3055 BA SANGAM COLLEGE

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Worksheet 27

School: Ba Sangam College **Year/Level**: 11

Subject: Physics

Strand	Current Electricity
Sub Strand	Household Electricity
Content Learning Outcome	Apply knowledge and develop skills in the concept of current electricity

PAYING FOR ELECTRICITY

Electricity, or rather electrical energy costs money. We pay for it when we buy a battery and we pay the electricity board for the electricity that we use from the mains supply. The electricity board measures the electrical energy that we use not in joules but in units called **kilowatt-hours**.

A kilowatt-hour (kWh) is the energy that a one kilowatt appliance uses in one hour.

Cost = Electrical power x time x cost per unit

Examples

1.Calculate the cost of running a 2 kW machine for 20 minutes. Take the Cost per kWh = $0.33.

Solution

W = P(Kw) x t(hr)= 2kW x (20/60)hr = 0.67kWh

Cost = 0.67 x 0.33 = $0.22

2. Calculate the cost of running a 150 W light bulb for 3 hours. Take the Cost per kWh = $0.33.

W = P(Kw) x t(hr)= 0.15kW x 3hr = 0.45kWh

Cost = 0.45 x 0.33 = $0.15

Note:

1. *A kilowatt-hour (kWh) is also called a UNIT of electrical energy.*
2. From the calculated amount an additional percentage is added as VAT.

HOUSEHOLD ELECTRICITY

Direct Current and Alternating Current

Batteries, fuel cells and solar cells all produce something called direct current **(**DC**).** The positive and negative terminals of a battery are always, respectively, positive and negative. Current always flows in the same direction between those two terminals.

The power that comes from a power plant, on the other hand, is called alternating current **(**AC**).** The direction of the current reverses 50 times per second in Fiji. The power that is available at a wall socket in Fiji is 240V at 50 Hertz.

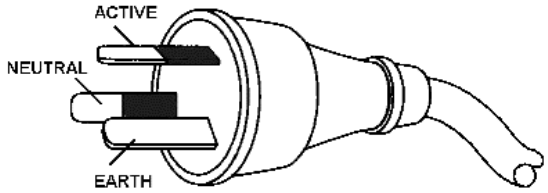
DC supply

AC supply

Three pin plug

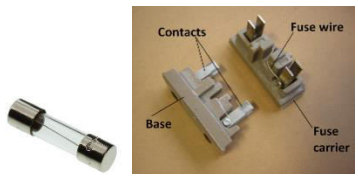
The three pin plug contains;

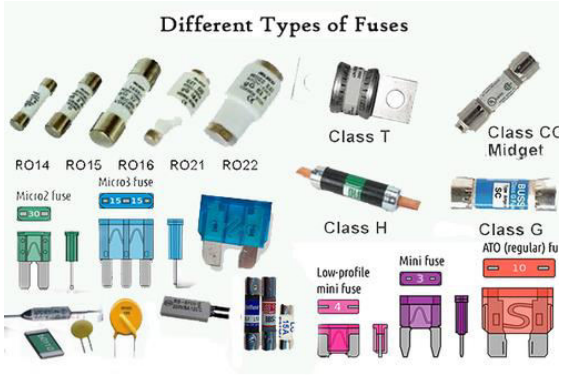
- The blue neutral wire which is held at around 0 volts.
- The green/yellow earth wire.
- The brown live wire which alternates between +240 volts and -240 volts.



Fuses

The most common fuse sizes are 3A, 5A and 13A (an electric cooker can have a 30A fuse). If the amount of current flowing through the fuse gets bigger than the fuse rating the wire inside the fuse gets hot and melts which disconnects the live wire from the appliance. **The purpose of fuse is to protect the circuit.** Fuses are cheap but operate more slowly than circuit breakers.





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Earth Wires

Appliances with metal cases are earthed with an earth wire. Some appliances do not require an earth wire as they are double insulated. If a fault develops and the earth wire connects to the metal case of the appliance, current begins to flow down the earth wire. The extra current being drawn in through the live wire causes the fuse wire in the fuse to heat up and melt. This disconnects the live wire and makes the appliance safe.

Circuit Breaker

Whenever electrical wiring in a building has too much current flowing through it, these simple machines cut the power until somebody can fix the problem. Without circuit breakers (or the alternative, fuses), household electricity would be impractical because of the potential for fires resulting from simple wiring problems and equipment failures.

Circuit breakers operate much faster than fuses.

There are two types of Circuit Breaker:

- Residual Current Circuit Breakers (RCCB's) which operate by detecting a difference in the current between the live and neutral wires.

- Earth Leakage Circuit Breakers (ELCB's) which detect when current flows through the Earth wire.

ACTIVITY (9 Marks)

1. Differentiate between a fuse and a circuit breaker.

2.Calculate the cost of running a 4000W electric heater for 40 minutes. Take the Cost per kWh = $0.21.

3. Calculate the cost of running a 250 W light bulb for 4.5 hours. Take the Cost per kWh = $0.29.

THE END