7 A circuit contains three similar lamps A, B and C. The circuit also contains three switches, S_1, S_2 and S_3, as shown in Fig. 7.1.

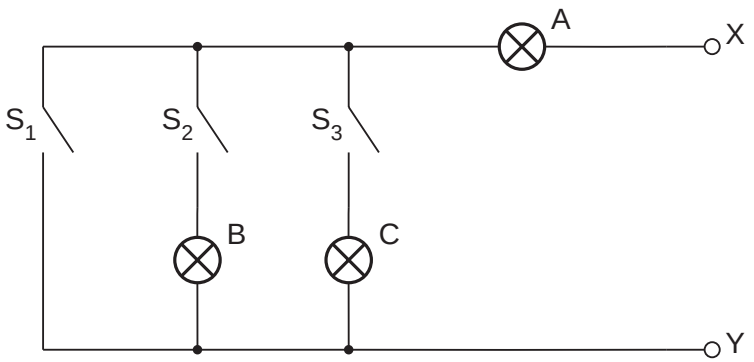

Fig. 7.1

One of the lamps is faulty. In order to detect the fault, an ohm-meter (a meter that measures resistance) is connected between terminals X and Y. When measuring resistance, the ohm-meter causes negligible current in the circuit.

Fig. 7.2 shows the readings of the ohm-meter for different switch positions.

switch			meter reading
S_1	S_2	S_3	/ Ω
open	open	open	∞
closed	open	open	15 Ω
open	closed	open	30 Ω
open	closed	closed	15 Ω

Fig. 7.2

(a) Identify the faulty lamp, and the nature of the fault.

faulty lamp: .....

nature of fault: ..... [2]

(b) Suggest why it is advisable to test the circuit using an ohm-meter that causes negligible current rather than with a power supply.

.....

..... [1]

(c) Determine the resistance of one of the non-faulty lamps, as measured using the ohm-meter.

resistance = …… Ω [1]

(d) Each lamp is marked 6.0 V, 0.20 A.

Calculate, for one of the lamps operating at normal brightness,

(i) its resistance,

resistance = …… Ω [2]

(ii) its power dissipation.

power = …… W [2]

(e) Comment on your answers to **(c)** and **(d)(i)**.

.....

.....

.....[2]