OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

B711/02

GATEWAY SCIENCE
SCIENCE B

Science modules B1, C1, P1
(Higher Tier)

WEDNESDAY 25 MAY 2016 – Afternoon

DURATION: 1 hour 15 minutes
plus your additional time allowance

MODIFIED ENLARGED 24pt

Candidate forename		Candidate surname	
Centre number		**Candidate number**	

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR SUPPLIED MATERIALS:

A copy of the Periodic Table

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. HB pencil may be used for graphs and diagrams only.

Answer ALL the questions.

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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION FOR CANDIDATES

The quality of written communication is assessed in questions marked with a pencil (✎).

A list of equations can be found on pages 4–5.

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 75.

Any blank pages are indicated.

BLANK PAGE

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

$$\text{efficiency} = \frac{\text{useful energy output} (\times\ 100\%)}{\text{total energy input}}$$

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

distance = average speed × time

$$s = \frac{(u + v)}{2} \times t$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

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

power = force × speed

$$KE = \frac{1}{2}mv^2$$

momentum = mass × velocity

$$force = \frac{change\ in\ momentum}{time}$$

GPE = mgh

$$mgh = \frac{1}{2}mv^2$$

$$resistance = \frac{voltage}{current}$$

Answer ALL the questions.

SECTION A – Module B1

1   Jim is a 14 year old boy who has Type 1 diabetes.

(a) Jim needs medical treatment to control his condition.

He injects insulin into his body.

Describe how insulin travels around the body.

_____ [1]

(b) The more carbohydrate Jim eats, the more insulin he needs.

Explain why.

_____

_____

_____ [2]

(c) Describe where and how carbohydrates are stored in the body.

_____

_____

_____ [2]

(d) Jim thinks he inherited diabetes.

Inherited characteristics are controlled by genes.

Cystic fibrosis is another inherited disorder.

Cystic fibrosis is caused by a recessive allele.

Complete the table below to describe the phenotypes of different individuals.

Genotype	Phenotype
FF	
Ff	
ff	

[2]

[TOTAL: 7]

2   This question is about alcohol.

(a) Explain why alcohol slows down transmission along nerve pathways.

_____

_____

_____

_____ [3]

(b) Women are advised to drink no more than 14 UNITS of alcohol each week.

Look at the table.

DRINK	AMOUNT	UNITS OF ALCOHOL
beer	one pint	2.3
gin and tonic	one measure	1.0
cider	one pint	2.6
wine	one glass	3.0
whisky	one measure	1.0

Connie writes down all the alcoholic drink she has in one week.

Monday – one glass of wine
Tuesday – none
Wednesday – none
Thursday – two glasses of wine
Friday – two glasses of wine, one measure of whisky
Saturday – two gin and tonics
Sunday – one glass of wine

Connie has drunk more than the advised amount.

Calculate by how much she is over the advised amount.

answer _____ units   [2]

(c) Connie is concerned about drinking alcohol.

She researches the effects of alcohol and finds the graph on page 11 opposite.

It shows the relative risk of having an accident if you drink alcohol and drive.

Connie writes down some conclusions about the graph opposite.

Put a tick (✓) next to TWO conclusions that best match the graph.

20–29 year olds reduce the relative risk of an accident by 30 if they have blood alcohol level of 50 mg/100 ml instead of 80 mg/100 ml. ☐

Only those aged 18–19 will have an accident with a blood alcohol level of 10 mg/100 ml. ☐

People over 30 are 20 times better drivers than people in other age groups. ☐

People with a blood alcohol level of 150 mg/100 ml are at least 200 times more likely to have an accident than people with no alcohol in their blood. ☐
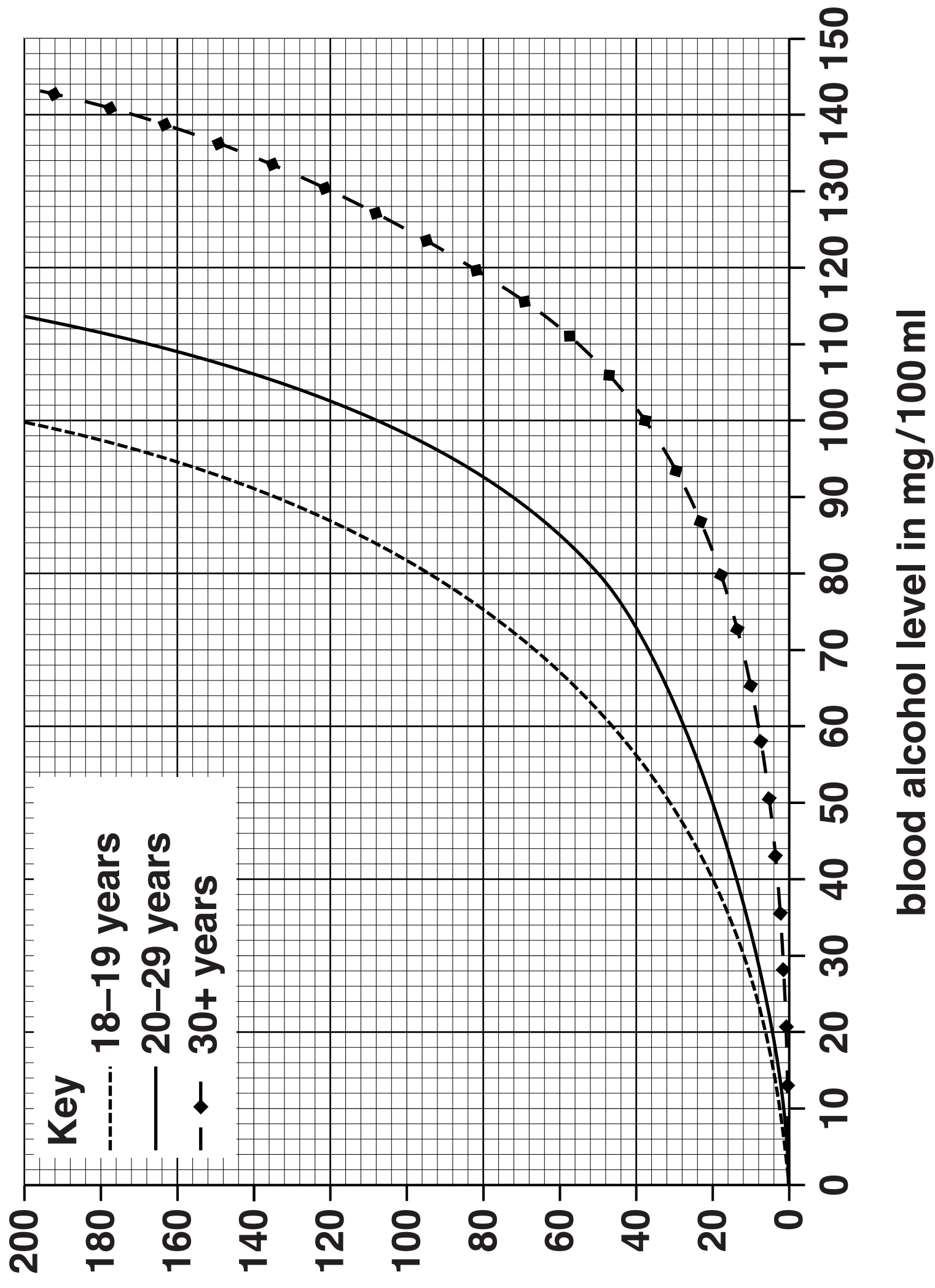
The lower the blood alcohol level the more likely you are to have an accident. ☐

