

GENERAL CERTIFICATE OF SECONDARY EDUCATION

**GATEWAY SCIENCE
 SCIENCE B**

B711/01

Unit B711: Science modules B1, C1, P1 (Foundation Tier)

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

OCR Supplied Materials:
 None

Duration: 1 hour 15 minutes

Other Materials Required:

- Pencil
- Ruler (cm/mm)

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The Periodic Table can be found on the back page.
- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document consists of **28** pages. Any blank pages are indicated.

Examiner's Use Only:			
1		9	
2		10	
3		11	
4		12	
5		13	
6		14	
7		15	
8		16	
Total			

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

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

momentum = mass × velocity

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

GPE = mgh

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

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

Answer **all** the questions.

Section A – Module B1

1 Deb is thirteen years old.

Her doctor has told her that she must eat enough protein each day.

She can calculate her estimated average requirement (EAR) for protein in grams using the formula:

$$\text{EAR in g} = 0.6 \times \text{body mass in kg}$$

Deb has a mass of 58 kg.

Look at the information about how much protein Deb eats in one day.

food	protein content in grams
breakfast cereal	5.0
salad sandwich	8.0
macaroni cheese pasta	13.9
rice pudding	3.0
tinned peaches	0.5

Using the formula for EAR, should Deb be concerned about the amount of protein she eats?

Explain why.

.....

.....

.....

.....

.....

.....

.....

[3]
[Total: 3]

2 Chaminda visits the doctor because he feels ill.

The doctor tells him:



A little while ago, some bacteria entered your body.
Your body will soon make antibodies to kill the bacteria.
To help, I will give you some medicine.
This medicine has been thoroughly tested on animals first.

(a) Describe how Chaminda's body normally defends against bacteria.

.....

.....

.....

.....

.....

.....

..... [4]

(b) Chaminda is concerned that the medicine had been tested on animals.

Suggest what his concerns might be.

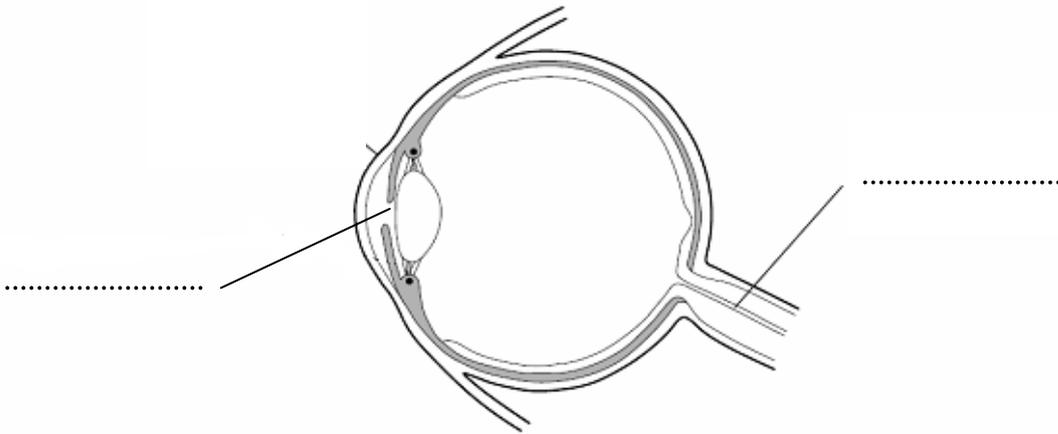
.....

.....

..... [2]

[Total: 6]

3 The diagram shows parts of a human eye.



(a) Finish labelling the diagram.

Choose the labels from this list.

blindspot

iris

optic nerve

pupil

retina

[2]

(b) (i) Look at the list of actions.

The eye is the receptor for all these actions.

Which of the actions are reflexes?

Put a tick (✓) in the box next to each reflex actions.

Put a cross (X) in the box next to each of the actions which are **not** reflex actions.

