GCSE Combined Science: Trilogy (AQA 8464)

Foundation Tier

Mark scheme

Introduction

The information provided for each question is intended to be a guide to the type of answers students may produce, but can be neither exhaustive nor prescriptive. Award marks according to your professional judgement for all appropriate responses.

Disclaimer

- These mark schemes and exemplar answer content are entirely the work of the question author and have not been produced by, reviewed by or endorsed by AQA.
- Where marks are suggested and levels mapped to particular styles or features of answers, these are intended for guidance only and cannot reflect the full examination marking process, which involves moderation and alignment of level boundaries across a full, national student cohort that cannot be determined from a standalone product such as this set of Practice Papers.
- Therefore, mark allocation, mark totals, suggested levels and overall assessments of performance as found in these Practice Papers and Mark Schemes represent only a limited guide to possible outcomes, and are not a reliable indicator of actual performance.

Information for teachers

1. General

The mark scheme for each question gives:

- the marks available for each part of the question
- the total marks available for the question
- the correct answer or, if multiple correct answers are possible, a typical correct answer with variations
- extra information to help with making decisions about how many marks to award
- the Assessment Objective(s) from the GCSE Specification that the part question is intended to cover.

The 'extra information' is aligned to the appropriate answer and is only intended for consideration with that particular part of the answer.

2. Marking of lists

For question parts where a set number of responses is requested, all possible correct answers are stated. Each correct response should be awarded a mark as indicated, up to a maximum for the question part as stated on the question paper and as written in this marks scheme.

If a student has provided more than the set number of responses requested, the principle to be followed is that 'right + wrong = wrong'. Each error or contradictory response negates each correct response. If the number of errors and contradictions equals or exceeds the number of correct responses, no marks can be awarded for that part of the question.

3. Use of symbols and formulae

If an accepted scientific symbol or formula is written instead of a required chemical name or unit, award full marks if the symbol or formula is correct and if, in the context of the question, the response is appropriate.

4. Calculations

Award marks for each correctly completed stage of a calculation, as students are instructed to show their working.

Full marks can be given for a correct numerical answer (including units), even though no working is shown.

5. Interpretation of 'it' and 'them'

Answers using the word 'it' or 'them' should be awarded marks only if it is clear that the 'it' or 'them' refers to the correct subject.

6. Errors carried forward

An error in the answers to a structured question should be penalised once only.

Allowances for errors carried forward are usually restricted to calculation questions. Where such allowances are permissible, the mark scheme includes a statement such as 'allow ecf'.

7. Phonetic spelling

The phonetic spelling of correct scientific terminology should be awarded marks unless there is a possible confusion with another technical term.

8. Brackets

(.....) in this marks scheme indicates information that is not essential for a mark to be awarded, but is included to help you identify the sense of the required answer.

9. Ignore / insufficient / do not allow

'Ignore' or 'insufficient' are used in this marks scheme to indicate information that is irrelevant to the question or not enough to gain the mark. Further correct amplification could gain the mark.

'Do not allow' indicates that this is a wrong answer which, even if the correct answer is also given, still means that the mark should not be awarded.

'Level of response' marking instructions

'Level of response' mark schemes are broken down into levels, each of which is given a descriptor. The descriptor for a level shows the average performance for that level. There are marks allocated to each level.

Before applying the mark scheme to a student's answer, read through the answer and annotate it to show the qualities that are being looked for. Then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a 'ladder' to see whether the answer meets the qualities given in the descriptor for that level. If the answer meets the lowest level, move up to the next level and repeat the assessment until you find a match between the descriptors and the answer.

When assigning a level, you should look at the overall quality of the answer and not be distracted by small details of the answer where the student may not have performed quite as well as their overall performance. If an answer covers different aspects of different levels of the mark scheme, use a 'best fit' approach: for example, if a response is predominantly level 2 with a small amount of level 3 material, place it in level 2 but award a mark near the top of the level because of the level 3 content.

Step 2 Determine a mark

The descriptors within each level can help with this, along with the exemplar answers or extra information given. Indicative content is provided as a guide. It is not exhaustive and you should credit other valid points in the answer. Students do not have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

Ignore any responses that are irrelevant. However, only award full marks if there are no incorrect or contradictory responses.

An answer that contains nothing of relevance to the question must be awarded no marks.

Read back through the full answer as you apply the mark scheme, so as to clarify points and assure yourself that the level and the mark are appropriate.

Paper 1 Question 01					
01.1	Pulmonary artery; D Right ventricle; B Right atrium; A		3	AO1/1 4.2.2.2	
01.2	right ventricle, pulmonary artery, lungs, pulmonary vein, left atrium		1	AO2/1 4.2.2.2	
01.3	ventricle contracts and blood pushes against the valve		1	AO2/1 4.2.2.2	
01.4	0.8 seconds		1	AO2/2 4.2.2.2	
TOTAL			6		

Question 02						
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.		
02.1	Solution 1: Starch Blue/black with iodine is positive result for starch.	Award the marks for explanations not for naming the solutions.	1	AO3/2b 4.2.2.1		
	Pale blue with Biuret is negative result for protein.		1	AO3/2b 4.2.2.1		
	Solution 2: Amylase Yellow with iodine is negative result for starch.		1	AO3/2b 4.2.2.1		
	Lilac with Biuret is positive for protein and enzymes are proteins.		1	AO3/2b 4.2.2.1		
02.2	mix equal volume of sample and Benedict's solution		1	AO1/1 4.2.2.1		
	heat / boil	Reject 'put in waterbath' unless high temperature is specified, e.g. over 80 °C	1	AO1/1 4.2.2.1		
02.3	brick-red with Benedict's shows the presence of sugar		1	AO1/1 4.2.2.1		
	amylase digests starch to sugars		1	AO3/2b 1		
TOTAL			8			

