



Pearson

Mark Scheme (Results)

Summer 2022

Pearson Edexcel GCSE
In Combined Science (1SC0) Paper 2CF

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		Command Word	
Strand	Element	Describe	Explain
AO1*		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

*there will be situations where an AO1 question will include elements of recall of knowledge directly from the specification (up to a maximum of 15%). These will be identified by an asterisk in the mark scheme.

Combined Science 1SC0/2CF

Question number	Answer	Additional guidance	Mark
1(a)(i)	Rb / Cs / Fr	symbols must have uppercase letter then lowercase letter reject answers with any other symbols ignore any names	(1) A02 1

Question number	Answer	Mark
1(a)(ii)	3 / three	(1) A02 1

Question number	Answer	Additional guidance	Mark
1(a)(iii)	A description including <ul style="list-style-type: none"> (the melting points) decrease (1) as the atomic number increases/ as you go down {the group / the alkali metals / group 1} (1) 	allow (melting points) {go down / get smaller} ignore less heat needed to melt it MP2 depends on MP1 allow (going) down (the table / list) allow down the periodic table ignore references to boiling point higher the atomic number, lower the melting point (2) ORA higher in {group/ table} the higher the melting point (2) ORA	(2) A03 1

Question number	Answer	Additional guidance	Mark
1(b)(i)	test tube / boiling tube	ignore just 'tube', testing tube	(1) AO2 2

Question number	Answer	Additional guidance	Mark
1(b)(ii)	<p>An explanation to include any three from:</p> <p>Step 2</p> <ul style="list-style-type: none"> cut a <u>smaller</u> piece of sodium (1) so less reaction / slower reaction (1) <p>Step 3</p> <ul style="list-style-type: none"> use a larger {container / trough} (of water) (1) there is more water so more heat is absorbed (1) 	<p>reject use powdered sodium for MP1 and MP2</p> <p>MP2 is dependent on MP1</p> <p>allow less sodium / smaller volume of sodium / $1(\text{cm}^3) \times 1(\text{cm}^3) \times 1(\text{cm}^3)$ cube / smaller mass of sodium</p> <p>ignore use less cubes</p> <p>allow smaller reaction / it is less reactive</p> <p>ignore so reaction is less vigorous</p> <p>MP4 is dependent on MP3</p> <p>allow name of larger container: beaker/ flask</p> <p>ignore use larger test tube / boiling tube</p> <p>ignore change container</p> <p>ignore add more water</p> <p>ignore add a safety screen / observe from a distance</p>	(3) AO3 3a

Question number	Answer	Mark
2 (a)(i)	A Heat energy is the only correct answer. B, C and D are incorrect as all exothermic reactions give out heat	(1) A01 1

Question number	Answer	Mark
2 (b)(i)	A / thermometer	(1) A02 2

Question number	Answer	Additional guidance	Mark
2 (b)(ii)	beaker	allow measuring beaker/ plastic beaker reject measuring cup/ jug	(1) A02 2

Question number	Answer	Additional guidance	Mark
2 (b)(iii)	it is a (good heat) insulator	allow would hold / trap heat / keeps heat in / doesn't absorb heat / reduces heat loss / poor conductor allow correct comparison of heat conductivity with glass e.g polystyrene is a better insulator than glass ignore keeps temperature in / heat resistant ignore not breakable / glass is breakable ignore 'traps energy' alone	(1) A02 2

Question number	Answer	Additional guidance	Mark
2 (b)(iv)	<p>-2.5°C scores 3 with or without working</p> <p>16.1 – 18.6 (1)</p> <p>= -2.5 (1)</p> <p>°C (1)</p>	<p>2.5°C scores 2 with or without working</p> <p>2.5 scores 1 with or without working</p> <p>MP3 standalone mark</p> <p>ignore 'C' / 'o' alone</p> <p>ignore 'deg C'</p>	<p>(3)</p> <p>A02 1</p>

Question number	Answer	Additional guidance	Mark
2 (b)(v)	<p>formula: NH_4NO_3 (1)</p> <p>name: ammonium nitrate (1)</p>	<p>letters must be capitals and 4, 3 must be subscripts</p> <p>allow $\text{NH}_4^+\text{NO}_3^-$</p> <p>allow $\text{N}_2\text{H}_4\text{O}_3$</p> <p>ignore state symbols</p> <p>ignore $\text{NH}_4^+ + \text{NO}_3^-$</p> <p>reject ammonia nitrate</p>	<p>(2)</p> <p>A02 1</p>

