Shapes of Molecules & Ions

Mark Scheme

Level	International A Level
Subject	Chemistry
Exam Board	Edexcel
Topic	Application of Core Principles of Chemistry
Sub Topic	Shapes of Molecules & Ions
Booklet	Mark Scheme

Time Allowed: **38 minutes**

Score: **/31**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

Question Number	Correct Answer	Mark
1	C	**(1)**
	Incorrect answers A – BF_3 is not pyramidal B – BF_3 is not pyramidal and PH_3 is not trigonal planar D - PH_3 is not trigonal planar	

Question Number	Correct Answer	Mark
2	B	**(1)**
	Incorrect answers A – graphite is not 109.5^o C – diamond is not 120^o and graphite is not 109.5^o D - diamond is not 120^o	

Question Number	Correct Answer	Mark
3	D	**1**

Question Number	Correct Answer	Mark
4	A	**1**

Question Number	Correct Answer	Mark
5	B	**1**

Question Number	Correct Answer	Mark
6	C	**1**

Question Number	Correct Answer	Reject	Mark
7	B		1

Question Number	Correct Answer	Reject	Mark
8	B		1

Question Number	Correct Answer	Reject	Mark
9	D		1

Question Number	Correct Answer	Reject	Mark
10	B		**1**

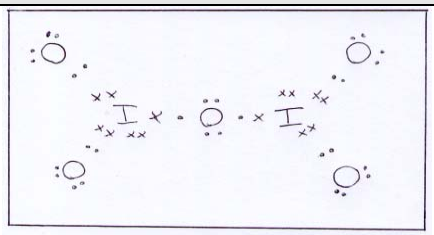
Question Number	Correct Answer	Reject	Mark
11	B		**1**

Question Number	Correct Answer	Reject	Mark
12	C		**1**

Question Number	Acceptable Answers	Reject	Mark
13(a)(i)	(No because) The oxidation number of iodine in HIO_3 **and** I_2O_5 is **+5 / 5+ / V** OR The oxidation number **+5 / 5+ / V** remains the same.	Yes	**1**

Question Number	Acceptable Answers	Reject	Mark
13(a)(ii)	To remove the water formed OR To prevent the 'back'/reverse reaction/to favour the right hand side/ to move the position of the equilibrium to the right/ to prevent I_2O_5 reacting with water OR To stop hydrolysis of iodine pentoxide	Water of hydration	**1**

Question Number	Acceptable Answers	Reject	Mark
13(a)(iii)	$I_2O_5 \rightarrow I_2 + 2½O_2$ Allow multiples/fractions Allow also the use of $\rightleftharpoons$. Ignore state symbols even if incorrect. Ignore temperatures.	Oxygen gas on both sides of the equation.	**1**

Question Number	Acceptable Answers	Reject	Mark
13(a)(iv)	 Double-bonded oxygens at the 4 corners, each with 2 lone pairs **(1)** Iodine to have 12 electrons and the central oxygen to be single-bonded with two lone pairs **(1)** Alternative diagrams with dative covalent bonds instead of double bonds to the oxygen, but then the oxygen would have three lone pairs, could be allowed for one mark. Allow one mark for correct diagram with all dots or all crosses Allow dots and crosses to be other way round, • for I and X for O. Lone pairs do not necessarily have to be clearly paired.		**2**

Question Number	Acceptable Answers	Reject	Mark
13(a)(v)	105° - 107° **(1)** Pyramidal **(1)** Ignore trigonal, or alternative spellings of, or triangular before pyramidal	Bipyramidal planar	**2**

Question Number	Acceptable Answers	Reject	Mark
	In (b) any units given must be correct. Penalise once only. **TE throughout**		
13(b)(i)	(0.01x 0.0216 =) 2.16×10^{-4}/0.000216 (mol)	2.2×10^{-4}/ 0.00022	**1**

Question Number	Acceptable Answers	Reject	Mark
	IGNORE SF except 1SF. Penalise once only in (b)(ii), (iv), (v) and (vii).		
13(b)(ii)	4.32×10^{-4}/0.000432 (mol) Allow 4.3×10^{-4}/0.00043 (mol) Allow TE from (b)(i) x 2 Allow any SF except 1		**1**

Question Number	Acceptable Answers	Reject	Mark
13(b)(iii)	(0.04 x 0.02 =) 8.0×10^{-4}/0.00080 (mol) **Allow 1SF here only.**		**1**

Question Number	Acceptable Answers	Reject	Mark
13(b)(iv)	(8.0×10^{-4} – 4.32×10^{-4} =) 3.68×10^{-4} (mol) Allow 3.7×10^{-4}/0.00037 Allow TE from (b)(iii) ans – (b)(ii) ans Allow any SF except 1		**1**

Question Number	Acceptable Answers	Reject	Mark
13(b)(v)	1.84×10^{-4}/0.000184 (mol) Allow 1.85×10^{-4}/0.000185/ 1.8×10^{-4}/0.00018 Allow TE from (b)(iv) ans ÷ 2 Allow any SF except 1		**1**

Question Number	Acceptable Answers	Reject	Mark
13(b)(vi)	$I_2O_5 + 5CO \rightarrow I_2 + 5CO_2$ Allow multiples/fractions Ignore state symbols even if incorrect		**1**

Question Number	Acceptable Answers	Reject	Mark
13(b)(vii)	$(1.84 \times 10^{-4}) \times 5$ **(1)** $\times 24 = 2.208 \times 10^{-2}/0.02208$ (dm^3) **(1)** Allow TE from (b)(v) and or b(vi) Allow any SF except 1 Correct answer no working **(2)** Allow answer in cm^3 but the unit must be given eg 22.08 cm^3		**2**

Question Number	Acceptable Answers	Reject	Mark
13(b)(viii)	Repeat the experiment (to get concordant titres)/ Divide solution into (equal) samples before carrying out titration/ divide the gas into (equal) samples before carrying out titration. IGNORE: Use a larger volume of gas/Use a weaker concentration of thiosulfate /Use more accurate equipment	Just 'repeat the titration'	**1**

Question Number	Acceptable Answers	Reject	Mark
13(c)(i)	(cars have a) Catalytic converter ALLOW Other suitable modifications which refer to more efficient combustion OR Use of hydrogen as a fuel or solar power Or use of electric cars.	Just 'car converted to run on other fuels which contain carbon' Just 'catalyst' Just 'more fuel efficient cars'	**1**

Question Number	Acceptable Answers	Reject	Mark
13(c)(ii)	The amount of CO_2 produced (on combustion) is equal to the amount of CO_2 absorbed (during photosynthesis) **(1)** Biofuel/ any suitable biofuel example such as bioethanol/ biodiesel/ suitable description of source such as "ethanol produced from sugar" **(1)** ALLOW Hydrogen produced using **renewable** resources Stand alone marks	Just 'carbon' Just 'Ethanol' Fuel cells	**2**

TOTAL FOR QUESTION 13 = 19 MARKS