

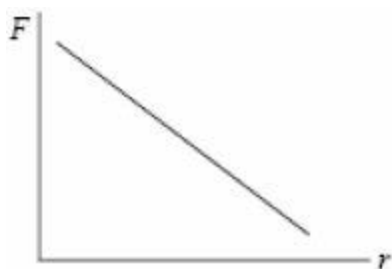
# Gravitational and electric fields – multiple choice

1. Near the surface of a planet the gravitational field strength is uniform and for two points, 10 m apart vertically, the gravitational potential difference is  $3 \text{ J kg}^{-1}$ . How much work must be done in raising a mass of 4 kg vertically through 5 m?

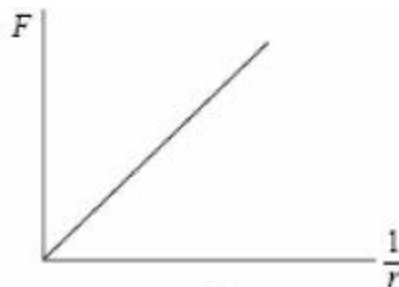
- A 3 J
- B 6 J
- C 12 J
- D 15 J

(Total 1 mark)

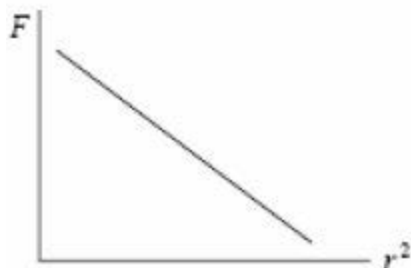
2. Which one of the following graphs correctly shows the relationship between the gravitational force,  $F$ , between two masses and their separation,  $r$ ?



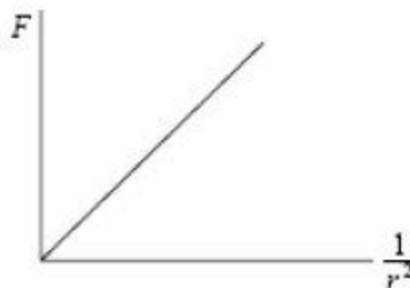
A



B



C



D

(Total 1 mark)

3. The Earth has density  $\rho$  and radius  $R$ . The gravitational field strength at the surface is  $g$ . What is the gravitational field strength at the surface of a planet of density  $2\rho$  and radius  $2R$ ?

- A  $g$   
B  $2g$   
C  $4g$   
D  $16g$

(Total 1 mark)

4. Two protons, each of mass  $m$  and charge  $e$ , are a distance  $d$  apart. Which one of the following expressions correctly gives the ratio  $\left(\frac{\text{electrostatic force}}{\text{gravitational force}}\right)$  for the forces acting between them?

- A  $\frac{4\pi\epsilon_0 e^2}{Gm^2}$   
B  $\frac{Ge^2}{4\pi\epsilon_0 m^2}$   
C  $\frac{e^2 m^2}{4\pi\epsilon_0 G}$   
D  $\frac{e^2}{4\pi\epsilon_0 Gm^2}$

(Total 1 mark)

5. Which one of the following statements about electric potential and electric field strength is correct?
- A electric potential is zero whenever the electric field strength is zero
  - B electric field strength is a scalar quantity
  - C electric potential is a vector quantity
  - D electric potential due to a point charge varies as  $(1/r)$  where  $r$  is the distance from the point charge
- (Total 1 mark)**
6. An electron travelling at constant speed enters a uniform electric field at right angles to the field. While the electron is in the field it accelerates in a direction which is
- A in the same direction as the electric field
  - B in the opposite direction to the electric field
  - C in the same direction as the motion of the electron
  - D in the opposite direction to the motion of the electron
- (Total 1 mark)**
7. Two isolated point charges are separated by 0.04 m and attract each other with a force of  $20 \mu\text{N}$ . If the distance between them is increased by 0.04 m, what is the new force of attraction?
- A  $5 \mu\text{N}$
  - B  $10 \mu\text{N}$
  - C  $20 \mu\text{N}$
  - D  $40 \mu\text{N}$
- (Total 1 mark)**