

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

B711/02

GATEWAY SCIENCE
SCIENCE B

Science modules B1, C1, P1
(Higher Tier)

THURSDAY 24 JANUARY 2013: Morning

DURATION: 1 hour 15 minutes
plus your additional time allowance

MODIFIED ENLARGED 18pt

| | | | |
|-------------------------------|--|------------------------------|--|
| 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:

Periodic Table (inserted)

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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil () .
- A list of equations can be found on pages 4 and 5.
- An enlarged copy of the Periodic Table is inserted.
- 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.

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EQUATIONS

$$\text{energy} = \text{mass} \times \frac{\text{specific heat}}{\text{capacity}} \times \text{temperature change}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

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

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$\text{power} = \text{voltage} \times \text{current}$$

$$\text{energy supplied} = \text{power} \times \text{time}$$

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

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

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

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

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

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

power = force × speed

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

momentum = mass × velocity

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

GPE = mgh

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

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

Answer ALL the questions.

SECTION A – MODULE B1

1 This question is about drugs.

(a) Different types of drugs have different effects on the body.

Draw a straight line from each DRUG to its CATEGORY.

| DRUG | CATEGORY |
|------------------|---------------------|
| LSD | depressant |
| temazepam | hallucinogen |
| aspirin | pain killer |

[1]

- (b) James has drunk a pint and a half of beer and a single gin and tonic.

People who drink more than four units of alcohol are likely to be over the legal limit for driving.

Look at the table.

| Drink | Amount | Units of alcohol |
|---------------|-------------|------------------|
| beer | one pint | 2.3 |
| gin and tonic | one measure | 1.0 |
| lager | one pint | 3.4 |
| wine | one glass | 3.0 |
| vodka | one measure | 1.0 |

Can James legally drive? _____

Explain your answer.

_____ [2]

- (c) Describe how alcohol damages the liver.

_____ [2]

[TOTAL: 5]

2 Kerry and Abbas investigate the nervous system.

They ask people to test their reactions using a computer game.

The game uses a square that changes colour.

It times how long it takes someone to react to the change.

The table (opposite) shows the results.

(a) Look at Diane's results. One of her results is inaccurate.

This has made her mean too high.

Calculate the mean for Diane WITHOUT the inaccurate result.

mean = _____ seconds [2]

(b) Describe the patterns in their results.

[2]

| Name | Sex | Age in years | Time taken to react in seconds | | | | | |
|-------|--------|--------------------|-----------------------------------|--------------|--------------|--------------|--------------|------|
| | | | Attempt 1 | Attempt 2 | Attempt 3 | Attempt 4 | Attempt 5 | Mean |
| Colin | male | 16 | 0.28 | 0.34 | 0.33 | 0.33 | 0.40 | 0.34 |
| Diane | female | 55 | 0.39 | 0.45 | 0.44 | 0.40 | 1.43 | 0.62 |
| Ewan | male | 14 | 0.31 | 0.28 | 0.24 | 0.30 | 0.33 | 0.29 |
| Freda | female | 72 | 0.53 | 0.48 | 0.54 | 0.48 | 0.53 | 0.51 |
| Tom | male | 12 | 0.26 | 0.29 | 0.30 | 0.30 | 0.27 | 0.28 |

- (c) To test their reactions the individuals use their eyes to see the colour change.**

Which part of the eye detects the colour change?

_____ **[1]**

- (d) Ewan has blue eyes.**

The alleles for blue eyes are recessive.

His parents both have brown eyes.

- (i) Explain what is meant by recessive.**

_____ **[1]**

- (ii) What is an allele?**

_____ **[1]**

- (iii) His mother's genotype is Bb.**

What is Ewan's genotype?

_____ **[1]**

[TOTAL: 8]

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3 Fritz and Carol are investigating the growth of plants.

