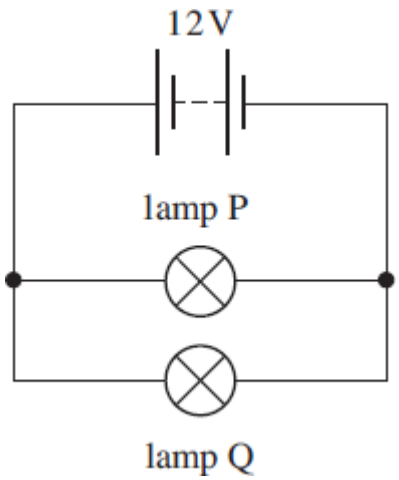
Name of the Student:_____
Max. Marks : 21 Marks **Time :** 21 **Minutes**

Q1.

A battery of negligible internal resistance is connected to lamp P in parallel with lamp Q as shown in **Figure 1**. The emf of the battery is 12 V.

Figure 1



(a) Lamp P is rated at 12 V 36 W and lamp Q is rated at 12 V 6 W.

(i) Calculate the current in the battery.

answer = _____ A

(2)

(ii) Calculate the resistance of P.

answer = _____ Ω

(1)

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(iii) Calculate the resistance of Q.

answer = _____ Ω

(1)

(b) State and explain the effect on the brightness of the lamps in the circuit shown in **Figure 1** if the battery has a significant internal resistance.

_____

_____

_____

_____

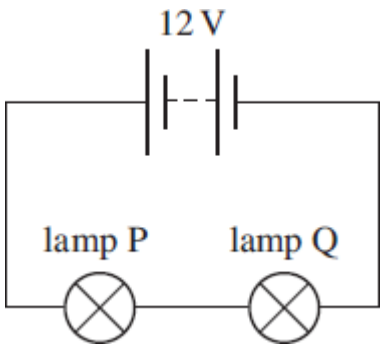
_____

_____

(3)

(c) The lamps are now reconnected to the 12 V battery in series as shown in **Figure 2.**

Figure 2



(i) Explain why the lamps will not be at their normal brightness in this circuit.

_____

_____

_____

_____

_____

(2)

(ii) State and explain which of the lamps will be brighter assuming that the resistance of the lamps does not change significantly with temperature.

_____

_____

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_____

_____

(3)

(Total 12 marks)

Q2.

(a) Some materials exhibit the property of *superconductivity* under certain conditions.

- State what is meant by superconductivity.
- Explain the required conditions for the material to become superconducting.

_____

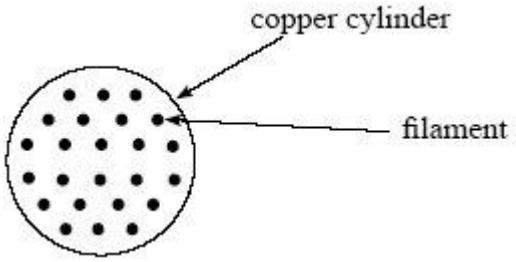
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(3)

(b) The diagram below shows the cross–section of a cable consisting of parallel filaments that can be made superconducting, embedded in a cylinder of copper.



(i) The cross–sectional area of the copper in the cable is 2.28×10^{-7} m^2. The resistance of the copper in a 1.0 m length of the cable is 0.075 Ω. Calculate the resistivity of the copper, stating an appropriate unit.

answer = _____

(3)

(ii) State and explain what happens to the resistance of the cable when the embedded filaments of wire are made superconducting.

_____

_____

_____

(3)

(Total 9 marks)

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