Question 03					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
03.1	lung cancer		1	AO1/1 4.2.2.6	
03.2	smoking		1	AO1/1 4.2.2.6	
03.3	lose weight / follow a low carbohydrate diet; take more exercise		2	AO2/2 4.2.2.6	
03.4	a substance that has no activity but looks like the drug being tested		1	AO1/1 4.3.1.9	
03.5	neither the patient nor the scientist know		1	AO1/1 4.3.1.9	
03.6	ask a lot of people to use the substance for a longer period and monitor them for side effects		1	AO2/2 4.3.1.9	
	check if the substance continues to help keep blood glucose levels low		1	AO2/2 4.3.1.9	
TOTAL			8		

Question 04					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
04.1	fever / high temperature (red skin) rash		1	AO1/1 4.3.1.2 AO1/1 4.3.1.2	
04.2	inhalation of droplets from sneezes and coughs	requires a bit more explanation than just 'airborne'	1	AO1/1 4.3.1.2	
04.3	Level 2: A detailed and coherent explanation is given, which logically links use of vaccine with development of immunity to measles.			AO1/1 4.3.1.7	
	Level 1: Discrete relevant points made. Links may not be made.				
	No relevant content.		0		
	 Indicative content vaccine is dead or inactive for antigen on vaccine stimulates white blood cells to if measles virus re-enters the k respond quickly to make more antibodies attack virus prevent infection if large proportion of population the virus is reduced / herd imm 				
TOTAL			7		

Question 05					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
05.1	light / sunlight		1	AO1/1 4.4.1.1	
05.2	water oxygen		2	AO1/1 4.4.1.1	
05.3	palisade		1	AO1/1 4.1.1.3	
05.4	light intensity	reject light on its own	1	AO2/2 4.4.1.2	
05.5	 Any three from the following: for respiration converts into starch (for storage) produces fat / oil (for storage) produces cellulose (for cell wall) produces amino acids/ proteins 		3	AO1/1 4.4.1.3 AO1/1 4.4.2.3	
TOTAL			8		

Question 06					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
06.1	8		1	AO2/1 4.1.3.1	
06.2	suitable scale on <i>y</i> -axis	scale should allow accurate plotting	1	AO2/2 4.1.3.1	
	3 points plotted correctly	all three points to be correct for 1 mark	1	AO2/2 4.1.3.1	
	correctly drawn line	points should be joined with straight lines	1	AO2/2 4.1.3.1	
06.3	as the length of side of the cube increases the surface area to volume ratio decreases	reject references to directly proportional	1	AO3/1a 4.1.3.1	
06.4	the smaller the surface area to volume ratio, the longer it takes for the cube to change colour completely	reject references to directly proportional	1	AO3/1a 4.1.3.1	
06.5	large surface area to volume ratio so oxygen can reach the centre of cell by diffusion quickly	allow other materials which enter cells instead of oxygen	1	AO3/2b 4.1.3.1	
06.6	provide large surface area for gas exchange	accept description of gas exchange	1	AO3/2b 4.1.3.1	
06.7	 Any three from the following: biconcave disc shape gives large surface area to volume ratio small size to travel through capillaries haemoglobin to carry oxygen lack of nucleus (so) more room (for haemoglobin) 	allow description of biconcave disc	3	AO1/1 4.2.2.3	
TOTAL			11		

Question 07							
QUESTION		ANSW	/ERS		EXTRA INFORMATION	MARK	AO / SPEC. REF.
07.1	Structure	Animal cell	Plant cell	Bacterial cell	mark by column, 1 mark per correct column	3	AO1/1 4.1.1.1
	Cell membrane	1	1	1			4.1.1.2
	Cell wall		✓	1			
	Nucleus	\checkmark	~				
	Chloroplast		~				
	Plasmids			1			
07.2	measure cell between A and B in mm convert to μm divide by 1000			award 2nd and 3rd marking points even if measurement is incorrect	1 1 1	AO2/2 4.1.1.5	
07.3	mitochondria, provide energy for active transport				1	AO2/2 4.1.1.3	
	folded membrane, increases surface area				1		
TOTAL						8	

Question 08						
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.		
08.1	translocation		1	AO1/1 4.2.3.2		
08.2	(phloem is composed of) tubes of elongated cells; pores in the end walls		2	AO1/1 4.2.3.2		
	cell sap can move from one phloem cell to the next		1	AO2/1 4.2.3.2		
08.3	starch is insoluble	accept is not washed out of cells	1	AO1/1 4.4.1.3		
	does not affect osmosis		1	AO2/1 4.1.3.2		
08.4	add iodine solution; blue/black colour (positive test for starch)		2	AO2/2 4.2.2.1		
TOTAL			8			

	Question 09				
QUESTION	ANSWERS	MARK	AO / SPEC. REF.		
09.1	Level 3: A coherent method is described with relevant detail, which demonstrates a broad understanding of the relevant techniques and procedures. The steps in the method are logically ordered. The method would lead to the production of valid results.	5–6	AO2/2 4.4.2.2		
	Level 2: The bulk of the method is described with mostly relevant detail, which demonstrates a reasonable understanding of the relevant scientific techniques and procedures. The method may not be in a completely logical order and may be missing some detail.	3–4			
	Level 1: Simple statements are made which demonstrate some understanding of some of the relevant scientific techniques and procedures. The response may lack a logical structure and would not lead to the production of valid results.	1–2			
No relevant content.		0			
	Indicative content:				
	 To get resting pulse: sit still for 5 minutes (or other stated length of time) take pulse using 2 fingers at wrist/neck count for 15 seconds and multiply by 4 to get beats per minute record pulse rate and repeat until pulse rate is constant low value 				
	 During exercise: ensure exercise is of same intensity throughout use a running machine with settings / use a metronome to get steps regular, etc. do not measure pulse rate during exercise 				
	 After exercise: immediately after stopping exercise note the time immediately after stopping take pulse using 2 fingers at wrist / neck count for 15 seconds and multiply by 4 to get beats per minute record pulse rate and repeat until pulse rate is same as value record the time at which this value is reached this is the recovery time 				
TOTAL		6			