[2]

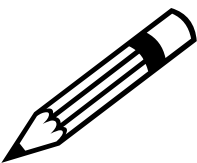[TOTAL: 7]

relative risk
of an
accident

Key
.... 18–19 years
—— 20–29 years
– ◆ – 30+ years

200
180
160
140
120
100
80
60
40
20
0

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

blood alcohol level in mg / 100 ml

3   Polio is an illness caused by a virus.
    In 1988 a campaign started to rid the world of polio.
    The campaign wanted to vaccinate children all over the
    world.

    Look at the graph below. It shows the number of polio cases
    in the world from 1984 to 2004.
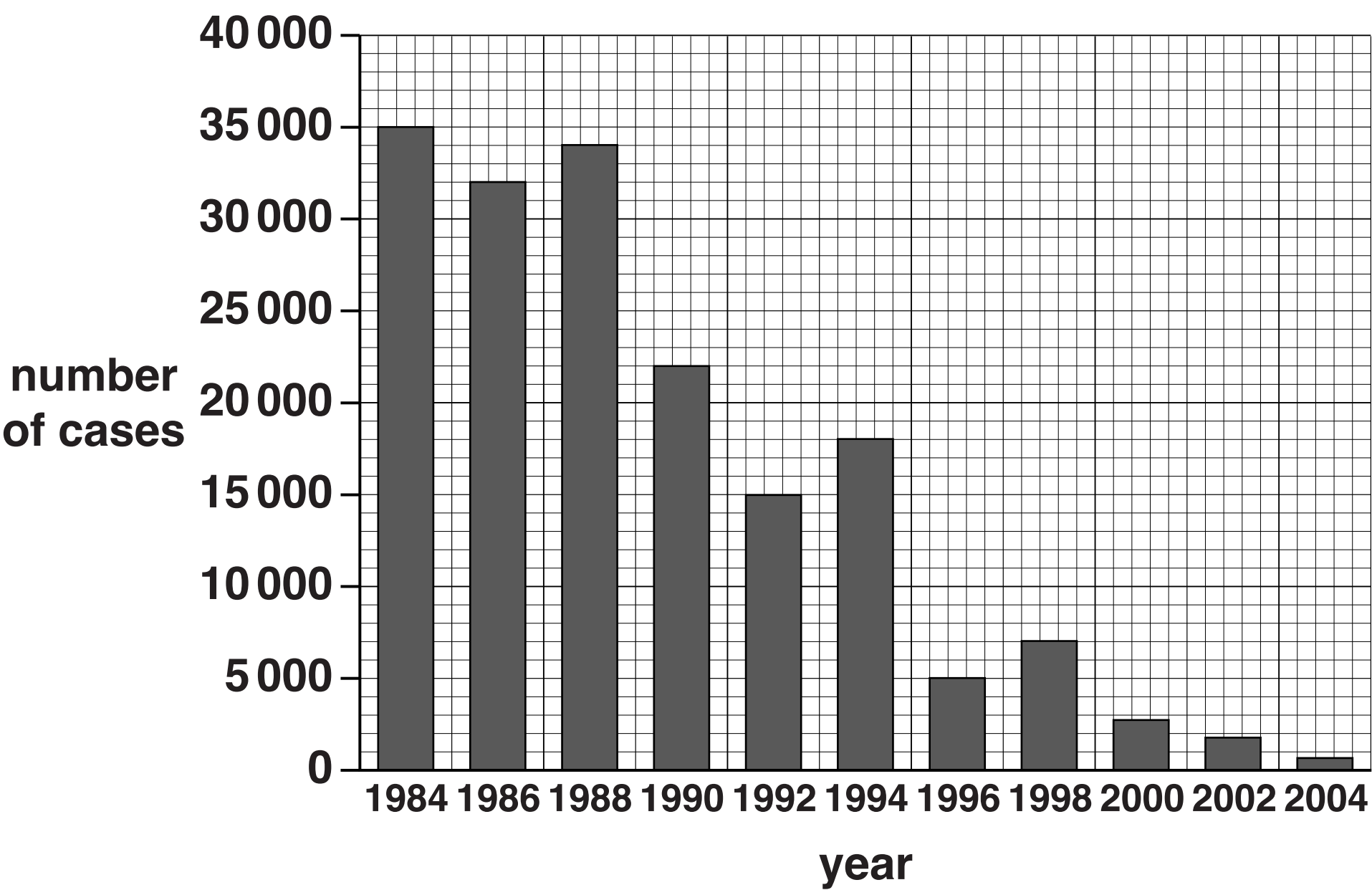
Explain how vaccinations work and use the data on page 12 to conclude if the campaign was successful or not.

The quality of written communication will be assessed in your answer to this question.

