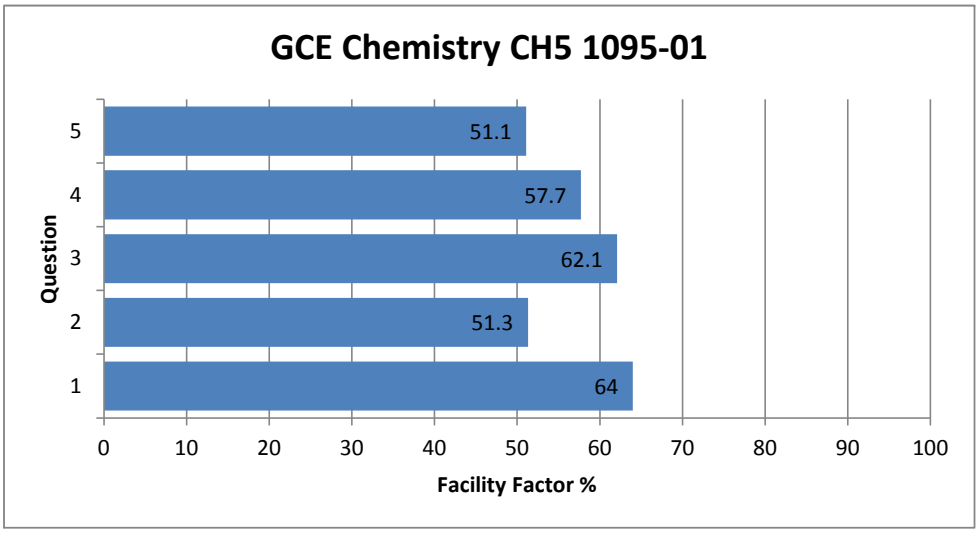
WJEC 2014 Online Exam Review

GCE Chemistry CH5 1095-01

All Candidates' performance across questions

Question Title	N	Mean	S D	Max Mark	F F	Attempt %
1	2043	6.4	2.3	10	64	100
2	2041	6.2	3.4	12	51.3	99.9
3	2042	11.2	4.1	18	62.1	100
4	2042	11.5	4.5	20	57.7	100
5	2040	10.2	4.9	20	51.1	99.8

3c ii
4b i
5c



Examiner only

(c) Manganese(IV) oxide *(line 10)* and potassium manganate(VII) *(lines 20-21)* are typical transition metal compounds.

(ii) Explain why transition metal complex ions appear coloured. [4]
QWC [1]

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Turn over.

Ligands cause splitting of the 3d-subshells in ions. 3 orbitals move up to a higher energy level and 2 move down to a lower energy level. Energy from the visible ~~spree~~ spectrum is absorbed when electrons move from lower energy level to higher energy level. The colour seen is the frequency not absorbed by electron.

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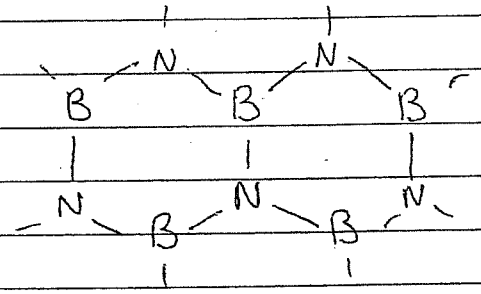
(b) Carbon is the first element in Group 4. Two of its allotropes are diamond and graphite. A compound that forms structures corresponding to diamond and graphite is boron nitride.

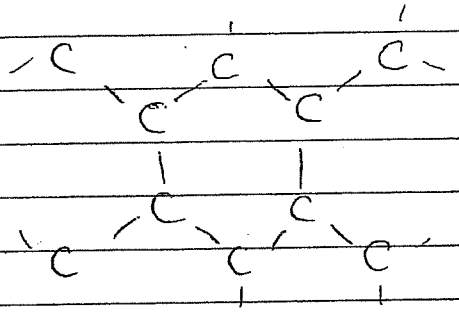
(i) Describe the structure of graphite and explain why **hexagonal** boron nitride can adopt the same structure yet have different electrical conductivity properties. [4]
QWC [1]

4 b) (i) BN is isolectronic to C so can form 3 covalent bonds and hence form a hexagonal structure.