Paper 2						
Question 01						
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.		
01.1	homozygous dominant		1	AO1/1 4.6.1.4		
01.2	black		1	AO3/2b 4.6.1.4		
01.3	Рр Рр рр рр	1 mark per row of Punnett square	2	AO2/2 4.6.1.4		
01.4	a ring around Pp		1	AO3/2b 4.6.1.4		
01.5	0.50		1	AO2/2 4.6.1.4		
01.6	mutation		1	AO1/1 4.6.2.1		
TOTAL			7			

Question 02					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
02.1	waste that is broken down by bacteria into harmless products		1	AO2/1 4.7.3.2	
02.2	reduce number of species of birds reduce number of species of animals reduce variety of food for predators	answer needs to convey idea that biodiversity is number of species not just numbers of individuals	1 1 1	AO1/1 4.7.3.2	
02.3	C, D, A, B		1	AO1/1 4.6.2.4	
02.4	bacteria take a long time to break down the plastic; there is a lot of plastic waste / waste is being produced faster		2	AO3/2a 4.7.3.2	
02.5	Two suitable suggestions, e.g. reduce plastic packaging; reuse plastic bottles; charge for plastic carrier bags	accept other suitable suggestions	2	AO2/1 4.7.3.2	
TOTAL			9		

Question 03						
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.		
03.1	all the organisms of the same species in one place		1	AO1/1 4.7.1.1		
03.2	place quadrats at random count the number of thistles in quadrat	reject throw quadrat accept description of placing	1	AO1/2 4.7.2.1		
	repeat several times calculate mean number of thistles per quadrat and multiply by area of the field	at least 10 times if number given	1			
03.3	30 × 63 ÷ 6 = 315		1	AO2/2 4.7.2.1		
03.4	overestimate if snails with paint are predated then fewer will be recaptured		1	AO2/2 4.7.2.1		
TOTAL			8			

Question 04					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
04.1	an increase in carbon dioxide in the atmosphere		1	AO1/1 4.7.3.3	
04.2	48.5% 37.2% amateur gardeners	allow answer in line with candidates answers to calculations	3	AO2/2 4.7.3.3	
04.3	Republic of Ireland		1	AO2/2 4.7.3.3	
04.4	coconuts do not grow near UK so costly to transport	accept other suitable explanations of disadvantages	1	AO3/2a 4.7.3.3	
TOTAL			6		

Question 05						
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.		
05.1	A: Respiration B: Photosynthesis C: Death	1 mark per correct line to a maximum of three, deduct 1 mark for additional lines	3	AO3/1a 4.7.2.2		
05.2	digest / break down dead plants and animals; respiration		2	AO1/1 4.7.2.2		
TOTAL			5			
	Qı	uestion 06				
06.1	functional		1	AO3/1a 4.7.1.4		
06.2	behavioural maintain body temperature		1	AO3/1a 4.7.1.4 AO2/1 4.7.1.4		
	reduces surface area (exposed to cold winds)		1	AO2/1 4.7.1.4		
06.3	reduces surface area for water loss		1	AO3/1a 4.7.1.4		
TOTAL			5			

Question 07					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
07.1	brain and spinal cord		1	AO1/1 4.5.2.1	
07.2	receptors		1	AO1/1 4.5.2.1	
07.3	stimulus – pain (from pin prick)		1	AO1/1 4.5.2.1	
	effector – muscle (in the arm which moves hand away)		1	AO1/1 4.5.2.1	
07.4	Level 3: A detailed and coherent explanation is provided of how each neurone is involved in the reflex and how response is enabled. Order of events is important for this level.			AO1/1 4.5.2.1	
	Level 2: Simple statements made, but not precisely and links not clear.		1–2	AO2/1 4.5.2.1	
	No relevant content.		0		
	Indicative content: receptor in fingertip detects pain impulse is sent to spinal cord via the sensory neurone impulse passes to relay neurone relay neurone is in spinal cord impulse is passed to motor neurone impulse passes down motor neurone to muscle in the arm muscle contracts finger is moved away from pin / pain 				
TOTAL		·	8		

Question 08					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
08.1	Kingdom tigris	ignore italics or underlining	1	AO1/1 4.6.4	
08.2	weight / mass of animals available for the tiger to eat		1	AO2/1 4.7.2.1	
08.3	20		1	AO2/1 4.7.1.1	
08.4	Level 2: A detailed and coherent explanation is provided. Logical links between clearly identified, relevant points explain how the population of tigers is affected by deforestation.		3–4	AO1/1 4.7.1.1	
	Level 1: Simple statements made, but not precisely. The logic is unclear.		1–2	AO2/2 4.7.1.3	
	No relevant content.		0		
	 Indicative content: loss of habitat for tigers loss of habitat for prey animals loss of food sources for prey animals so fewer prey animals increased competition between tigers and/or other predators for prey as less prey fewer tigers in the forest increased competition between tigers for mates as fewer tigers 				
TOTAL			8		

Question 09					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
09.1	meiosis halves chromosome number but cannot halve 33		1	AO2/1 4.6.1.1	
09.2	seeds are formed when gametes / pollen and egg cells fuse	look for the idea that without gametes there can be no fertilisation	1	AO2/1 4.6.1.1	
09.3	suckers produced by mitosis; all cells will be genetically identical OR no meiosis; so no genetic variation in cells	look for idea that without sexual reproduction there will be a lack of genetic variation	2	AO2/1 4.6.1.1	
09.4	Level 2: A detailed and coherent explanation is provided. The student makes logical links between clearly identified, relevant points that explain how resistant plants can be produced from plant meristem tissue.		3–4	AO2/2 4.1.2.3	
	Level 1: Simple statements are r logic is unclear.	nade, but not precisely. The	1–2	AO1/1 4.1.2.3	
	No relevant content.		0		
	 Indicative content: all the stem cells from the meristem of the resistant plant will have resistance genes meristem tissue from plants divides by mitosis meristem tissue in plants can differentiate into any type of plant cell clones of the resistant plant can be produce quickly all the plants will be genetically identical all the plants will be resistant to the disease 				
TOTAL			8		