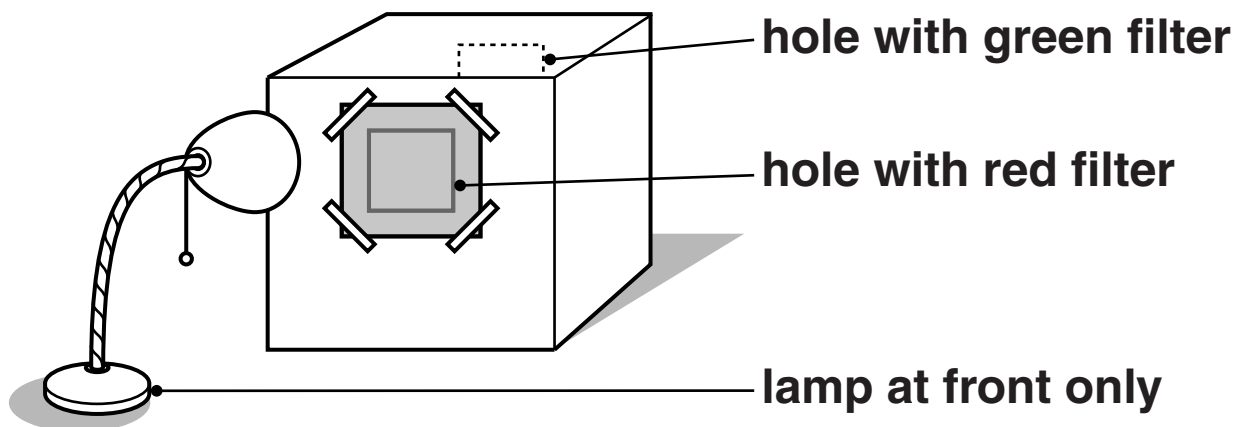
They put a plant in a box with a hole in each end.

The box has a filter that lets only red light into one hole.

It has another filter that lets only green light into the other hole.

They put a lamp in front of the red filter.

Light can only get into the box through the two holes.



After five days the top of the plant is pointing towards the red filter.

Fritz concludes that red light has a greater effect on auxin than green light.

Carol concludes that the plant bends towards the greater light intensity.

Evaluate their METHOD and their CONCLUSIONS.



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

[6]

[TOTAL: 6]

4 Read the information about some diseases.

| Disease | Type of pathogen that causes the disease | How the pathogen gets into body | Some countries where the disease occurs |
|---------------------|---|---|--|
| diphtheria | bacteria | through the nose | Brazil South Africa India |
| malaria | protozoa | by the mosquito acting as a vector | China Kenya Gambia |
| cholera | bacteria | drinking contaminated water | Kenya India Vietnam |
| typhoid | bacteria | drinking contaminated water | Kenya India Vietnam |
| yellow fever | virus | by the mosquito acting as a vector | Brazil Kenya Gambia |

Use the information in the table and your scientific knowledge to answer these questions.

- (a) A town in Kenya is trying to reduce the numbers of people infected with yellow fever.**

They start by reducing the amount of stagnant water within the town.

Explain why this could help.

[2]

(b) Sally is going on holiday to Brazil. Before she goes Sally has two different vaccinations.

- (i) One vaccination gives Sally active immunity to yellow fever. The second gives passive immunity to diphtheria.**

Explain how Sally's immunity to yellow fever and diphtheria will be different.

[2]

- (ii) Explain the process of immunisation to provide active immunity.**

[2]

[TOTAL: 6]

SECTION B – MODULE C1

5 This question is about pigments in paints.

Pigments give paints their colour.

Look at the table. It shows information about some pigments used in paints.

| Pigment | Colour | Effect of increasing the temperature | Effect of light | Type of paint made |
|----------------|---------------|---|--|---------------------------|
| A | blue | no change | no change | oil based |
| B | yellow | no change | colour fades | emulsion |
| C | red | changes to yellow | colour fades | oil based |
| D | green | colour fades | absorbs light and later gives off light | emulsion |

(a) (i) Which pigment is phosphorescent?

Choose from A, B, C or D.

answer _____ [1]

(ii) A toy tests the temperature of a baby's bath.

Which pigment should the toy contain?

