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| Candidate forename | | Candidate surname | |
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| Centre number | | | | | | Candidate number | | | | |
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

J649

B482/01

APPLIED SCIENCE: DOUBLE AWARD

**Unit 2: Science for the needs of society
(Foundation Tier)**

MONDAY 17 JANUARY 2011: Morning

DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

**Candidates answer on the question paper.
A calculator may be used for this paper.**

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**
- **Answer ALL the questions.**

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 60.**
- **The marks allocated and the spaces provided are a good indication of the length of answers required.**

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Answer ALL the questions.

1 Cling film is used to wrap food.

Cling film is made from thin sheets of polymer.

Cling film needs to be very stretchy so that it can wrap around food.

The first cling film to be produced was made from PVC.

(a) The table shows some information about PVC.

| PROPERTY | |
|----------------------|---|
| strength | low |
| melting point | 80 °C |
| flexibility | high |
| density | 1.5 g per cm³ |
| biodegradable | no |
| flammability | flammable and produces toxic gases |

For each question choose the property from the table that gives the BEST explanation.

(i) Why is PVC a good choice of polymer for making cling film to wrap food?

_____ [1]

(ii) Why is cling film made from PVC NOT used to wrap hot food?

_____ [1]

(iii) Disposing of cling film can cause harm to the environment.

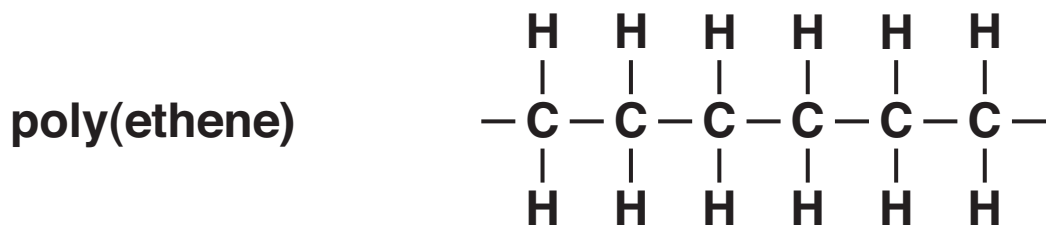
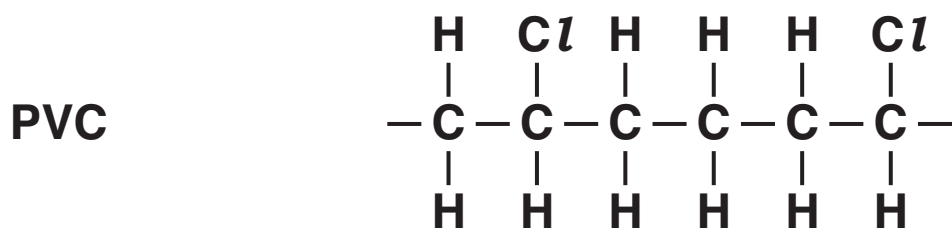
Give TWO reasons why.

_____ [2]

(b) Cling film can also be made from other polymers.

One polymer that is now used to make cling film is poly(ethene).

The diagrams show the structures of PVC and poly(ethene).



(i) Write down two SIMILARITIES between the structure of PVC and poly(ethene).

1. _____

2. _____ [2]

(ii) Write down one way that the structure of PVC is DIFFERENT to that of poly(ethene).

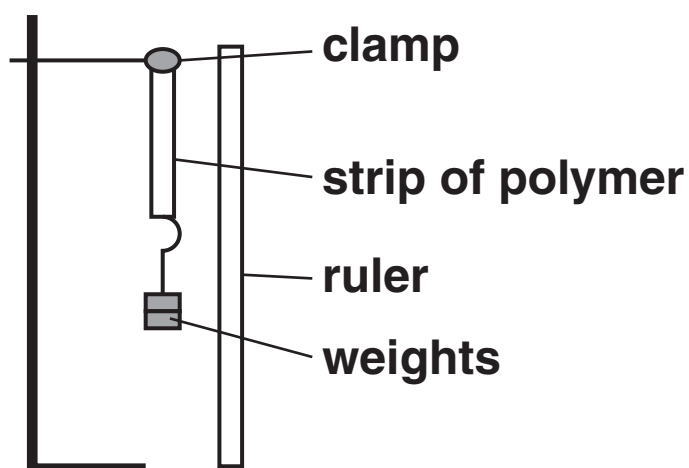
_____ [1]

(c) Liz works for the company that makes cling film.

