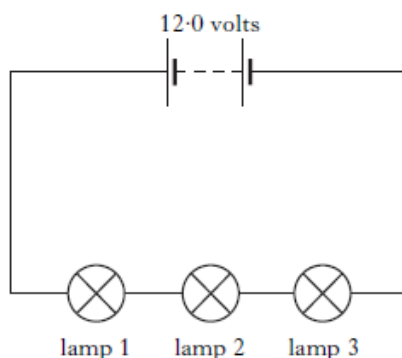# Electricity 1 Questions – NAT 5

1) Three identical lamps are connected as shown in **circuit 1**.
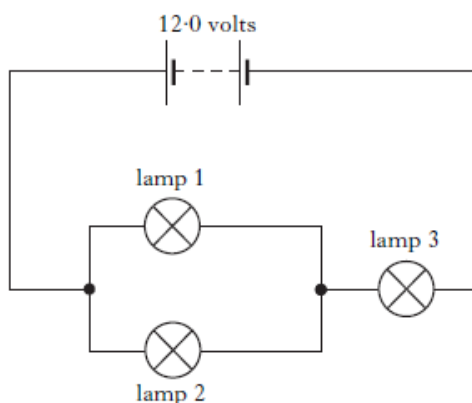
A 12.0V battery supplies a current of 0.2 A.

12·0 volts

lamp 1   lamp 2   lamp 3

Circuit 1

a) i) State the current in lamp 1.

ii) Calculate the voltage across lamp 1.

b) The lamps are now connected as shown in **circuit 2**.

The 12.0V battery supplies a current of 0.4A.

12·0 volts

lamp 1

lamp 3

lamp 2

Circuit 2

i) Complete the table to show the **current passing through** each lamp and the

voltage dropped across each lamp.

|	Lamp 1	Lamp 2	Lamp 3
Voltage (volts)			8·0
Current (amperes)			0·4

ii) Calculate the power dissipated in lamp 3.

iii) State the **useful** energy change in a lamp.

2) A student sets up an experiment to investigate the current through and the voltage across

two different resistors.

The student uses a battery, an ammeter, a voltmeter and some wires to obtain

measurements for each resistor.

a) Complete the diagram below by inserting a resistor, to show how the measurements

could be obtained.
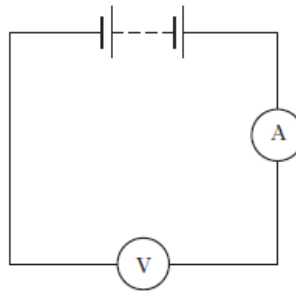
b) The measurements obtained for each resistor are shown in the table below.

Resistor	Current (amperes)	Voltage (volts)
X	0·6	1·5
Y	7·5	1·5

i) Use the information to calculate the resistance of resistors X and Y.

ii) When the resistance of the circuit increases, what happens to the current flowing

in the circuit?

3) A student sets up the following experiment to investigate the power of a filament lamp.
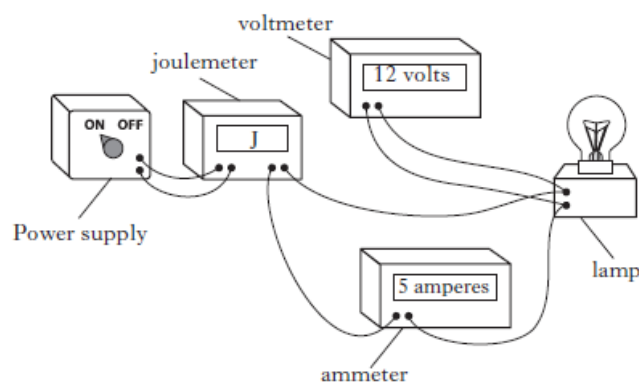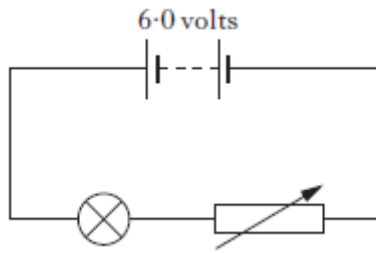

The reading on the voltmeter is 12V and the reading on the ammeter is 5A.

