40 This question compares the properties of pure aluminium with Aluminium Strong Alloy. **Fig. 40.1** and **Fig. 40.2** show stress against strain graphs for these metals. **Fig. 40.2** shows that both metals have the same initial elastic regions.

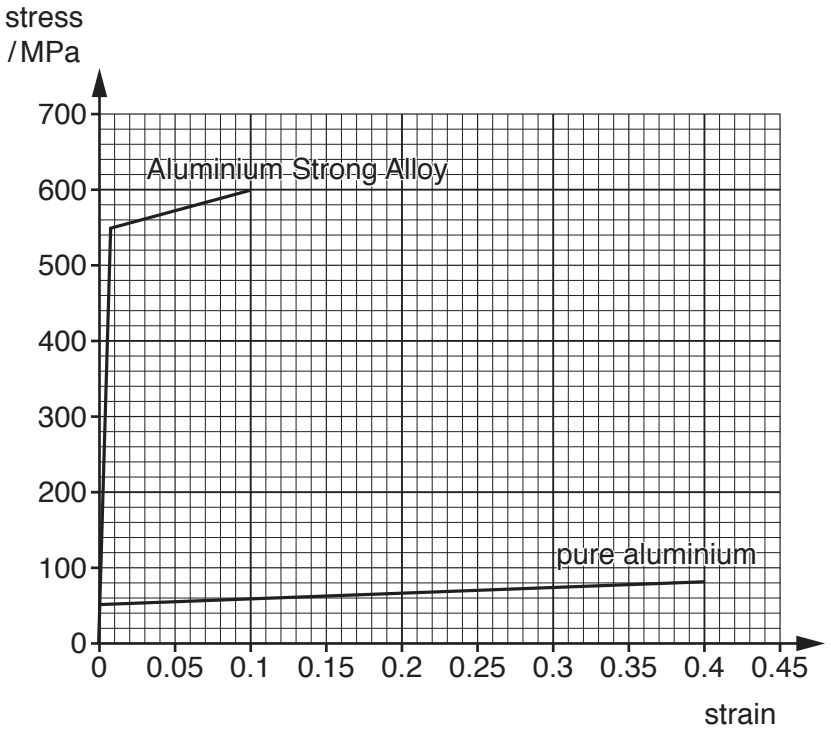

Fig. 40.1

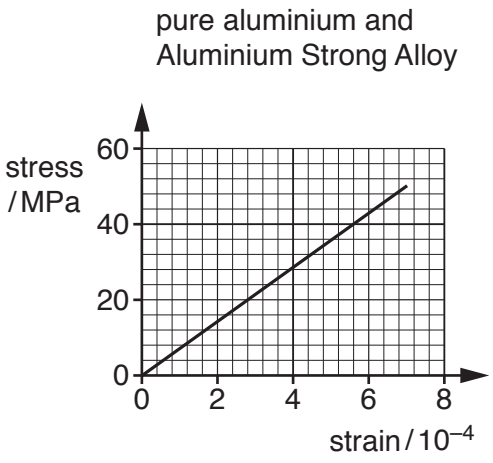

Fig. 40.2

(a) Calculate the Young modulus for the metals using data from **Fig. 40.2**.

Young modulus = ... Pa **[1]**

(b) State and justify which of the metals you would use for the crumple zone of a car.

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..... **[2]**

(c) **Fig. 40.3** shows a TEM (transmission electron microscope) image of atoms in a metal with a scale marker of 1 nm.

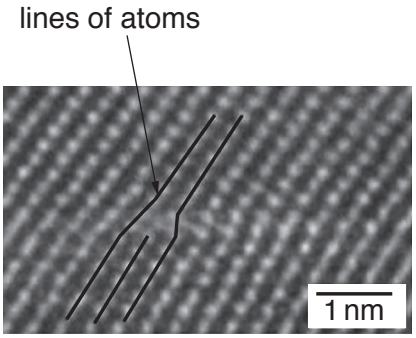

Fig. 40.3

(i) Use the **Fig. 40.3** to estimate the diameter of a metal atom.

diameter = ... m **[2]**

(ii) Name the feature represented by the lines of atoms added to the image.

name of structure ..... **[1]**

(d)* Use ideas about bonding and structures in pure metals and alloys to explain the similarities and differences in elastic and plastic properties of aluminium and its strong alloy shown in **Fig. 40.1**.

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..... **[6]**

32 **Fig. 32.1** represents the internal structure of a metal alloy.

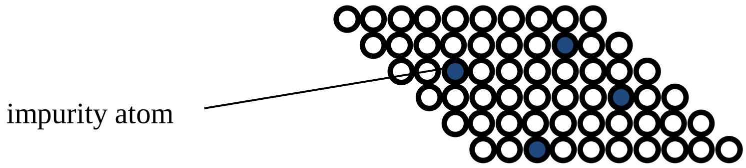

Fig. 32.1

Describe and explain how the presence of impurity atoms makes the metal harder.

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…… **[3]**

33 Light of wavelength 633 nm passes through a diffraction grating.

The first order maximum is at an angle of 0.19 radian.

(a) Show that the grating has about 300 lines per mm.

[3]

(b) Calculate the number of orders of maximum that can be obtained from this grating with this light source.

[2]