Question 10					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
10.1	Type 1 do not produce insulin Type 2 produce insulin but cells do not respond to it		2	AO1/1 4.5.3.2	
10.2	points plotted accurately points joined with straight lines	reject line of best fit	2	AO2/2 4.5.3.2	
10.3	fasting blood glucose level is high blood glucose level rose and stayed high		2	AO2/2 4.5.3.2	
TOTAL			6		

Paper 3						
Question 01						
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.		
01.1	Zinc No reaction, not even with steam.		1	AO1/5.4.1.2		
	Lead Fizzing with liquid water.		1			
	Silver Slow reaction with liquid water.		1			
	Sodium Slight reaction with steam.		1			
TOTAL			4			
	Question 02					
02.1	Filtration Chromatography Distillation Fractional distillation Evaporation	1 mark per correct line. If 2 or more lines are coming from a picture, ignore all lines coming from that picture.	4	AO1/5.1.1.2		
TOTAL			4			

Question 03				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
03.1	hydrogen		1	AO1/5.4.2.1
	red		1	AO1/5.4.2.1
	water		1	AO1/5.4.2.2
	evaporation		1	AO1/5.4.2.3
TOTAL			4	
Question 04				
04.1	В		1	AO1/5.5.1.2
04.2	D		1	AO1/5.5.1.2
04.3	exothermic		1	AO1/5.5.1.1
TOTAL			3	
	Qı	uestion 05		
05.1	bromine		1	AO1/5.4.3.2
05.2	reduction		1	AO1/5.4.3.2
05.3	В		1	AO1/5.4.3.3
05.4	С		1	AO1/5.4.3.3
TOTAL			4	

Question 06					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
06.1	it does not show the electrons		1	AO3/5.2.1.4	
06.2		four shared pairs of electrons between each C and O four electrons on each O	1	AO2/5.2.1.4	
06.3	there are weak / no forces between the molecules they do not require much energy to break this gives them low melting points	accept weak intermolecular forces	1 1 1	AO2/5.2.2.4	
TOTAL			6		
	Question 07				
07.1	all points correct	within 1/2 small square	2	AO2/5.5.1.1	
	suitable line drawn	allow 1 mark for 7–8 points correct	1		
07.2	the reaction had finished	mark is independent of points correctly plotted	1	AO2/5.6.1.1 MS4b	
07.3	Any one from: • use a polystyrene cup • put a lid on the beaker • stir the liquid		1	AO3/5.5.1.1	
07.4	the temperature increases		1	AO2/5.5.1.1	
TOTAL			6		
	Que	stion 08			
08.1	((54.0 × 6.0) + (56.0 × 92.0) + (57.0 × 2.0)) / 100 = 55.9	allow 2 marks for the answer 55.9 without working	1	AO3/5.1.1.6	
08.2	they have different masses	thev have different densities	1	AO2/5.4.1.2	
	they might be radioactive	·····	1		
TOTAL			4		

Question 09					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
09.1	masses		1	AO1	
				5.1.2.2	
09.2	properties		1	AO1	
				5.1.2.2	
09.3	Groups		1	AO1	
				5.1.2.2	
09.4	he left them for undiscovered		1	AO2	
	elements;			5.1.2.2	
	that fitted the properties of the group		1		
09.5	argon would have been in Group 1	accept argon/potassium	1	AO2	
		would be in a group with different properties		5.1.2.2	
		accept potassium would			
		have been in Group 0			
09.6	air is a mixture	accept air is not an	1	AO1	
		element		5.1.2.2	
TOTAL			7		
	Questi	on 10			
10.1	they can be used to deliver drugs into the body	accept they are used as lubricants or as catalysts	1	AO1/5.2.3.3	
10.2	they have a high tensile strength		1	AO1/5.2.3.3	
	they have high electrical conductivity		1		
10.3	it is a good conductor of electricity		1	AO1/5.2.3.3	
	it has a low density		1	WS1.2	
				WS1.4	
TOTAL			5		

Question 11					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
11.1	Level 3: A detailed and coherent explanation is given, which demonstrates a broad understanding of the key scientific ideas. The response covers at least one similarity and one difference between lithium and rubidium.		5–6	AO3/5.4.2.5 5.4.2.2	
	Level 2: An explanation is given which demonstrates a reasonable understanding of the key scientific ideas. The response covers one similarity and one difference or an explanation is given as to why rubidium is more reactive than lithium.		3–4	•	
	Level 1: Simple statements are made which demonstrate a basic understanding. The response covers one similarity or one difference.		1–2	•	
	No relevant content.		0		
	Similarities				
	Lithium and rubidium lose 1 electron.	Accept lithium			
	Lithium and rubidium are both in Group 1.	both form +/1+			
	Differences	ions.			
	The outermost electron in rubidium is further from the nucleus.	Accept rubidium has more			
	Explanation as to why rubidium is more reactive than lithium	electron shells than lithium.			
	There is a weaker attraction between the outer electron in rubidium and its nucleus compared to lithium.				
	This is also due to the shielding effect of the electrons in the other shells between the nucleus and the outermost electron.				
	Rubidium loses its outer electron more easily than lithium.				
TOTAL			6		

Question 12					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
12.1	164	allow 1 mark for evidence of $40 + (14 \times 2) + (16 \times 3 \times 2)$	2	AO2/1 5.2.1.4 5.3.1.2	
12.2	The volume of water in dm ³ = 5000 \div 1000 = 5 dm ³ Concentration of calcium nitrate in water is 150 \div 5 = 30 g/dm³	30 g/dm ³ with no working gets 2 marks accept 150 \div 5000 = 0.03 g/cm ³ for 1 mark accept 0.03 × 1000 = 30 g/dm ³ for 1 mark	1	AO2/5.3.2.5 MS3b	
12.3	The volume of water in dm ³ = $500 \div 1000 = 0.5 \text{ dm}^3$ The mass of sodium chloride dissolved in water is $0.5 \times 20 = 10 \text{ g}$	10 g with no working gets 2 marks accept 20 \div 1000 = 0.02 g/cm ³ for 1 mark accept 0.02 \times 500 = 10 g for 1 mark	1	AO2/5.3.2.5 MS3b	
TOTAL			6		