Question number	Answer	Additional guidance	Mark
3 (a)(i)	carbon (1) hydrogen (1)	allow answers in either order	(2) AO1 1

Question number	Answer	Mark
3 (a)(ii)	B a chain molecule is the only correct answer. A, C and D are incorrect because propane is a not an oxide, a fullerene or a ring molecule	(1) AO1 1

Question number	Answer	Mark
3 (a)(iii)	C 44 is the only correct answer. A, B and D are incorrect because $3 \times 12 + 8 \times 1 = 44$	(1) AO2 1

Question number	Answer	Additional guidance	Mark
3 (b)	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>fraction</p> <div style="border: 1px solid black; padding: 5px; margin: 5px;">petrol</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">kerosene</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">bitumen</div> </div> <div style="text-align: center;"> <p>use</p> <div style="border: 1px solid black; padding: 5px; margin: 5px;">fuel for aircraft</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">fuel for ships</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">fuel for cars</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">making plastic</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">extracting iron</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">making road surfaces</div> </div> </div>	reject more than one line from each fraction	(3) AO1 1

Question number	Answer	Additional guidance	Mark
3 (c)	<p>An explanation to include three from :</p> <p>HCl</p> <ul style="list-style-type: none"> • goes red (1) • (HCl) is an acid (1) <p>SO₂</p> <ul style="list-style-type: none"> • goes red (1) • (SO₂ solution) is an acid (1) 	<p>all MPs are marked independently</p> <p>allow pink for red reject other colours for MP1 reject references to test for chlorine/ bleaching for MP1</p> <p>allow hydrogen chloride for HCl</p> <p>allow pink for red reject other colours for MP3 reject references to test for chlorine/ bleaching for MP3</p> <p>both go red/ they go red (2) for MP1 and MP3 both are acids (2) for MP2 and MP4</p>	<p>(3) AO1 1 AO2 1</p>

Question number	Answer	Mark
4 (a)	<p>B chlorine is the only correct answer</p> <p>A, C and D are incorrect because only chlorine is green</p>	<p>(1) A01 1</p>

Question number	Answer	Additional guidance	Mark
4 (b)(i)	<p>iron + chlorine → (1)</p> <p>→ iron chloride (1)</p>	<p>allow = for →</p> <p>MP1: allow iron wool/ reactants in either order/ ignore heat</p> <p>MP2: reject if extra products but ignore heat</p> <p>reject more than one arrow for both marks e.g. iron → chlorine → iron chloride</p> <p>if symbol equation given only allow: $\text{Fe} + \text{Cl}_2 \rightarrow \text{FeCl}_2$ (2) OR $2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{FeCl}_3$ (2) all formulae must have correct capital and small letters and subscripts</p>	<p>(2) A02 1</p>

Question number	Answer	Additional guidance	Mark
4 (b)(ii)	chlorine	allow CL / Cl / Cl ₂	<p>(1) A03 2</p>

Question number	Answer	Additional guidance	Mark
4 (b)(iii)	<p>iron = 43 and chlorine = 82 scores 3 with or without working</p> <p>$\frac{34.4}{100} \times 125$ (1)</p> <p>= 43 given as mass of iron (1)</p> <p>125 – 43 = 82 given as mass of chlorine (1)</p> <p>OR</p> <p>$\frac{65.6}{100} \times 125$ (1)</p> <p>= 82 given as mass of chlorine (1)</p> <p>125 – 82 = 43 given as mass of iron (1)</p>	<p>one correct and one incorrect (or missing) value with or without working scores 2</p> <p>allow ECF</p> <p>allow ECF but must add up to 125g for MP3</p> <p>allow ECF but must add up to 125g for MP3</p> <p>allow final answers reversed on answer lines for 2 marks with or without working.</p>	(3) A02 1

Question number	Answer	Mark
4 (c)	<ul style="list-style-type: none"> • catalyst (1) • unchanged (1) 	(2) A01 1

