Name _____

Q18.   A set of Christmas tree lights is made from twenty identical lamps connected in series.

(a)   Each lamp is designed to take a current of 0.25 A. The set plugs directly into the 230 V
mains electricity supply.

   (i)   Write down the equation that links current, potential difference and resistance.

   ....

   ....

(1)

   (ii)   Calculate the resistance of **one** of the lamps. Show clearly how you work out your
final answer and give the unit.

   ....

   ....

   ....

   ....

   Resistance = ...

(4)

   (iii)   What is the total resistance of the set of lights?

   ....

   ....

   Total resistance = ...

(1)

Page 1

(b)   How does the resistance of a filament lamp change as the temperature of the filament changes?

....

....

....

....

(1)
(Total 7 marks)

##

Q19   A combination oven can cook food by using three methods; a microwave generator, a grill and a heating element.

voltage	230 V
microwave power (max)	900 W
grill power	1300 W
convection heater power	1200 W

(a)   What is the current when the oven is operating using full microwave power? Give the equation and show your working.

....

....

....

Current = ... A

(3)

(b)   It is possible to cook using infrared radiation, from the grill, and microwaves. What is the maximum current in the oven when using both together?

....

....

....

Current = ... A

(2)

(c)   For baking and roasting, the microwave is used at 450 W and the convection heating element is on fully at 1200 W. A thawed or fresh medium-sized chicken takes 30 minutes to cook.

Calculate the energy transferred in kilowatt-hours.

Use:

units (kWh) = power (kW) × time (h)

....

....

....

Energy = ... kWh

(2)

(d)   Why is a combination oven of this sort more economical than a convection-only oven?

....

....

(1)
(Total 8 marks)

Q20.   In a hairdryer circuit there is a heater and a motor. It is important that the motor is always running when the heater is switched on.

(a)   Using the symbols shown below only **once** each, draw a circuit for a hairdryer.
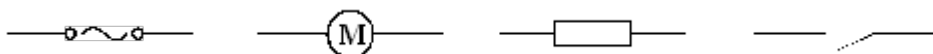
(2)

(b)   Modern hairdryers are described as *double insulated.*

Explain what this term means.

....

....

....

(2)

(c)   On a modern hairdryer handle it states:

            1600 W   230 V   50 Hz

(i)   [A]   Write an equation which shows the relationship between current, power and voltage.

....

(1)

[B]   Calculate the current in the hairdryer when it is on full power.
Show clearly how you get your answer.

....

....

Current = ... A

(2)

(ii)   [A]   Write an equation which shows the relationship between current, resistance and voltage.

....

(1)

[B]   The resistance of the heater is 20 ohms. Calculate the resistance of the motor.

Show clearly how you get your answer.

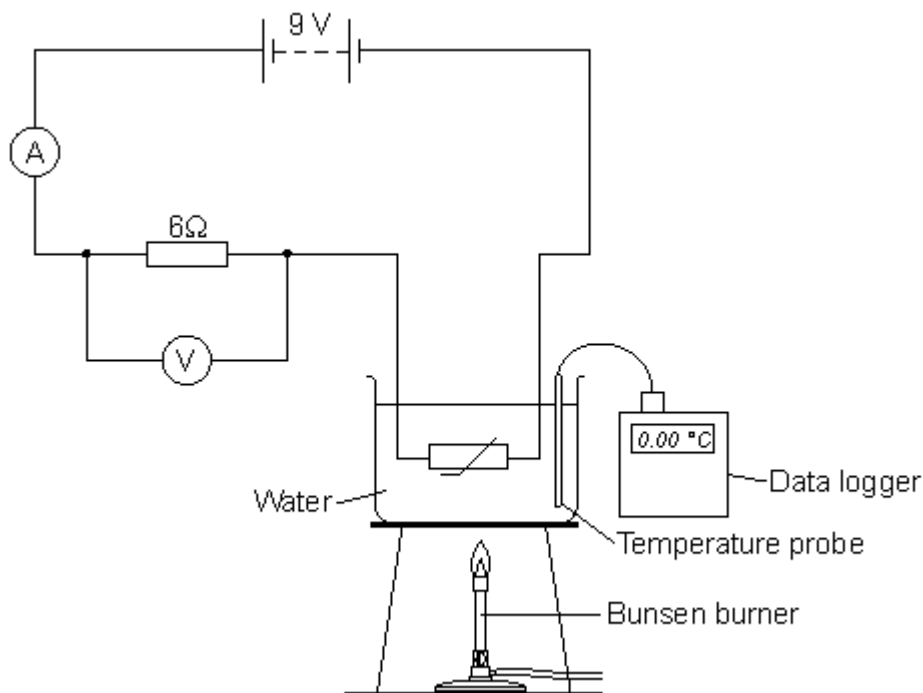...

