OCR

SPECIMEN F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

B761/01

FURTHER ADDITIONAL SCIENCE B

Unit B761/01: modules B5, C5, P5 (Foundation Tier)

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)

Duration: 1 hour 15 minutes

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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 with a pencil (✎).
- 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			
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

$$KE = \tfrac{1}{2}\, mv^2$$

momentum = mass × velocity

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

GPE = mgh

$$mgh = \tfrac{1}{2}\, mv^2$$

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

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \tfrac{1}{2}\, at^2$$

$$m_1u_1 + m_2u_2 = (m_1 + m_2)v$$

$$\text{refractive index} = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$$

$$\text{magnification} = \frac{\text{image size}}{\text{object size}}$$

$$I_e = I_b + I_c$$

$$\frac{\text{voltage across primary coil}}{\text{voltage across seconday coil}} = \frac{\text{number of primary turns}}{\text{number of secondary turns}}$$

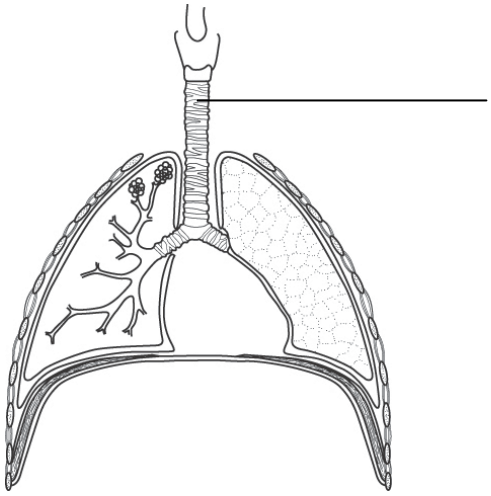
power loss = $(\text{current})^2$ × resistance

$$V_pI_p = V_sI_s$$

Answer **all** the questions.

Section A – Module B5

1 The diagram shows the main parts of the human respiratory system.



(a) Write the correct name next to the label line.

Choose the part from this list.

air sac

bronchus

diaphragm

intercostal muscle

trachea

[1]

(b) The respiratory system can be damaged by a number of different medical conditions.

One of these conditions is asthma.

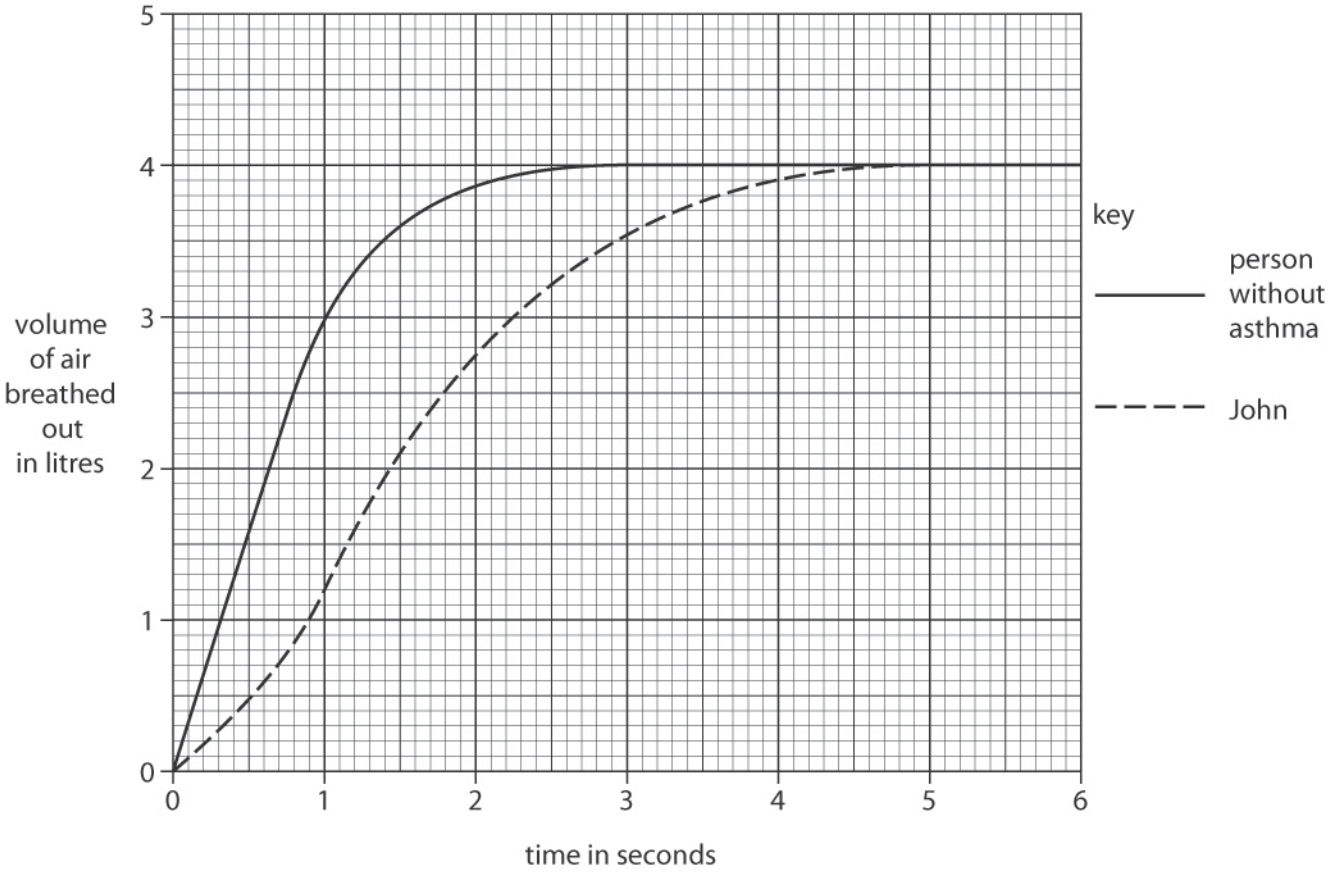
Write down the name of **one other** condition that can damage the respiratory system.