_____

_____

_____

_____

_____

_____

_____

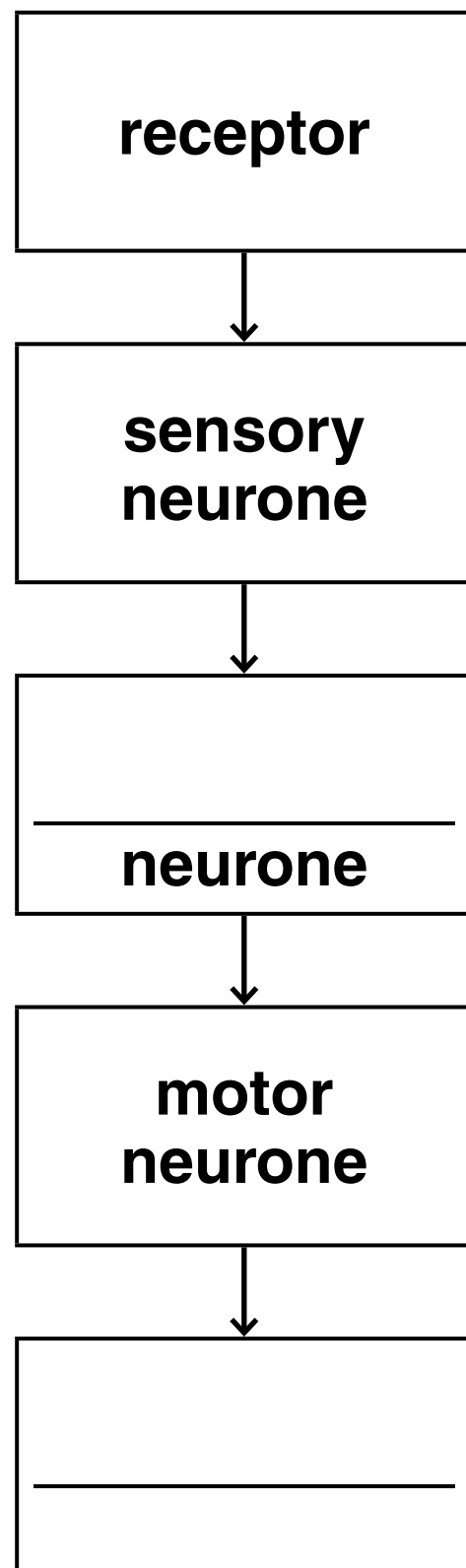_____

_____

_____ **[6]**

[TOTAL: 6]

4 Benny is cooking his tea.

He lifts a hot plate of food.

The plate is too hot to hold.

Benny drops the plate.

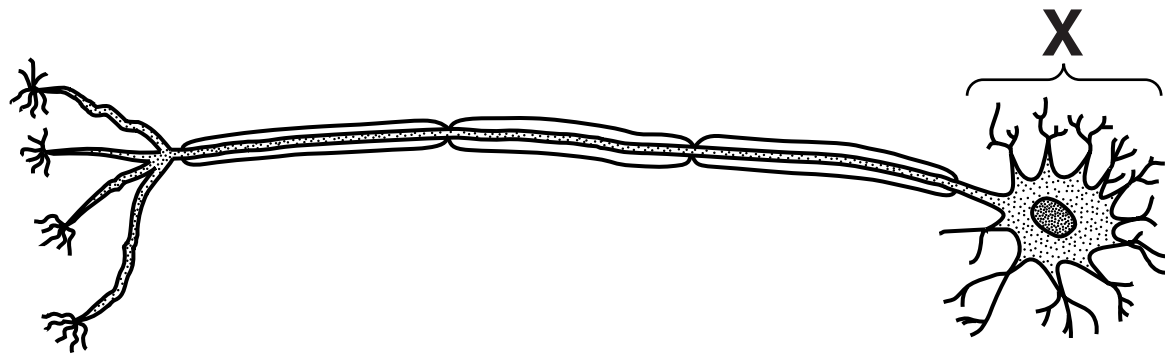(a) Benny's response to the hot plate is a reflex action.

Finish the flow chart below to show the path taken by the impulse that causes the reflex.

```
┌─────────────────┐
│    receptor     │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│    sensory      │
│    neurone      │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ _____  │
│    neurone      │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│     motor       │
│    neurone      │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│                 │
│ _____  │
└─────────────────┘
```

[2]

(b) Motor neurones are part of Benny's nervous system.
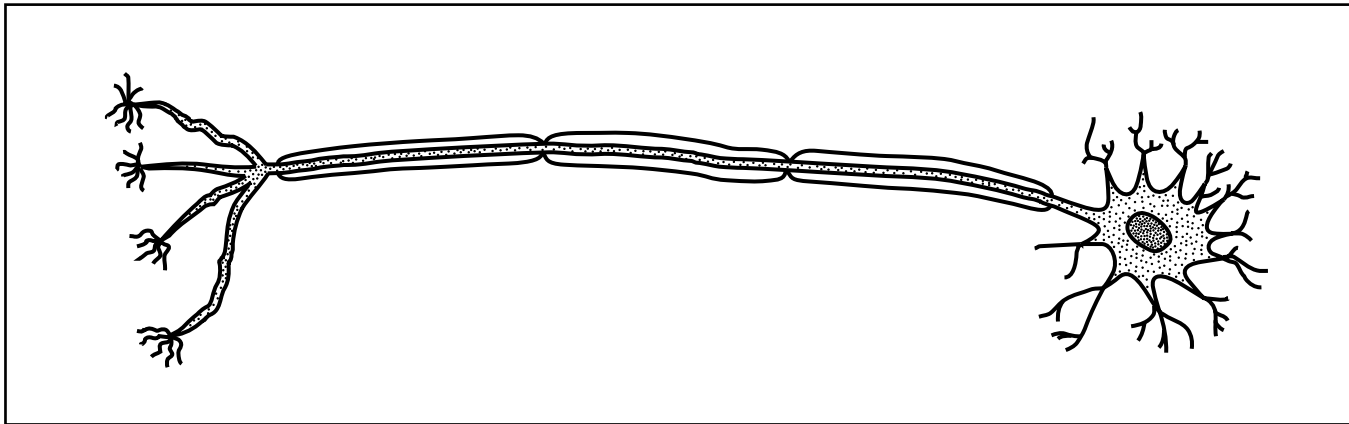
Look at the diagram below of a motor neurone.
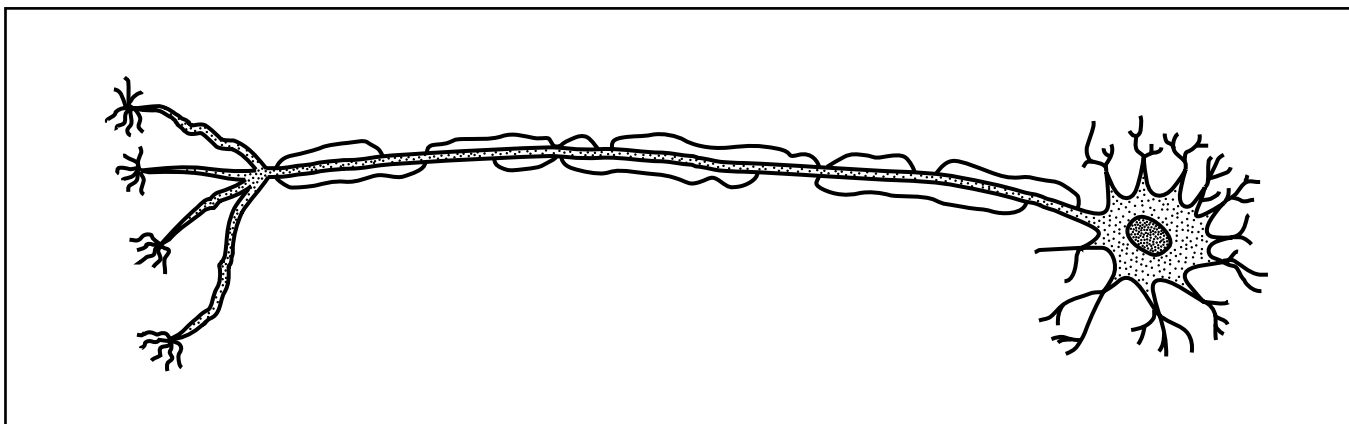