She tests some polymers to find out if they can be used to make cling film.

She hangs weights onto strips of each polymer.

She adds more weight until the polymer breaks.



She measures how much PVC and two other polymers stretch before they break.

The table shows her results.

| POLYMER | WEIGHT ADDED WHEN STRIP BREAKS IN g | AMOUNT OF STRETCH IN cm |
|------------------|--|--------------------------------|
| PVC | 60 | 6.0 |
| polymer A | 230 | 0.5 |
| polymer B | 50 | 5.0 |

(i) Which polymer is the strongest?

Put a **ring** around the correct answer.

PVC polymer A polymer B [1]

(ii) The company want to find a replacement for PVC for making cling film.

They decide to use polymer B.

Explain why polymer B is a better choice than polymer A.

_____ [2]

[Total: 10]

2 Eve smokes cigarettes. She talks to a nurse at her workplace about giving up.

‘I would like to give up. I feel tired all the time and I am sure that smoking is affecting my health.’

‘Well, you are not allowed to smoke at work because of the dangers of passive smoking. Therefore you are already going for hours without a cigarette.’

(a) Explain what is meant by ‘passive smoking’.

_____ [2]

(b) The nurse checks Eve’s temperature and tells her it is normal.

What is normal body temperature?

Put a ring around the correct answer.

15 °C 20 °C 37 °C 72 °C 100 °C

[1]

(c) The nurse tells Eve that smoking harms her heart and lungs.

She shows Eve a diagram of the structure of the inside of her chest.

Label the diagram.

Use the words in this list.