..... **[1]**

(c) John goes to the doctor.

His doctor uses a spirometer to measure the volume of air John breathes out in a single deep breath.

The graph shows the results for John and for a person of John's size and age who does **not** have asthma.



(i) John and the other person have the same vital capacity.

Look at the graph.

What is their **vital capacity**?

answer ..... litres **[1]**

(ii) The doctor thinks that John may have asthma.

How does the graph support the doctor's view?

.....

..... **[1]**

(iii) For people with asthma blowing hard into the spirometer might lead to an asthma attack.

Suggest what precautions John or his doctor could have taken to make the test as safe as possible.

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

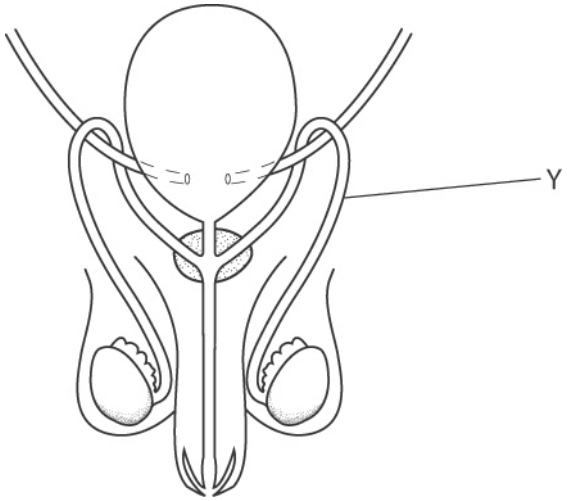
[Total: 6]

2 Paul and Sue have been trying to start a family.

However, so far, Sue has not become pregnant.

Paul goes to his doctor to check his fertility.

(a) The diagram shows Paul's reproductive system.



Paul's doctor finds that the tube labelled **Y** on the diagram is narrower than usual.

Will this affect Paul's fertility? Explain your answer.

.....

.....

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

(b) Fertility treatments have been developed by scientists to help people become pregnant.

Suggest how such developments could affect couples like Paul and Sue.

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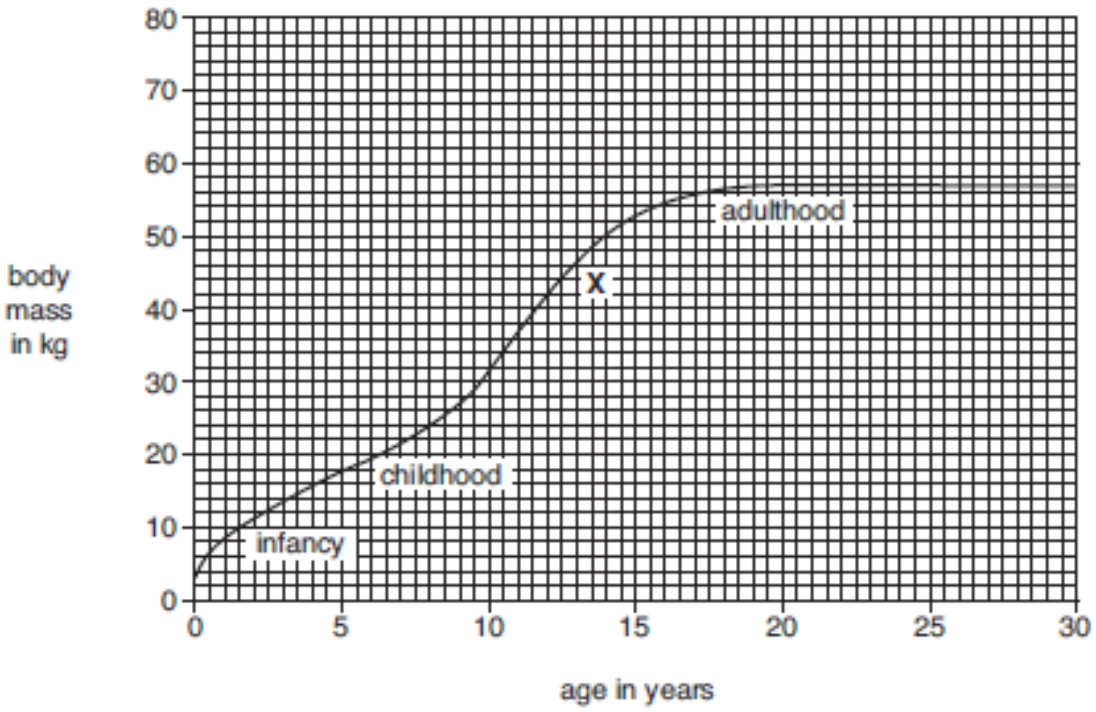
..... **[2]**

[Total: 4]

3 Mass since birth can be recorded on average growth charts.

The graph shows average growth data for women up to the age of 30.



(a) The graph shows four different stages of growth.

Look at the graph.

Name the stage labelled with an **X**.

..... **[1]**

(b) Look at the graph.

(i) At what age do women grow most quickly?

..... **[1]**

(ii) At what age do women stop growing?

..... **[1]**

(c) Lucy is a 10 year-old girl with a body mass of 22 kg.

Lucy's parents are concerned about her growth.

Should Lucy's parents be concerned about her growth and what factors could have affected Lucy's growth?

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

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..... **[6]**

[Total: 9]

4 Tony decides to donate blood.

The nurse in charge of the donation is talking to him.

I am glad that you have decided to give blood.

We have tested your blood. You are O negative and we have not found any problems with your blood.

(a) Why is it important to donate blood?

.....

.....

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

(b) The nurse tells Tony that he is **O negative**.

What is this describing?