Question number	Answer	Additional Guidance	Mark
5 (a)(i)	<ul style="list-style-type: none"> • 100 cm³ measuring cylinder/ (gas) syringe (1) • which has smaller gradations / higher resolution (1) 	<p>allow 'smaller measuring cylinder'</p> <p>ignore gas measurer reject (upturned) burette for MP1</p> <p>MP2 is dependent on MP1 allow (more) precise / (more) accurate allow smaller measurements/ increments</p> <p>ignore easier to use / no gas will escape</p>	(2) AO3 3b

Question number	Answer	Additional guidance	Mark
5 (a)(ii)	<ul style="list-style-type: none"> • volume read at 90s = 29 cm³ (1) • rate = $\frac{\text{volume}}{90}$ (1) • = 0.3222.... (cm³ per second) (1) 	<p>0.31, 0.32, 0.33 with or without working scores 3 all other answers require working to have marks awarded 0.3 alone scores 0</p> <p>allow any value 28-30 ECF for incorrect volume</p> <p>ECF if fraction inverted ECF if 1.5 used instead of 90 eg $\frac{28/29/30}{1.5} = 18.66.../ 19.33.../ 20$ scores 2</p> <p>MP3 must be decimal value correctly rounded – ignore fractions</p>	(3) AO3 2

Question number	Answer	Additional guidance	Mark
5 (a)(iii)	volumes were {constant / stopped rising} OR graph was {flat/plateaued/ levelled off}	allow reactant(s) used up / limiting factor allow no more hydrogen evolved allow EVIDENCE that reaction stopped: measurements stayed the same/ no more bubbles allow graph has reached zero gradient ignore graph is a straight line ignore it has reached the highest {point / volume} ignore reaction has stopped / is complete reject reaction is becoming slower	(1) AO3 2

Question number	Answer	Additional guidance	Mark
5 (b)(i)	An explanation linking <ul style="list-style-type: none"> more particles present (in same volume) (1) so more frequent collisions/ more chance of collision (1) 	allow atoms/ molecules/ ions for particles ignore more acid present allow more collisions per {sec/min/unit time} ignore more collisions/ more successful collisions ignore references to energy / moving faster mark independently	(2) AO1 1

Question number	Answer	Mark
5 (b)(ii)	D use the same metal but in a powdered form is the only correct answer B and C are incorrect because the reactants are not changed A is incorrect because the reaction will be slower	(1) AO2 1

Question number	Answer	Additional guidance	Mark
5 (c)	<p>A description including any two from:</p> <ul style="list-style-type: none"> • {crush/ break} the large chips (1) • in pestle and mortar (1) • use sieves to separate different sized chips/ sort the chips by size (1) 	<p>ignore {cut / chop} them up ignore breaking down by cutting / chopping / tearing / heating etc</p> <p>allow any suitable <u>laboratory</u> apparatus/ tool e.g. hammer ignore domestic equipment e.g. scissors / rolling pin allow leave in acid (to reduce size) for MP2 but MP1 cannot score</p> <p>allow pick out the sizes you need allow repeat the method to get even smaller chips</p>	<p>(2) AO1 2</p>

Question number	Answer	Mark
6 (a)	B effervescence is seen is the only correct answer. A, C and D are incorrect as they are not linked to gas production	(1) AO1 2

Question number	Answer	Mark
6 (b)	B chlorine is the only correct answer. A, C and D are incorrect because only chlorine bleaches litmus	(1) AO1 1

Question number	Answer	Additional guidance	Mark
6 (c)	2.20 with or without working scores (2) <ul style="list-style-type: none"> • $5(.000) - 2.8(00) = 2.2(00)$ (1) • $= 2.20$ (1) 	<p>reject additional processing for MP1 (e.g $5 - 2.8 = 2.2$ then $\frac{2.2}{100} = 0.0220$)</p> <p>does not score MP1 – additional process of dividing by 100 does not score MP2 - using a number not in the question</p> <p>for MP2 final answer must be to 3sf, correct evaluation of expression using only numbers from the question</p> <p>2.2 / 2.200 scores 1 mark $\frac{5.000}{2.800} = 1.79$ scores 1 mark $\frac{2.800}{5.000} = 0.560$ scores 1 mark [0.56 = 0] $5.000 \times 2.800 = 14.0$ scores 1 mark [14 = 0] $5.000 + 2.800 = 7.80$ scores 1 mark [7.8 = 0]</p>	(2) AO2 1