Write down the name of part X.

_____ [1]

(c) Sometimes neurones can be damaged.

Look at the pictures of an undamaged and a damaged neurone.

undamaged neurone

damaged neurone

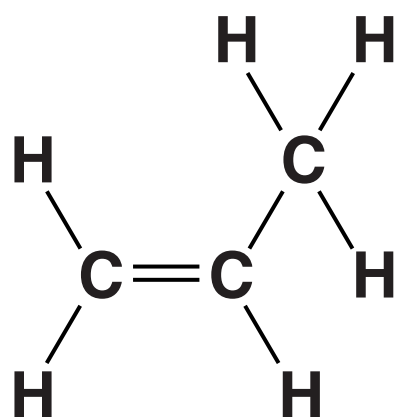**How would the damage affect the transmission of impulses?**

Explain your answer.

_____
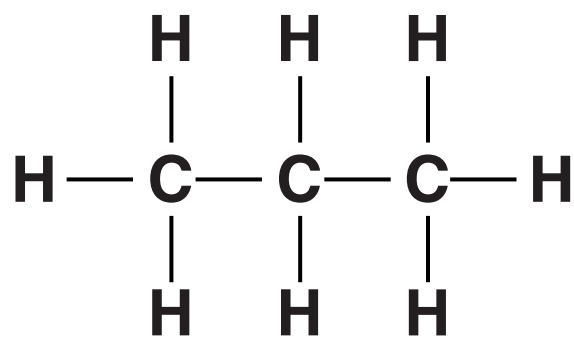
_____

_____ **[2]**

[TOTAL: 5]

5   This question is about carbon compounds.

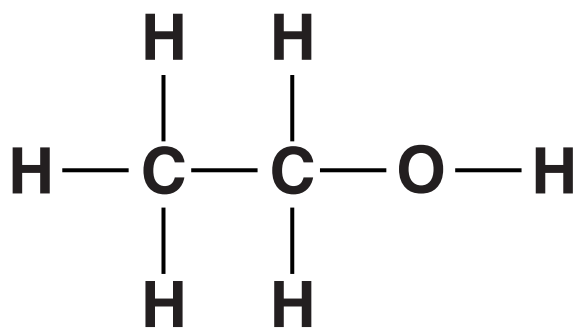Look at the displayed formulas.

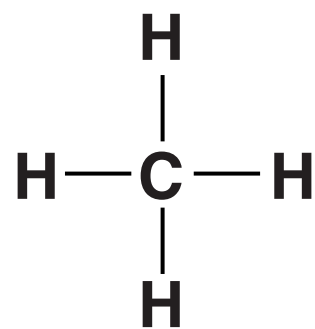**Compound A**

Compound B

Compound C

Compound D

(a) Which compound is NOT a hydrocarbon?

Explain your answer.

_____

_____ **[2]**

(b) What is the MOLECULAR FORMULA of compound C?

_____ **[1]**

(c) Compound A is an **UNSATURATED** compound.

Explain why.

_____

_____ **[1]**

(d) Molecules of compound A can join together to make a polymer.

Draw the **DISPLAYED FORMULA** of the polymer made.

[1]

[TOTAL: 5]

6 This question is about crude oil.

Crude oil is a fossil fuel.

(a) Fossil fuels are FINITE resources and are NON-RENEWABLE.

Explain what is meant by finite AND non-renewable.

_____

_____

_____

_____ **[2]**

(b) Crude oil is often transported in large ships called oil tankers.

This could cause ENVIRONMENTAL PROBLEMS.

Explain TWO of these environmental problems.

_____

_____

_____ **[2]**

(c) Crude oil is separated into useful fractions by fractional distillation.

Look at the table below. It shows information about some of the fractions separated from crude oil.

FRACTION	PERCENTAGE SUPPLY IN CRUDE OIL	PERCENTAGE DEMAND FROM CUSTOMERS
LPG	2	4
petrol	15	27
diesel	14	21
paraffin	14	9
heating oil	14	14
fuel oil and bitumen	36	25

There is not enough petrol to meet the demand for it.

(i) Write down the names of TWO other fractions where the supply does not meet the demand from customers.

_____ and

_____   [1]

(ii) Explain how an oil refinery matches the supply of PETROL with the demand for it.

Use information from the table above to help you.

_____

_____

_____

_____ [2]

[TOTAL: 7]

7 This question is about fuels.

(a) Butane, C_4H_{10}, burns in oxygen, O_2.

Carbon dioxide and water are made.

Write a BALANCED SYMBOL equation for this combustion reaction.

_____ [2]

(b) Some carbon monoxide is made when petrol burns in a car engine.

A catalytic converter changes carbon monoxide into another gas.
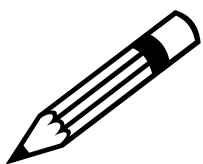
What is the name of this gas?

