

- 5 (a) Define the *gravitational potential* at a point.

[1]

- (b) The variation of gravitational potential ϕ with distance r from the centre of Jupiter is shown in Fig. 5.1.

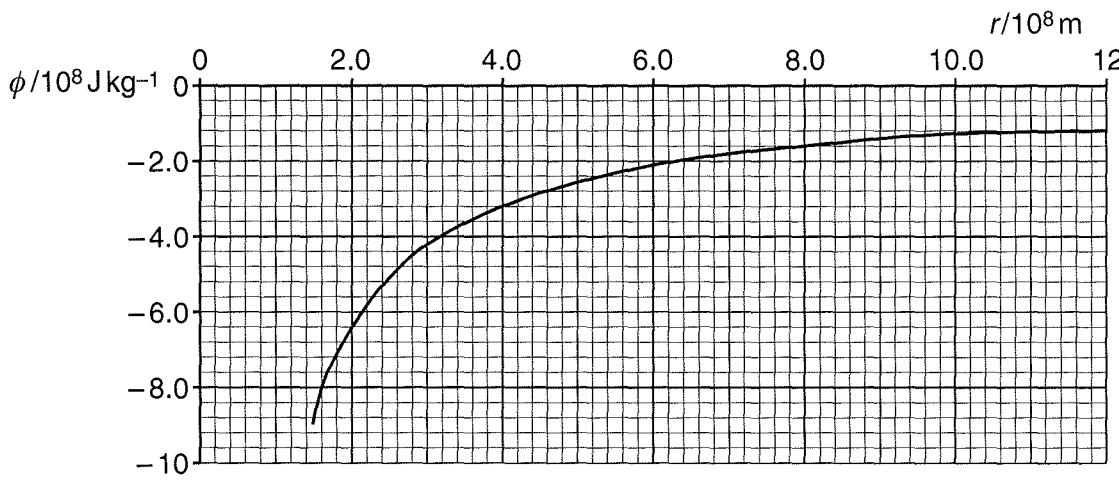


Fig. 5.1

- (i) Use Fig. 5.1 to determine the mass of Jupiter.

mass = kg [2]

- (ii) A moon of Jupiter has a circular orbit of radius of $4.22 \times 10^8 \text{ m}$. The period of its orbit is $1.53 \times 10^5 \text{ s}$. The moon has a mass of $8.93 \times 10^{22} \text{ kg}$.

Calculate the total energy of the moon.

total energy = J [3]



(c) Fig. 5.2 shows the variation of the electric potential V with distance x from a charged object S.

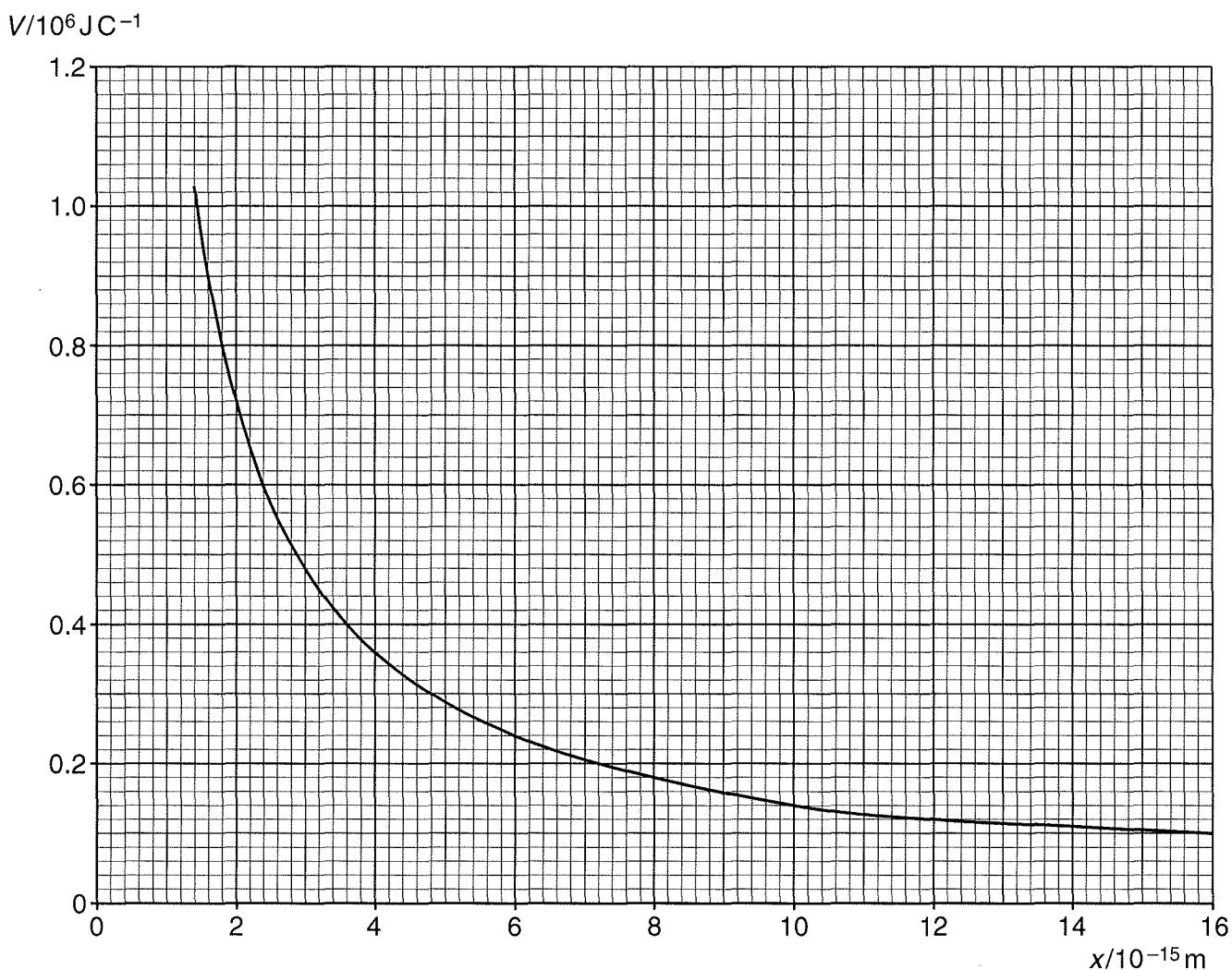


Fig. 5.2

The object S is fixed in position. A proton has a speed v at a distance of $1.0 \times 10^{-10} \text{ m}$ from S. The proton moves towards S and comes to rest at a distance of $1.4 \times 10^{-15} \text{ m}$ from S.

Use Fig. 5.2 to determine the speed v .

$$v = \dots \text{ m s}^{-1} [3]$$





- (d) State and explain one similarity and one difference in the variations in the electric and gravitational potential shown in Fig. 5.1 and Fig. 5.2.

similarity:

.....

difference:

.....

.....

[2]