Question 13					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
13.1	add inert electrodes to the solution		1	AO2/5.4.3.4	
	put an electric current through the solution		1		
	silver is formed at the negative electrode		1		
	oxygen is formed at the positive electrode		1		
TOTAL			4		
Question 14					
14.1	5.6	evidence of $\frac{(5.6 + 5.4 + 5.7)}{3}$ obtains 1 mark	2	AO2/5.4.2.3 MS2b	
		5.57 obtains 1 mark (not to the correct number of significant figures)			
TOTAL			2		
		Question 15			
15.1	$2Ca(s) + (1)O_2(g) \rightarrow 2CaO(s)$	accept no number in front of O ₂ all numbers must be right for the mark	1	AO2/5.1.1.1	
15.2	20 protons		1	AO2/5.1.1.5	
	18 electrons		1		
	20 neutrons		1		
15.3	0.114 (nm)		1	AO2/5.1.1.5 2h	
TOTAL		·	5		

Paper 4				
Question 01				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
01.1	D		1	AO1/5.7.1.3
01.2	A		1	AO1/5.7.1.2
01.3	A		1	AO1/5.7.1.3
01.4	D		1	AO1/5.7.1.3
TOTAL			4	

Question 02				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
02.1	endothermic		1	AO1/5.6.2.2
	white		1	
	exothermic		1	
	equilibrium		1	
02.2	It goes pop when a lit splint is added to it.		2	AO1/5.8.2.1
				AO1/5.8.2.2
	Hydrogen It relights a glowing splint.			
	Oxygen It makes limewater cloudy.			
	It bleaches damp litmus paper.			
02.3	carbon dioxide		1	AO1/5.9.1.2
02.4	nitrogen		1	AO1/5.9.1.1
02.5	methane		1	AO1/5.9.3.2
02.6	carbon monoxide		1	AO1/5.9.3.2
02.7	photosynthesis		1	AO1/5.9.1.3
02.8	crude oil		1	AO1/5.10.2.1
	biodegradable		1	
02.9	acid rain		1	AO1/5.9.3.2
	asthma		1	
TOTAL			15	

Question 03				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
03.1	sulfur		1	AO2/5.8.1.3
03.2	ignore the anomalous result (42 s) = (66 + 62) / 2 = 64 s	award 1 mark only if anomalous result included and mean given as 57 or 56	1 1 1	AO2/5.8.1.3
03.3	sensible scales, using at least half the grid for the points points plotted correctly line of best fit plotted correctly		1 2 1	AO3/5.6.1.1
03.4	depends on graph student has plotted	accept any answer that matches graph student produces, even if original graph is itself incorrect	1	AO3/5.6.1.1
03.5	Any one from:surface area of marble chipsconcentration (of acid)	ignore volume or amount of acid ignore amount of marble chips	1	AO2/5.6.1.2
03.6	60 / 70 0.85714 0.86 cm ³ / s	if 0.75 is given as the answer, award marks 2 and 3 (this answer assumes that the reaction stopped at 80 because that was the end of the graph) accept ecf	1 1 1	AO2/5.6.1.1
		any answer given to 2 s.f. should be awarded 1 mark, even if incorrect award 1 mark for correct units even if numbers are incorrect		
03.7	steeper line to left of original line finishes at same overall volume of gas collected		1 1	AO3/5.6.1.1
TOTAL			16	

Question 04				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
04.1	Sample 1		1	AO2/4.10.1.2
	 One reason from: Its boiling point is exactly 100 °C. Its pH is exactly 7.0. It leaves no solids when it is boiled away. 		1	
04.2	water is evaporated / boiled		1	AO2/4.10.1.2
	water is condensed		1	
	the dissolved solids remain in the first conical flask		1	
04.3	biological treatment		1	AO1/4.10.1.3
04.4	screening		1	AO1/4.10.1.3
04.5	addition of chlorine		1	AO1/4.10.1.3
TOTAL			8	
	Questi	on 05		
05.1	(Distance moved by dye A)	accept ecf for the	1	AO2/
	8 cm	distance moved by	1	4.8.1.3
	3/8		1	
	0.375		1	
	Answer to 2 s.f. (0.38)		1	
05.2	$0.6 \times 8 = 4.8 \text{ cm}$		1	AO2/4.10.3.3
				WS 1.4, 3.5. 3.8
TOTAL			6	

Question 06				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
06.1	(very) high temperature catalyst	accept any temperature from 500 °C or higher allow named catalyst, e.g. zeolite, Al ₂ O ₃ , silica, ceramic, porous pot	1	AO1/5.7.1.4
06.2	C ₉ H ₂₀		1	AO2/5.7.1.4 5.1.1.1
06.3	If only one molecule is mentioned, 3 marks maximum. Any four per substance from: Ethene • has a carbon-carbon double bond • has fewer hydrogens • makes bromine water colourless • can be turned into polymers • can be hydrogenated to make ethane • undergoes combustion • burns with a slightly smoky flame	Accept is unsaturated. Accept converse for ethane. Accept any other halogen.	4	AO2/5.7.1.4
	 Ethane has all single bonds does not react with bromine water does not react with hydrogen does not form polymers undergoes combustion burns with a clean flame 	Accept is saturated.		
TOTAL			7	