_____ [1]

(c) Look at the information on page 23 about some fuels.

Richard wants to use methane to heat a new factory.

Edward suggests using coal instead of methane.

Evaluate the advantages and disadvantages of these two fuels and suggest which would be the more sensible choice to heat the factory.

Use the information from the table on page 23 to help you.

The quality of written communication will be assessed in your answer to this question.

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

[TOTAL: 9]

FUEL	STATE AT ROOM TEMPERATURE	AVAILABILITY	ENERGY RELEASED IN kJ/g	CARBON DIOXIDE RELEASED (0=LOW, 5=HIGH)	COST OF 1kg IN £
COAL	solid	good	33	3.7	0.3
METHANE	gas	good	56	2.8	1.3

8 Helen has bought a new bottle of perfume.

(a) Draw a straight line to join each **PROPERTY OF HELEN'S PERFUME** to the most important **REASON**.

Draw only **THREE** lines.

PROPERTY OF HELEN'S PERFUME

REASON

PROPERTY OF HELEN'S PERFUME	REASON
	so the perfume cannot be washed off easily
insoluble in water	
	so Helen is not poisoned
does not react with water	
	so Helen can put the perfume directly onto her skin
non-irritant	
	so that the perfume does not react with perspiration

[2]

(b) Helen's friends are able to smell her perfume because it is VOLATILE (evaporates easily).

Explain, using ideas about particles, why Helen's perfume evaporates easily.

_____

_____

_____

_____ **[2]**

[TOTAL: 4]

SECTION C – Module P1

9 This question is about waves.

(a) Look at the list.

It shows waves from the electromagnetic spectrum.

infrared

radio

ultraviolet

visible
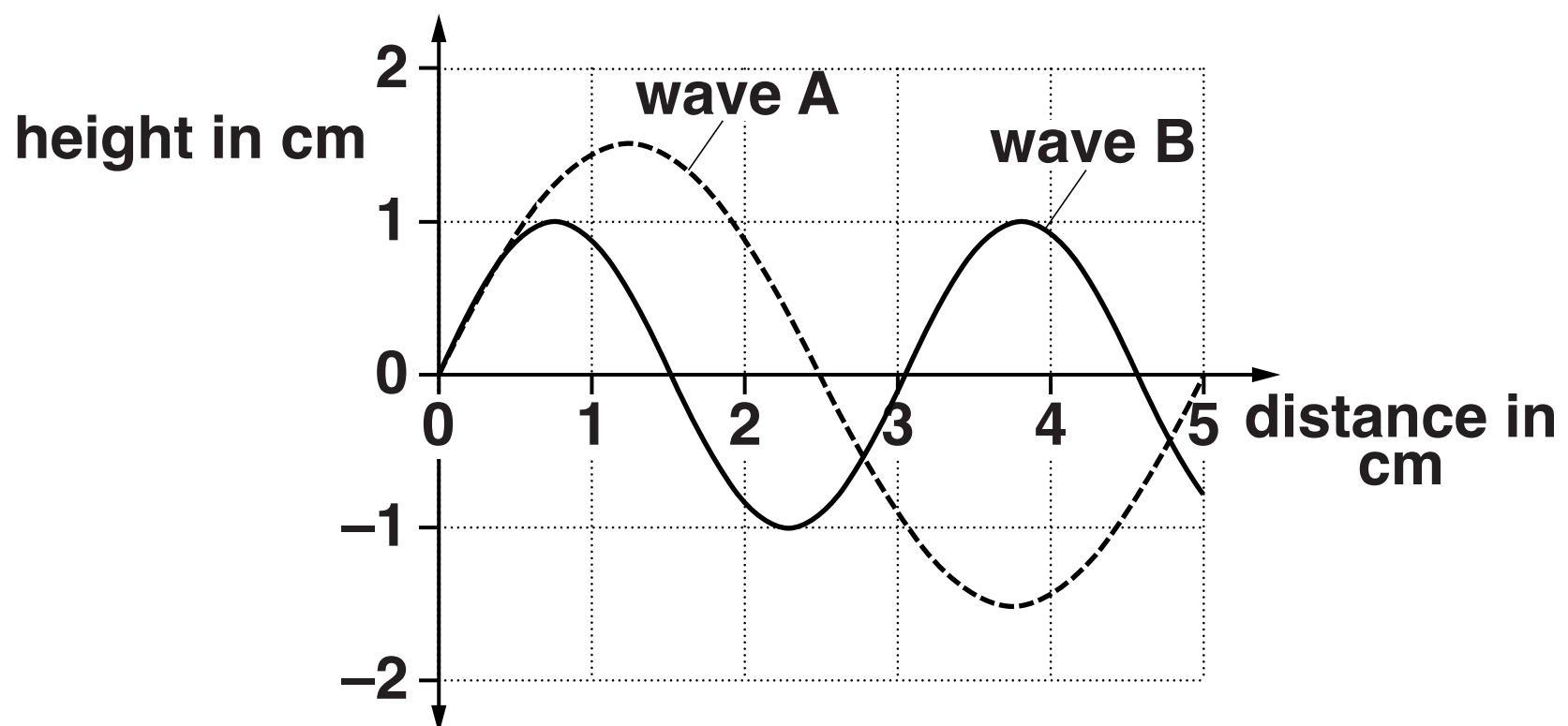
X-rays

Complete the sentences using words from the list.

(i) The wave that is reflected by shiny surfaces and can heat the surface of food is

_____ .   [1]

(ii) The wave with the greatest wavelength is

_____ .   [1]

26

(b) Look at the diagram below of two transverse waves.

What is the DIFFERENCE in wavelength between wave A and wave B?

_____

Difference in wavelength _____ cm   [1]

(c) Mobile phones use microwave signals.

There is not much diffraction of microwave signals around large buildings.

This causes signal loss.

