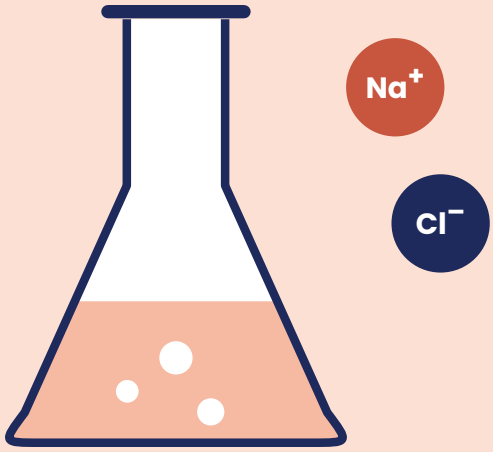
YOUR SCIENCE ONLINE
yourscienceonline.com

Year 10–11 • Cambridge IGCSE Chemistry 0620

Chemical Bonding

Mark Scheme – Teacher Copy



Answers, marking points and guidance for the Chemical Bonding topic practice paper (Cambridge IGCSE Chemistry 0620 style).

Ions | Ionic | Covalent | Giant covalent | Metallic | Properties

KEY IDEAS IN THIS PAPER

CORE + EXTENDED

Name: _____ Class: _____

Date set: _____ Date due: _____

What's inside

Question 1	Structure and properties	**7 marks**
Question 2	Ionic bonding in sodium chloride	**10 marks**
Question 3	Covalent bonding in simple molecules	**9 marks**
Question 4	Diamond and graphite	**9 marks**
Question 5	Metallic bonding [Extended]	**6 marks**
Question 6	Types of bonding	**4 marks**

Marking notes

- ; separates marking points. / separates alternatives.
- ( ) words in brackets are not needed for the mark.
- M1, M2 = first and second marking points.
- Accept any correct, clearly expressed alternative.

Total marks

45

© Your Science Online • yourscienceonline.com • For personal and single-classroom use only. Please do not share or resell.

Chemical Bonding – Mark Scheme

Maximum mark: 45 (Core: 32). ";" separates marking points. Accept correct alternative wording. allow = accept this answer; do not allow = reject this answer.

Question 1 – Structure and properties

Q	Answer	Mark	Guidance
1(a)(i)	P;	1	
1(a)(ii)	Q;	1	
1(a)(iii)	R;	1	
1(a)(iv)	S;	1	S conducts as a solid and as a liquid
1(b)	in the solid, ions cannot move / are held in fixed positions (in a lattice); when molten, ions are free to move (and carry charge);	2	do not allow: electrons move (0 for that point)
1(c)	liquid and 25 °C is above its melting point but below its boiling point;	1	both state and reason needed
	Total	**7**	

Question 2 – Ionic bonding in sodium chloride

Q	Answer	Mark	Guidance
2(a)(i)	2,8,1;	1	allow 2.8.1
2(a)(ii)	2,8;	1	
2(b)	sodium (atom) loses one electron (to form Na^+); chlorine (atom) gains one electron (to form Cl^-);	2	allow: electron transferred from sodium to chlorine for 1 mark only if no other credit
2(c)	one dot added in the gap on the shell, making 8 outer electrons; charge – (or 1–) written at the top right, outside the brackets;	2	do not allow: + charge
2(d)	strong (electrostatic) attraction; between oppositely charged ions;	2	do not allow: strong covalent bonds / intermolecular forces (0); allow: lots of energy needed to overcome the attraction (max 1 if no ions mentioned)
2(e)(i)	$CaCl_2$;	1	allow: $Ca^{2+}(Cl^-)_2$
2(e)(ii)	Al_2O_3;	1	
	Total	**10**	

Question 3 – Covalent bonding in simple molecules

Q	Answer	Mark	Guidance
3(a)	a pair of electrons shared between two atoms;	1	do not allow: electrons transferred
3(b)(i)	3;	1	
3(b)(ii)	1;	1	
3(c)	weak forces between molecules / weak intermolecular forces; little energy needed to overcome them; covalent bonds are not broken;	2	any two; do not allow: weak covalent bonds / covalent bonds break (max 1)
3(d)	no ions or no free / mobile electrons (to carry charge);	1	allow: made of (neutral) molecules
3(e)	two double bonds: two shared pairs (four electrons) between C and each O; two non-bonding (lone) pairs on each O atom; 8 outer electrons around each atom, with dots and crosses used correctly for C and O;	3	outer shells only; circles not needed. If single bonds are drawn between C and O, maximum 1 mark.
	Total	**9**	

Question 4 – Diamond and graphite

Q	Answer	Mark	Guidance
4(a)	B;	1	
4(b)(i)	4;	1	
4(b)(ii)	3;	1	
4(c)	each carbon atom uses only 3 of its 4 outer electrons in bonding; (one electron per atom is) delocalised / free to move (through the layers / structure);	2	allow: free electrons carry the charge (M2); do not allow: ions move
4(d)	(graphite is made of) layers (of carbon atoms); weak forces between the layers, so layers can slide over each other;	2	do not allow: weak covalent bonds between layers (0 for M2)
4(e)	diamond is very hard; each carbon atom is joined to four others by strong covalent bonds / giant (rigid) structure with many strong bonds;	2	allow: high melting point so it does not melt when the drill heats up (for M1)
	Total	**9**	

Question 5 – Metallic bonding [Extended]

Q	Answer	Mark	Guidance
5(a)	lattice of positive (metal) ions; (in a) sea of delocalised electrons; (electrostatic) attraction between positive ions and delocalised electrons;	2	any two
5(b)	delocalised electrons can move (through the structure);	1	do not allow: ions move
5(c)	layers / rows of (positive) ions; can slide over each other (when a force is applied) without the bonding breaking / delocalised electrons still hold the ions together;	2	allow: atoms for ions
5(d)	high melting point / hard / does not conduct electricity / insoluble in water;	1	any one
	Total	**6**	

Question 6 – Types of bonding

Q	Answer	Mark	Guidance
6(a)	ionic: KBr and CaO; covalent: CH_4, HCl and H_2O;	2	all five correct = 2; three or four correct = 1; a row with two ticks scores 0
6(b)	ionic; XY;	2	do not allow: X_2Y or XY_2
	Total	**4**	

Paper total: 45 | Core total: 32 | Extended-only marks: 2(e), 3(c), 3(e), Q5