Question 07				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
07.1	Level 3: An in-depth description to describe all the changes in the Earth's atmosphere along with clear explanations on how they changed.	Accept $4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$ Or word equation. Accept $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ Or word equation.	5–6	AO3/5.9.1.2 AO3/5.9.1.3 AO3/5.9.1.4 WS 3.5
	Level 2: An attempt to describe most the events that changed the Earth's atmosphere along with explanations that may be unclear.		3–4	1
	Level 1: Simple statements made about some of the gases. The logic is unclear:		1–2	
	No relevant content.		0	
	 Indicative content: Water vapour decreased. Because as the Earth's temperature of became liquid and formed oceans. Oxygen increased due to algae formin This is because algae underwent pho produces oxygen. Carbon dioxide decreased due to oce As oceans got larger, more carbon dia Carbon dioxide decreased as rocks for Carbon dioxide decreased with metal ox rocks. Carbon dioxide decreased when algae This is because algae underwent pho absorbs carbon dioxide. Volcanoes produced nitrogen gas. Ammonia decreased in the Earth's atm Because it reacted with oxygen producation dioxide and water. 	cooled, water vapour ng. tosynthesis which eans forming. oxide dissolved in them. ormed. tides to form carbonate e formed. tosynthesis which mosphere. uced by algae to make		
TOTAL			6	

Question 08					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
08.1	50 (years)	$1.75 \times 10^{12}/3.5 \times 10^{10}$ obtains 1 mark	2	AO2/5.7.1.1 MS 3d	
08.2	 Any two from: have a funnel under the flame put test tube A in cold water or put cobalt chloride paper in test tube A have a pump to pump the air through the system 	award one mark for each different answer to a maximum of 2	2	AO3/5.7.1.3 WS 2.3	
TOTAL			4		
	Question	09			
09.1	$(1)C_7H_{16}(I) + 4O_2(g) \rightarrow 7C(s) + 8H_2O(g)$	2 or 3 correct numbers = 1 mark	2	AO2/5.7.1.3	
09.2	It causes lung problems/ lung cancer. It causes global dimming.	requires a bit more explanation than just 'airborne'	1	AO1/5.9.3.2	
TOTAL			4		

Paper 5					
Question 01					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
01.1	Box 3: Energy that is dissipated in the surroundings.		1	AO1/6.1.2.1	
01.2	Use lubrication on the gears.		1	AO2/6.1.2.1	
	Remove dirt and dust from the gears.		1		
01.3	Before dropping the ball the gravitational potential energy store is full . When the ball is in contact with the floor the gravitational potential energy store has emptied and some energy has transferred to the elastic potential energy store. The rest of the energy dissipated in the surroundings and fills the thermal energy store.	1 mark for each correct term	4	AO1/6.1.1.1	
01.4	$E_{e} = m g h$ (or word equation) $E_{e} = 0.240 \times 9.8 \times 0.57$	quote equation	1	AO2/6.1.1.2	
	= 1.341 J	answer	1		
01.5	efficiency = 1.341 / 2.352 = 0.57 Alternative method: efficiency = 57 m / 1 m = 0.57	substitution answer (decimal number must be shown)	1	AO3/6.1.1.2	
TOTAL			12		

Question 02					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
02.1	Any two from: • nuclear fuels • biofuel • hydroelectricity • geothermal • tides • water waves	do not accept oil, coal or natural gas	2	AO1/6.1.3	
02.2	In this order on the table: C B A D	1 mark for each correct answer	4	AO1/6.1.3	
02.3	Solar panels need light from the Sun to work. During the times in A and D it is too dark for the panels to generate electricity. So the power used in A and D needs to be supplied by other energy resources.		1 1 1	AO1/6.1.3	
02.4	20 000 000 / 3400 = 5882		1	AO2/6.2.4.1	
02.5	Box 2: The power output of the solar panels depends on weather conditions.		1	AO2/6.1.3	
TOTAL			12		

Question 03					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
03.1	Variable resistor		1	AO1/6.2.4.1	
03.2	03.2 Level 3: Detailed method with safety considerations and suggestions to improve accuracy.		5–6	AO2/6.5.4.3.3 WS 2.2	
	Level 2: Detailed method with s considerations).	ome omissions (e.g. no safety	3–4		
	Level 1: Some relevant points m procedure.	nade to outline a simple	1–2		
	No relevant content.		0		
	 Indicative content: measure current across the filament lamp measure p.d. across the filament lamp calculate resistance from <i>I</i> and <i>V</i> measured repeat readings and mean calculation safety considerations, e.g. using p.d. lower than lamp's rating changing resistance of variable resistor to change the p.d. and current 				
03.3	The student should reverse the p	o.d.	1	AO2/6.2.1.3	
	and record the p.d. and current for negative values of p.d. by changing the resistance of the variable resistor.		1	WS 2.2, WS 2.6	
03.4	Box 1:		1	AO3/6.2.1.3	
	The temperature of the filament i through it increases, so it has high	ncreases as the current gher resistance.			
TOTAL			10		

Question 04					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
04.1	Level 3: Detailed method with details of so how to minimise them.	ources of errors and	5	AO3/6.3.1.1	
	Level 2: Detailed method with some omis discussion of potential sources of error).	sions (e.g. no	3–4		
	Level 1: Some relevant points made to ou procedure.	tline a simple	1–2		
	No relevant content.		0		
	 Indicative content: setting scale to zero before measuring mass of rods measuring diameter of rods in at least two different points and calculating a mean use ruler to measure length of rod calculate volume of rod discuss potential difficulties with making accurate readings, e.g. rods may be slightly bent, etc. 				
04.2	correct use of standard form		1	AO2/6.3.1.1	
	density = 0.1788 / 0.000 02		1		
	= 8940		1		
04.3	5.24 mm		1	AO1/6.3.1.1	
TOTAL			9		

Question 05					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
05.1	$\Delta E = m c \Delta \theta$ or word equation		1	AO2/6.3.2.2	
	$\Delta \theta = 36.7 - 21.4 = 15.3^{\circ}$		1		
	$\Delta E = 0.000 \ 61 \times 140 \times 15.3$		1		
	= 1.3 J		1		
05.2	As the thermometer is in contact with the body, there is a temperature difference between the body and the mercury in the thermometer.		1	AO3/6.3.2.1	
	This causes an energy transfer between the body and the mercury.		1		
	The atoms of mercury begin to move faster.		1		
	The mercury expands and climbs along the capillary tube in the thermometer.		1		
TOTAL			8		