Choose from A, B, C or D.

answer _____ [1]

(b) There are two types of paint:

**emulsion paints
oil based paints.**

Explain how EACH type of paint dries.

[2]

(c) Some pigments are used to make nail varnish.

In some countries these nail varnishes are tested using animals.

Some people think we should test cosmetics on animals.

Other people think we should NOT test cosmetics on animals.

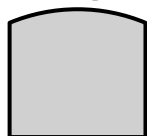
Explain why people have these different views.

[2]

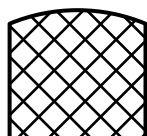
[TOTAL: 6]

6 Look at the data about crude oils A, B, C and D from different parts of the world.

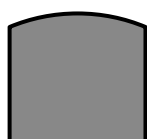
Key:



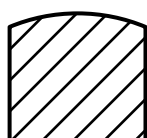
**petrol and
chemical feedstock**



paraffin



heating oil



fuel oil

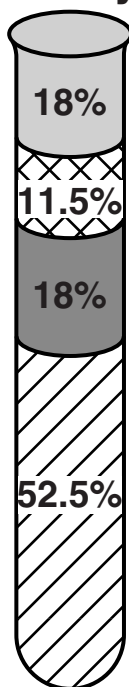
Middle East

**Arabian
Heavy**

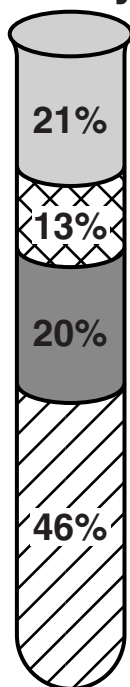
**Iranian
Heavy**

**Arabian
Light**

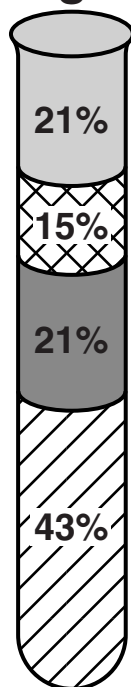
**North
Sea**



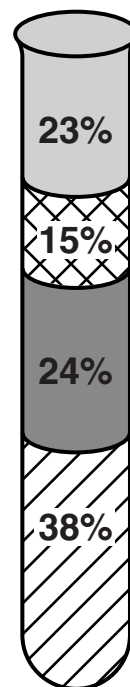
A



B



C



D

- (a) (i) Which crude oil would be the best one to use to make fuel oil?**

Choose from A, B, C or D.

answer _____ [1]

- (ii) Suggest why obtaining North Sea crude oil is beneficial to the UK.**

_____ **[3]**

- (b) All four crude oil samples contain more fuel oil than is needed.**

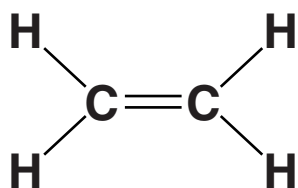
Explain how an oil refinery manager overcomes this problem.

_____ **[2]**

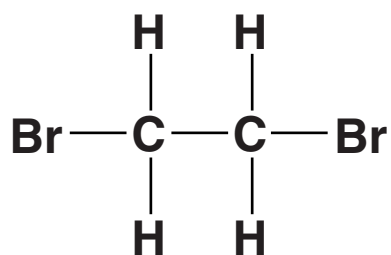
[TOTAL: 6]

- 7 Look at the displayed formulas of ethene and two compounds that can be made from ethene.

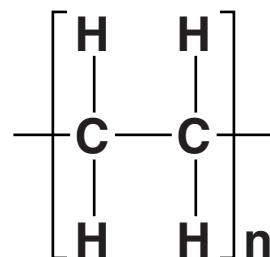
ethene



compound A



compound B



Write about the TYPES of compound shown and explain the reactions where ethene is changed into compound A and compound B.



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

[6]

[TOTAL: 6]

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8 Look at the table (opposite). It shows information about gases which pollute the air.

(a) Karen thinks that pollutant gases A, C and D all cause acid rain.

Does the evidence support this?

Explain your answer.

[3]

(b) Cars are fitted with catalytic converters in order to remove carbon monoxide.

