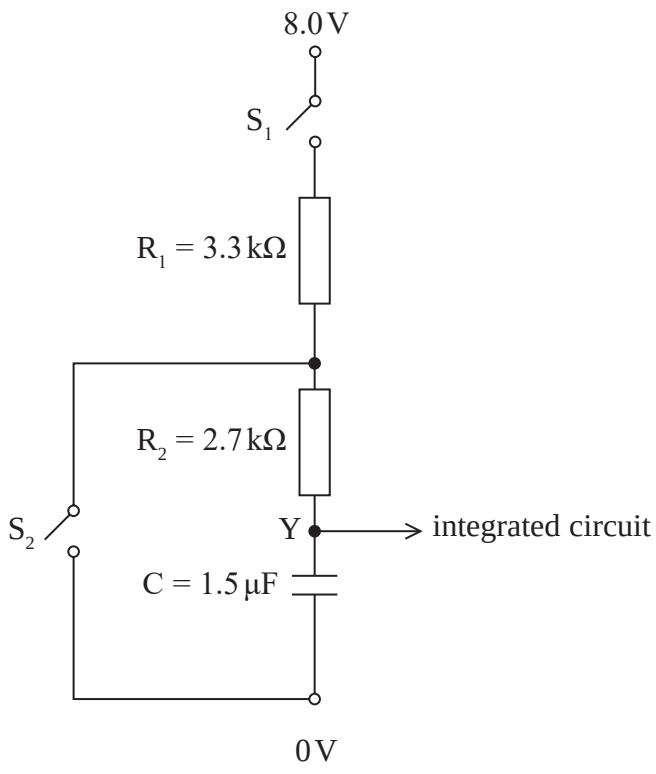
15 The properties of capacitors make them useful in timing circuits.

The following circuit is used to provide an input Y to an integrated circuit.



(a) Initially the capacitor is uncharged. The switch S_1 is closed.

Sketch a graph to show how the potential at point Y varies with time.

(3)

(b) When the potential at Y is 8.0 V, the switch S_2 is closed.

(i) Calculate the time taken for the potential at Y to decrease to 2.0 V.

(3)

Time taken = ...

(ii) Calculate the energy stored on the capacitor when the potential at Y is 2.0 V.

(2)

Energy stored = ...

(c) When the potential at Y is 2.0 V, the switch S_2 is opened.

Calculate the power dissipated by the resistance R_1 when the potential at Y is 2.0 V.

(3)

Power dissipated = ...

(Total for Question 15 = 11 marks)