Boron nitride:



Graphite:



Graphite has strong covalent bonds between the carbons but weak Van der Waals forces between its layers meaning the layers slide over each other. Boron nitride has the same structure which makes them both good lubricants. Graphite can conduct electricity as it has a free valence electron which can move and carry charge.
Boron nitride is an insulator as Boron is more electronegative than nitrogen.

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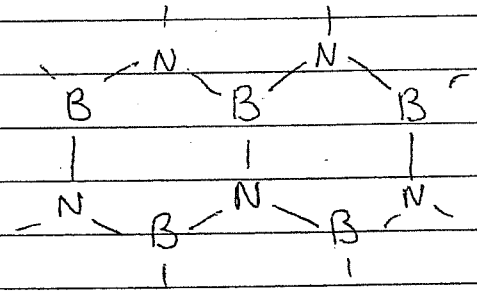

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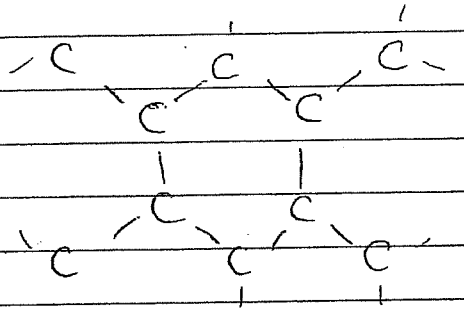

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(i). Graphite and hexagonal BN are iso electronic. Both form 3 bonds with one non-utilised p-orbital. Both graphite and hexagonal BN exist in hexagonal layers. Graphite can conduct electricity because the non-utilised p-orbital electron can more around the layers delocalised. BN cannot conduct electricity because, unlike graphite, the N has a full non-utilised p-orbital and B has an empty non-utilised p-orbital. N is more electronegative than B so pulls electron density away from B so electrons cannot be delocalised and more around layers like in graphite.

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(b)

(i) Graphite is made from carbon atoms. ~~Strongly covalently bon~~ It is a giant covalent structure. It has weak van der waals forces, so layers of ~~grap~~ the hexagons structure can slide of each other. This makes graphite a good lubricant. Hexagonal boron nitride can adopt this structure because C and BN are isoelectronic, and can ~~form~~ both for hexagonal structures. Graphite is a good conductor of electricity, because it has a 'sea' of delocalised electrons, so ~~current~~ currents can flow. BN however cannot conduct electricity, instead it is a great ~~conductor~~ insulator. It cannot conduct electricity as the Nitrogen is more electronegative than the boron, so the density is not spread out.

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5

5. *(c)* Most ionic chlorides, e.g. sodium chloride, are soluble in water. However some, e.g. silver chloride, are insoluble.

The enthalpy change of solution of an ionic compound and its solubility depend on the balance between two enthalpy changes. Name these enthalpy changes and state if they are endothermic or exothermic. Explain how the enthalpy change of solution of a compound and its solubility depend on the balance between them. [4]

QWC [1]

c) It depends on the balance between enthalpy change of lattice breaking and enthalpy change of hydration. Enthalpy change of lattice breaking is exothermic whereas enthalpy change of hydration is endothermic. Enthalpy change of hydration must be greater than enthalpy change of lattice breaking for a compound to be soluble.

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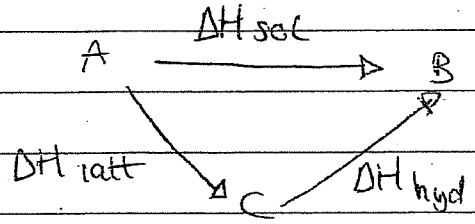

For ΔH solution to be positive ΔH lattice breaking has to be smaller than the ΔH value for hydration. ΔH lattic breaking is exothermic and ΔH hydration is endothermic.

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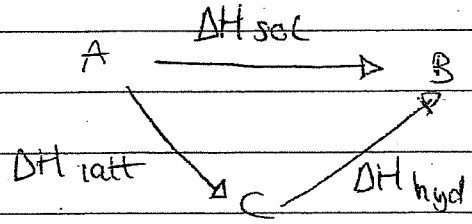

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3