Carbon monoxide, CO, reacts with nitrogen monoxide, NO.

Carbon dioxide and nitrogen, N₂, are made.

Write a BALANCED SYMBOL equation for this reaction.

[2]

| Pollutant gas | Solubility in water | pH of solution | Effect on marble statues | Effect on steel | Effect on humans |
|----------------------|----------------------------|-----------------------|---------------------------------|--------------------------|---|
| A | very soluble | 8 | none | none | none |
| B | insoluble | not applicable | none | none | poisonous |
| C | very soluble | 3 | reacts slowly | increases rusting | causes coughing |
| D | very soluble | 4 | reacts slowly | increases rusting | causes coughing and photochemical smog |

(c) It is important that air pollution is controlled.

Explain why.

[2]

[TOTAL: 7]

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SECTION C – MODULE P1

9 This question is about waves.

- (a) A loudspeaker gives out a sound of frequency 80 Hz.**

What does 80 Hz mean?

_____ [1]

- (b) Look at the diagram (opposite) of a water wave.**

- (i) What is the wavelength of this wave?**

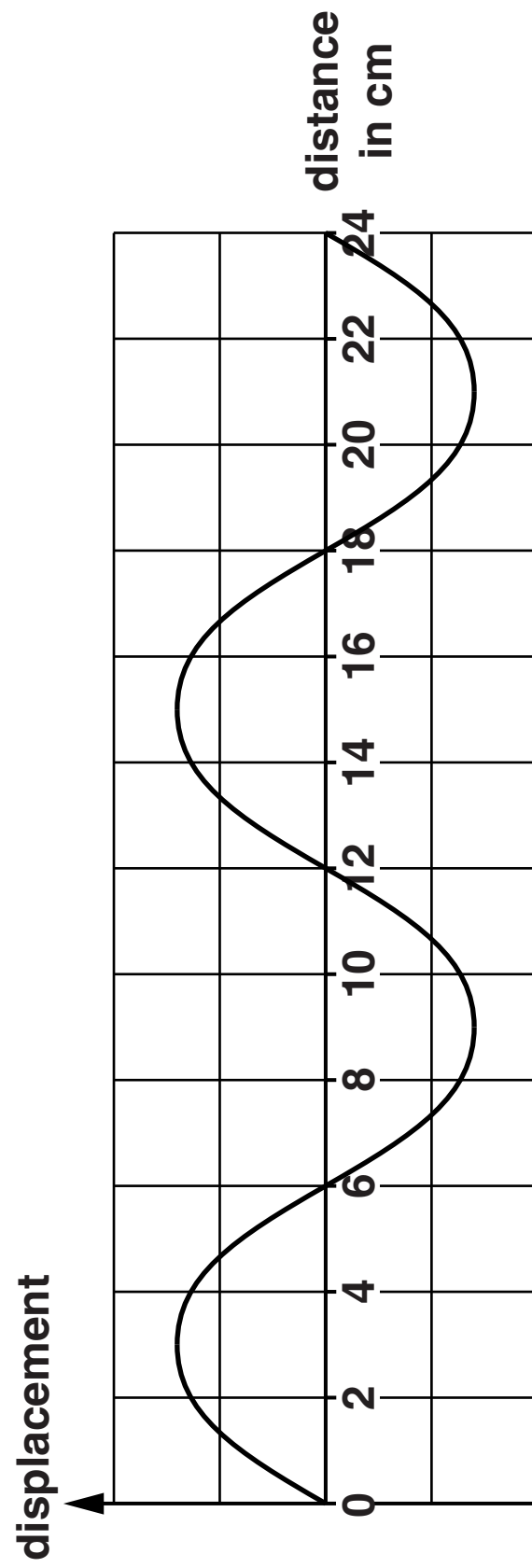
answer _____ cm [1]

