2 **(a)** Explain why gravitational potential has a negative value.

.....

.....

.....

..... [2]

(b) Fig. 2.1 shows the variation of the gravitational potential ϕ with distance d from the surface of a certain planet. Point P is at a distance of 1.0×10^7 m from the surface of the planet and point Q is on the surface of the planet.

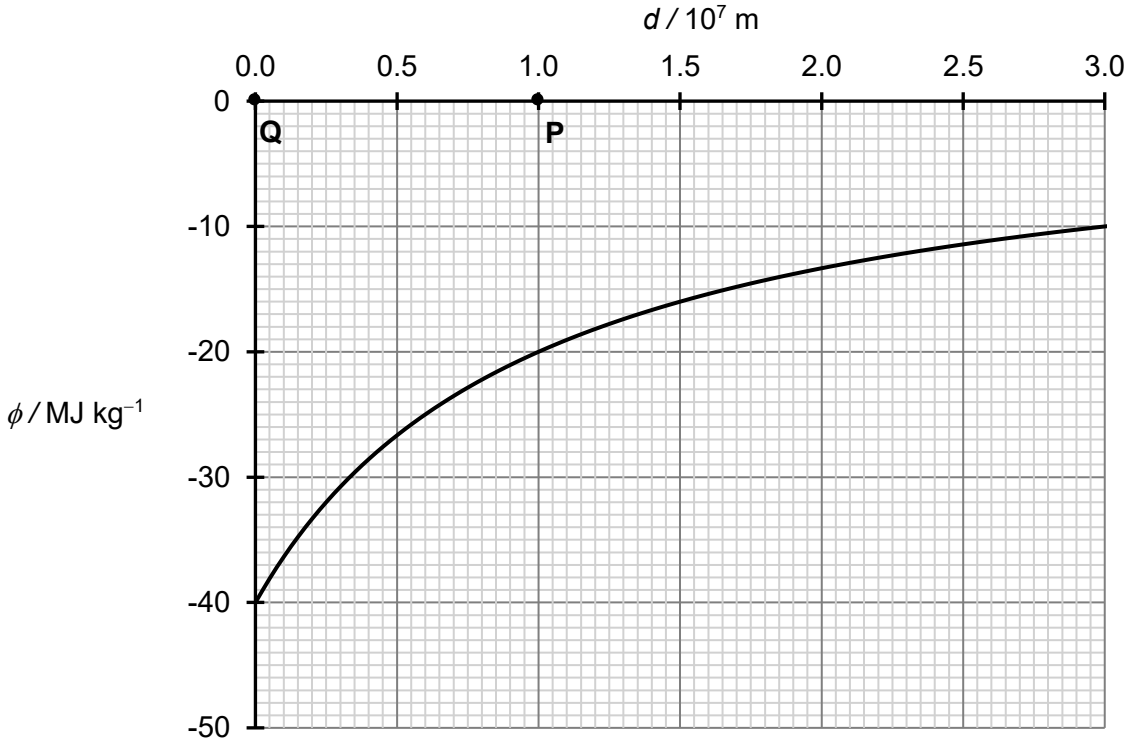

Fig. 2.1

(i) Determine the gravitational acceleration at point P.

gravitational acceleration = ... m s^{-2} [2]

(ii) Assuming that a 1.0 kg mass falls from point P toward point Q with the acceleration obtained in **(b)(i)** throughout the motion, calculate the increase in its kinetic energy.

increase in kinetic energy = ... J [2]

(iii) Indicate, using vertical double-head arrows, the parts of the graph that represent

1. your answer in **(b)(ii)**. Label this arrow **A**.

2. the actual increase in the kinetic energy of the 1.0 kg mass when the gravitational acceleration from P to Q is not constant. Label this arrow **B**.

[2]