Automatically blinking when an object is thrown towards your face.	
--	--

Changing the shape of your pupil without thinking in bright light.	
--	--

Turning on the light when it gets dark.	
---	--

[1]

(ii) Some reflex actions slow down as people get older.

Why might this be a problem?

.....

..... [1]

[Total: 4]

4 Tobacco smoke contains chemicals and can affect the lungs.

(a) One of these chemicals is an addictive substance.

Write down the name of this chemical.

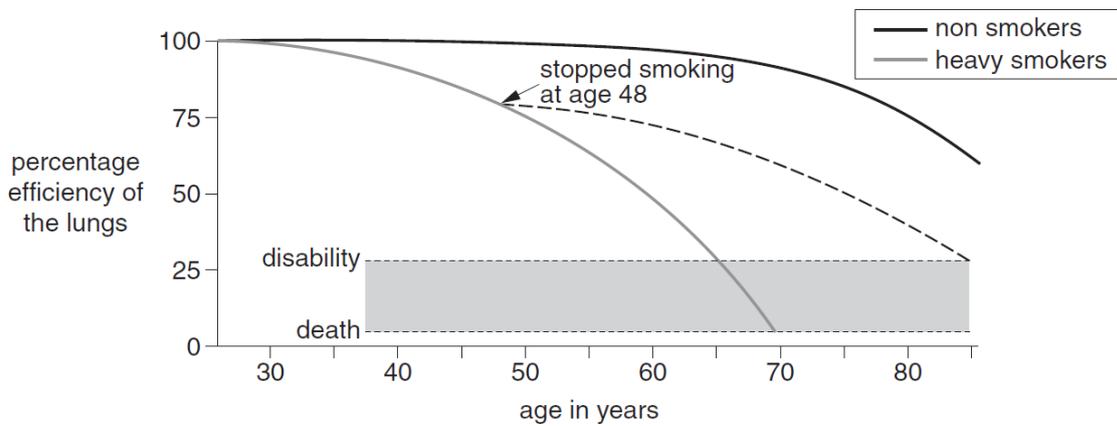
..... [1]

(b) The graph shows how well the lungs work at different ages.

This is shown for two groups of people.

One group is heavy smokers. The other group is non-smokers.

The dotted line shows the possible effect of stopping smoking at age 48.



Doug is a 48 year-old heavy smoker.



(i) Doug decides to give up smoking.

What difference will this make to the age at which lung damage is likely to make him disabled?

.....

..... [2]

- (ii) Explain this difference in the age at which Doug would become disabled.
Use your knowledge of the effect of smoking on the lungs in your answer.

.....

.....

..... [2]

[Total: 5]

5 Basil is a gardener.

He keeps a diary of the work that he does in his garden.

Here is part of his diary.

27th September

Today I decided to grow some new geranium plants.

I cut small shoots off the plants and dipped them into a powder to make them grow roots.

I then planted the shoots in some soil.



(a) Basil dips the geranium shoots into a powder containing plant hormones before planting them.

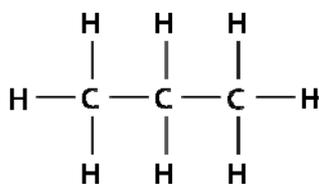
Explain why.

..... [1]

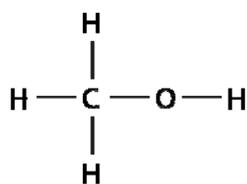
Section B – Module C1

6 This question is about carbon compounds.

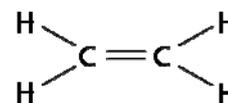
Look at the displayed formulas.



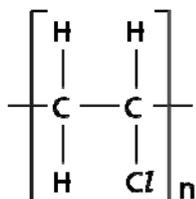
propane



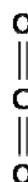
methanol



ethene



poly(chloroethene)



carbon dioxide

(a) Which compound is found in liquefied petroleum gases (LPG)?

Choose from the displayed formulas.

..... [1]

(b) How many atoms are present in the formula for propane?

