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 asingle atom.

[1]

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

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

absorption spectrum

frequency →

emission spectrum

frequency →

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 themolten 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