- (ii) The speed of this water wave is 20 cm/s.**

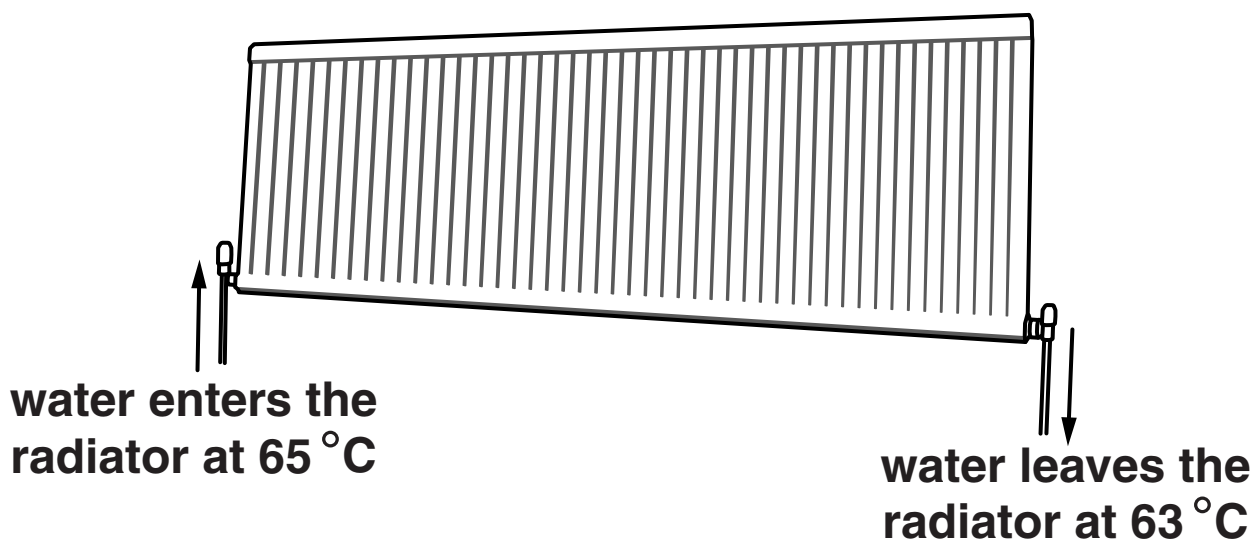
Calculate the frequency of this wave.

answer _____ Hz [2]

[TOTAL: 4]



10 Laura's living room is heated by a radiator.



- (a) The water enters the radiator at 65 °C and leaves the radiator at 63 °C.**

The radiator gives out 2000 J of heat each second.

The specific heat capacity of water is 4200 J/kg °C.

Calculate the mass of water flowing through the radiator each second.

Give your answer to TWO decimal places.

answer _____ kg [3]

(b) Laura's friend thinks about an identical radiator that uses oil instead of water.

Oil has a lower specific heat capacity than water.

How can this radiator give out the same amount of energy as Laura's radiator?

[1]

[TOTAL: 4]

11 Oliver wants to reduce energy loss from his house.

He decides to put insulation in his loft.

He knows that the U-value of the INSULATION AND THE CEILING TAKEN TOGETHER is a measure of the rate of energy loss.

Better insulators have lower U-values.

Look at the information in the table.

| Thickness of insulation in mm | U-value of insulation and ceiling | Saving in energy bills each year in £ |
|--------------------------------------|--|--|
| 0 | 2.30 | 0 |
| 100 | 0.40 | 40 |
| 200 | 0.20 | 57 |
| 400 | 0.10 | 70 |

Oliver thinks that doubling the thickness of insulation in his loft should halve his heating bills.

Describe how the loft insulation reduces energy loss and suggest reasons why Oliver's heating bills are NOT halved.



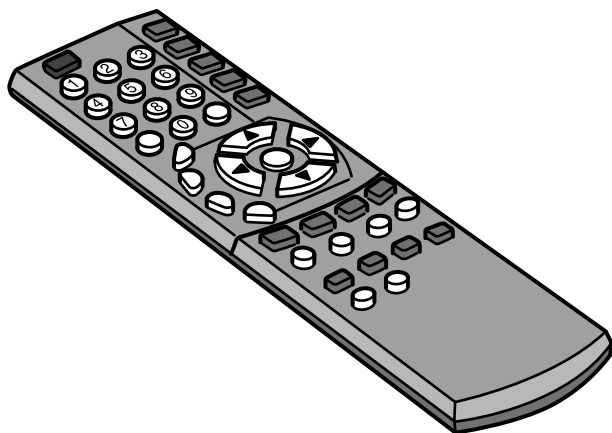
The quality of written communication will be assessed in your answer to this question.

