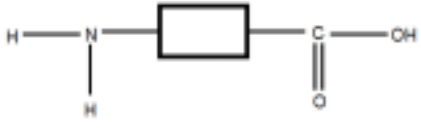


1. (i) portable [1]
- (ii) oxygen **or** air [1]
- (b) both have four outer **or** valency electrons [1]  
 need to share four more [1]  
**or** need four more to complete energy level  
**NOT** four bonds
- (ii) hard  
 brittle  
 high melting **or** boiling point  
 poor conductor of electricity **or**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

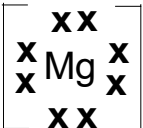
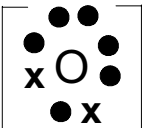
**TOTAL = [12]**

- 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; [2]  
all zinc reacted/used up
- (c) graph drawn with faster initial rate and starting at 0-0;  
ALLOW: straight line as initial rate  
ends up at 55 cm<sup>3</sup> [2]
- (d) (i) 2 (HCl) [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 chemical means [1]  
NOT 'can't be split' alone  
NOT is a pure substance

Question	Answer	Marks
3(a)(i)	$\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$ ;	1
(a)(ii)	di	1
(a)(iii)	solid forms at: A; explanation: ammonia molecules / particles have a smaller mass; (and so) move / diffuse faster;	1 2 3
(a)(iv)	<b>M1</b> solid forms in less time / faster / quicker; <b>M2</b> particles / molecules have more energy; <b>M3</b> (and so) move faster / diffuse faster;	1 1 1 3
(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;	1 2 3
(b)(ii)	test: add silver nitrate (solution); result: add (dilute) nitric acid; white precipitate;	1 2 3

Question	Answer	Marks
(c)(i)	cov	1
(c)(ii)	<b>M1</b> one shared pair of electrons between each N and H; <b>M2</b> one shared pair of electrons between the N atoms; <b>M3</b> one lone pair on each N and no additional electrons anywhere;	1 1 1
(d)(i)		1
(d)(ii)	proteins are made from more than two monomers; <b>OR</b> nylon is made from 1 or 2 monomers (only);	1
(d)(iii)	acids;	1
(e)	 <p>The diagram shows a chemical structure of an amino acid. On the left, a nitrogen atom (N) is bonded to two hydrogen atoms (H), one above and one below. A horizontal line extends to the right from the nitrogen atom to a rectangular box. From the right side of the box, a horizontal line extends to a carbon atom (C). This carbon atom is also bonded to an oxygen atom (O) below it and a hydroxyl group (OH) to its right. A semicolon (;) follows the structure.</p>	1

Question	Answer	Marks
4(a)	the number of e <sup>-</sup> gained or lost = numerical value of oxidation state;  any two from: <ul style="list-style-type: none"> <li>• Na to Al (Si) lose e<sup>-</sup> ;</li> <li>• (Si) P to Cl gain e<sup>-</sup> ;</li> <li>• Si gains and loses e<sup>-</sup> / Ar neither gains nor loses e<sup>-</sup> ;</li> </ul>	1  2
(b)	<b>M1</b> positive ions / cations / metallic ions; the (correct) particles named in <b>M1</b> 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: <ul style="list-style-type: none"> <li>• sodium chloride is ionic <b>and</b> <math>PCl_3</math> is covalent;</li> <li>• ionic bonds are strong <b>and</b> intermolecular forces are weak;</li> <li>• <math>PCl_3</math> reacts with water <b>and</b> <math>NaCl</math> does not;</li> </ul>	<b>2</b>
(g)	<p>MgO will react with / dissolve in / neutralise hydrochloric acid / acid / acid oxide;</p> <p>if amphoteric, MgO will react with or dissolve in or neutralise hydrochloric acid or acid or acid oxide <b>and</b> MgO will react with dissolve in or neutralise sodium hydroxide or alkali or base or basic oxide;</p> <p>MgO will not react with or dissolve in or neutralise sodium hydroxide or alkali or base or basic oxide = [2]</p>	<b>2</b>
(h)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <math>2+</math>   </div> <div style="text-align: center;"> <math>2-</math>   </div> </div> <p>magnesium with 8 or 0 outer shell electrons;</p> <p>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;</p> <p>correct charges;</p>	<b>3</b>