



Mark Scheme (Results)

January 2020

Pearson BTEC Level 3 Applied Science /
Forensic and Criminal Investigation

Unit 1: Principles and Applications of
Science I – Chemistry (31617H)

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Unit 1: Applications of Science I – sample marking grid

General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do, rather than be penalised for omissions.
- Examiners should mark according to the marking grid, not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks, if the learner's response is not rewardable according to the marking grid.
- Where judgement is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

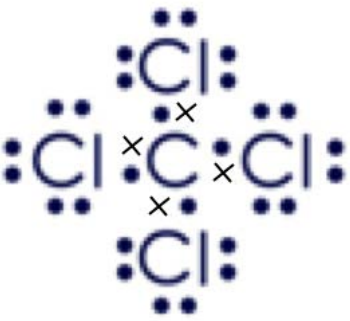
Specific marking guidance

The marking grids have been designed to assess learner work holistically. Rows in the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer, in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band, depending on how they have evidenced each of the descriptor bullet points.

BTEC Next Generation Mark Scheme Template

Applied Science Unit 1: Chemistry FINAL 2001

Question Number	Answer	Additional Guidance	Mark
1 (a)	B – The carbon atom forms four single bonds		1 (MCQ)
1 (b)	 <p>(2)</p> <p>OR</p> <p>1 shared pair of electrons between a carbon and a chlorine (1)</p>	<p>Allow dots, crosses or a mixture of both</p> <p>ignore inner shells</p>	2 (grad)
1 (c)	Van der Waals (forces)	<p>allow London (dispersion forces) / {temporary/instantaneous} dipole (- induced dipole forces)/</p> <p>allow induced dipole-dipole</p> <p>reject dipole-dipole alone / permanent dipole</p>	1 (expert)
1 (d)	<p><u>substitution (1)</u></p> <p>$(80 \times 35) + (20 \times 37)$</p> <p><u>percentage (1)</u></p> <p>$\frac{(3540)}{100}$</p> <p>allow other alternative methods</p>	<p>allow full marks for correct answer of 35.4 without working</p> <p>allow ecf</p> <p>Power of ten error scores 1 mark</p> <p>Note 35.5 or 35 with no working scores 0</p>	2 (expert)
Total			6 marks

Question Number	Answer	Additional Guidance	Mark
2 (a)	Any two from: (there is an) electrostatic attraction (between the ions) (1) (contains) { positive and negative / oppositely charged} ions (1) (arranged in a) (giant ionic) lattice / giant (ionic) structure (1)	ignore references to intermolecular forces non-metal and metal ions ignore references to transfer or sharing of electrons	2 (grad)
2 (b)	Mg + H₂SO₄ → MgSO₄ + H₂ (2) Or Mg (1) H ₂ SO ₄ (1)	allow multiples allow SO ₄ H ₂ / S(HO ₂) ₂ reject H ₂ SO ₄ , H ² SO ⁴ etc award 1 mark max if balanced incorrectly allow reactants in either order	2 (grad)
2 (c)(i)	<u>6.02</u> (= 0.05) 120.4	allow full marks for correct answer of 0.05 without working allow alternative methods	1 (expert)
2 (c)(ii)	Answer taken from (c)(i) <u>conversion of volume (1)</u> <u>500</u> 1000 <u>calculation of concentration (1)</u> <u>(0.05)</u> 0.5 <u>evaluation (1)</u> 0.1 (mol dm ⁻³) OR Using value 0.04 <u>conversion of volume (1)</u> <u>500</u> 1000 <u>calculation of concentration (1)</u> <u>0.04</u> 0.5 <u>evaluation (1)</u> 0.08 (mol dm ⁻³)	allow full marks for correct answer of 0.1 without working allow ecf 0.5 0.5 allow alternative methods	3 (expert)
Total			8 marks

Question Number	Answer	Additional Guidance	Mark
3 (a)	D – Iodine		1 (MCQ)
3 (b)(i)			1 (MCQ)
3 (b)(ii)	gains (1) gas (1)		2 (clerical)
3 (b)(iii)	<p>An explanation linking the identification of : (electronegativity) decreases (down group 7) (1) and then two from the number of (electron) shells increases / <u>outer</u> shell further from nucleus / atomic radius increases (1) more shielding (of the nuclear pull by the inner shells from the bonding pair of electrons) (1) (bonding pair of) electrons are not attracted as strongly (1)</p>	<p>allow ORA throughout allow {<u>outer</u> electrons / bonding pair} becomes further away from nucleus (1)</p>	3 (expert)
3 (c)	<p>An explanation linking the identification of : chlorine (bromine) iodine (1) and then two amplifications from: chlorine reacts with (sodium) bromide and (sodium) iodide / chlorine displaces bromine and iodine (1) bromine reacts with (sodium) iodide but not with (sodium) chloride / bromine displaces iodine but not chlorine (1) iodine does not react with (sodium) chloride or (sodium) bromide / iodine does not displace chlorine or bromine (1)</p>	<p>allow chlorine reacts with 2 solutions allow bromine reacts with 1 solution allow iodine does not react with any of the solutions</p>	3 (expert)
Total			10 marks

Question number	Indicative content
4	<ul style="list-style-type: none"> • X must have a metallic structure • X conducts electricity because it has a metallic structure • X has delocalised electrons that are free to move • X has electrons that move to carry a current • when molten, X has electrons that are still delocalised and can still move <ul style="list-style-type: none"> • Y must have an ionic structure • when solid, Y ions are fixed by strong ionic bonds • Y ions cannot move • therefore, solid ionic compounds cannot carry a current • when molten/in liquid form the ions are free to move • free moving ions carry the current <ul style="list-style-type: none"> • they both contain charged particles that can move when in liquid state

Mark scheme (award up to 6 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
Level 0	0	No rewardable material.
Level 1	1–2	<ul style="list-style-type: none"> · Demonstrates adequate knowledge of scientific facts/concepts with generalised comments made · Generic statements may be presented rather than linkages being made so that lines of reasoning are unsupported or partially supported · The explanation shows some structure and coherence
Level 2	3–4	<ul style="list-style-type: none"> · Demonstrates good knowledge and understanding by selecting and applying some relevant scientific knowledge facts/concepts to provide the discussion being presented. · Lines of argument mostly supported through the application of relevant evidence · The explanation shows a structure which is mostly clear, coherent and logical
Level 3	5–6	<ul style="list-style-type: none"> · Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of scientific facts/concepts to provide the discussion being presented. · Line(s) of argument consistently supported throughout by sustained application of relevant evidence · The explanation shows a well-developed structure which is clear, coherent and logical

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