.....

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

(c) In the past, leeches were used to treat people by removing some of a patient's blood.

The leech was placed on the patient so its mouthparts pierced the skin so it could feed on the patient's blood.

When a leech feeds, **anti-coagulants** from its mouthparts enter the patient's blood.

Suggest how the anti-coagulants help the leech.

.....

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

[Total: 6]

Section B – Module C5

5 Steve looks at the label on his bottle of concentrated pineapple cordial (pineapple drink).

It shows some information about **100 cm^3** of concentrated pineapple cordial.

nutrient	mass in milligrams	percentage of guideline daily amount (GDA)
vitamin C	20.8	25

preparation guidelines
Shake well and dilute (1 part concentrated cordial to 4 parts water)

(a) Steve makes 1000 cm^3 of diluted pineapple cordial using the preparation guidelines.

What mass of vitamin C will be in 1000 cm^3 of diluted cordial?

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.....

mass of vitamin C =..... mg **[1]**

(b) Steve suggests he could get all the vitamin C he needs by drinking pineapple cordial.

What volume of **diluted** cordial would Steve need to drink each day?

.....

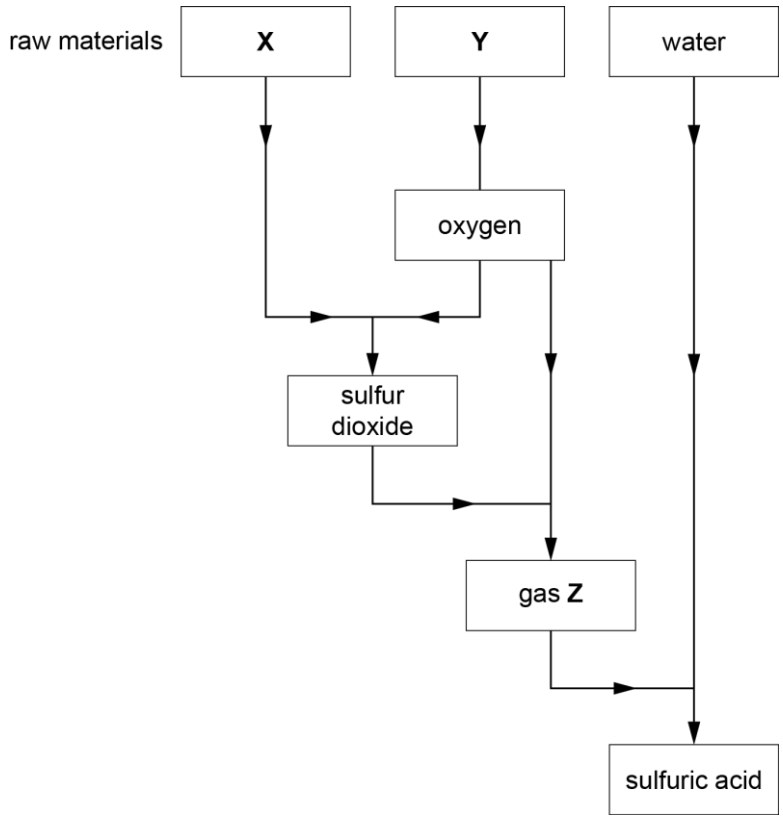
.....

volume of diluted cordial = ... cm^3 **[1]**

[Total: 2]

6 Sulfuric acid is made in the Contact Process.

Look at the flow chart. It shows all the stages in the Contact Process.



(a) The three raw materials used in the Contact Process are at the top of the chart.

Water is shown.

Write down the **names** of the other two raw materials (**X** and **Y**) and suggest why water is a good raw material.

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

(b) Sulfur dioxide and oxygen react to give gas **Z**.

$$\text{sulfur dioxide} + \text{oxygen} \rightleftharpoons \text{gas } \mathbf{Z}$$

What is the name of gas **Z**?

..... **[1]**

[Total: 4]

7 This question is about acid-base titrations.

Issy decides to find out the volume of dilute nitric acid needed to neutralise 25.0 cm^3 of an alkali.

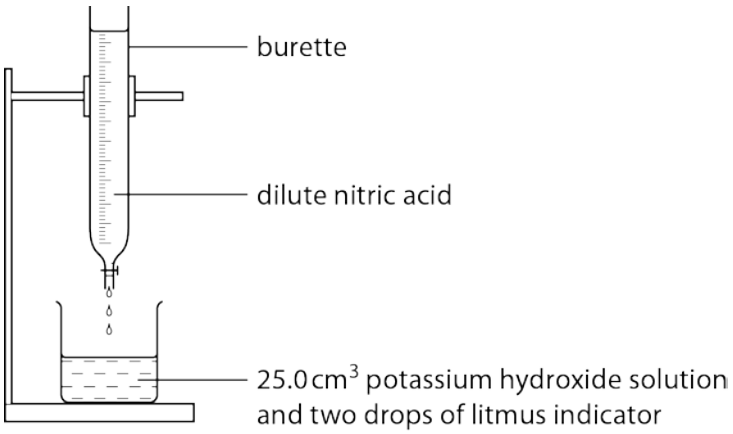
She uses 0.100 mol/dm^3 potassium hydroxide solution.

(a) Issy measures 25.0 cm^3 of potassium hydroxide solution.

Write down the name of a piece of apparatus she can use.

.....**[1]**

(b) Look at the apparatus Issy uses to do her titrations.



She adds dilute nitric acid slowly until the end point is reached.

Describe what Issy sees when the end point of the titration has been reached.

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

(c) She repeats the experiment two more times.

Look at Issy's results table.

titration number	**1**	**2**	**3**
final burette reading in cm^3	29.7	27.0	34.8
initial burette reading in cm^3	8.5	6.9	24.9
volume of acid used (titre) in cm^3	21.2		

(i) Calculate the **mean** titre for titration numbers 2 and 3.

