

- 1 (a) Define *gravitational potential* at a point.

.....

.....

..... [2]

- (b) An isolated solid sphere of radius r may be assumed to have its mass M concentrated at its centre. The magnitude of the gravitational potential at the surface of the sphere is ϕ .

On Fig. 1.1, show the variation of the gravitational potential with distance d from the centre of the sphere for values of d from $d = r$ to $d = 4r$.

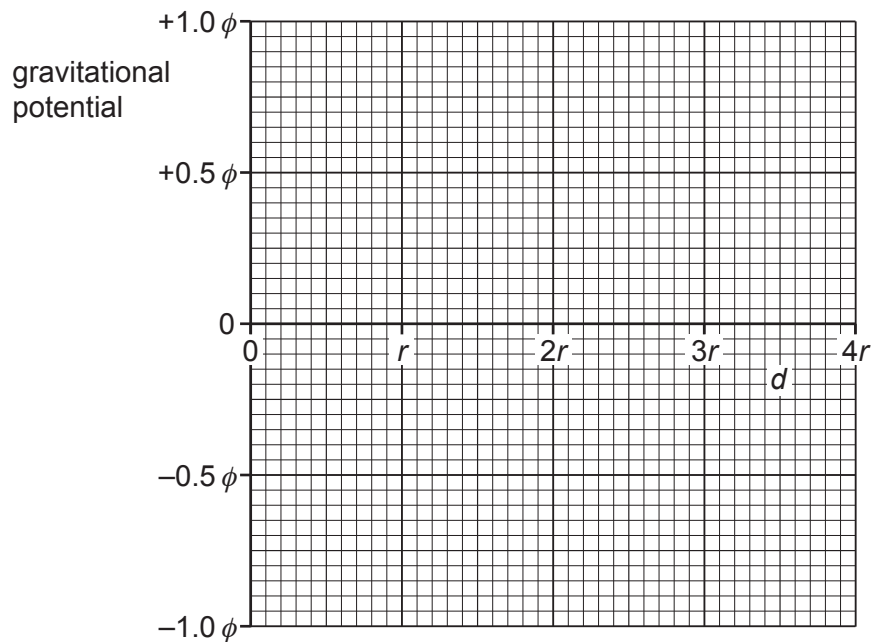


Fig. 1.1

[3]

- (c) The sphere in (b) is a planet with radius r of $6.4 \times 10^6 \text{ m}$ and mass M of $6.0 \times 10^{24} \text{ kg}$. The planet has no atmosphere.

A rock of mass $3.4 \times 10^3 \text{ kg}$ moves directly towards the planet. Its distance from the centre of the planet changes from $4r$ to $3r$.

- (i) Calculate the change in gravitational potential energy of the rock.

change = J [3]

- (ii) Explain whether the rock's speed increases, decreases or stays the same.

.....
 [2]