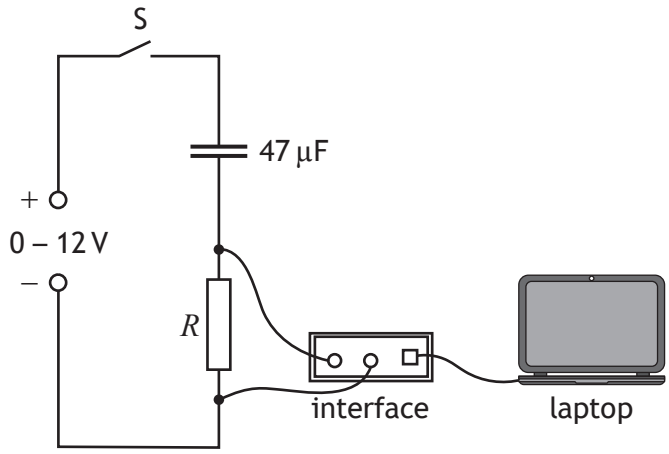
13. A student investigates the charging of a capacitor.

The student sets up the circuit as shown using a 47 μF capacitor.



The capacitor is initially uncharged. The switch S is now closed. A laptop connected to an interface displays a graph of current against time as the capacitor charges.

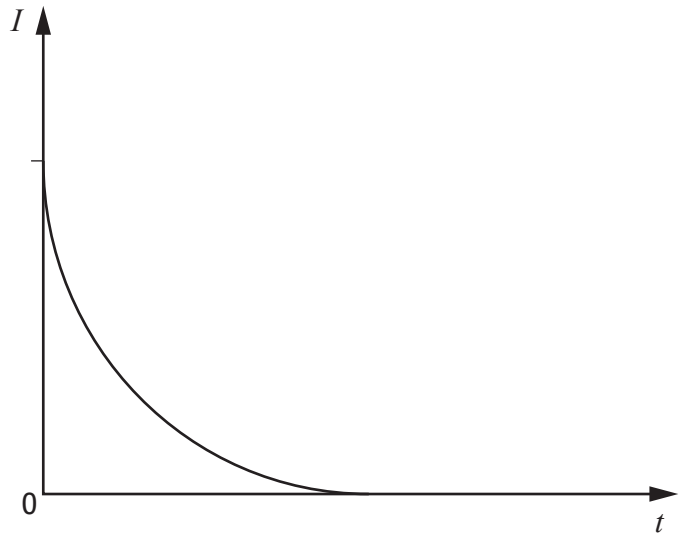
(a) The variable voltage supply is set at 6·0 V.

Calculate the maximum charge stored by the capacitor. **3**

Space for working and answer

13. (continued)

(b) The graph shows how the current I varies with time t as the capacitor charges.



Switch S is opened, and the capacitor is discharged.

The resistor is now replaced with one that has a greater resistance.

Switch S is again closed and the capacitor charges.

Add a line to the graph above to show how the current now varies with time as the capacitor charges. **2**

(An additional graph, if required, can be found on *page 45*.)

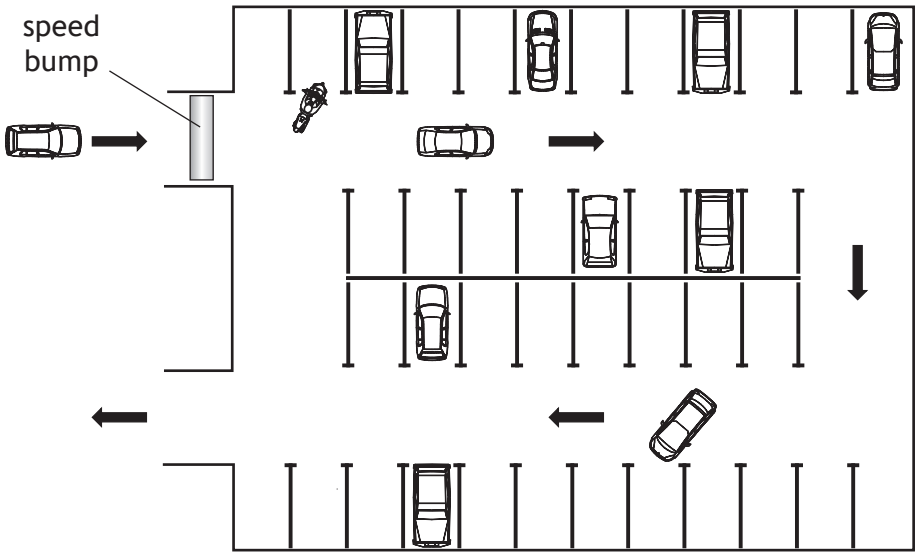
(c) Suggest an alteration the student could make to this circuit to increase the maximum energy stored by the 47 μF capacitor. **1**

[Turn over

13. (continued)

(d) The use of analogies from everyday life can help improve the understanding of physics concepts.

Vehicles using a car park may be taken as an analogy for the charging of a capacitor.



Use your knowledge of physics to comment on this analogy. **3**