....

Resistance = ... ohms

(2)
(Total 10 marks)

Q21.   A student designed the circuit below to measure temperature using a thermistor.

To calibrate the thermistor to measure temperature, the student placed the thermistor in a beaker of water at 0 °C and took the voltmeter reading. The student then heated the water slowly with a Bunsen burner. The student recorded the reading on the voltmeter every 10 °C.

(a)   (i)   Before calibrating the thermistor the student completed a risk assessment.

Write down **one** possible hazard that the student should have written in the risk assessment and what the student should do to reduce the risk of the hazard causing an injury.

....

....

....

....

....

(2)

(ii)   At 0 °C the reading on the ammeter is 0.5 A.
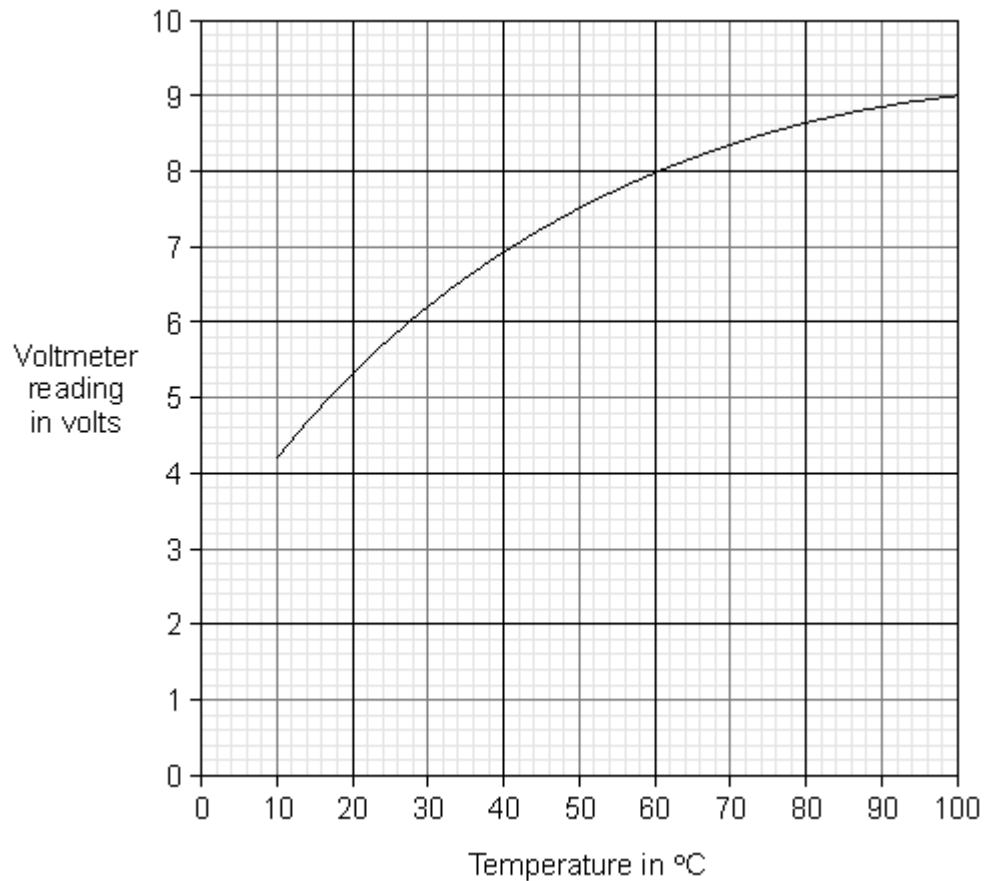
Calculate the reading on the voltmeter at 0 °C.

Write down the equation you use, and then show clearly how you work out your answer.

....

....

....

<div align="center">Voltmeter reading = ... V</div>

(2)

(b)   Most of the readings taken by the student are displayed in the graph.

(i)   Explain why the reading on the voltmeter changes when the temperature of the water increases.

....

....

....

....

....

(3)

(ii)   What is the temperature interval that can be measured with this circuit?

....

....

(1)

(iii)   Once calibrated, between which temperatures would this circuit give the greatest resolution for temperature readings?

Tick (✔) **one** box.

20 °C to 40 °C   ☐

40 °C to 60 °C   ☐

60 °C to 80 °C   ☐

Give a reason for your answer.

....

....