..... [1]

(c) Write down the **names** of the two elements present in a hydrocarbon.

..... and [1]

[Total: 3]

7 Phil is heating his house.



©Robert Brook/Science Photo Library

(a) Phil decides to use natural gas (methane) to heat his house.

Look at the word equation.

It shows what happens during the **complete combustion** of methane.

methane + oxygen \longrightarrow + water

Finish the word equation.

[1]

(b) Phil uses a gas water heater.

He notices that the water heater is producing lots of soot.

It is important that he gets the gas heater serviced. Explain why.

.....

.....

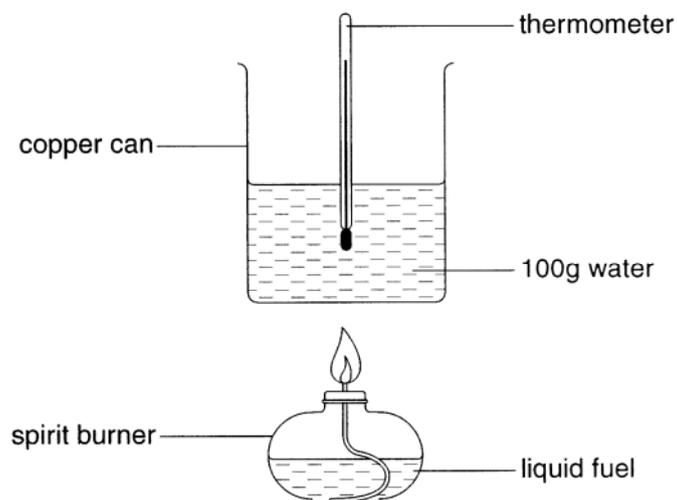
..... [2]

(c) Phil wants to heat his greenhouse.

He decides to test four liquid fuels to see which fuel is the best to use.

Look at the diagram.

It shows the apparatus he uses to measure the energy given out by these fuels.



Look at the table. It shows his results.

fuel	temperature of water at start in °C	temperature of water at end in °C	cost of fuel burned in pence
A	15	30	1.0
B	22	42	2.0
C	20	25	0.5
D	20	30	1.5

Phil decides to use fuel **C** to heat his greenhouse.

Evaluate if this is a sensible choice.

.....

.....

.....

.....

.....

..... [3]

[Total: 6]

8 This question is about removing nail varnish.

(a) Some solvents can dissolve nail varnish.

Lesley investigates the solubility of different nail varnishes.

Look at the table of the results of her investigation.

solvent	colour of nail varnish				
	black	blue	purple	red	white
ethanol	S	I	S	I	I
ethyl ethanoate	S	S	S	S	S
petrol	S	S	I	S	I
propanone	S	S	S	S	S
water	I	I	I	I	I

I = insoluble and S = soluble

(i) Which solvent did not dissolve any of the nail varnishes?

..... [1]

(ii) Why is ethyl ethanoate a better solvent for nail varnishes than petrol?

.....
 [1]

(b) Finchfield Pharmaceuticals make a new nail varnish remover.

It must be tested before it can be approved for use by humans.

Give **two** examples of risks that should be tested for.

.....

 [2]

[Total: 4]

9 (a) Look at the list. It shows some of the gases found in **clean** air.

- oxygen
- carbon dioxide
- water vapour

Write down the name of one **other** gas present in **clean** air.

..... [1]

(b) Sulfur dioxide causes air pollution.

Write about the **effects** of sulfur dioxide pollution.

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

(c) Some people throw away plastic bottles. This can cause a litter problem.

Explain why throwing away plastic bottles can cause problems.

