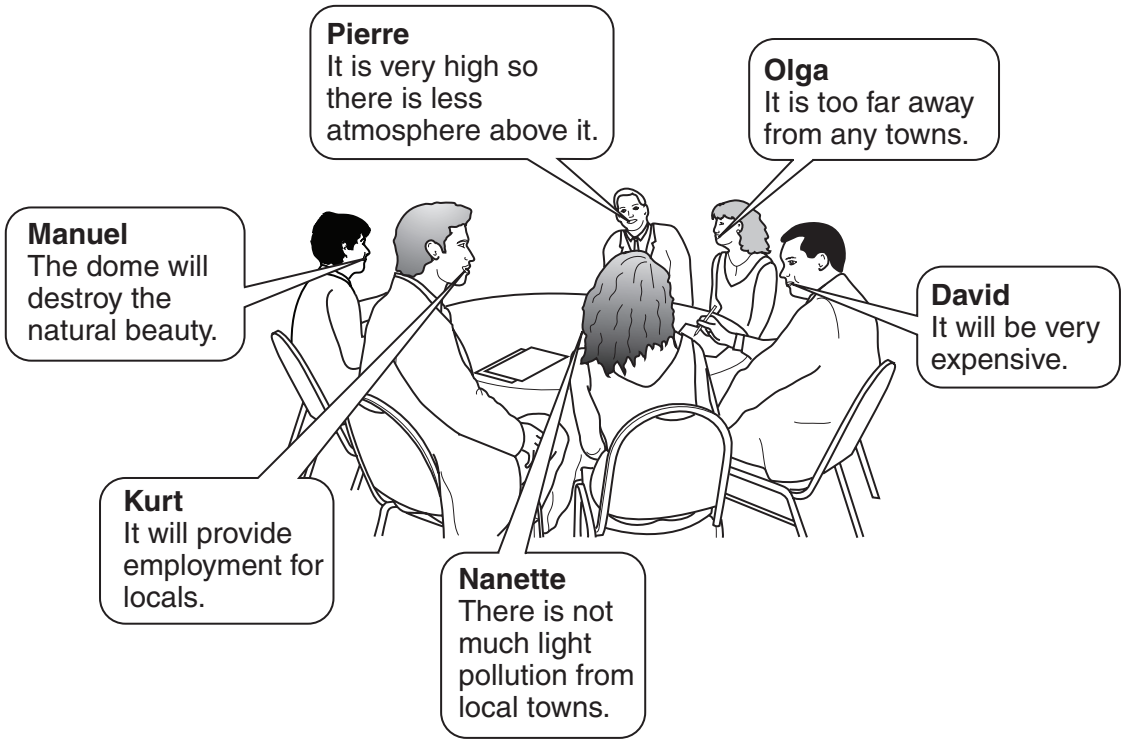
4 A group of countries are planning to build a new astronomical observatory.



(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]

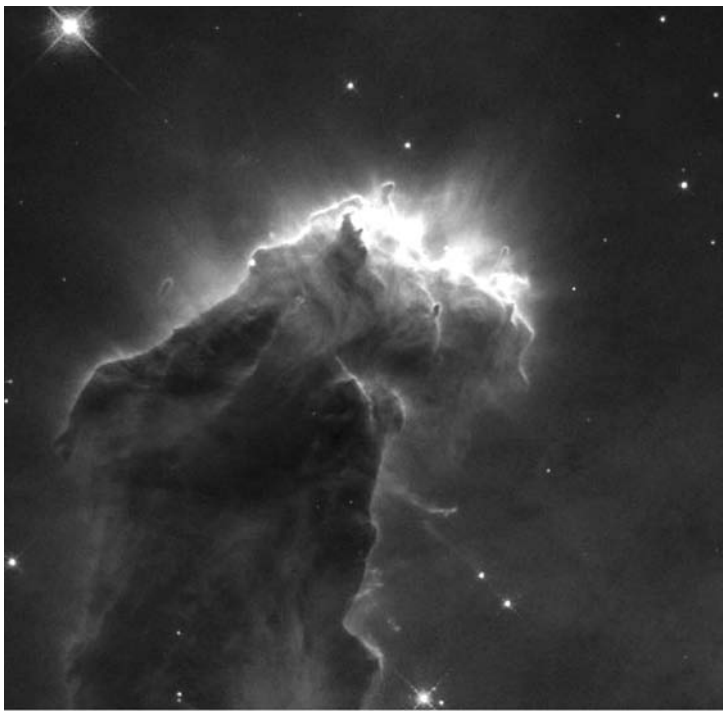
(d) Write down **one** advantage of a group of countries working together for a 'big science' project like this.