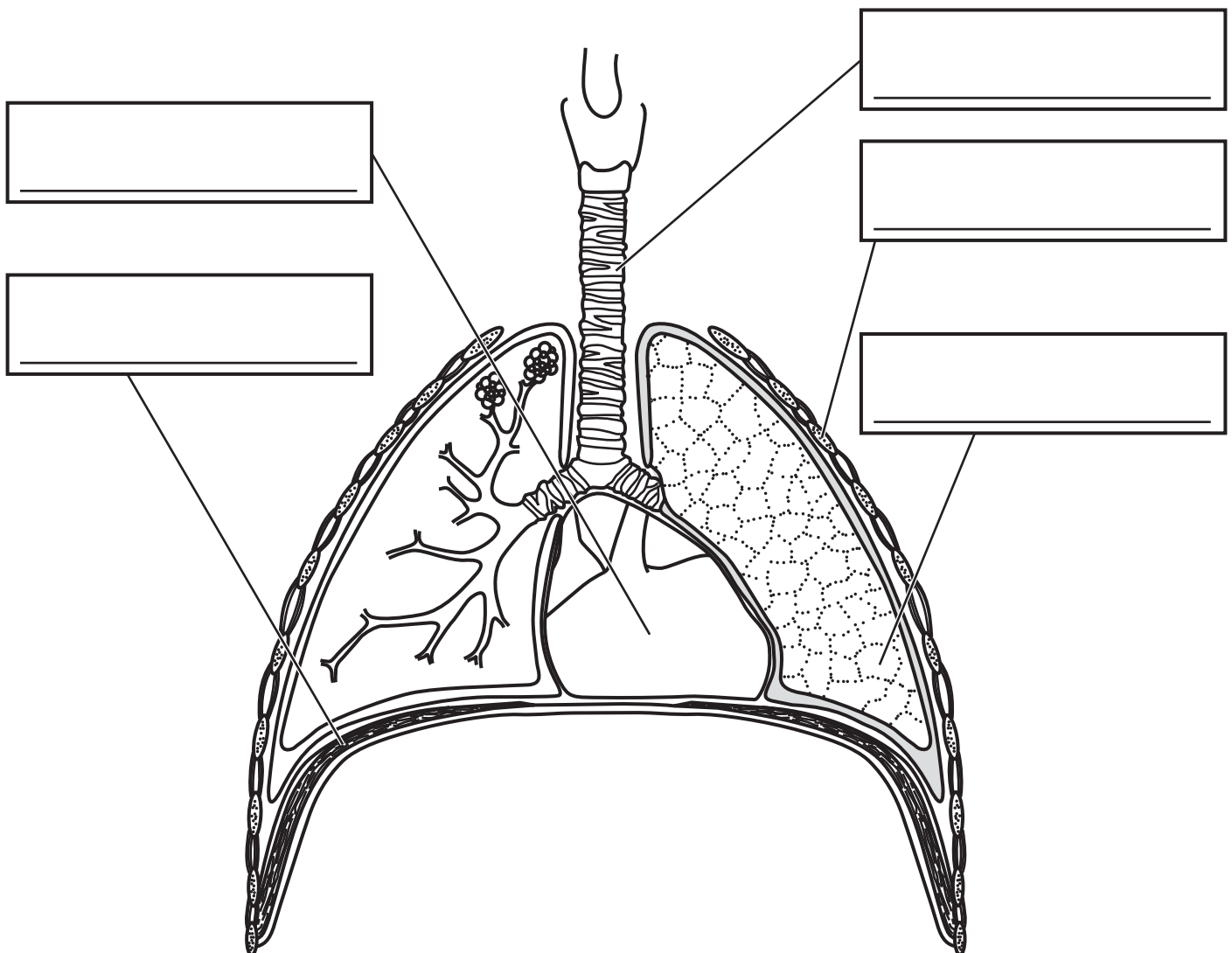
DIAPHRAGM

HEART

LUNG

RIB

TRACHEA



[3]

(d) The nurse talks to Eve about why she feels tired.

‘Energy is released in your body during respiration. The substances you need for respiration are not being carried around your body very well. You also need to do more exercise. This will improve the transport of substances around your body.’

(i) What substances does the body use for respiration?

Put a tick (✓) in the boxes next to the TWO correct answers.

- | | |
|-----------------|--------------------------|
| water | <input type="checkbox"/> |
| hydrogen | <input type="checkbox"/> |
| oxygen | <input type="checkbox"/> |
| nitrogen | <input type="checkbox"/> |
| glucose | <input type="checkbox"/> |

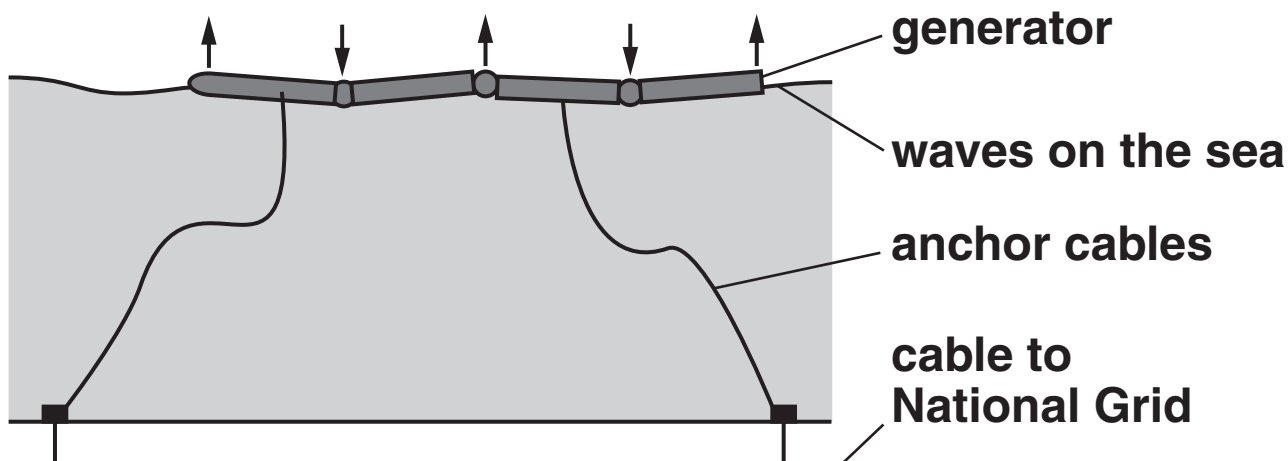
[2]

(ii) How will exercise improve the transport of substances around Eve’s body?