(2)

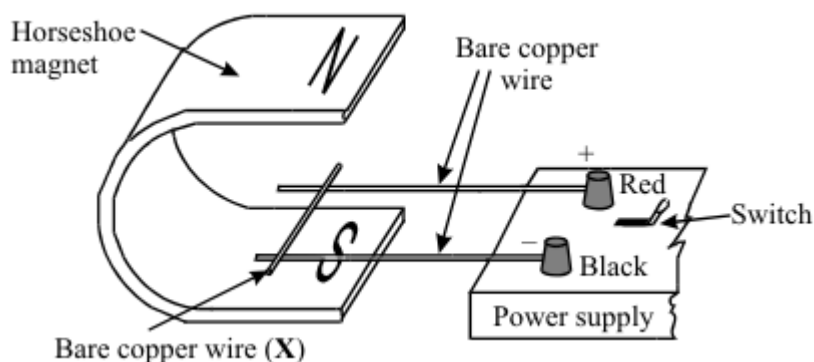(c)   Thermistors have many practical uses, including being used as a thermometer to measure temperature.

Give **one** other practical use for a thermistor.

....

....

(1)
(Total 11 marks)

Q22.   The diagram shows apparatus used to demonstrate the motor effect. **X** is a short length of bare copper wire resting on two other wires.

(a)   (i)   Describe what happens to wire **X** when the current is switched on.

....

....

....

(ii)   What difference do you notice if the following changes are made?

A   The magnetic field is reversed.

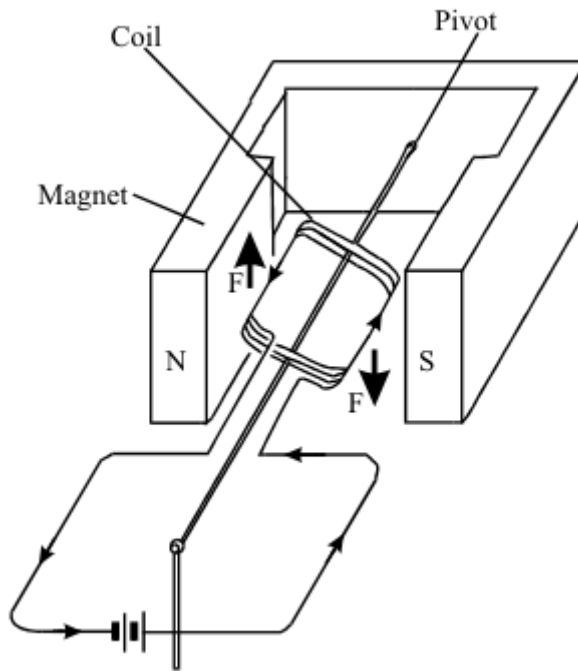...

....

B   The current is increased.

....

....

(3)

(b)   The diagram shows a coil placed between the poles of a magnet. The arrows on the sides of the coil itself show the direction of the conventional current.

The arrows labelled **F** show the direction of the forces acting on the sides of the coil. Describe the motion of the coil until it comes to rest.

....

....

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....

(3)

(c)   Most electric motors use electromagnets instead of permanent magnets. State three of the features of an electromagnet which control the strength of the magnetic field obtained.
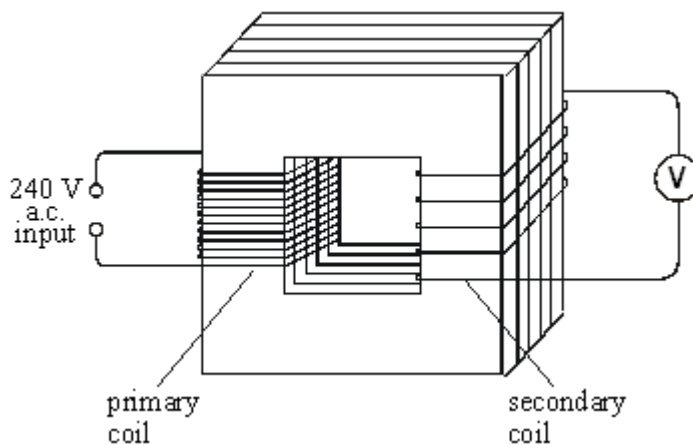
1 ....

2 ....

3 ....

(3)
(Total 9 marks)

Q23.   The diagram below shows a transformer.

(i)   Name the material used to make the core of the transformer.

....

(1)

(ii)   The primary coil has 48 000 turns and the secondary coil 4000 turns.

If the input voltage is 240 V a.c., calculate the output voltage.

....

....

Answer V

(2)

(iii)   Explain how the use of such a transformer could be adapted to transform a low voltage into a higher voltage.

....

....

(1)
(Total 4 marks)