.....

.....[1]

[Total: 7]

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 3 K.
What temperature is 3 K 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.

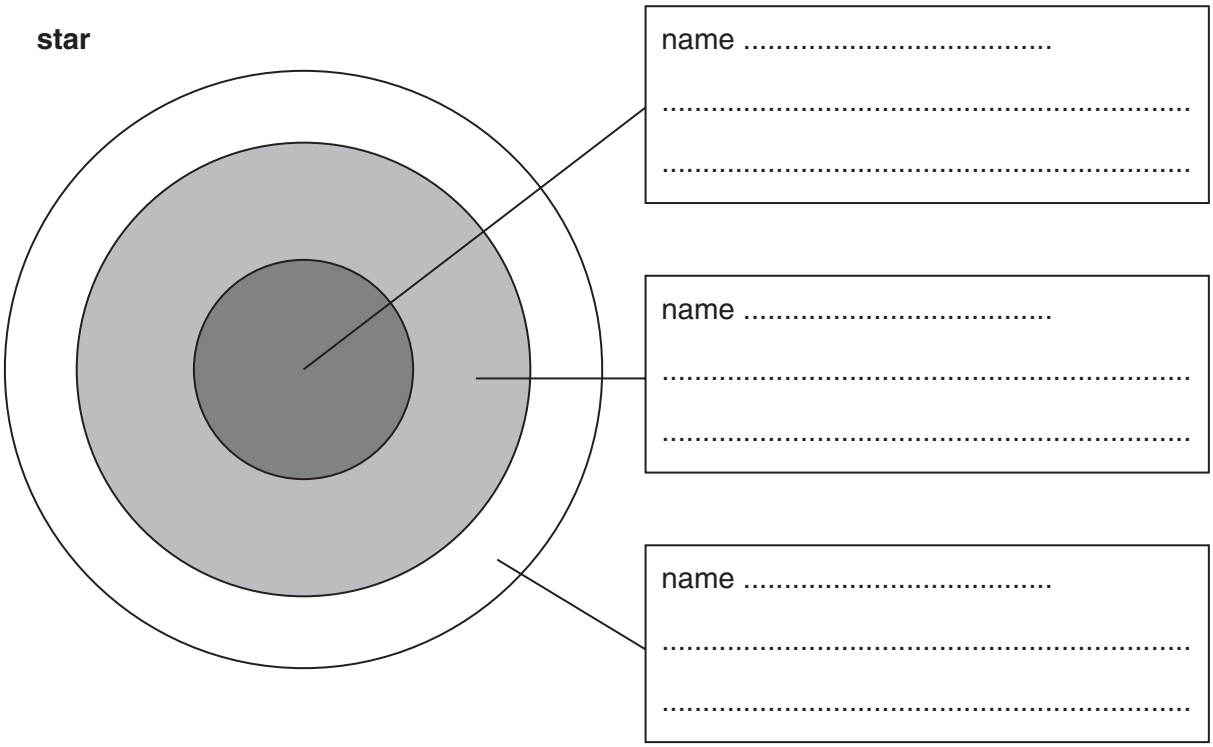
4 ..... → ..... + energy

[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?

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