

- 1 (a) State what is meant by *gravitational potential* at a point.

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..... [1]

- (b) The planet Mars has a mass of  $6.4 \times 10^{23}$  kg and a diameter of  $6.8 \times 10^3$  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  $5.0 \times 10^3$  ms<sup>-1</sup>.

[2]

- (c) (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 (b).

temperature = ..... K [2]

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

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..... [2]