Warm up set 5

Question

1. HRW6 26.TB.03. [119752] A capacitor C "has a charge Q". The actual charges on its plates are:
  (a) Q/2, Q/2
  (b) Q, –Q
  (c) Q/2, –Q/2
  (d) Q, 0
  (e) Q, Q

Answer:
(b) Q and –Q

The plates of a capacitor always have equal and opposite charges. The characterization of a capacitor as "having charge Q" is simply a convention for a capacitor with plates charged Q and –Q.

Question

2. HRW6 26.TB.13. [119762] Pulling the plates of an isolated charged capacitor apart:
   (a) increases the potential difference
   (b) increases the capacitance
   (c) does not affect the capacitance
   (d) decreases the potential difference
   (e) does not affect the potential difference

Answer:

(a) Increases the potential difference

The capacitance of a plate capacitor is:

$$C = \frac{Q}{V} = \varepsilon \frac{A}{d}$$

Thus the distance and the potential are directly related, and if the distance increases, so must the potential difference across the plates.

Question

3. HRW6 26.TB.25. [119774] Let Q denote charge, V denote potential difference and U denote stored energy. Of these quantities, capacitors in series must have the same:

   (a) Q only
   (b) Q and U only
   (c) U only
   (d) V and U only
   (e) V only

Answer:

(a) Q only

$$C = \frac{Q}{V} = \varepsilon \frac{A}{d}$$