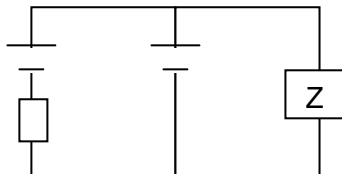


## Physics Tutorial 16(b)

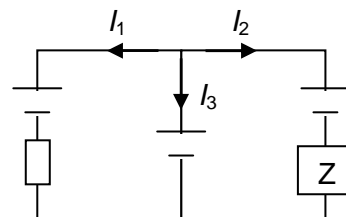
### DC Circuits

1. Calculate the current through and potential difference across the load  $Z$  (resistance 50 ohms) for each of the following circuits. Assume all batteries to be 2.0 V with internal resistances of 1.0 ohm, and all resistors to have resistance 10 ohms.

(a)

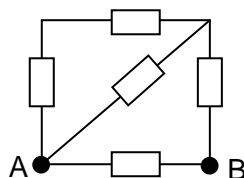


(b)

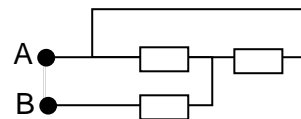


2. Given that each resistor has a resistance of  $R$ , find the total resistance between the points AB in the following circuits.

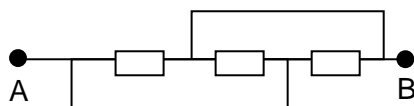
(a)



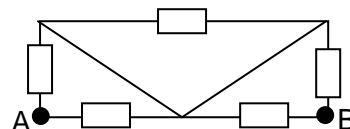
(b)



(c)



(d)

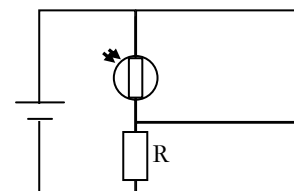


Ans:  $(5R/8)$ ,  $(3R/2)$ ,  $(R/3)$ ,  $(R)$

3. The resistance of a light dependent resistor (LDR) decreases when light shines on it. A typical LDR, with resistance varying from  $2.0 \text{ M}\Omega$  when dark to  $100 \Omega$  when bright, is used in a light sensing circuit to turn on a nightlight when dusk falls.

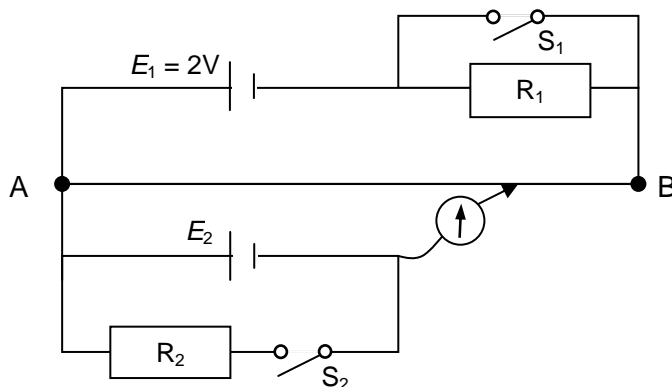
(a) Should the nightlight be connected parallel to the LDR or the fixed resistor  $R$ ?

(b) A 3.0 V power supply and a  $2.0 \text{ M}\Omega$  nightlight are connected. If the nightlight is switched on when the voltage across it is above 2.5 V and is switched off when the voltage across it is less than 0.50 V, what range can the resistance of  $R$  be?



Ans:  $0.5 \text{ k}\Omega$  to  $200 \text{ k}\Omega$

4. The potentiometer below is used to measure the e.m.f. and internal resistance of battery  $E_2$ . Slide wire AB is 50.0 cm long, with a resistance of  $10.0\ \Omega$ .  $E_1$  is a driver battery of negligible internal resistance.  $R_1$  and  $R_2$  have resistances  $15.0\ \Omega$  and  $5.0\ \Omega$  respectively. With the switches  $S_1$  and  $S_2$  are both open, the galvanometer has zero deflection when AJ is 31.25 cm. With the two switches closed, the balance length AJ is 5.00 cm.



Calculate

- the e.m.f. and internal resistance of  $E_2$ ,
- the balance length of AJ when  $K_1$  is open and  $K_2$  is closed,
- the balance length of AJ when  $K_2$  is open and  $K_1$  is closed.

Ans: 0.25 m from one end,  $2.0\ \mu\text{A}$