1.	**(**	**(i)**	portable	**[1]**
		(ii)	oxygen **or** air	**[1]**
	(b)		both have four outer **or** valency electrons need to share four more **or** need four more to complete energy level **NOT** four bonds	**[1]** **[1]**
		(ii)	hard brittle high melting **or** boiling point poor conductor of electricity **or** semi-conductor any **TWO** **NOT** insoluble in water, **NOT** tough **NOT** appearance	**[2]**
		(iii)	germanium **or** carbon **NOT** graphite	**[1]**
	(c)		correctly balanced	**[1]**
		(ii)	lost oxygen **or** decrease in oxidation number **NOT** accepts electrons unless valid explanation	**[1]**
		(iii)	4 oxygen atoms around 1 silicon atom 2 silicon atoms around 1 oxygen tetrahedral **or** diagram that looks tetrahedral If some wrong chemistry, such as ionic MAX 2/3	**[1]** **[1]** **[1]**
				TOTAL = [12]

2 **(a)** drop small tube in acid/loosen string/idea of mixing zinc and acid/let go of cotton
ALLOW: cut the string [1]
NOT: heat (the acid)
NOT: pull the string

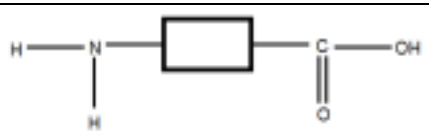
(b) **(i)** correct plotting including 0-0 point (−1 per omission or error) [2]
(ii) best curve drawn and to go through origin [1]
(iii) no more gas produced/reaction finished;
all zinc reacted/used up [2]

(c) graph drawn with faster initial rate and starting at 0-0;
ALLOW: straight line as initial rate
ends up at 55 cm^3 [2]

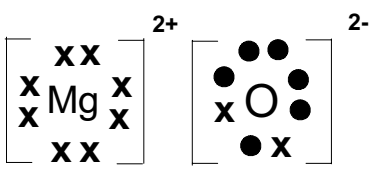
(d) **(i)** 2 (HC*l*) [1]
(ii) zinc chloride [1]
(iii) 136 [1]
IGNORE units

(e) substance containing only one type of atom/substance which cannot be broken down to any other substance by <u>chemical means</u> [1]
NOT 'can't be split' alone
NOT is a pure substance

Question	Answer	Marks
3(a)(i)	$NH_3 + HCl \rightarrow NH_4Cl$;	**1**
(a)(ii)	di	**1**
(a)(iii)	solid forms at: A; explanation: ammonia molecules / particles have a smaller mass; (and so) move / diffuse faster;	**3** 1 2
(a)(iv)	**M1** solid forms in less time / faster / quicker; **M2** particles / molecules have more energy; **M3** (and so) move faster / diffuse faster;	**3** 1 1 1
(b)(i)	test: add sodium hydroxide (solution and warm); result: test gas / ammonia with (red) litmus / Universal Indicator / pH paper; indicator turns blue / ammonia produced;	**3** 1 2
(b)(ii)	test: add silver nitrate (solution); result: add (dilute) nitric acid; white precipitate;	**3** 1 2

Question	Answer	Marks
(c)(i)	cov	**1**
(c)(ii)	**M1** one shared pair of electrons between each N and H; **M2** one shared pair of electrons between the N atoms; **M3** one lone pair on each N and no additional electrons anywhere;	**3** 1 1 1
(d)(i)		**1**
(d)(ii)	proteins are made from more than two monomers; **OR** nylon is made from 1 or 2 monomers (only);	**1**
(d)(iii)	acids;	**1**
(e)	 ;	**1**

Question	Answer	Marks
4(a)	the number of e gained or lost = numerical value of oxidation state; any two from: • Na to A*l* (Si) lose e ; • (Si) P to C*l* gain e ; • Si gains and loses e / Ar neither gains nor loses e ;	**1** **2**
(b)	**M1** positive ions / cations / metallic ions; the (correct) particles named in **M1** are arranged in a lattice / rows / layers; sea of electrons / delocalised electrons;	**3**
(c)	they have mobile electrons;	**1**
(d)	chlori	**1**
(e)	strong covalent bonds ; in a giant lattice / macromolecule / giant (structure);	**2**

Question	Answer	Marks
(f)	any two from: • sodium chloride is ionic **and** PCl_3 is covalent; • ionic bonds are strong **and** intermolecular forces are weak; • PCl_3 reacts with water **and** $NaCl$ does not;	**2**
(g)	MgO will react with / dissolve in / neutralise hydrochloric acid / acid / acid oxide; if amphoteric, MgO will react with or dissolve in or neutralise hydrochloric acid or acid or acid oxide **and** MgO will react with dissolve in or neutralise sodium hydroxide or alkali or base or basic oxide; MgO will not react with or dissolve in or neutralise sodium hydroxide or alkali or base or basic oxide = [2]	**2**
(h)	 magnesium with 8 or 0 outer shell electrons; oxygen with 8 outer shell electrons and 2 indicated differently from the other 6 and these 2 electrons must match the Mg electrons if these have been shown; correct charges;	**3**