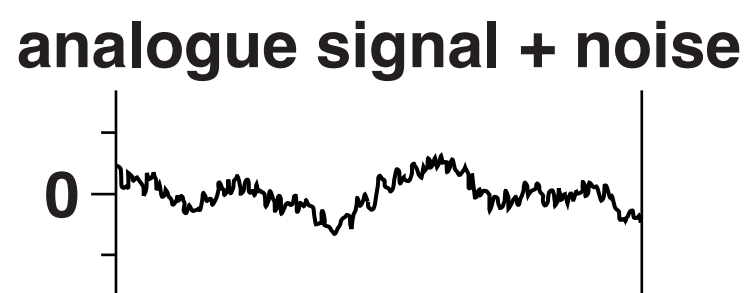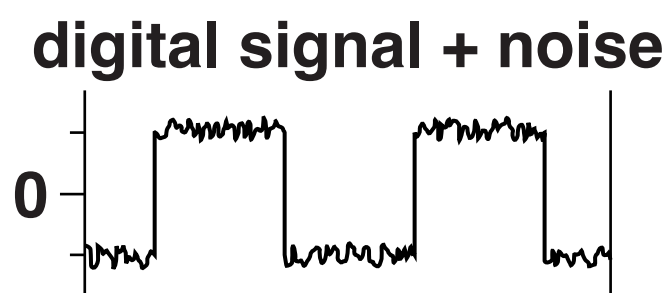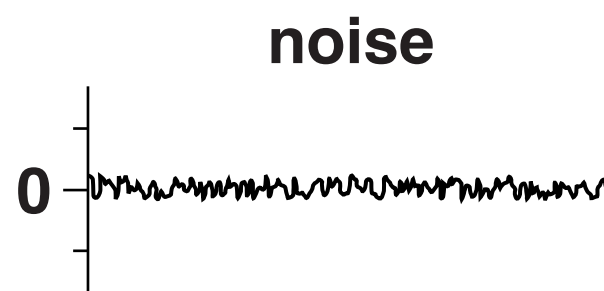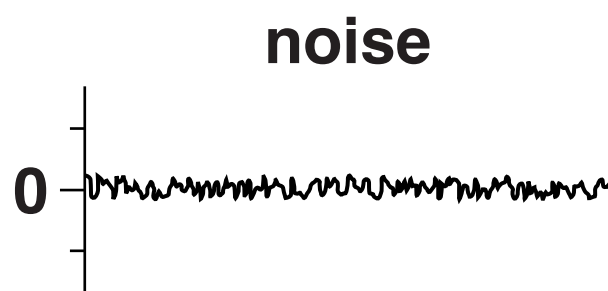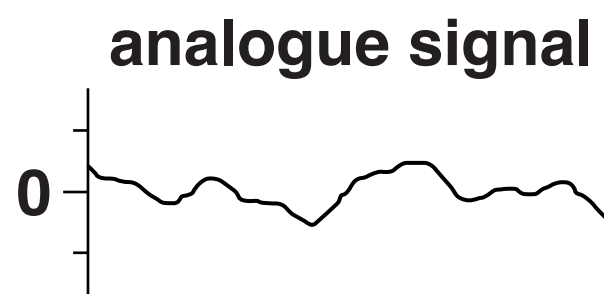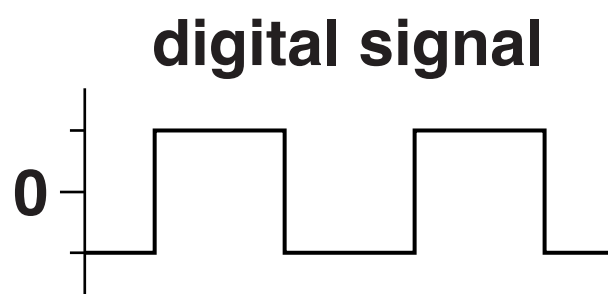**One way a mobile phone company can reduce the problem is to boost the signal.**

Suggest TWO other ways a mobile phone company can reduce the problem of signal loss.
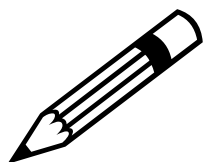
_____

_____

_____ [2]

[TOTAL: 5]

10 This question is about digital and analogue signals.

Look at the information showing what happens to the signals when noise is added to them.

Use the diagrams to explain why it is easier to remove noise from digital signals and how the properties of digital signals played a part in the switching from analogue to digital TV broadcasts. [6]
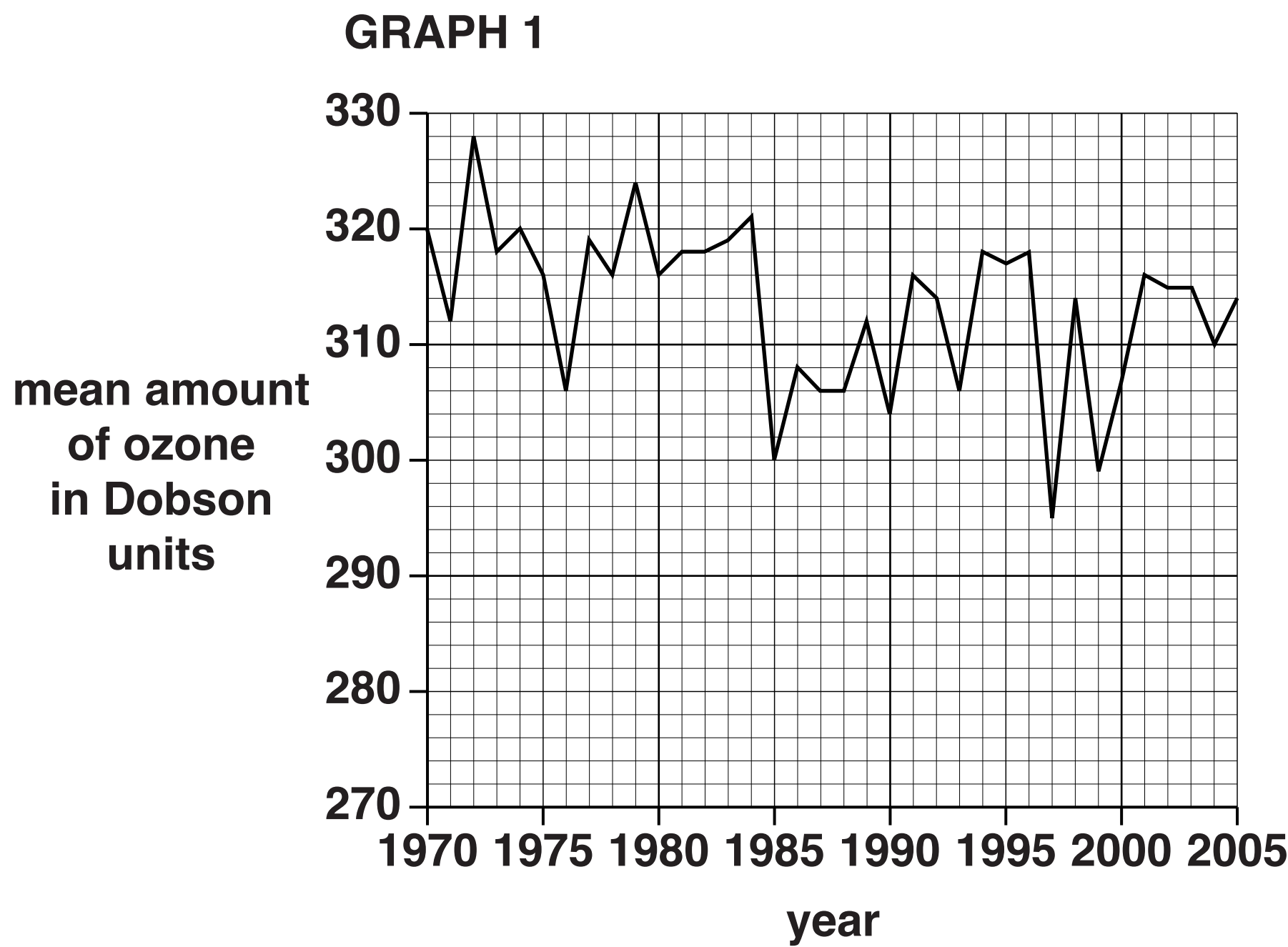
The quality of written communication will be assessed in your answer to this question.