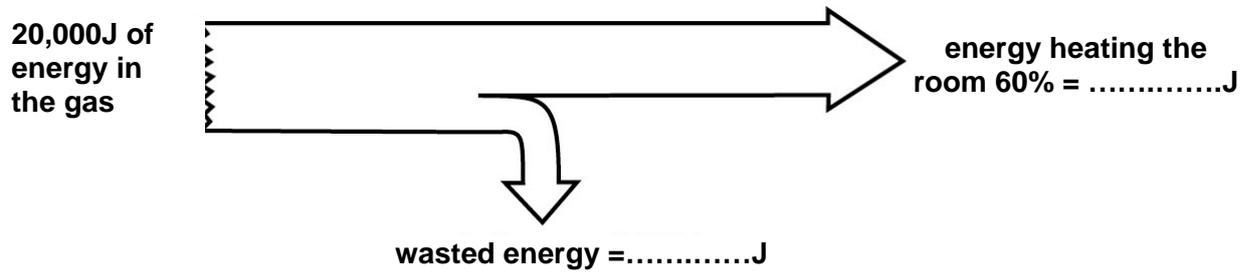
.....
.....
.....
..... [3]

[Total: 6]

Section C – Module P1

11 Asif has an old gas fire that heats the living room of his house.

(a) The diagram shows how much of the energy in the gas actually heats the room.



The total energy **input** is 20 000 J.

Complete the Sankey diagram.

[2]

(b) Asif changes his old gas fire for new one because he thinks a more efficient fire will save him money.

Look at the data in the table about new gas fires.

model of gas fire	efficiency (%)	cost to buy gas fire in £	1 year saving on fuel costs compared to old gas fire in £
aspect	76	900	80
concept	74	600	70
firewell	70	750	50
moment	69	475	45
tinder	74	850	70

Asif plans to keep the new gas fire for **10 years**.

The salesman recommends that Asif buys the model with the highest efficiency.

Asif considers the payback time for each gas fire and the saving on fuel cost.

Which model of gas fire should he choose?

answer

Explain your answer.

.....

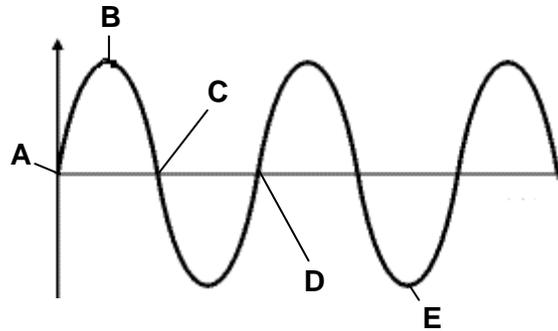
 [2]

[Total: 4]

12 This question is about waves.

(a) A water wave is a transverse wave.

Look at the diagram of a transverse wave.



Use the letters on the diagram to identify the wavelength of this wave.

The **wavelength** is [1]

(b) (i) The following measurements of some water waves on a lake were recorded.

4 waves pass a point in 2 seconds,

the wavelength = 1.25 m,

the depth of water is unknown.

Calculate the **speed** of this water wave.

.....

.....

answer m/s. [2]

(ii) The **speed** of water waves **varies with the depth** of the lake.

Look at the information in the table.

It shows the speed of waves as they cross the lake.

depth of water in m	speed of wave in m/s
1.8	3.2
0.9	2.7
0.3	1.7

Use your answer from question (b) to estimate the depth of water in which the measurements were made.

.....

..... [1]

[Total: 4]

14 This question is about radiation from the Sun.

Radiation is harmful.

One of the harmful effects of radiation is increased risk of cataracts.

Write about **one other** harmful effect of radiation from the Sun and **different** ways to reduce the risk of damage.

.....

.....

.....

.....

.....

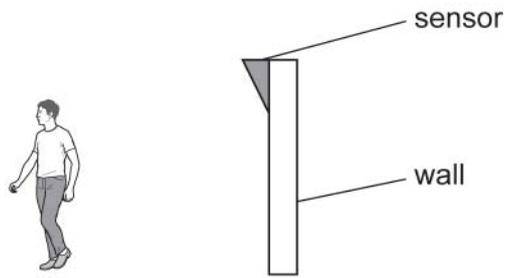
..... [3]

[Total: 3]

15 This question is about using waves and signals.

(a) Infrared sensors are used in burglar alarms.