Give your answer to **one** decimal place.

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mean titre = ...cm^3 **[2]**

(ii) Issy repeats the titration experiment with three more acids.

Look at the results.

acid	**mean titre in cm^3**
A	24.2
B	18.7
C	22.0

Which is the most concentrated acid?

Choose from **nitric acid**, acid **A**, acid **B** or acid **C**.

Explain your answer.

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..... **[1]**

[Total: 6]

8 Silicon dioxide and sodium ferrate have been discovered on the planet Mars.

(a) Silicon dioxide, SiO_2, has a molar mass of 60 g/mol.

Calculate the molar mass of sodium ferrate, Na_2FeO_4.

The relative atomic mass of O is 16, of Na is 23, of Si is 28 and of Fe is 56.

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molar mass = ... g/mol **[1]**

(b) Compound **X** has been discovered on the planet Mars.

Compound **X** has the empirical formula CH.

Which formula could be the formula of compound **X**?

CH_4	**C_2H_6**
C_4H_4	**C_4H_8**
C_6H_{12}	**$C_{10}H_{22}$**

answer .... **[1]**

[Total: 2]

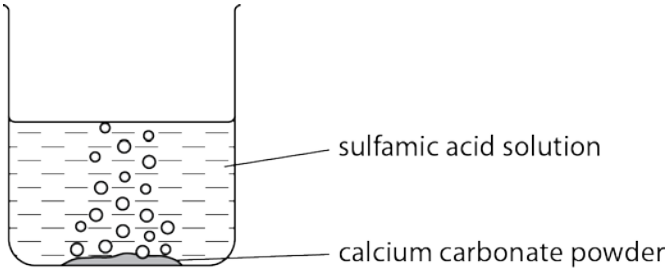
9 Sulfamic acid is a **weak** acid.

It reacts with calcium carbonate as shown in the equation.

sulfamic acid + calcium carbonate → calcium sulfamate + carbon dioxide + water

Hayley investigates 1.0 mol/dm^3 sulfamic acid solution and 1.0 mol/dm^3 nitric acid.

Look at the diagram.



Hayley adds 1.0 g of calcium carbonate powder to 100 cm^3 of the sulfamic acid solution.

There is a lot of fizzing but after a minute the reaction stops.

Hayley repeats the experiment using a **strong** acid. This time she uses 100 cm^3 of the nitric acid.

Describe and explain, using the particle model, one **similarity** and one **difference** between the reactions of the two acids with calcium carbonate.

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

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..... **[6]**

[Total: 6]

10 Emma wants to prepare a pure dry sample of lead iodide by a precipitation reaction.

$$2KI(aq) + Pb(NO_3)_2(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$$

She starts with potassium iodide solution and lead nitrate solution.

(a) Describe the steps Emma must take to get a **pure dry** sample of lead iodide.

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

(b) Look at the equation.

It shows the masses of the reactants used and products made in this reaction.

$2KI(aq)$	+	$Pb(NO_3)_2(aq)$	$\rightarrow$	$PbI_2(s)$	+	$2KNO_3(aq)$
3.3g		3.3g		4.5g		1.9g

What conclusions can be drawn about the principle of conservation of mass from this reaction?

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

[Total: 5]

Section C – Module P5

11 Artificial satellites orbit the Earth and send back information.

Satellites have many different uses. The choice of orbit for the satellite depends on what the satellite is used for.

Describe how different types of satellite orbit the Earth. Give examples of different uses of satellites and explain what type of orbit should be used and why.

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

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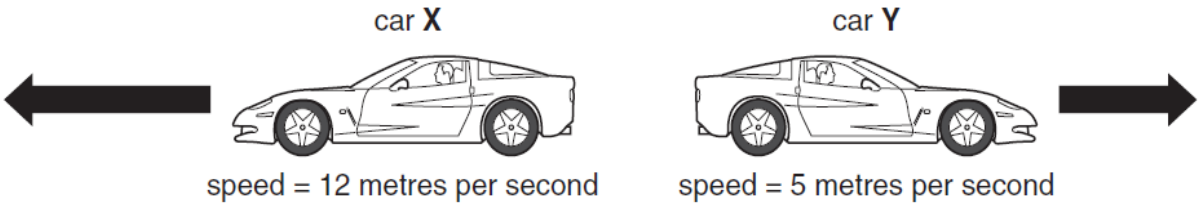
..... **[6]**

[Total: 6]

12 Look at the diagram of two cars.

Car **X** moves in the **opposite** direction to car **Y**.



(a) They then move in the same direction.

Look at the diagram below.

Explain why the relative speed of the cars changes.

.....

..... **[1]**

(b) (i) Car **Y** moves at a speed of 5 metres per second.

It accelerates steadily to a new speed of 15 metres per second. This takes 30 seconds.

Calculate the distance travelled in this time.

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.....

answer .....m **[2]**

(ii) Car **X** is following 10 metres behind car **Y**.

Car **X** stays at a speed of 12 m/s.

Using your answer to part **(i)**, explain whether car **X** overtakes car **Y** within 30 seconds.

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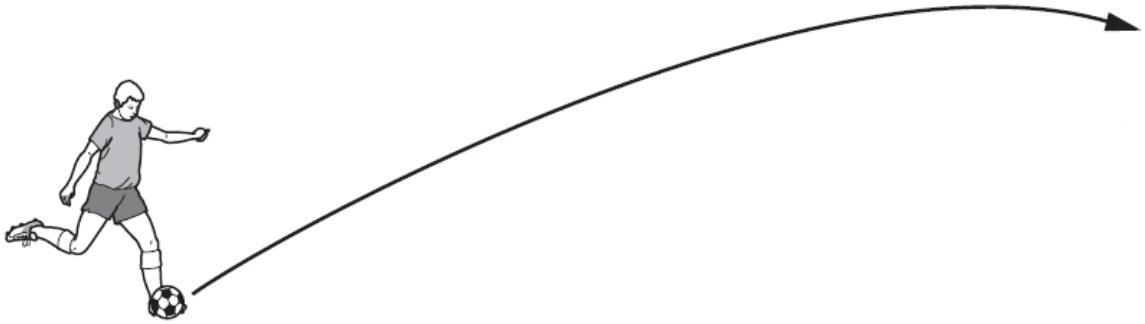
.....**[2]**

[Total: 5]

13 Fred is practising his goal kicks.



Fred thinks that increasing the angle above the ground will increase the range of his kick.

