24 Worksheet (A2)

Data needed to answer questions can be found in the Data, formulae and relationships sheet.

1 A 30 μF capacitor is connected to a 9.0 V battery.

a Calculate the charge on the capacitor. [2]

b How many excess electrons are there on the negative plate of the capacitor? [2]

2 The p.d. across a capacitor is 3.0 V and the charge on the capacitor is 150 nC.

a Determine the charge on the capacitor when the p.d. is:

i 6.0 V [2]

ii 9.0 V. [2]

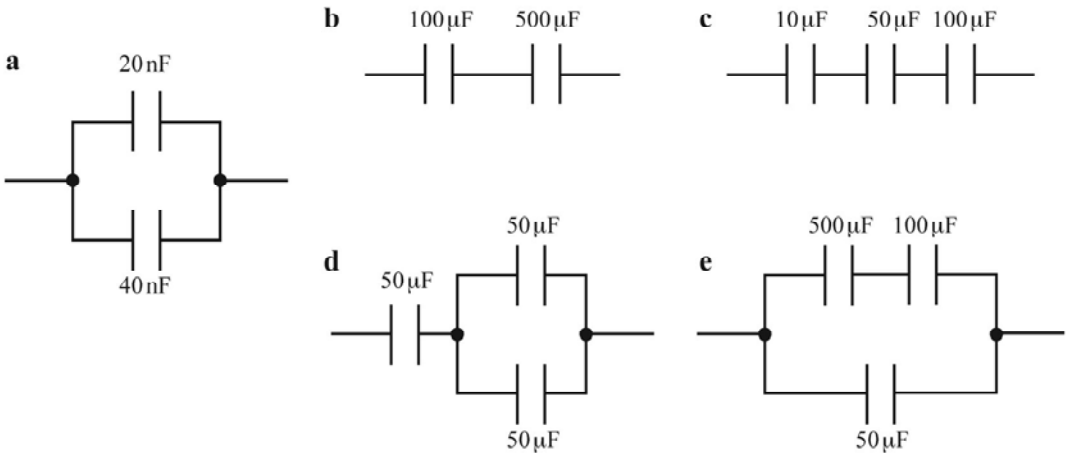
b Calculate the capacitance of the capacitor. [2]

3 A 1000 μF capacitor is charged to a potential difference of 9.0 V.

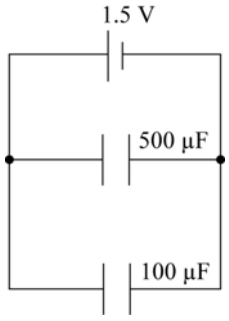
a Calculate the energy stored by the capacitor. [2]

b Determine the energy stored by the capacitor when the p.d. across it is doubled. [2]

4 For each circuit below, determine the total capacitance of the circuit. [13]



5 The diagram shows an electrical circuit.



a Calculate the total capacitance of the two capacitors in parallel. [2]

b What is the potential difference across each capacitor? [1]

c Calculate the total charge stored by the circuit. [2]

d Calculate the total energy stored by the capacitors. [2]

Original material © Cambridge University Press 2010

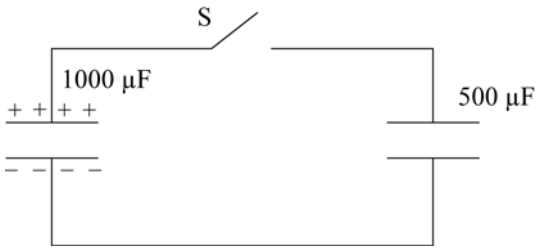
6 A 10 000 μF capacitor is charged to its maximum operating voltage of 32 V. The charged capacitor is discharged through a filament lamp. The flash of light from the lamp lasts for 300 ms.

a Calculate the energy stored by the capacitor. [2]

b Determine the average power dissipated in the filament lamp. [2]

7 The diagram shows a 1000 μF capacitor charged to a p.d. of 12 V.

a Calculate the charge on the 1000 μF capacitor. [2]

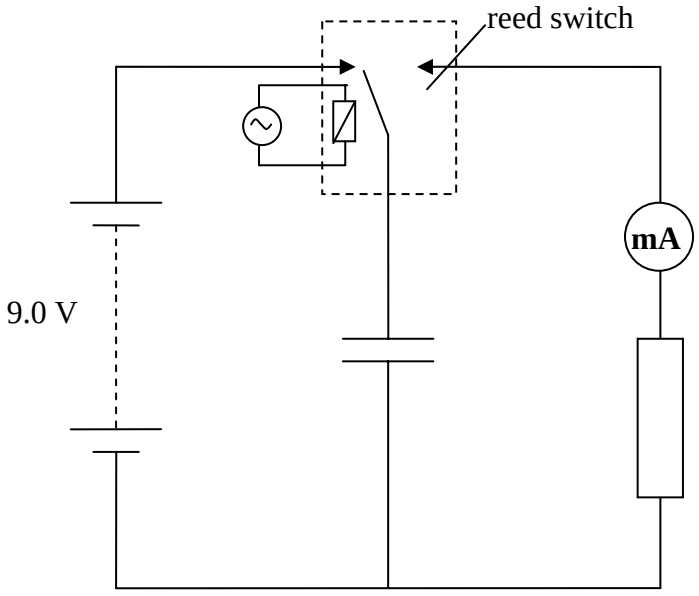


b The 1000 μF capacitor is connected across an uncharged 500 μF capacitor by closing the switch **S**. The charge initially stored by the 1000 μF capacitor is now shared with the 500 μF capacitor.

i Calculate the total capacitance of the capacitors in parallel. [2]

ii Show that the p.d. across each capacitor is 8.0 V. [2]

8 The diagram shows a circuit used to measure the capacitance of a capacitor.



The reed switch vibrates between the two contacts with a frequency of 50 Hz. On each oscillation the capacitor is fully charged and totally discharged. The current through the milliammeter is 225 mA.

a Calculate the charge that flows off the capacitor each time it is discharged. [1]

b Calculate the capacitance of the capacitor. [2]

c Calculate the current through the milliammeter when a second identical capacitor is connected:

i in parallel with the original capacitor [1]

ii in series with the original capacitor. [1]

 Original material © Cambridge University Press 2010

9 A capacitor of capacitance 200 μF is connected across a 200 V supply.

a Calculate the charge stored on the plates. [1]

b Calculate the energy stored on the capacitor. [1]

The capacitor is now disconnected from the power supply and is connected across a 100 μF capacitor.

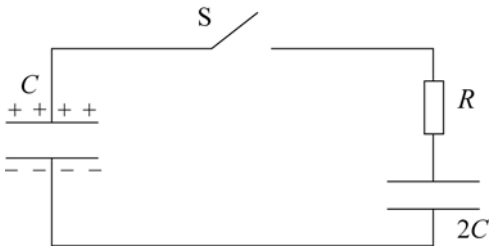
c Calculate the potential difference across the capacitors. [3]

d Calculate the total energy stored on the capacitors. [2]

e Suggest where the energy has been lost. [1]

10 The diagram below shows a charged capacitor of capacitance *C*. When the switch **S** is closed, this capacitor is connected across the uncharged capacitor of capacitance 2*C*.

Calculate the percentage of energy lost as heat in the resistor and explain why the actual resistance of the resistor is irrelevant. [7]



Total: _____ Score: %
64

Original material © Cambridge University Press 2010