Look at the diagram.



Why does this sensor detect a burglar but not a curtain moving in the wind?

.....

.....

..... [2]

(b) (i) Look at the digital signal.



Write the code for this signal in the boxes below.

--	--	--	--	--	--	--	--	--	--

[1]

(ii) Here is another signal.



How can you tell this is not a digital signal?

..... [1]

(c) Many years ago it was difficult to send messages long distances.

A runner had to carry a written message.

Technology has developed so that light can be used to send messages.

One example of such technology is optical fibres.

Describe one advantage and one disadvantage of using light to send messages.

.....

.....

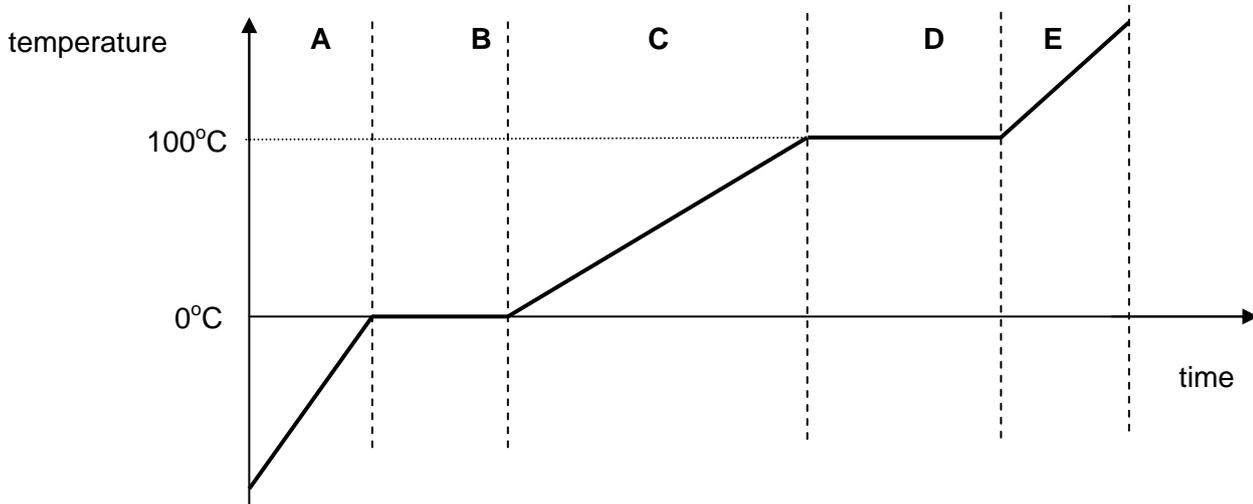
..... [2]

[Total: 6]

16 This question is about heating a solid.

The solid is warmed.

Look at the graph.



(a) Why does the temperature remain constant in part **B** of the graph?

.....

..... [1]

(b) Explain why the temperature goes up in part **E** after staying constant in part **D**.

.....

.....

..... [1]

[Total: 2]

[Paper Total: 75]

END OF QUESTION PAPER

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PERIODIC TABLE

1	2											3	4	5	6	7	0	
		Key																4 He helium 2
relative atomic mass atomic symbol name atomic (proton) number																		
1 H hydrogen 1																		
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10	
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18	
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36	
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54	
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86	
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated							

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B711/01

SCIENCE B

Unit B711: Science modules B1, C1, P1 (Foundation Tier)

MARK SCHEME

Duration: 1 hours 15 minutes

MAXIMUM MARK 75

Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/ = alternative and acceptable answers for the same marking point