Question 06				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
06.1	protons		1	AO1/6.4.1.1
	neutrons		1	
06.2	Box 3:		1	AO1/6.4.1.2
	Atoms that have different mass numbe number.	r, but the same atomic		
06.3	7 protons		1	AO1/6.4.1.2
	7 electrons		1	
	16 – 7 = 9 neutrons		1	
TOTAL			6	
	Questi	on 07		
07.1	Bohr's model Atoms were thou could not be divided in the discovery of the electron Rutherford's model This model sugged of positive charged embedded in the electrons orbit the distances. Thomson's model This model show atom is concentra and that the nuclear model	ght to be tiny spheres that ded. ested that atoms are balls es with negative electrons m. elel suggests that the e nucleus at specific ed that the mass of an ated in its centre (nucleus) eus was positively charged.	3	AO2/6.4.1.3
TOTAL			3	

Question 08					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
08.1	Box 2:		1	AO1/6.4.2.1	
	A nucleus of helium (two protons and two neutrons).				
08.2	Box 3:		1	AO2/6.4.2.1	
	Beta particles or gamma rays.				
08.3	Box 5:		1	AO2/6.4.2.3	
	Any one is possible.				
08.4	${}^{90}_{38}$ Sr $\rightarrow {}^{90}_{39}$ Y + ${}^{0}_{-1}$ e		2	AO2/6.4.2.2	
TOTAL			5		

Question 09					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
09.1	Box 1		1	AO1/6.4.2.3	
	The time it takes for the number of nuclei of the isotopes in a sample to halve.				
09.2	3 days		1	AO2/6.4.2.3	
09.3	The half-life of the sample is 3 days, so 12 days is 4 half-lives after the count started.		1	AO3/6.4.2.3	
	The activity at 9 days (3 half-lives) is 50 Bq.		1		
	So the activity at 12 days will be half the previous value, i.e. 25 Bq.		1		
TOTAL			5		

Paper 6						
	Qı	uestion 01				
QUESTION	UESTION ANSWERS EXTRA INFORMATION MARK SPI					
01.1	north (pole)		1	AO1/6.7.1.1		
	because two north poles repel	accept two like poles or two poles that are the same	1			
01.2	electrostatic (force)		1	AO1/6.5.1.2		
	gravitational (force)		1			
01.3	contact force, objects are (physically) touching		1	AO2/6.5.1.2		
	non-contact force, objects are (physically) separated	accept not touching	1			
01.4	push the north pole of his magnet towards one end of the piece of metal and see if it attracts		1	AO3/6.7.1.1 6.7.1.2		
	push the south pole of his magnet towards the same end of the piece of metal		1			
	if it is a magnet it will repel, if it is a magnetic material it will attract		1			
TOTAL			9			

Question 02				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
02.1	the needle (on the compass) will move / deflect		1	AO3/6.7.2.1
	when a current flows through a wire it produces a magnetic field		1	
	the magnetic field of the wire affects/ attracts/repels the plotting compass (pointer)		1	
02.2	field lines must be parallel or very nearly parallel inside the coil	Field lines similar to a bar magnet.	2	AO1/6.7.2.1
	direction of field lines from north to south (arrows must be present)	Award 2 marks for all three points,		
	lines must be present that demonstrate lines starting on north and ending on south pole	1 mark for one or two points.		
	S N			
02.3	more turns		1	AO2/6.7.2.1
	put an iron core inside the coil		1	
TOTAL			7	

Question 03				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
03.1	radio waves infrared	both in correct order required	1	AO1/4.6.2.1
03.2	all are transverse waves transfer energy not matter 	All three correct, 2 marks, only one or two correct, 1 mark only.	2	AO1/6.6.2.1 6.6.1.2
03.3	 Any four of the following: ultraviolet, X-rays and gamma rays have hazardous effects on human (body) tissue ultraviolet, X-rays and gamma rays all cause ionisation ionisation can lead to cell mutation cell mutation can cause rapid cell growth cancer is a form of cell mutation (or rapid cell growth) large amounts of ultraviolet can cause blindness large amounts of ultraviolet can cause skin cancer (too much) exposure to UV, X-rays and gamma rays are all associated with cancer 	1 mark per correct response	4	AO3 × 2 AO2 × 2/6.6.2.1 6.6.2.3
03.4	 Any two from: benefits outweigh the risks scientists use appropriate data to limit the risks perception of risk is often different to measured risk use of peer review among scientific communities 	1 mark per response. Accept other sensible responses.	2	AO3/6.6.2.3 WS1.5 WS1.6 WS1.4 WS1.3
TOTAL			9	

	Question 04					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.		
04.1	Level 3: A detailed and coherent explanation is provided. The student gives examples of each of the three laws that demonstrate deep knowledge. The student makes logical links between clearly identified, relevant points.		5–6	AO2 × 3		
	Level 2: An explanation is provided that has elements that are detailed and coherent but that do not always demonstrate deep knowledge. The logic used may not be clear at all times. The student has explained the forces and physics ideas of at least 2 of the 3 laws.		3–4	AO1 × 3 6.5.4.2.1 6.5.4.2.2		
	Level 1: Simple statements are made but the response may fail to make logical links between the points raised. The student has made statements about at least one of the 3 laws.		1–2	6.5.4.2.3 MS3b, c		
	No relevant content.		0	WS 4.2		
	Marks continue on next page.					