Calculate or find:

a) Resistance of the lamp.

b) Power dissipated in the lamp.

4) A student is investigating the operation of a filament lamp using the following circuit.

6·0 volts

When the **voltage across** the lamp is 2V the **current through** the lamp is 0.2A.

a) Calculate the power dissipated in the lamp.

b) i) Calculate the resistance of the lamp.

ii) Calculate the voltage across the variable resistor.

c) The resistance of the variable resistor is increased.

i) What happens to the brightness of the lamp?

ii) Explain your answer.

5) A car headlamp is rated at 60W. The light produced is 20% of the total energy transferred to the lamp.

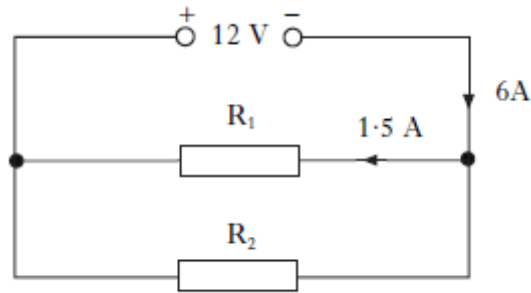Calculate the energy transferred as **light** in 10s.

6) A circuit is set up as shown below.

6 V
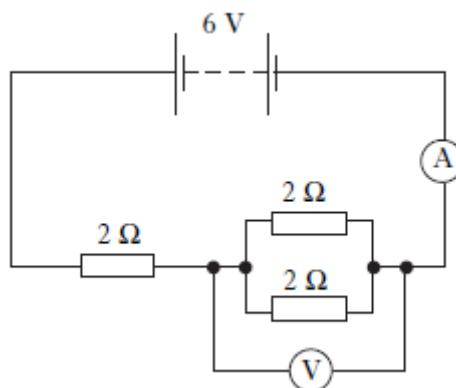
Calculate or find:

a) Reading on the ammeter

b) Reading on the voltmeter
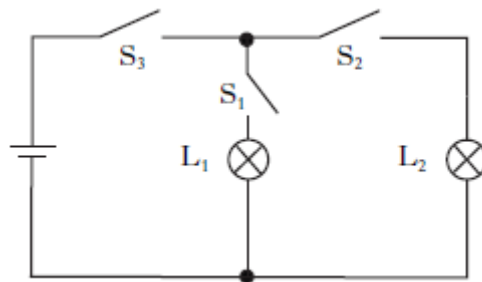
c) Power dissipated in the 2Ω resistor in series.

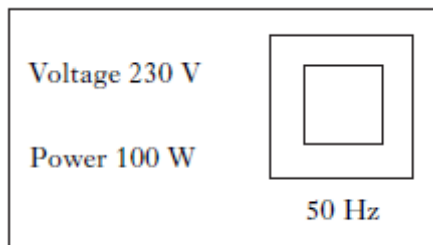**7)** A circuit is set up as shown below.

Calculate or find:

a) Current through R_2.

b) Potential difference across R_2.

c) i) Resistance R_1.

   ii) Resistance R_2.

8) A circuit is set up as shown below.

a) Which switches must be closed to light up lamp L_1?

b) Which switches must be closed to light up lamp L_2?

9) The information show is for an electric food mixer.

Voltage 230 V

Power 100 W

50 Hz

Calculate or find:

a) The current passing through the food mixer when it is operating.

b) The resistance of the food mixer.

10) A charge of 15C passes through a resistor in 12s. The potential difference across the resistor is 6V.