_____ **[2]**

[Total: 10]

3 A type of wave power generator is being trialled in the North Sea.



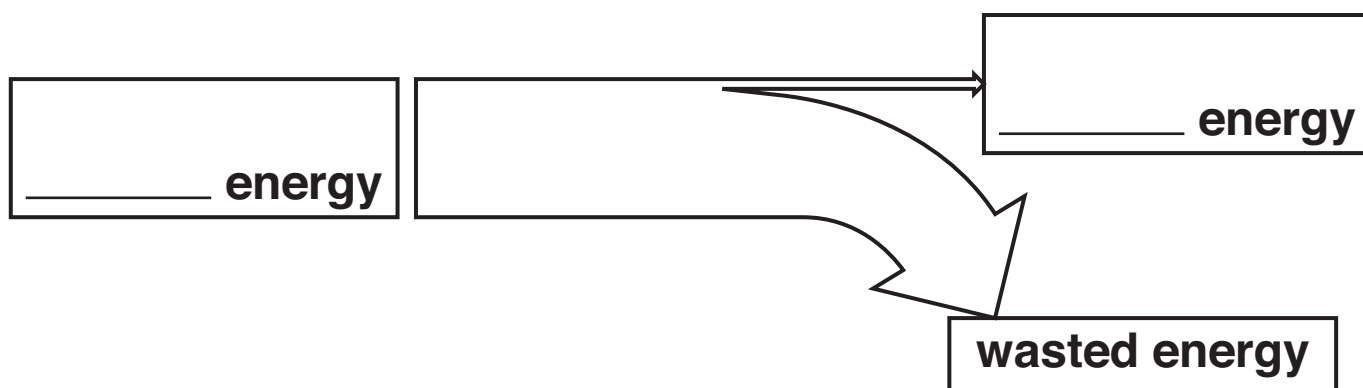
As the waves pass the generator they make it bend.

This bending movement is used to produce electricity.

The electricity can then be sent to the National Grid.

(a) The generator produces electrical energy from a wave energy input.

(i) Complete this Sankey diagram for the wave generator.



[2]

- (ii) The generator does not use all of the wave energy to make electricity.

The generator produces 750 kJ of electrical energy.

It wastes 7500 kJ of energy.

Calculate the energy input from the waves.

Show your working.

wave energy = _____ kJ [2]

- (b) The wave power generator produces electricity.

Electricity is a good way to supply energy to our homes.

Explain why electricity is a good way of supplying energy.

[2]

(c) Wave energy is an example of a renewable energy source.

(i) Which statement best describes a RENEWABLE energy source?

Put a tick (✓) in the box next to the BEST answer.

Renewable energy is a source that ...

... produces carbon dioxide.

... will not run out.

... makes electricity.

... burns to produce energy.

[1]

(ii) Write down two examples of renewable energy sources, other than waves.

1. _____

2. _____ [2]

[Total: 9]

4 Scientists are interested in how the Earth's atmosphere developed.

The table shows how the percentages of carbon dioxide, nitrogen and oxygen have changed over millions of years.

| GAS | MILLIONS OF YEARS AGO | | | | |
|---------------------------|------------------------------|-------------|-------------|-------------|--------------|
| | 4000 | 3000 | 2000 | 1000 | TODAY |
| carbon dioxide (%) | 20 | 8 | 3 | 1 | 0.03 |
| nitrogen (%) | 35 | 55 | 72 | 77 | 78 |
| oxygen (%) | 0 | 0 | 1 | 10 | 21 |
| other gases (%) | | 37 | 24 | 12 | 0.97 |

(a) Write down two changes that have happened to the atmosphere over the last 4000 million years.

1. _____

2. _____ [2]

(b) Calculate the percentage of OTHER GASES in the atmosphere 4000 million years ago.

Show your working.

other gases = _____ % [2]

(c) The pie chart shows the gases in the atmosphere 2000 million years ago.