_____

_____

_____

_____

_____

_____

_____

29

_____

_____

[TOTAL: 6]

11 **The condition of the ozone layer near the South Pole concerns scientists.**

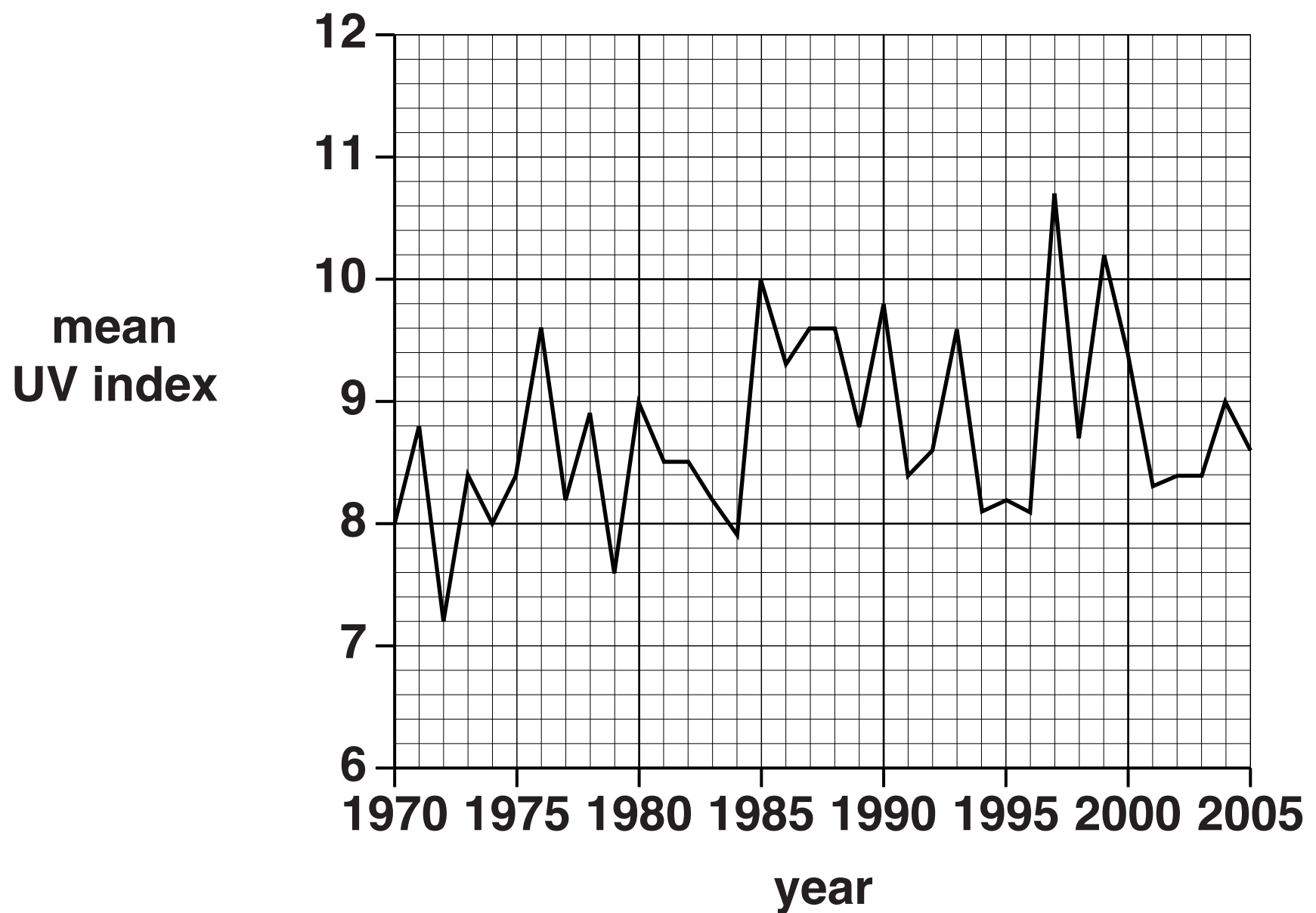**Scientists have been measuring the mean amount of ozone in the upper atmosphere.**

Look at their results from 1970 to 2005.

GRAPH 1

mean amount of ozone in Dobson units

year

Scientists have also been measuring the mean ultraviolet (UV) index from 1970 to 2005.

GRAPH 2

(a) Look at GRAPH 1 on page 30.

Scientists predicted that the amount of ozone in 1997 was the lowest they were likely to record.

Is this prediction correct?

_____

Explain your answer.

_____

_____ [1]

(b) (i) Compare Graphs 1 and 2 on pages 30 and 31.

Describe the relationship between the mean amount of ozone and mean UV index.