Calculate or find:

a) The current passing through the resistor.

b) Power developed by the resistor.
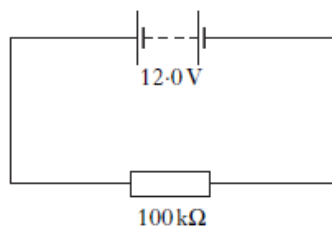
11) A circuit is set up as shown below.
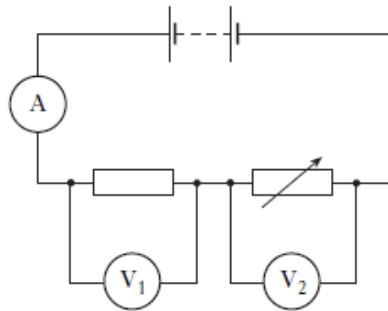
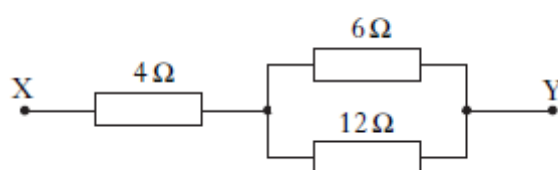The resistance of the variable resistor is gradually reduced.

What will happen to:

a) The reading on the ammeter?

b) The reading on voltmeter V_1?

c) The reading on voltmeter V_2?

12) A circuit is set up as shown below.

12·0 V

100 kΩ

Calculate the power supplied to the resistor.

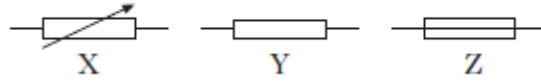**13)** Three resistors are connected as shown.

6 Ω

4 Ω

X

Y

12 Ω
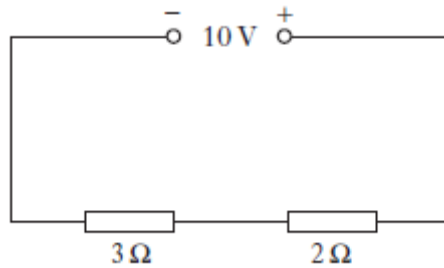
Calculate the total resistance between X and Y.

14) The mains voltage in the UK is 230V ac.

a) What is the frequency of the mains supply in the UK?

b) How does the peak voltage of the mains supply in the UK compare with 230V?

15) Identify the circuit symbols below.


X   Y   Z

16) A circuit is set up as shown below.

Calculate or find:

a) The potential difference across the 3Ω resistor.

b) The power developed across the 3Ω resistor.

17) Which of the following statements are true or false:

a) In an ac circuit the direction of the current changes regularly.

b) In a dc circuit the current flows in one direction only.

c) In an ac circuit the size of the current stays constant.

18) A circuit is set up as shown below.
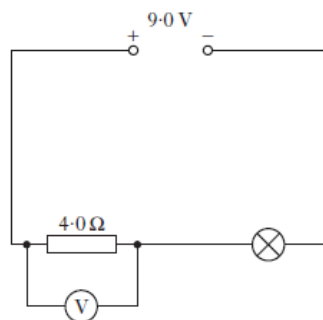
The current flowing through the lamp is 1.5A.

Calculate or find:

a) The reading on the voltmeter.

b) The power developed in the lamp.

19) A mobile phone contains a battery which is charged using a base unit. The base unit

contains a transformer and is connected to the ac mains supply.

a) What is the purpose of the mains supply?

b) Name the supply mentioned that is dc.

c) ac is short for alternating current.

Explain what is meant by alternating current.

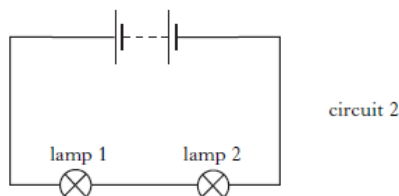**20)** Two identical lamps are connected to a 6.0V battery as shown in circuit 1.
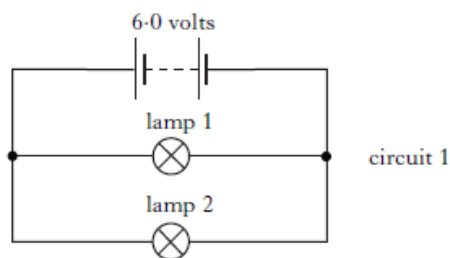
a) The battery supplies a current of 0.4A to the circuit.