Label the pie chart.

Use the percentages of the gases in the table to help you.

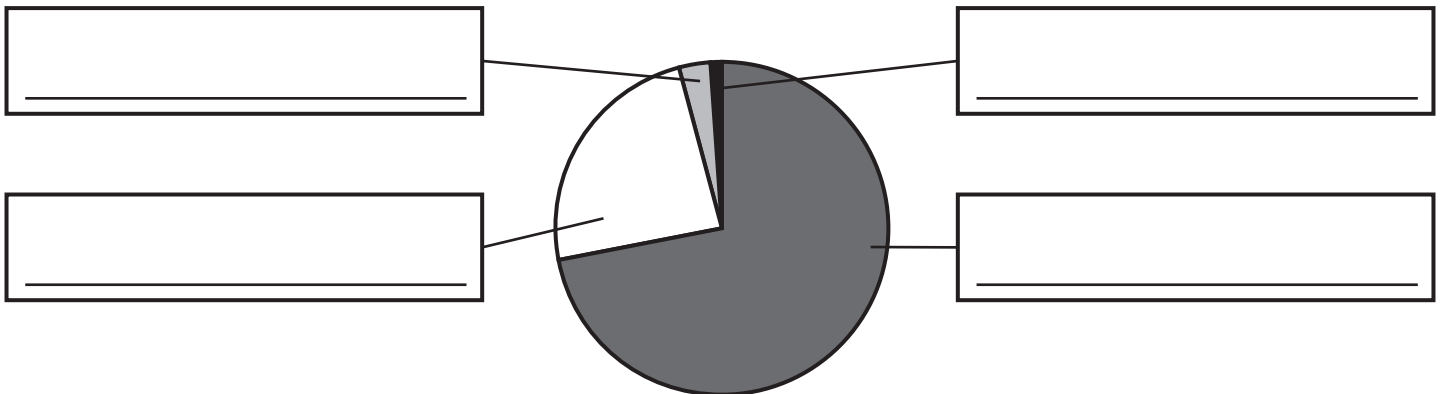
Use these labels.

CARBON DIOXIDE

NITROGEN

OXYGEN

OTHER GASES



[2]

(d) There were no animals on Earth 4000 million years ago.

(i) Use information in the table to explain why.

_____ [1]

(ii) The air that animals breathe out is different to the air that they breathe in.

Write down TWO ways that breathed out air is different.

1. _____

2. _____ [2]

- (e) The changes to the atmosphere have happened over millions of years.

Some changes to the Earth happen quickly.

Which of the following changes to the surface of the Earth has happened over **MILLIONS OF YEARS** and which happen **QUICKLY**?

Put a tick (✓) in the correct box in each row.

| | happens over millions of years | happens quickly |
|---------------------------------|---------------------------------------|------------------------|
| an earthquake | | |
| formation of a continent | | |
| formation of a mountain | | |
| a tsunami | | |

[2]

[Total: 11]

5 Read the information about using mercury in low energy light bulbs.

In 2012, shops in the UK will stop selling filament light bulbs.

Only low energy light bulbs will be sold.

This will reduce the amount of carbon dioxide released into the atmosphere by 5 million tonnes every year.



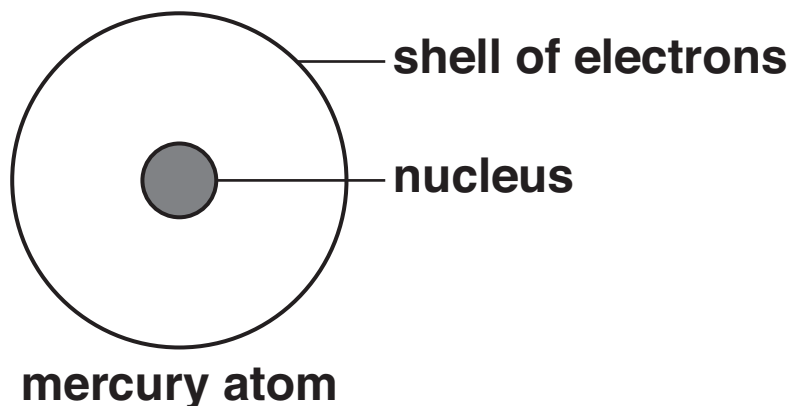
low energy bulb

(a) How will using low energy light bulbs instead of filament bulbs reduce the amount of carbon dioxide going into the atmosphere?

