5 **(a)** Define potential at a point in an electric field.

.....

.....[2]

(b) An isolated metal sphere of radius r carries a charge $+Q$. The charge may be assumed to be concentrated at the centre of the sphere.

(i) State, in terms of r and Q, the electric potential V at the surface of the sphere. Identify any other symbols you use.

.....

.....

(ii) Write down the relationship between capacitance C, charge Q and potential V.

.....

(iii) Hence show that the capacitance C of the sphere is given by

$$C = 4\pi\varepsilon_0 r.$$

[3]

(c) The sphere in **(b)** has a radius of 15 cm and carries a charge of 2.0×10^{-6} C.

Calculate

(i) the capacitance of the sphere,

capacitance = ... μF

(ii) the energy stored on the sphere.

energy = ... J
[4]

[Turn over