Mark Scheme (Results)

January 2021

Pearson BTEC Nationals
In Applied Science (31617H1C)
Unit 1: Principles and Applications of Science I - Chemistry

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Unit 1: Principles and Applications of Science I

General marking guidance

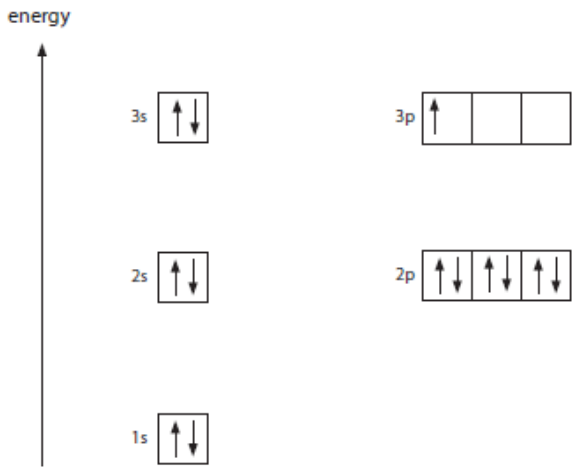
- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do, rather than be penalised for omissions.
- Examiners should 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.

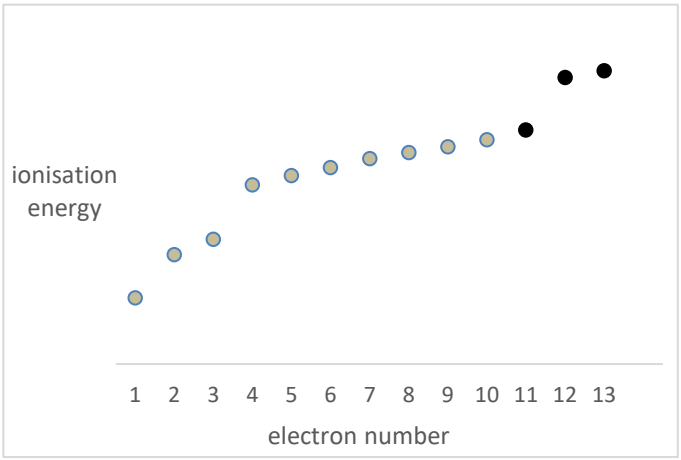
Specific marking guidance

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.

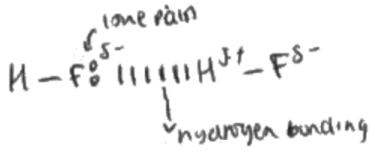
- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer, in response 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

Question Number	Answer	Additional Guidance	Mark
1 (a)	use (1) linked property (1) e.g. bridges (1) as metal is strong (1) OR jewellery (1) as metal is malleable / shiny / durable / unreactive (1) OR wiring (1) metal {is ductile/conducts electricity} (1) allow any reasonable use with linked property	ignore saucepan needs to conduct heat ignore explanations of properties whether correct or otherwise mark independently but max 1 if use and property are not linked	2
1 (b)(i)	 Figure 1 (1)	do not allow both arrows in each box with same spin allow half arrows	1

1 (b)(ii)	 (2) OR points plotted for ionisation energy numbers 11, 12 and 13 that consecutively show an increase from electron 10 (1) large increase between the points plotted for ionisation energy 11 and 12 (1)	if no other mark awarded allow 1 mark for electrons 11, 12 and 13 showing a consecutive increase	2
		Total	**5 marks**

Question Number	Answer	Additional Guidance	Mark
2 (a)	**B** high melting point		1
2 (b)	(in the manufacture of): cleaning (products) e.g detergents medication e.g laxatives drying agents defrosting windows cattle feed paper pulping batteries glass allow any other reasonable use		1
2 (c)(i)	losing	allow giving (up) / removing	1
2 (c)(ii)	**C** +6		1
2 (d)(i)	<u>number of moles of sodium sulfate (1)</u> <u>2.842</u> = 0.02 142.1	0.02 gains 1 mark with or without working	1
2 (d)(ii)	<u>number of moles of sodium hydroxide (1)</u> 0.02 x 2 = (0.04) <u>mass of sodium hydroxide (1)</u> 0.04 x 40 = <u>evaluation (1)</u> = 1.6 (g) **Using 0.025** <u>number of moles of sodium hydroxide (1)</u> 0.025 x 2 = (0.05) <u>mass of sodium hydroxide (1)</u> 0.05 x 40 = <u>evaluation (1)</u> = 2 (g)	1.6 gains 3 marks with or without working allow ECF throughout 2 gains 3 marks with or without working	3
2 (d)(iii)	**D** 59.82 %		1
		Total	**9 marks**

Question Number	Answer	Additional Guidance	Mark
3 (a)	any two from: low melting point (1) poor conductors of electricity (1) poor conductors of heat (1)	ignore low boiling point allow does not conduct electricity allow does not conduct heat / insulator allow 1 mark for "poor conductor" alone ignore malleable / ductile / brittle allow insoluble in water / **some** soluble in water allow soluble in non-polar solvents	2
3 (b)	H_2 (g) + F_2 (g) → 2HF (g) (3) Or g (1) F_2 (1) 2 (1)	do not allow super script numbers rather than subscript allow (G) do not allow (gas) allow multiples	3
3 (c)	(large) difference in electronegativity (between H and F) / δ^+ on H **and** δ- on F (1) attraction between H($^{\delta+}$) and lone pair (of electrons in different molecule) (1) marks can be awarded from annotated diagram of HF molecules e.g.  (2)	allow F is more/most electronegative ignore references to covalent / ionic bonding ignore references to O, N	2

3 (d)	boiling point increases / takes more energy to break (the intermolecular forces) (1) increasing number of electrons from HCl to HI (1) (therefore) {stronger/greater} (van der Waals forces / intermolecular forces) (1)	allow London dispersion forces, temporary dipole-induced dipole forces ignore hydrogen bonding gets stronger	3
		Total	**10 marks**

Question number	Indicative content
4	• all are covalent bonds, which means that electrons are shared between two atoms • electrostatic attraction between electrons and nuclei • the table shows that shorter bonds are stronger than longer bonds • the stronger the bond is, the more energy is needed to break the bond • single carbon bond/C-C contains one pair of electrons • double carbon bond/C=C contains two pairs of electrons • therefore greater electron density between nuclei and electrons in C=C • therefore more attraction between nucleus and bonding pair • therefore bond length of C=C is shorter and therefore more energy needed to break • C-C and C-Br are both single bonds/ have one shared pair of electrons • C-Br is longer than C-C bond • bromine atom has more shells of electrons than carbon atom • therefore greater shielding effect between nuclei and electrons • so less attraction between nucleus and bonding pair • therefore C-Br bond needs less energy to break • pi bond is weaker than sigma bond • so energy to break double bond is not double that of breaking a single bond accept any other valid response.

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	• Adequate interpretation, analysis and/or evaluation of the scientific information with generalised comments being made • Generic statements may be presented rather than linkages being made so that lines of reasoning are unsupported or partially supported • The discussion shows some structure and coherence
Level	**Mark**	**Descriptor**
Level 2	3–4	• Good analysis, interpretation and/or evaluation of the scientific information • Lines of argument mostly supported through the application of relevant evidence • The discussion shows a structure which is mostly clear, coherent and logical
Level 3	5–6	• Comprehensive analysis, interpretation and/or evaluation of all pieces of scientific information • Line(s) of argument consistently supported throughout by sustained application of relevant evidence • The discussion shows a well-developed structure which is clear, coherent and logical