[2]

(b) However, low energy bulbs contain mercury.

The electrons in the mercury atom are involved in producing light in the bulb.



A mercury atom has 80 PROTONS in its nucleus.

(i) Write down the name of the OTHER type of particle in the nucleus.

_____ [1]

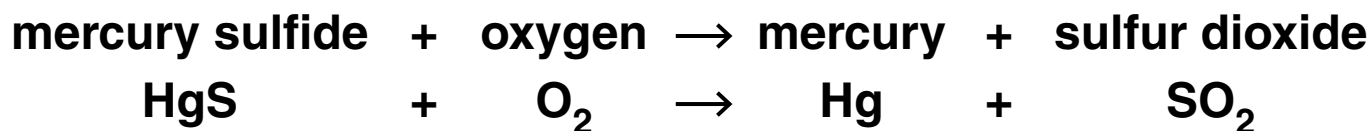
(ii) How many ELECTRONS are in a mercury atom?

_____ [1]

- (c) Mercury is extracted from an ore called cinnabar. The ore contains mercury sulfide, HgS.

Cinnabar is heated in air to extract the mercury. Mercury is a shiny grey liquid that conducts electricity.

Sulfur dioxide gas is made at the same time.



Which of the statements about the chemicals in the reaction are TRUE and which are FALSE?

Put a tick (✓) in one box in each row.

| | TRUE | FALSE |
|--------------------------------------|------|-------|
| three of the chemicals are compounds | | |
| mercury is a non-metal | | |
| sulfur atoms react with oxygen atoms | | |
| all the chemicals are inorganic | | |

[2]

(d) Most of the mercury used to make light bulbs is mined in China.

Shen is talking about the effects of mining near where he lives.

‘All the land around the mine is poisoned because mercury is toxic.

It’s because the water runs out of the mine. It runs into the water supplies and the crops don’t grow properly. The water buffaloes died.

People who drink the water get sick.

The factory where the ore is heated gives off toxic gases so people have breathing problems too.’

Describe what the MINING COMPANY could do to reduce the environmental and health problems that the mercury mine causes.

[2]

(e) The mining company employs some scientists to deal with the environment and safety.

What other jobs in the company need scientists?

Put a tick (✓) in TWO boxes next to the correct answers.

hiring people to dig in the mines

working out the best conditions for the heating process

organising transport for raw materials

checking the quality of the mercury that is made

managing the money for the company

[2]

[Total: 10]

6 In 2009 scientists announced a breakthrough in genetic engineering.

They had cured colour blindness (a genetic disease) in monkeys.

The scientists were able to restore full colour vision to adult monkeys born colour blind.

Colour blindness also occurs in humans.

(a) (i) Describe what is meant by GENETIC ENGINEERING.

_____ [2]

(ii) Explain how a genetic disease is different from other infectious diseases.

_____ [2]

(b) Some scientists have said that this cure for colour blindness could be used on humans.

Some people are in favour of using genetic engineering to cure colour blindness.

Some people are against using genetic engineering to cure colour blindness.

(i) Give one reason FOR and one reason AGAINST using genetic engineering to cure colour blindness to give full colour vision.

for _____

against _____

_____ **[2]**

(ii) Which two of the following are genetic diseases in humans?

Put ticks (✓) in the boxes next to the TWO correct answers.

cystic fibrosis

rubella

tuberculosis

Huntington's chorea

polio

[2]

(c) Read the following sentences about how colour blindness can be passed on to the next generation.

Two words, labelled A and B, can be used to fill in the spaces to complete the sentences.

The colour blindness characteristic is controlled by _____A_____ .

Each parent passes on the _____A_____ during _____B_____ reproduction.

Whether the offspring is colour blind or not depends on these _____A_____ from the parents.

Write down the missing words A and B.

A _____

B _____

[2]

[Total: 10]

END OF QUESTION PAPER

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