(1) = separates marking points

not/reject = answers which are not worthy of credit

ignore = statements which are irrelevant - applies to neutral answers

allow/accept = answers that can be accepted

(words) = words which are not essential to gain credit

words = underlined words must be present in answer to score a mark

ecf = error carried forward

AW/owtte = alternative wording

ora = or reverse argument

eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)

work done = 0 marks

work done lifting = 1 mark

change in potential energy = 0 marks

gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

Question		Expected answers	Marks	Additional guidance
1		Deb's EAR is 34.8 (1) Total protein intake is 32.4g which is less than EAR (1) any one from yes (no mark) because she / teenagers needs (a lot of) protein for growth (1) Deb's actual requirement for protein will be higher than calculated because she is a teenager (1) no (no mark) idea that she is only slightly below and could make this up another day / EAR is an average figure so she should take average protein intake over a number of days (1)	3	marking points must support conclusion to gain credit
		Total	3	

Question		Expected answers	Marks	Additional guidance
2	(a)	skin provides a barrier / AW (1) clotting blood prevents entry (at cuts) (1) trapped by mucus in airways (1) killed by (hydrochloric) acid in stomach (1)	4	
	(b)	ethical worries concerning animal rights (1) concerns about different effects on animals compared with humans (1)	2	
		Total	6	

Question		Expected answers	Marks	Additional guidance
3	(a)	pupil (1) optic nerve (1)	2	
	(b) (i)	✓ ✓ X	1	all three correct to score the mark
	(ii)	because reflexes are protective (so if they are slower there is) more chance of injury / AW (1)	1	
		Total	4	

Question		Expected answers	Marks	Additional guidance
4	(a)	nicotine (1)	1	
	(b)	(i) older / takes longer to become disabled (1) 20 years extra (before becoming disabled) (1)	2	
		(ii) because smoking causes damage to cilia which means chemicals build up and cause cancer / emphysema (1) but giving up prevents further damage to cilia / less build-up of chemicals so reducing risk of cancer / emphysema (1)	2	answers must link giving up smoking to limiting lung damage and subsequent risk of disease in order to gain full credit
		Total	5	

Question		Expected answers	Marks	Additional guidance
5	(a)	to make roots grow (faster) (1)	1	
	(b) 	<p>Level 3 Answer thoroughly evaluates both conclusion and method, in terms of not testing directional growth, and applies knowledge of how to conduct this experiment to discuss in detail the flaws in the experimental method outlined including lack of unidirectional light and control of variables. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5–6 marks)</p> <p>Level 2 A limited evaluation of conclusion and method, and applies knowledge of how to conduct this experiment to discuss specific flaws in the method including timing and watering. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3–4 marks)</p> <p>Level 1 An incomplete answer, simple evaluation in terms of conclusion not right, applies knowledge to experimental method to identify method was not a 'fair test'. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1–2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>relevant points include:</p> <ul style="list-style-type: none"> • Basil is not right to draw this conclusion based on his evidence <p>evaluation of conclusion</p> <ul style="list-style-type: none"> • idea that conclusion not valid / not based on evidence • because experiment did not test directional growth • experiment was testing whether plant grows in light or dark <p>evaluation of method</p> <ul style="list-style-type: none"> • not enough detail to allow method to be followed • reference to condition of unidirectional light required / idea that should have blocked out light from all but one direction • reference to not watering both batches equally • reference to not leaving them to grow for the same length of time • idea of not a 'fair test' • reference to not doing repeats / controlling variables • reference to variables that were not controlled eg size of plant at the start <p>allow examples of how the experiment should have been done</p>
Total			7	

Question		Expected answers	Marks	Additional guidance
6	(a)	propane (1)	1	allow C ₃ H ₈
	(b)	11 (1)	1	
	(c)	hydrogen and carbon (1)	1	not 'hydro and carbon' not C and H
Total			3	