Question 04				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
04.1	Indicative content:			
	 Newton's first law: If the resultant force acting on an object is zero a the object is stationary, the object remains stat the object is moving, the object continues to m same speed and in the same direction. 	nd: tionary nove at the		
	So the object continues to move at the same velo	ocity.		
	Examples could be provided that demonstrate the such as:If a vehicle travels at a steady speed and the rest balance the driving force. The car will maintain a	e same ideas sistive forces a steady speed.		
	To summarise: the velocity (speed and/or direction will only change if a resultant force is acting on the second s	on) of an object ne object.		
	For zero resultant force, accept idea of forces being balanced or no overall force acting. Newton's second law: As an equation: $F = m a$ or force = mass × acceleration			
	The acceleration of an object is proportional to the force acting on the object, (and inversely proport mass of the object).	ne resultant ional to the		
	If there is a resultant force acting on an object it we change in motion.	will cause a		
	If the car is moving and the resultant force is in the direction as the motion it will accelerate/ speed u	ne same Ip.		
	If the car is moving and the resultant force is in the direction to the motion it will decelerate/ slow do	ne opposite wn.		
	If a car is stationary and a resultant force acts on acceleration (or deceleration).	it, it will cause		
	For non-zero resultant force accept idea that force balanced or there is an overall force acting.	ces are not		
	Newton's third law: Whenever two objects interact, the forces they ex other are equal and opposite.	xert on each		
	The idea: for every force, there is an equal and or force.	oposite reaction		
	The idea can be explained with examples such a jumps off a boat the push he exerts on the boat i the force the boat exerts on him.	s if a person s the same as		
TOTAL			6	

Question 05					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
05.1	$v = f \times \lambda$ or wave speed = frequency × wavelength	1 mark for stating formula clearly in words or symbols	1	AO1/6.6.1.2	
	$\lambda = \frac{v}{f} = \frac{3.0 \times 10^8}{98 \times 10^6}$	1 mark correctly rearranging or substitution	1	MS1c, b, 3b AO2	
		1 mark correct handling/conversion of mega prefix	1	WS 4.4 WS 4.3	
	3.1 m	1 mark correct answer must have unit	1		
TOTAL			4		

Question 06				
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.
06.1	work done = force \times distance W = Fs	penalise incorrect use of upper or lower case	1	AO1/6.5.2
06.2	N m or newton-metre	penalise incorrect use of upper or lower case	1	AO1/6.5.2
06.3	$W = mg$ $W = 50 \times 10 = 500 \text{ N}$	correct answer required unit not required	1	AO2/6.5.1.3 MS3a, c, d
06.4	$W = Fs$ $W = 500 \times 0.9$ $W = 450 \text{ J}$	neither unit nor workings required	1	AO2/6.5.2 MS 1a MS3a, c, d
06.5	work done = 8 × 450 = 3600 J	Workings not required as long as 3600 J seen in answer.	1	AO2/6.2.4.2 MS3a, c, d
	$P = \frac{E}{t}$	Correct use of equation and correct conversion of 1 minute into 60s.	1	
	$P = \frac{3600}{60} = 60 \text{ W}$	Correct answer alone award 2 marks.	1	
		Unit required for final mark accept watts or J/s.		
TOTAL			7	

Question 07					
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.	
07.1	Thinking distance: listening to loud music drug/alcohol abuse tiredness texting 	All required. For three correct, 1 mark. For two correct, 0 marks.	2	AO1/6.5.4.3.1 6.5.4.3.3	
	Braking distance: • wet/icy roads • excessive speed • brake conditions • old worn tyres	All required. For three correct, 1 mark. For two correct, 0 marks.	2		
07.2	F = ma $F = 300 \times 4.5$ 1350 (N)	2 marks for correct answer without workings.	1	AO2/6.5.4.3.4	
07.3	 Any three from: Driving too fast will lead to a greater stopping distance (if the same force is applied). Driving too fast will require a greater deceleration to stop in the same distance. A greater deceleration will require a greater braking force. A greater braking force/ deceleration may lead to brakes overheating. Overheating could lead to a loss of control of the vehicle. Overheating could cause permanent damage to brakes. 		3	AO1 × 1 AO2 × 2 /6.5.4.3.4	
TOTAL			9		

Question 08							
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.			
08.1	sound or P-wave		1	AO1/6.6.1.1			
08.2	Any of the following: • at 90° • perpendicular • at right angles		1	AO1/6.6.1.1			
08.3	amplitude A correctly labelled wavelength λ correctly labelled set λ correctly labelled λ correctly labelled		1	AO1/6.6.1.2			
08.4	24 s		1	AO1/6.6.1.2			
08.5	$f = \frac{1}{T}$ $f = \frac{1}{24}$ 0.042 Hz	Accept correct substitution of incorrect 8.4. Accept any answer that rounds to 0.042. Award two marks if correct answer seen without workings. Unit required for 2nd mark.	1	AO2/6.6.1.2 MS 1c, 3b, c AO2			
TOTAL			7				

Question 09							
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.			
09.1	A		1	AO1/6.7.1.2			
	E		1				
09.2	(plotting) compass	do not accept reference to iron filings	1	AO1/6.7.1.2			
	(bar) magnet		1				
	points		1				
TOTAL			5				

Question 10							
QUESTION	ANSWERS	EXTRA INFORMATION	MARK	AO / SPEC. REF.			
10.1	Choosing suitable scale Plotting points correctly Line of best fit correctly drawn 5 - 1 - 4 - 5 - 1 - 5 - 5 - 7 - 5 - 5 - 7 - 5 - 5 - 7 - 5 - 5	Use at least $\frac{1}{2}$ of axis for both force and acceleration. 5 points plotted correctly with allow +/- one small square. Line must be a straight line and should not pass through 3 N or 4 N reading.	1 1 1	AO2/6.5.4.1.5 MS4c			
10.2	reading taken at 3 N	accept reading of 4.0 m/s ²	1	AO3/6.5.4.1.5			
10.3	take repeat readings to calculate a mean take repeat readings to discard anomalies	or words to that effect	1	AO3/6.5.4.1.5 WS2.7			
10.4	force is directly proportional to acceleration	accept for 1 mark, if force increases acceleration increases	2	AO3/6.5.4.1.5 WS3.5 4.5.6.2.2			
TOTAL			7				



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