6 **(a)** A capacitor consists of two parallel metal plates, separated by air, at a variable distance x apart, as shown in Fig. 6.1. The capacitance C is inversely proportional to x.

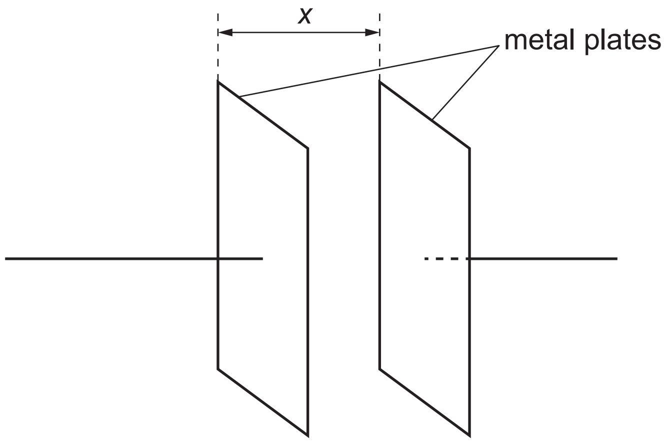

Fig. 6.1

The capacitor is charged by a supply so that there is a potential difference (p.d.) V between the plates.

State expressions, in terms of C and V, for the charge Q on one of the plates and for the energy E stored in the capacitor.

Q = ... E = ... [1]

(b) The charged capacitor in **(a)** is now disconnected from the supply. The plates of the capacitor are initially separated by distance L. They are then moved closer together by a distance D, as shown in Fig. 6.2.

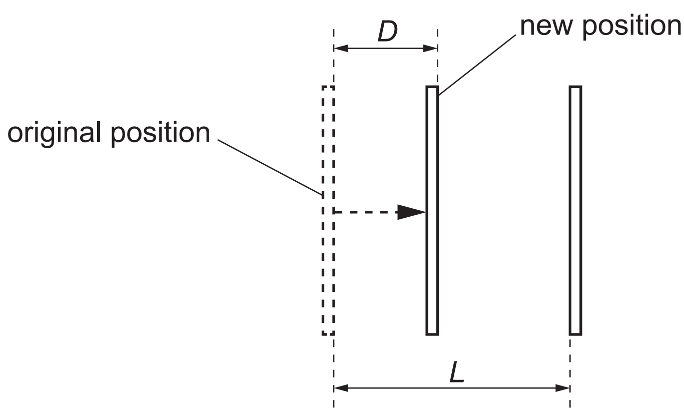

Fig. 6.2

State expressions, in terms of C, V, L and D, for:

(i) the new capacitance C_N

C_N = ... [1]

(ii) the new charge Q_N on one of the plates

Q_N = ... [1]

(iii) the new p.d. V_N between the plates.

V_N = ... [1]

(c) Explain whether reducing the separation of the plates in **(b)** results in an increase or decrease in the energy stored in the capacitor.

....

....

.... [1]

[Total: 5]