He tests his prediction.

Look at the table of his results.

angle in °	max height in m	range in m
10	4	27
25	21	61
40	50	79
55	80	75
70	106	51

Is Fred's prediction correct?

Use the data and your own knowledge to explain why you reached your conclusion.

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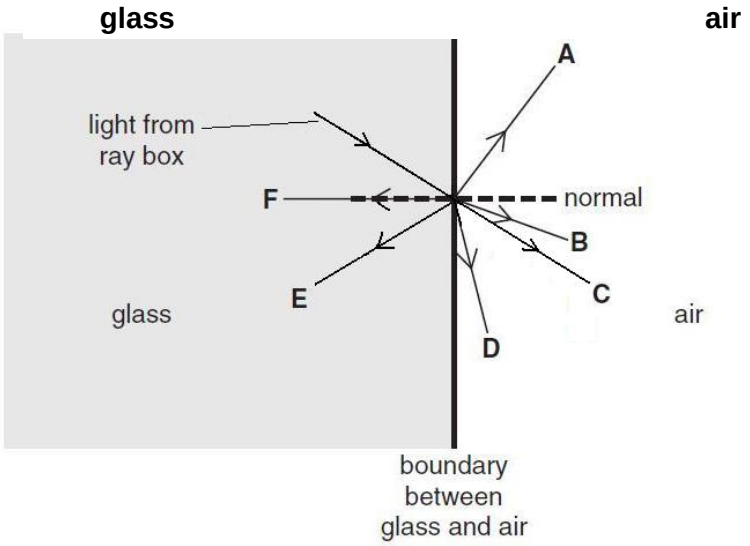
..... **[3]**

[Total: 3]

14 (a) Danny shines a ray of light from a ray box through a glass block.

He looks at the paths of light **after** it hits the boundary.



Which path shows the two rays he sees?

Choose **two** from **A**, **B**, **C**, **D**, **E** and **F.**

answer..... and ..... **[1]**

(b) What happens to light, at a boundary, as it passes **from** glass to air?

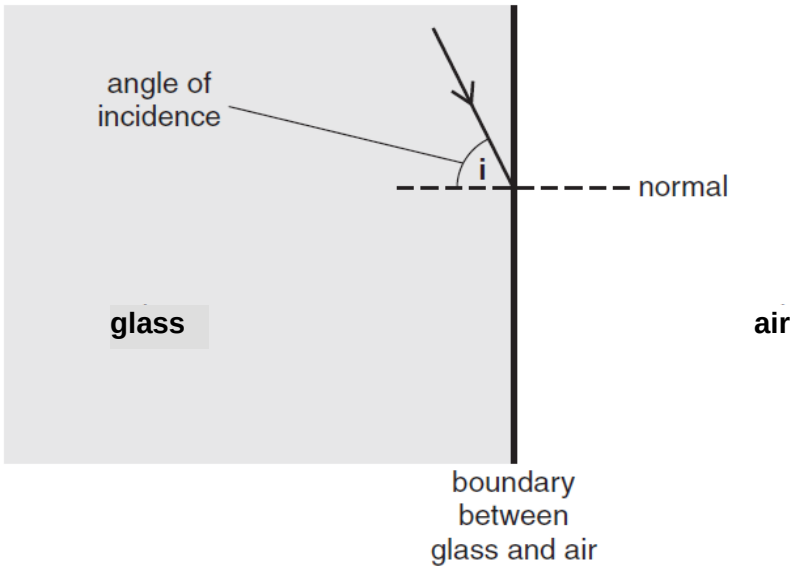
Put a tick (✓) in the box next to the correct answer

light is absorbed	☐
light is radiated	☐
light is reflected	☐
light is refracted	☐

[1]

(c) Danny moves the ray box.

The angle of incidence, **i**, is larger than the critical angle.



Complete the diagram **accurately** to show what happens to the ray of light. **[1]**

[Total: 3]

15 This question is about waves and light.

(a) Look at the sentences about waves.

Put a tick (✓) in the box beside the sentence if it is true.

Put a cross (✗) in the box if the sentence is false.

One has been done for you.

	✓ or ✗
Eclipses happen because light travels in straight lines.	✓
Light can never 'bend'.	
Electromagnetic waves are longitudinal.	

[1]

(b) Bharat's science teacher is explaining interference using two loudspeakers.

The loudspeakers are producing identical sound waves.

Bharat walks along a line in front of the speakers as shown:

Describe what Bharat hears as he walks along the line and why the sound waves produce this effect.

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.....