[6]

[TOTAL: 6]

12 This question is about electromagnetic radiation.

- (a) An infrared remote control can be used to control a television.**

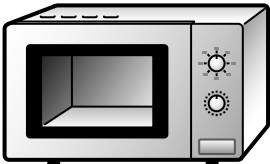
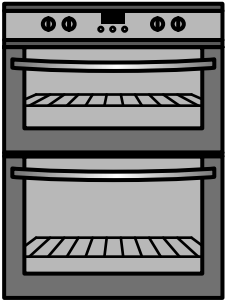


The SIGNAL from a remote control can change the channel on a television.

Explain how.

[2]

(b) Look at the information about cooking similar-sized potatoes in two different ovens.

| Type of oven | Type of radiation | Cooking time for a jacket potato in minutes |
|--|-------------------|---|
|  microwave | microwaves | 12 |
|  conventional oven | infrared | 60 |

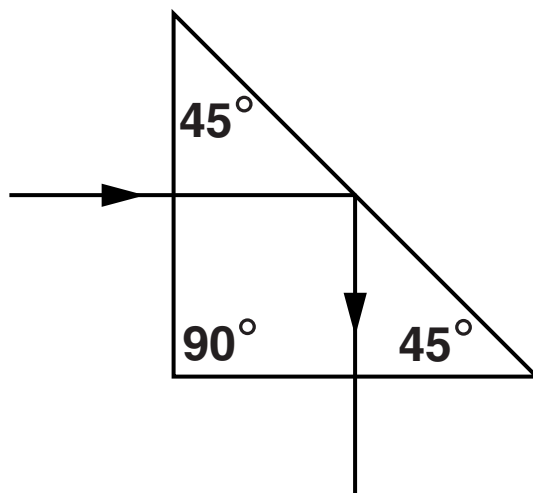
Explain how a potato is cooked in both ovens and why the microwave oven cooks the potato quicker.

[3]

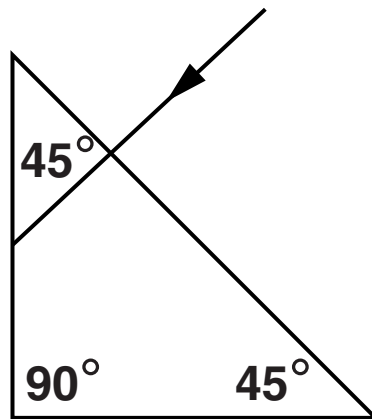
(c) Mary investigates how light passes through a prism.

She does two experiments.

Look at the result of her first experiment.



COMPLETE the path of the light in her second experiment.



[2]

[TOTAL: 7]

13 (a) When an earthquake happens, S-waves and P-waves are produced.

Put ticks (✓) in the boxes next to ALL the CORRECT statements.

P-waves are longitudinal.

☐

S-waves are longitudinal.

☐

P-waves travel faster than S-waves.

☐

S-waves and P-waves travel at the same speed.

☐

P-waves travel slower than S-waves.

☐

S-waves can travel through all parts of the Earth.

☐

P-waves can travel through all parts of the Earth.

☐

[2]

- (b) On a sunny day, Mark can stay in the sun for 20 minutes before he gets sunburnt.**

He wants to sunbathe for 3 hours.

What is the LOWEST level of sun protection that he should use?

Choose from: 5 15 20 30 50

answer _____ [1]

- (c) People with darker skin have a lower risk of developing skin cancer from sunbathing.**

Suggest a reason why.

_____ **[1]**

[TOTAL: 4]

END OF QUESTION PAPER

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