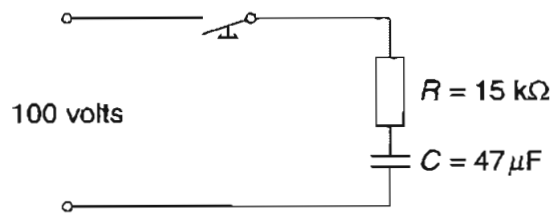
Question 20 (5 marks)

An electrical circuit is shown.



Calculate, showing all working:

(a) the time constant for the circuit; **2**

$t = RC$

$t = 15000 \times 47 \times 10^{-6}$

$= 0.705$ seconds

∴ 1 time constant $= 0.705$ sec

(b) the maximum circuit current; **1**

$V = IR$

$I = \frac{V}{R}$ $\quad I = \frac{100}{15000}$

$= 6.67$ mA

(c) the value of resistance to be added to change the time constant to one second. **2**

$t = RC$ $\quad (C = 47\mu F)$

$\frac{t}{C} = R$

$R = \frac{1}{47 \times 10^{-6}}$

$R = 21276.59574\ \Omega$

$= 21.28\ k\Omega$ (2 dp)