

velocity = .....  $\text{m s}^{-1}$  [2]

- 4 (a) The planet Mars has a mass of  $6.4 \times 10^{23} \text{ kg}$  and a diameter of  $6.8 \times 10^3 \text{ km}$ . A rock, initially at rest a long distance from Mars, travels towards its surface.

Assuming that Mars is isolated in space, show that the speed of the rock as it reaches the surface of Mars is  $5.0 \times 10^3 \text{ m s}^{-1}$ .

[2]

- (b) (i) Helium-4 may be assumed to be an ideal gas.

Calculate the temperature of helium-4 gas at which the r.m.s. speed of its atoms is equal to the speed of the rock in (a).

[2]

- (ii) Suggest, with a reason, whether helium-4 is found on the surface of Mars.

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