3 (a) State what is meant by electric field strength. [2]

(b) Two point charges A and B are situated a distance 15 cm apart in a vacuum, as illustrated in Fig. 3.1.
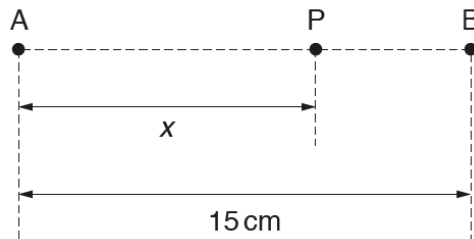

Fig. 3.1

Point P lies on the line joining the charges and is a distance x from charge A. The variation with distance x of the electric field strength E at point P is shown in Fig. 3.2.
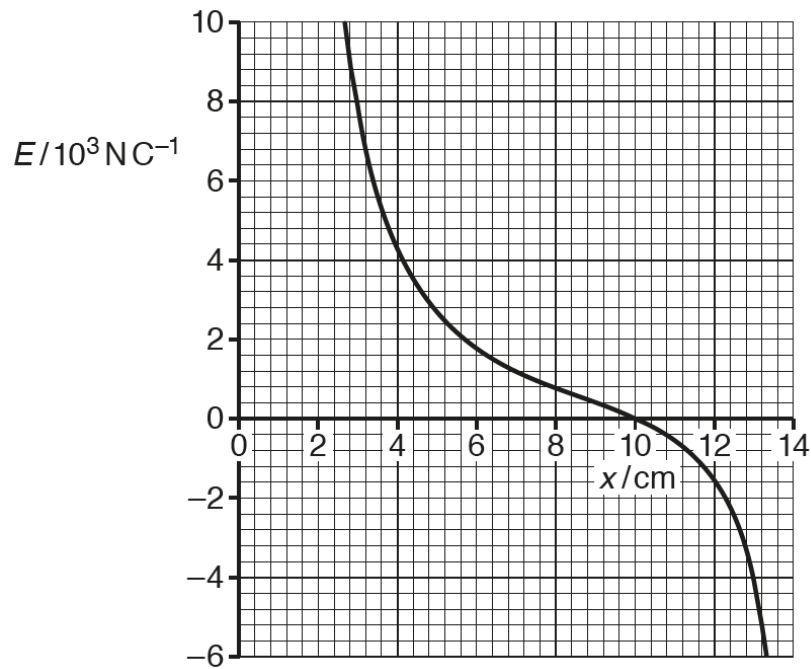

Fig. 3.2

(i) By reference to the direction of the electric field, state and explain whether the charges A and B have the same, or opposite, signs. [2]

(ii) State why, although charge A is a point charge, the electric field strength between $x = 3.0$ cm and $x = 7.0$ cm does not obey an inverse-square law. [1]

(iii)   A proton is at point P where x = 6.0 cm. Use data from Fig. 3.2 to determine the
         magnitude of the acceleration of the proton.   [3]

(iv)   Use Fig. 3.2 to determine the ratio of the magnitude of charge A to the magnitude of
         charge B.   [3]