Complete the table below to show the current in each lamp and the voltage across

each lamp.

|	Lamp 1	Lamp 2
Current (amperes)		
Voltage (volts)		

b) The two lamps are now connected as shown in circuit 2.

State the voltage of the battery required to light the lamps with the same brightness
as in circuit 1.

c) In which of the two circuits, circuit 1 or circuit 2, would lamp 2 still be on when lamp 1
is removed?

21) A design uses three ammeters to measure the current, in amperes, at various points in the circuit of a model-sized electric fan heater.
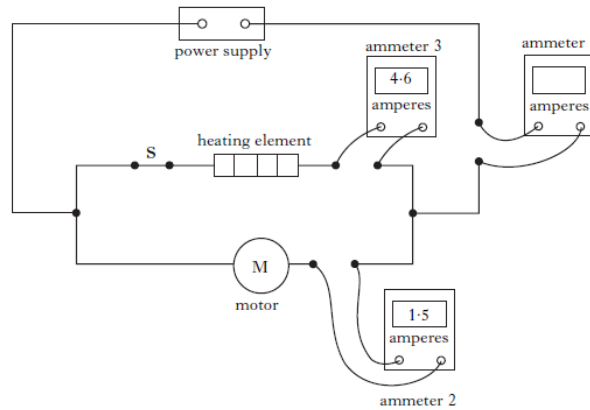
a) Calculate the reading on ammeter 1.

b) What happens to the reading on ammeter 1 when the switch is opened?

c) The full size mains heater has a rating plate for the UK supply stating its operational voltage and current.

i) Is the UK mains supply ac or dc?

ii) State the value of the mains voltage in the UK.

iii) State the value of the mains frequency in the UK.

22) A bathroom is fitted with an electrically heated towel rail. The towel rail is filled with water which is heated by a 300W electric heating element connected to the mains supply.
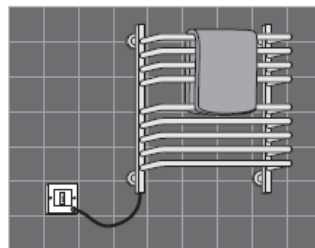
a) State the declared value of the mains voltage.

b) Calculate the current supplied to the towel rail when it is operational.
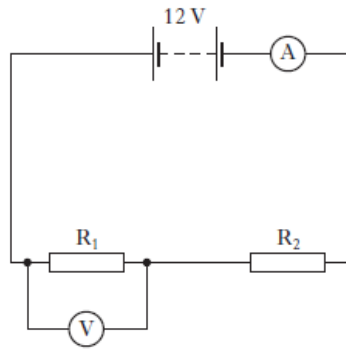
c) Calculate the resistance of the towel rail.

23) The charge passing through an 8Ω resistor in 20 s is 80C.

Calculate or find:

a) The current flowing through the resistor.

b) The power developed in the resistor.

c) The heat energy given off by the resistor over the 20s.

24) A circuit is set up as shown below.

The reading on the ammeter is 3.0A and the reading on the voltmeter is 4.0V

Calculate or find:

a) Resistance R_1.

b) Resistance R_2.

25) A halogen heater contains four heater tubes which can be switched on separately or all together. The heater is mains operated.

a) When one heating tube is switched on the current is 1.25A and the voltage across the tube is 230V.

Calculate the resistance of the tube.

b) During cold weather the heater is used to heat a large conservatory.

The heater is switched on at its highest setting.

At this setting the heater has a power rating of 1600W.

The heater is operated for 8 hours each day for one week.

i) Calculate the energy in kilowatt-hours used in this week.

ii) How much would it cost to run this heater for a week if it costs 15p per unit?