_____

_____ [1]

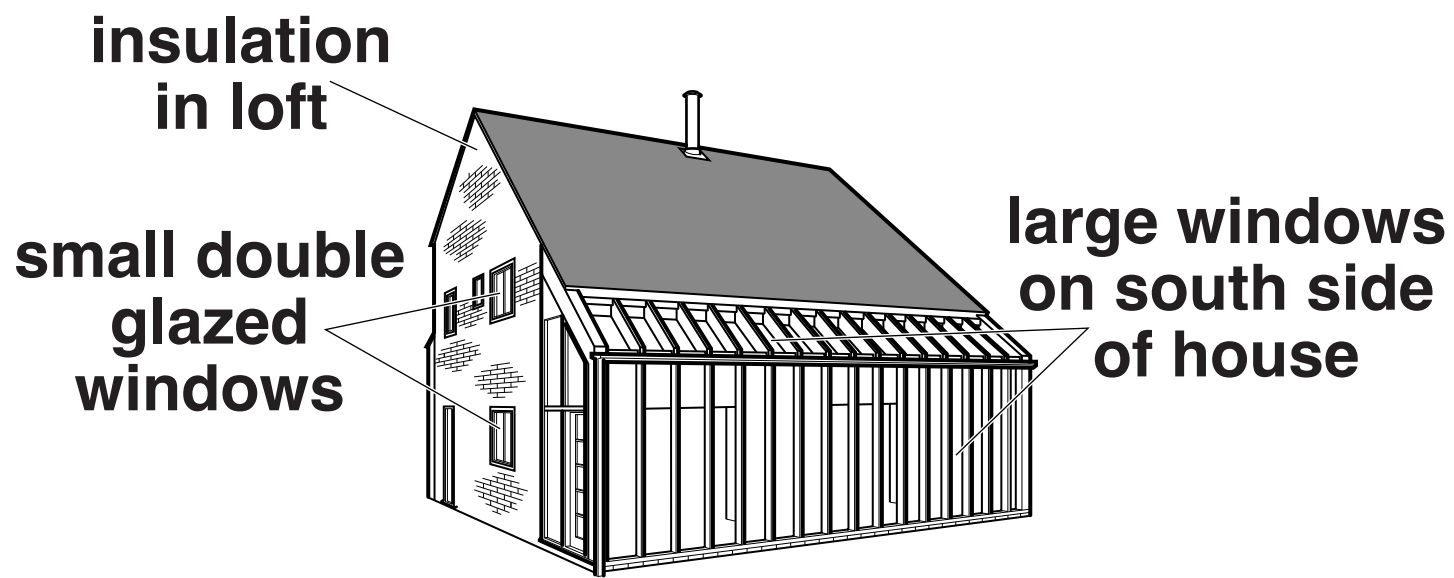**(ii) Describe why it is important to maintain a high level of ozone in the Earth's upper atmosphere.**

_____

_____ [1]

(c) Describe why the reduction in the level of pollution from CFCs needed international agreement to benefit society.

_____

_____

_____

_____ [2]

[TOTAL: 5]

12 Lyndsay and Kevin buy a new house.

insulation
in loft

small double
glazed
windows

large windows
on south side
of house

(a) Their house does NOT have cavity wall insulation but is more energy efficient than most houses.

Look at the picture.

Explain how TWO energy saving features of their house improve its energy efficiency.
Use ideas about energy transfer in your answer.

_____

_____

_____

_____

_____ **[2]**

(b) Here are three different ways to increase the energy efficiency of Lyndsay and Kevin's house.

HOW TO INCREASE ENERGY EFFICIENCY	COST TO INSTALL IN £	SAVING ON ENERGY BILLS EACH YEAR IN £
Cavity wall insulation	1400	400
Low energy light bulbs for whole house	20	10
Thermostat for heating	35	100

(i) One of the ways to increase efficiency is to add cavity wall insulation to the house.

Lyndsay thinks this is a good idea because they will be living in the house for at least 5 years.

Use the information in the table above to show that Lyndsay is correct.

_____

_____

_____

_____ **[2]**

(ii) Kevin thinks the cost of cavity wall insulation is expensive.

He wants to spend £55 on low energy light bulbs and a thermostat.

Which will save more money after 5 years

cavity wall insulation

low energy light bulbs and a thermostat?
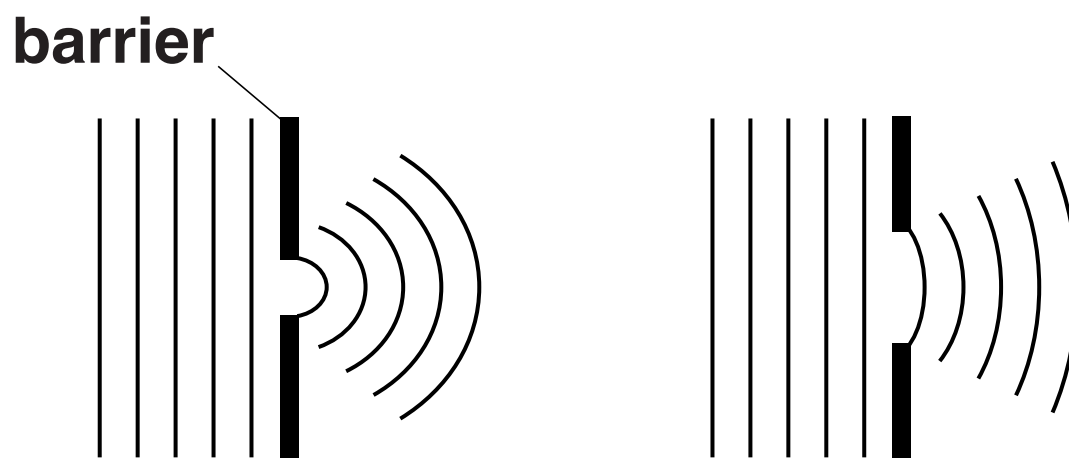
answer

_____

Explain your answer.

_____

_____

_____ **[2]**

[TOTAL: 6]

13 Diffraction patterns in water are made using a ripple tank.

Look at the two different diffraction patterns.

Diffraction pattern A   **Diffraction pattern B**

barrier

Describe and explain the similarities and differences between these two diffraction patterns.

You may draw on the diffraction patterns and draw diagrams to help explain your answer.

_____

_____

_____

_____ **[3]**

[TOTAL: 3]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

38

39

OCR

Oxford Cambridge and RSA