Question		Expected answers	Marks	Additional guidance
7	(a)	carbon dioxide (1)	1	allow CO ₂ not CO2 or CO ² or Co ₂ not carbon dioxide + heat
	(b)	idea that soot shows that incomplete combustion is happening (1) so poisonous carbon monoxide (may be being) formed / so less energy is being released (1)	2	answers must be linked for 2 marks eg poisonous carbon monoxide may be being formed because incomplete combustion is happening shown by soot being made (2) allow less heat is produced (1)
	(c)	fuel C is a sensible choice because it is cheaper than all the others (1) evidence of calculation of temperature differences to conclude that fuel C is not a sensible choice because fuel B gives the largest temperature rise / ora (1) OR evidence of calculation of temperature rise per penny to conclude that fuel C is not a sensible choice because fuel A has the highest temperature rise for 1 pence of fuel burned / ora (2)	3	answers must link choice of fuel with evidence to gain credit allow answers in terms of fuel B being a better choice if linked to evidence allow answers in terms of fuel C being a better choice if linked to evidence
Total			6	

Question			Expected answers	Marks	Additional guidance
8	(a)	(i)	water (1)	1	
		(ii)	ethyl ethanoate dissolves more of the colours (1)	1	allow ora
	(b)		any two from: idea that nail varnish remover could irritate skin or nails or hands (1) toxicity / AW (1) does not react with water / sweat / perspiration (1)	2	allow idea that could have harmful vapours (1)
Total				4	

Question			Expected answers	Marks	Additional guidance
9	(a)		nitrogen / helium / neon / argon / krypton (1)	1	allow correct symbols allow radon
	(b)		sulfur dioxide causes acid rain (1) which kills plants / kills fish / attacks stonework / corrodes metals (1)	2	allow idea that sulfur dioxide aggravates asthma (1)
	(c)		plastics are non-biodegradable (1) so (plastics) do not rot / decay by bacterial action (1) this means that they need to be disposed of by burning / by landfill / by recycling (1)	3	first and second marking points can be in either order allow 'difficult to recycle because difficult to sort' as alternative to the third marking point (1)
Total				6	

Question	Expected answers	Marks	Additional guidance
10 	<p>Level 3 Answer identifies both conditions needed for cracking and applies knowledge of cracking to explain that the decision should be based on both matching supply and demand and molecule size, with examples given from the table. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5-6 marks)</p> <p>Level 2 Answer identifies at least one correct condition and applies limited knowledge of cracking to explain why at least one fraction from the table could be cracked. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3-4 marks)</p> <p>Level 1 Answer includes one condition and some idea about using cracking to make more useful products. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1-2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>relevant points include:</p> <ul style="list-style-type: none"> • cracking needs a high temperature / heating • cracking needs a catalyst / use of zeolite • cracking converts large hydrocarbon molecules into smaller ones • cracking converts less useful hydrocarbons into more useful hydrocarbons • cracking converts named fractions that are in excess into named fractions that are in short supply e.g. bitumen or paraffin into petrol or diesel • the table shows that petrol and diesel are in short supply • the table shows that bitumen and paraffin are in excess and that these are large molecules
	Total	6	

Question		Expected answers	Marks	Additional guidance
11	(a)	12 000 J heating the room (1) 8 000 J wasted (1)	2	allow ecf for wasted energy if wasted + heating add up to 20 000 J
	(b)	concept (no mark) because concept is the only model where payback time is less than 10 years and this means that Asif saves most money (£100) over 10 years with the concept (2) OR because concept is the only model where payback time is less than 10 years / over 10 years Asif saves the most money with the concept (1)	2	concept not chosen or incorrect model chosen answer scores (0) allow correct use of figures eg paid £600 and get £700 back in savings at the end of 10 years (1) allow although aspect is more efficient / saves more on fuel each year, aspect costs more than the concept (1)
Total			4	

Question		Expected answers	Marks	Additional guidance
12	(a)	idea of distance between A and D (1)	1	both letters needed (either order)
	(b) (i)	2.5 (m/s) (2) but if answer is incorrect 2 X 1.25 (1)	2	
	(ii)	estimated depth of water within the range of 0.3 – 0.9 (m) (1)	1	allow ecf from part (b)
Total			4	