Question number	Answer	Additional guidance	Mark
6 (d)(i)	<p>An explanation linking:</p> <ul style="list-style-type: none"> it has two electrons in outer shell/ it has a full outer shell / OWTTE (1) so does not {gain/ lose/ transfer/ share} electrons (1) 	<p>MP1 – reject if number of electrons in outer shell is stated and not 2 ignore references to protons and neutrons allow helium has two electrons in its (only) shell / helium's (only) shell is full</p> <p>ignore helium does not need to react</p>	(2) AO1 1

Question number	Answer	Additional guidance	Mark
6 (d)(ii)	less dense than air	<p>allow less dense than nitrogen allow low density / not (very) dense allow diffuses slowly out of balloon</p> <p>ignore less dense than oxygen ignore it is a gas / light / lightweight / inert/ unreactive/ non-flammable / lighter than air / makes balloon float / it rises/ it floats</p> <p>ignore non-toxic / not poisonous</p>	(1) AO2 1

Question number	Indicative content	Mark
*6(e)	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p>AO1 (6 marks)</p> <p>Natural: Origins:</p> <ul style="list-style-type: none"> • {carbon dioxide / water / gases} from volcanoes • the Earth cooled • so water vapour condensed (to form oceans/seas) reducing amount of water vapour • carbon dioxide {dissolves in/absorbed by} the oceans reducing amount of carbon dioxide • some carbon dioxide incorporated into sea animals' shells <p>Natural: Evolution</p> <ul style="list-style-type: none"> • plants evolved • photosynthesis • photosynthesis releases oxygen increasing amount of oxygen • photosynthesis absorbs carbon dioxide reducing amount of carbon dioxide <p>Human effects</p> <ul style="list-style-type: none"> • amounts of carbon dioxide in recent time increasing due to burning fossil fuels • amounts of carbon dioxide in recent time increasing due to agriculture • deforestation means less carbon dioxide absorbed • reforestation means more oxygen produced 	(6) AO1

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	<ul style="list-style-type: none"> • Demonstrates elements of chemical knowledge, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	<ul style="list-style-type: none"> • Demonstrates chemical knowledge, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	<ul style="list-style-type: none"> • Demonstrates accurate and relevant chemical knowledge throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then: Information directly copied from the table is not credited e.g water vapour goes down Water vapour has gone down (0) Humans respire giving carbon dioxide (0)
Level 1	1–2	<u>Additional Guidance</u> Candidate gives basic ideas only, these may or may not be linked	<u>Possible candidate response</u> Carbon dioxide is produced by volcanoes (1) Water vapour decreased because the earth cooled (1) Water vapour in the atmosphere condensed to form oceans (2) Trees photosynthesise and absorb carbon dioxide (2) Trees take in carbon dioxide and produce oxygen (2) Plants release oxygen, burning fossil fuels release carbon dioxide (2)
Level 2	3–4	<u>Additional Guidance</u> candidate gives basic idea about two areas. OR candidate gives a detailed explanation about one process	<u>Possible candidate response</u> Carbon dioxide is absorbed during photosynthesis by plants and burning fossils produces carbon dioxide (3) Trees photosynthesise which absorb carbon dioxide and release oxygen. The Earth cooled and water condensed to produce oceans, these oceans absorbed carbon dioxide (4) Trees photosynthesise which absorb carbon dioxide and release oxygen (3) Primitive plants evolved in oceans and started to photosynthesise which decreased the amount of carbon dioxide and increase the amount oxygen in the atmosphere. (4)
Level 3	5–6	<u>Additional Guidance</u> candidate explains ideas about all three areas	<u>Possible candidate response</u> Trees photosynthesise which absorb carbon dioxide and release oxygen. The Earth cooled and water condensed to produce oceans, these oceans absorbed carbon dioxide. Cars produce carbon dioxide (5) Trees photosynthesise which absorb carbon dioxide and release oxygen. The Earth cooled and water condensed to produce oceans, these oceans absorbed carbon dioxide. Burning fossil fuels produces carbon dioxide and deforestation has led to fewer trees and therefore less carbon dioxide being absorbed (6)