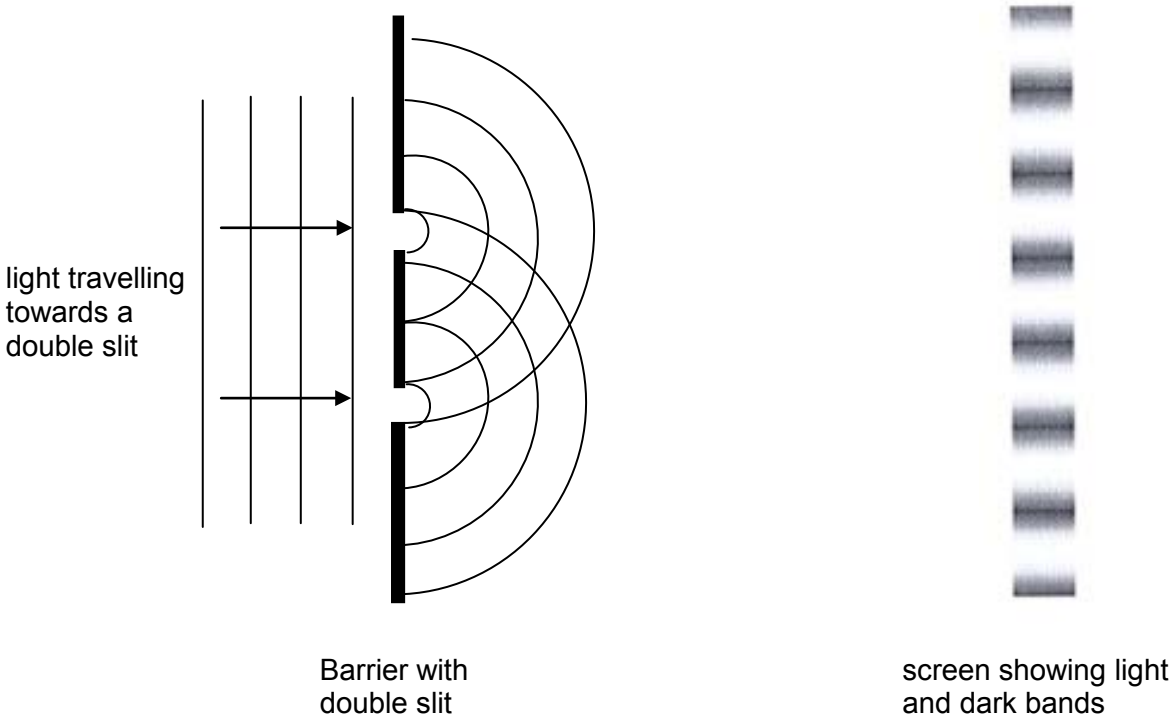
..... **[2]**

(c) Bharat's teacher then shows his class an experiment with light passing through a double slit.

When the experiment was first performed many years ago it altered scientists' views about the properties of light.

His teacher draws a diagram to explain the experiment.

Look at the diagram.



Scientists made a conclusion about the nature of light from this experiment.

What was this conclusion and what evidence in the diagram supported it?

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

(d) Radio waves can be used to communicate with satellites beyond the Earth's atmosphere.

Look at the table.

radio wave	frequency
A	25 MHz
B	40 GHz
C	10 GHz

One of these radio waves can be used to communicate with a satellite beyond the Earth's atmosphere.

Bharat thinks radio wave **B** can be used.

Is he correct?

Explain your answer.

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

[Total: 8]

[Paper Total: 75]

END OF QUESTION PAPER

PERIODIC TABLE

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
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 **A*l*** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **C*l*** 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 **T*l*** 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						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

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

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SPECIMEN **F**

GENERAL CERTIFICATE OF SECONDARY EDUCATION

B761/01

FURTHER ADDITIONAL SCIENCE B

Unit B761/01: modules B5, C5, P5 (Foundation Tier)

MARK SCHEME

Duration: 1 hour 15 minutes

MAXIMUM MARK 75

This document consists of 16 pages

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, e.g. 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
   <u>words</u> = underlined words must be present in answer to score a mark
   ecf = error carried forward
   AW/owtte = alternative wording
   ora = or reverse argument

   e.g. 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	(a)		trachea (1)	1	
	(b)		bronchitis / (lung) cancer / pneumonia (1)	1	**allow** higher level answers: cystic fibrosis / asbestosis / tuberculosis / emphysema (1)
	(c)	(i)	4 (litres) (1)	1	
		(ii)	he breathes out more slowly (than the person without asthma) / AW (1)	1	
		(iii)	make sure breathing is normal at start / after test (1) have inhalers available (in case of asthma attack) (1)	2	**allow** let him stop the test if he is having problems / AW (1)
			Total	**6**	

Question			Expected answers	Marks	Additional guidance
2	(a)		(yes – no mark) Y is the sperm duct / carries sperm (1) so if Y is narrower then it carries fewer sperm (1) OR (no – no mark) Y is the sperm duct / carries sperm (1) Y is still open so sperm can still pass through (1)	2	**answers must support conclusion drawn to gain credit** **allow** Y is narrower so could get more easily blocked (1)
	(b)		**any two from** idea of increasing **chances** of pregnancy by using treatments (1) although pregnancy still not guaranteed (1) can cost money to go through treatments / may not be able to afford treatment (1) increased chance of multiple births (with some treatments) (1) have to consider ethical issues (1)	2	**allow** example of ethical issue (1)
			Total	**4**	

Question			Expected answers	Marks	Additional guidance
3	(a)		adolescence / puberty (1)	1	**ignore** teenager / youth
	(b)	(i)	answer in range 0 – 6 months / 0.5 years (1)	1	
		(ii)	answer in range 19 – 20 years (1)	1	

Question			Expected answers	Marks	Additional guidance
3	(c) ✎		**Level 3** Well-reasoned conclusion about Lucy's parents' concern. Applies knowledge of factors that affect growth to show how a broad range of interacting factors could have led to Lucy growing less than average. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Quality of written communication does not impede communication of the science at this level. (5–6 marks) **Level 2** Simple conclusion about Lucy's parents. Applies knowledge of factors that affect growth to show how at least two factors could have led to Lucy growing less than average. 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. Quality of written communication partly impedes communication of the science at this level. (3–4 marks) **Level 1** Recalls some factors that affect growth. Answer may be simplistic. There may be limited use of specialist terms. Quality of written communication impedes communication of the science at this level. (1–2 marks) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**relevant points include:** • yes because she is below the line and therefore underweight • no because she is only being compared to an average, there is time for her to grow and catch up, it is not necessarily bad to be below average factors include: • genes inherited from parents / quality of diet / amount of exercise / levels of hormones / health / disease applications include: • genes: Lucy's parents are shorter / lighter than average so Lucy will inherit genes which make her shorter / lighter • diet: in Lucy's diet a possible lack of proteins needed for growth / calcium needed for teeth and bones / not having balanced diet could limit growth / eating too little / AW • exercise: lack of regular exercise by Lucy could mean she does not develop strong bones / strong muscles • hormones: lack of hormones during infancy / puberty to stimulate growth • health / disease: Lucy could suffer from poor health / (specific) diseases which can limit growth • idea that could be a combination of factors that influence growth
			Total	**9**	

