

AS Level Chemistry B
H033/02 Chemistry in depth

Question Set 11

11 Many of the chemical elements found on Earth were produced in nuclear fusion reactions in stars.

- (a) Write a nuclear equation to show the fusion of the nuclei of two hydrogen-2 atoms to give a single atom.

[1]

- (b) The presence of different elements in stars is shown by absorption or emission atomic spectra.

The diagrams below represent parts of an absorption spectrum and an emission spectrum.

absorption spectrum



emission spectrum



A student says that the absorption and emission spectra are for the same element.

Discuss whether the student is correct, giving the chemical theory.

[3]

- (c) The element indium was discovered in 1863 from an emission spectrum.

Indium has two naturally occurring isotopes as shown in the table.

Isotope	Isotopic mass
^{113}In	112.90
^{115}In	114.90

The relative atomic mass, A_r , of indium is 114.82.

Calculate the percentage abundances of the two isotopes.

^{113}In %; ^{115}In % [2]

- (d) Indium is in Group 13 of the periodic table, the same group as aluminium.

- (i) Complete the electronic configuration of indium.

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2$

[1]

(ii) Indium has the same structure and bonding as aluminium.

Explain why indium conducts electricity.

[1]

(iii) Indium forms an oxide that has a melting point of 1910°C and conducts electricity in the molten state.

Explain this high melting point in terms of the structure and bonding in the compound. [1]

(e) A student is asked to predict and explain the shape of an InH_3 molecule.

The student writes, 'Since the formula, InH_3 , is similar to ammonia, NH_3 , the shape must be the same, so it is trigonal pyramidal with bond angles of about 107° '.

Discuss the student's statements about

InH_3 . Give the supporting chemistry.

..... [3]

Total Marks for Question Set 11: 12



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