Homework 4 – Electrical Power

1. The filament of a lamp has a resistance of 3·0 Ω and the current through the filament is 2·0 A. Calculate the electrical power produced by the lamp.

   A 1·5 W
   B 6·0 W
   C 12 W
   D 18 W
   E 36 W

2. Identify which row in the table correctly shows the units for energy, current and power.

	Energy	*Current*	*Power*
A	joule	ampere	coulomb
B	joule	ampere	watt
C	volt	coulomb	joule
D	volt	coulomb	watt
E	coulomb	ampere	joule

3. A kettle is rated at 230 V, 2300 W.
   Calculate how much charge passes through the kettle in 200 s.

   A 20 C
   B 2000 C
   C 46 000 C
   D 460 000 C
   E 529 000 C

4. An electric motor is connected to a 12 V supply and draws a current of 0·50 A.
   Calculate how much energy is supplied to the motor in 30 s.

   A 6·0 J
   B 15 J
   C 180 J
   D 360 J
   E 720 J

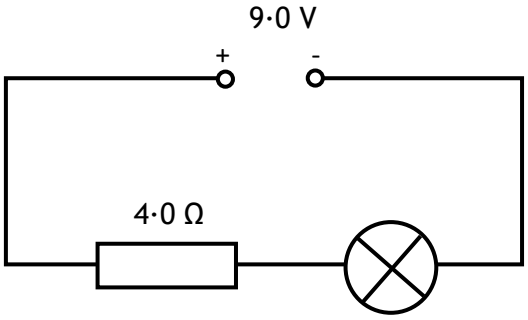
5. The information shown below applies to an electric iron.

ELECTRIC IRON	
Operating voltage	230 V
Power	2·3 kW
Resistance	23 Ω

   The iron is switched on for 10 minutes. Calculate how much electrical energy is converted to heat energy in this time.

   A 5300 J
   B 530 000 J
   C 720 000 J
   D 1 400 000 J
   E 2 100 000 J

6. A battery is connected in series to a lamp and a resistor, as shown.



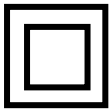
The current in the lamp is 1·5 A.
Calculate the power developed in the lamp.

A 3·0 W
B 4·5 W
C 6·0 W
D 9·0 W
E 13·5 W

7. The information shown is for an electric food mixer.

ELECTRIC FOOD MIXER

Operating voltage	230 V
Power	100 W



50 Hz

Calculate the resistance of the food mixer.

A 0·43 Ω
B 2·3 Ω
C 4·6 Ω
D 530 Ω
E 23 000 Ω

8. Identify which of the following is the equivalent unit to 1 watt.

A 1 ampere per volt
B 1 joule per coulomb
C 1 coulomb per second
D 1 coulomb per volt
E 1 joule per second

9. The resistance of a length of wire is 6·0 Ω and the power developed in the wire is 24 W.
Calculate the current in the wire.

A 0·25 A
B 1·5 A
C 2·0 A
D 4·0 A
E 96 A

10. An electric kettle is rated at 2·76 kW for use with a 230 V supply. The following statements are made about the kettle.

I The kettle uses energy at a rate of 2·76 joules per second.
II The current in the element of the kettle is 12 A.
III 230 coulombs of charge flow through the element of the kettle every second.

Identify which of the statements is/are correct.

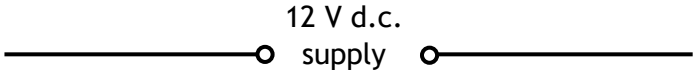
A I only
B II only
C I and II only
D II and III only
E I, II and III

11. Two groups of pupils are investigating the electrical properties of a lamp.

(a) Group 1 is given the following equipment:

ammeter voltmeter 12V d.c. supply lamp connecting leads

Copy and complete the following circuit diagram to show how this equipment can be used to measure the current through and the voltage across, the lamp.



(b) Group 2 uses the same lamp and is only given the following equipment:

ohmmeter lamp connecting leads

Identify which property of the lamp is measured by the ohmmeter.

(c) The results of both groups are combined and recorded in the table below.

$I\ (A)$	$V\ (V)$	$R\ (\Omega)$	IV	I^2R
2	12	6		

(i) Use these results to complete the last two columns of the table.
(ii) Identify the quantity represented by the last two columns of the table.
(iii) State the unit for this quantity.

12. An overhead projector contains a lamp and a motor that operates a cooling fan.
A technician has the choice of two lamps to fit in the projector.

Lamp A: 24·0 V, 2·5 Ω

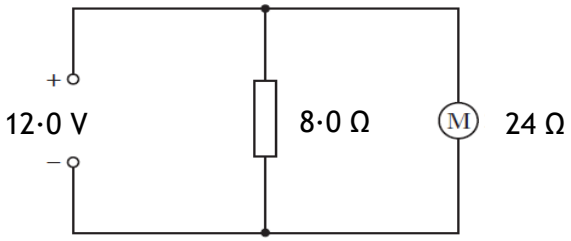
Lamp B: 24·0 V, 5·4 Ω

(a) Identify which lamp would be brighter when operating at the correct voltage.
Justify your answer.

(b) Calculate the power developed by lamp A when it is operating normally.

(c) The overhead projector plug contains a fuse.
(i) Draw the circuit symbol for a fuse.
(ii) State the purpose of the fuse fitted in the plug of an appliance.

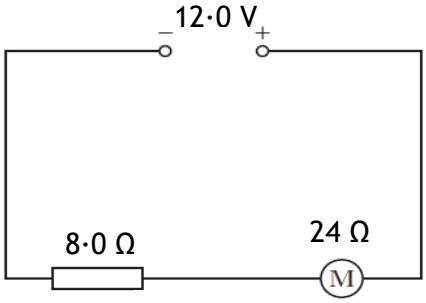
(d) The technician builds a test circuit containing a resistor and a motor, as shown in **Circuit 1**.



Circuit 1

(i) State the voltage across the motor.
(ii) Calculate the combined resistance of the resistor and the motor.

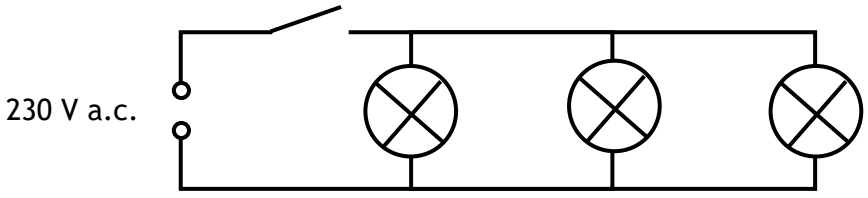
(e) The resistor and motor are now connected in series as shown in **Circuit 2.**



Circuit 2

State how this affects the speed of the motor compared to **Circuit 1**.
Explain your answer.

13. A hotel owner decides to install three lamps on the drive between the hotel and the street. The circuit diagram below shows how the lamps are connected to the mains supply.



Each lamp is rated 230 V, 200 W.

(a) Explain why the lamps must be connected in parallel.
(b) Calculate the resistance of each lamp.
(c) Calculate the current drawn from the supply when all the lamps are on.