Question			Expected answers	Marks	Additional guidance
4	(a)		because blood is always needed / otherwise blood will run out (1) blood is needed for transfusions / used in operations / used for injured people (1)	2	**allow** people with blood loss / people who need blood e.g. haemophilia (1)
	(b)		blood group O (1) rhesus negative (1)	2	
	(c)		stop (blood) clotting (1) so blood keeps flowing / leech can keep feeding (1)	2	
			Total	**6**	

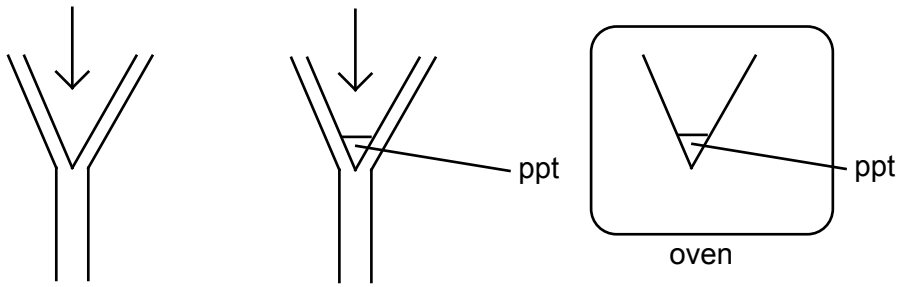
Question			Expected answers	Marks	Additional guidance
5	(a)		41.6 (1)	1	unit **not** needed answer on answer line takes precedence
	(b)		2000 (1)	1	unit **not** needed
			Total	**2**	

Question			Expected answers	Marks	Additional guidance
6	(a)		**X** is sulfur (1) **Y** is air (1) water is good because it is readily available / very cheap (1)	3	**allow X** is S **allow** one mark if **X** is air and **Y** is sulfur **allow** correct answers written on flow chart if answer lines are blank **allow** water is free
	(b)		sulfur trioxide (1)	1	**allow** SO_3 **ignore** sulfur oxide
			Total	**4**	

Question			Expected answers	Marks	Additional guidance
7	(a)		pipette (1)	1	**allow** measuring cylinder
	(b)		indicator suddenly changes colour (1) from blue or purple in alkali to red or pink (1)	2	**both colours needed**
	(c)	(i)	calculated titres for 2 and 3 as 21.1 and 19.9 (1) mean titre = 20.0 (1)	2	titres can be in text or in the table unit **not** needed but must be correct if quoted answer must be to **one** decimal place
		(ii)	**B** because the least amount of acid is used to neutralise the alkali (1)	1	
			Total	**6**	

Question			Expected answers	Marks	Additional guidance
8	(a)		166 (1)	1	**ignore units**
	(b)		C_4H_4 (1)	1	
			Total	**2**	

Question			Expected answers	Marks	Additional guidance
9	✎		**Level 3** Applies understanding of weak and strong acids to describe in detail both a similarity and a difference which are explained in terms of hydrogen ions and collision theory. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Quality of written communication does not impede communication of the science at this level. (5–6 marks) **Level 2** Applies knowledge of weak and strong acids to describe that both acids make carbon dioxide and the nitric acid reaction is faster. Explanation that involves the use of collision theory although not in terms of hydrogen ions specifically. 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. Quality of written communication partly impedes communication of the science at this level. (3–4 marks) **Level 1** Describes that both acids make a gas (if named the gas is carbon dioxide) and that the nitric acid reaction is faster. Answer may be simplistic. There may be limited use of specialist terms. Quality of written communication impedes communication of the science at this level. (1–2 marks) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**relevant points include:** <u>description</u> • both acids make carbon dioxide and water • same volume / amount of carbon dioxide made • nitric acid has a faster reaction / ora • reaction with nitric acid finishes before one minute <u>explanation</u> • both contain hydrogen ions which react with calcium carbonate to give carbon dioxide (and water) • same amount of acid / same volume and concentration of acid / same number of moles used in both cases so both make same volume or amount of carbon dioxide • with nitric acid more hydrogen ions in solution / greater concentration of hydrogen ions / hydrogen ions are more concentrated • with nitric acid more collisions (per second) between hydrogen ions and particles of calcium carbonate so faster reaction **allow** ora for sulfamic acid but must specify which acid is being referred to
			Total	**6**	

Question			Expected answers	Marks	Additional guidance
10	(a)		add two solutions and filter (1) wash the residue with water (1) dry the residue in an oven / leave in air to evaporate (1)	3	**ignore** sieving filtering stage must be before the washing and drying stage washing stage must be before the drying stage drying stage must be the last stage **allow** let it dry in air **ignore** dry it / let it dry **ignore** heat it **not** use of a Bunsen burner to dry the residue **allow** marks from a diagram reaction mixture water 

Question			Expected answers	Marks	Additional guidance
10	(b)		masses do not support the principle of conservation of mass because the difference in mass is significant / more evidence is needed / AW (1) **OR** masses support the principle of conservation of mass because the total mass of reactants is very close to total mass of products / the difference is due to experimental error/spillage/loss of product during filtering (1) **WITH use calculation for second mark** evidence of calculation of mass of reactants = 6.6g and mass of products = 6.4g used to support conclusion / difference in masses = 0.2g (1)	2	**to gain second mark numerical evidence must be used to support either conclusion**
			Total	**5**	