Question	Expected answers	Marks	Additional guidance
13 	<p>Level 3 A detailed description of the three processes by which energy is transferred from inside to outside and how energy losses are reduced using cavity wall insulation. Applies knowledge of how inclusion of shiny foil reduces energy loss in the context of a cavity wall. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5-6 marks)</p> <p>Level 2 Limited description of some processes by which energy is transferred, order from inside to outside may be confused, some reductions by cavity walls described but not linked to different forms of transfer. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3-4 marks)</p> <p>Level 1 An incomplete description, naming some processes by which energy is transferred. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1-2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>relevant points include:</p> <ul style="list-style-type: none"> • cavity wall insulation slows down the process of heat transfer • cavity wall insulation retains more heat inside the home • energy moves by conduction through the internal bricks • foam or air is a poor conductor/foam or air is a good insulator so energy transfer is reduced • air / bubbles trapped (in foam) reduces convection • reduces heat or energy radiated into cavity • inner silver foil surface reflects heat or IR back • outer silver foil surface emits less heat • energy moves by conduction through the external bricks <p>accept cavity wall insulation reduces energy losses mainly by conduction and convection</p> <p>ignore heat escapes</p> <p>reject heat particles</p>
	Total	6	

Question		Expected answers	Marks	Additional guidance
14		<p>sunburn / skin cancer / premature skin ageing (1)</p> <p>spend less time in the sunshine (1)</p> <p><u>use a higher factor</u> sun cream/block (1)</p>	3	<p>allow excessive sun tan (1)</p> <p>allow put on a hat / sit in the shade (1)</p>
Total			3	

Question		Expected answers	Marks	Additional guidance
15	(a)	<p>infrared sensors are sensitive to heat, and can detect objects that are warmer than their surroundings (1)</p> <p>the burglar gives out body heat and so is warmer than the surroundings, and the curtain is not (1)</p>	2	<p>marking points in either order can gain credit</p> <p>'infrared sensors detect body heat' alone is worth 1 mark</p> <p>ignore the curtain is not hot</p>
	(b) (i)	<p>correct table</p> <p>0 1 0 1 0 1 1 1 0 0</p> <p>(1)</p>	1	
	(ii)	it has continuously varying values (1)	1	allow it is not only on or off / it is not only 0 or 1
	(c)	<p>advantage: increased speed of communication compared to runner / digital signal used so easier to remove interference (1)</p> <p>disadvantage: idea of need for a code / need for technology to support use of light (at transmitter and receiver) (1)</p>	2	<p>allow faster / quicker communication (1)</p> <p>allow higher level answers above target grade eg allows use of multiplexing (1)</p>
Total			6	

Question		Expected answers	Marks	Additional guidance
16	(a)	because the solid is melting (1)	1	allow higher level answers above the target grade eg energy supplied is used to break bonds between molecules (1) ignore changing state
	(b)	because the gas (made during boiling) is heating up / liquid has all boiled in part D or previous part of graph (1)	1	
Total			2	

Assessment Objectives (AO) Grid

(includes quality of written communication )

Question	AO1	AO2	AO3	Total
1	1	2		3
2(a)	4			4
2(b)	2			2
3(a)	2			2
3(b)(i)		1		1
3(b)(ii)		1		1
4(a)	1			1
4(b)(i)		2		2
4(b)(ii)	1	1		2
5(a)	1			1
5(b) 		4	2	6
6(a)	1			1
6(b)		1		1
6(c)	1			1
7(a)	1			1
7(b)		2		2
7(c)		1	2	3
8(a)(i)		1		1
8(a)(ii)		1		1
8(b)		2		2
9(a)	1			1
9(b)	2			2
9(c)	3			3
10 	3	3		6
11(a)		2		2
11(b)			2	2
12(a)	1			1
12(b)(i)	1	1		2
12(b)(ii)		1		1
13 	4	2		6
14	3			3
15(a)	1	1		2
15(b)(i)		1		1
15(b)(ii)		1		1
15(c)	1	1		2
16(a)		1		1
16(b)		1		1
Totals	35	34	6	75

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