Question			Expected answers	Marks	Additional guidance
11	✎		**Level 3** Answer clearly describes forces involved in orbiting satellites. Answer gives a broad range of satellite uses and explains which orbits are suitable with detailed reference to a number of characteristics. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Quality of written communication does not impede communication of the science at this level. (5–6 marks) **Level 2** Answer gives a range of satellite uses with some description of the different types of orbit **and** at least one linking of characteristic included. 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. Quality of written communication partly impedes communication of the science at this level. (3–4 marks) **Level 1** An incomplete answer that gives a use of satellites and recognises a difference between types of orbit. Answer may be simplistic. There may be limited use of specialist terms. Quality of written communication impedes communication of the science at this level. (1–2 marks) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**relevant points include:** • gravitational force needed to maintain orbit • lower speed at higher orbit and v.v. • orbits include geostationary/fixed position/equatorial and polar • lower orbits tend to be used for polar orbit satellites • higher orbits tend to be used for equatorial/geostationary orbit satellites uses • communications • weather forecasting • military/spying • research • GPS links for characteristic of orbit to use • polar orbits view different areas of the Earth, e.g. for spying • lower orbit increases the rate of image updating, e.g. for weather forecasting • lower orbit results in a higher period/speed which means the same point on Earth is covered more often/frequently, e.g. for GPS • geostationary orbits are in a fixed-position over the Earth, e.g. for TV satellite communications/weather forecasting • higher the orbit the greater the ground coverage, e.g. for TV or radio
			Total	**6**	

Question			Expected answers	Marks	Additional guidance
12	(a)		(relative speed decreases) because the cars were moving in the opposite direction / apart, but now they are moving in the same direction (1)	1	**allow** from 17 to 7 m/s or 12 m/s + 5 m/s (1)
	(b)	(i)	300 (m) (2) **but if answer is incorrect** average speed (10 or {15 + 5} ÷ 2) or correct working (10 x 30) (1)	2	
		(ii)	car **X** overtakes car **Y** because 300+10<360 / AW (2) OR car **X** overtakes car **Y** / distance travelled by car **X** is greater than the distance travelled by car **Y** / 300+10 / 360 (1)	2	**allow** ecf from part (i) both evidence of calculation and explanation needed for 2 marks
			Total	**5**	

Question			Expected answers	Marks	Additional guidance
13			no (no mark) because the range increases as the angle increases to 40° but then the range decreases (1) because the optimum angle is 45° (1) **then** because increasing the angle increases the time the ball spends in the air but decreases the horizontal velocity (2) **OR** increasing angle increases the time the ball spends in the air / increasing angle decreases horizontal velocity (1)	3	**allow** max 1 mark for comments relating to fair testing or experimental method, e.g. he didn't kick the ball equally hard each time / he didn't do repeats and get an average linking the effect of increasing angle to time and horizontal velocity is worth 2 marks **allow** answers in terms of at high angles more energy being used to move the ball upwards than across (1)
			Total	**3**	

Question			Expected answers	Marks	Additional guidance
14	**(a)**		**D** and **E** (1)	1	any order
	(b)		light is <u>refracted</u> (1)	1	tick in fourth box
	(c)		light is reflected (internally and correct side of the normal) correctly with reflected angles equal to incident angle by inspection – margin of error +/- 2^{o} (1)	1	any refracted light shown on diagram scores zero
			Total	**3**	

Question			Expected answers	Marks	Additional guidance
15	(a)		light travels... (✓) light can bend... × EM longitudinal… ×	1	2 correct = (1) 1 correct = (0)
	(b)		idea of he hears loud and quiet areas / quiet or soft area followed by louder area followed by quiet or soft area (1) because of the overlap of waves from the two speakers (1)	2	**allow** different loudness (1) **allow** sound and no sound (1) **allow** higher level answers in terms of constructive and destructive interference (1)
	(c)		(scientists concluded) that light travels as waves (1) waves produce (an interference) pattern (1)	2	**allow** higher level answers in terms of constructive and destructive interference
	(d)		no (no mark) idea that signal **B** will be **reduced in strength** because of atmospheric effects and so will not pass through (1) idea that signal **A** will be **reflected** because it is below 30 MHz (1) idea that signal **C** (10 GHz) is in the band that can **pass through** the atmosphere so can be used (1)	3	**for full credit answers must link signals with their behaviour in the atmosphere**
			Total	**8**	

Assessment Objectives (AO) Grid

(includes quality of written communication ✎)

Question	AO1	AO2	AO3	Total
1(a)	1			**1**
1(b)	1			**1**
1(c)(i)		1		**1**
1(c)(ii)		1		**1**
1(c)(iii)		2		**2**
2(a)	2			**2**
2(b)		2		**2**
3(a)	1			**1**
3(b)(i)		1		**1**
3(b)(ii)		1		**1**
3(c) ✎	2	2	2	**6**
4(a)	2			**2**
4(b)	2			**2**
4(c)	1	1		**2**
5(a)		1		**1**
5(b)		1		**1**
6(a)	2	1		**3**
6(b)	1			**1**
7(a)	1			**1**
7(b)	2			**2**
7(c)(i)		2		**2**
7(c)(ii)		1		**1**
8(a)		1		**1**
8(b)		1		**1**
9 ✎	3	3		**6**
10(a)	3			**3**
10(b)			2	**2**
11 ✎	4	2		**6**
12(a)	1			**1**
12(b)(i)	1	1		**2**
12(b)(ii)		2		**2**
13	1		2	**3**
14(a)		1		**1**
14(b)	1			**1**
14(c)		1		**1**
15(a)	1			**1**
15(b)	2			**2**
15(c)	1	1		**2**
15(d)		2	1	**3**
Totals	36	32	7	**75**