Greenridge Secondary School

Secondary Four Express Physics

Chapter 19 – Practical Eectricity

Name: _____ ( ) **Class: 4-9**

Date: 2 May 2024

At the end of this chapter, you should be able to

☺ Describe the use of the heating effect of electricity in appliances such as electric kettles, ovens and heaters.

☺ Recall the relationship $P = VI$ and $E = VIt$.

☺ Apply the relationships for electrical power and energy to new situations or to solve related problems.

☺ Calculate the cost of using electrical appliances where the energy unit is kWh.

☺ State the hazards of using electricity in the following situations:

(i) damaged insulation

(ii) overheating of cables

(iii) damp conditions.

☺ Compare the use of non-renewable and renewable energy sources such as fossil fuels, nuclear energy, solar energy, wind energy and hydroelectric generation to generate electricity in terms of energy conversion efficiency, cost per kWh produced and environmental impact.

☺ Explain the use of fuses and circuit breakers in electrical circuits and of fuse ratings.

☺ Explain the need for earthing metal cases and for double insulation.

☺ State the meaning of the terms, *live*, *neutral*, and *earth*.

☺ Describe how to wire a mains plug.

☺ Explain why switches, fuses and circuit breaker are wired into the live-conductor.

19.1 Measurement of Electrical Energy

Electrical Power, *P*

Name	Unit	Formula	50 W means..
Electrical Power			

Example 1

A bulb uses a 3 V supply and takes a current of 0.2 A.
What is the power rating of the bulb?

Electric Energy, *E*

Name	Unit	Formula
Electrical Energy		

Example 2

A filament lamp is rated 60 W and 240 V. Find

(a) the current flowing through the lamp.
(b) the resistance of the filament and
(c) the energy produced by the lamp in one hour.

Example 3

An electric iron has a heating element of resistance 80 $\wedge$. If the operating current flowing through is 4 A, calculate

(a) the supply voltage.
(b) the electrical power produced and
(c) the heat energy produced in 5 minutes,

Calculating the cost of electricity consumption

- Electrical energy consumed in household appliances is measured in _____ _____ (_____).
- 1 kWh is the _____ _____.
- To calculate energy in kWh:

Example 4

If Singapore Power charges 15 cents for each kWh of electrical energy used, calculate the total cost of using a 5 kW electric kettle for 15 minutes and a 200 W filament bulb for 2 hours.

19.2 Some Uses of Electricity (Refer to textbook)

Electric Heating

Electric Lighting

Electric Motor

19.3 Dangers of Electricity

Hazards of electricity

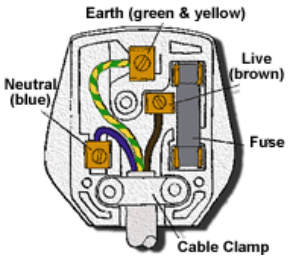
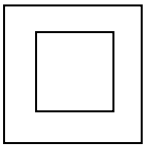
What	How	Dangers
Damaged Insulation 		
Overheating of cables		
Damp Conditions		

19.4 Safe Use of Electricity at Home

- Electric supplied to a house by an underground cable containing two wires, the live wire and neutral wire.
- Electric current enters the house through the live wire and returns to the local substation through the neutral wire.
- The live wire is a dangerous wire as it carries a high voltage while the neutral wire is usually at zero volt.

Safety features in an electric circuit

What	How	Safety feature
Fuses	**A fuse contains a small piece of wire which becomes hot and melts when current flowing through it exceeds a certain value**	
Switches	**Break or complete a circuit**	**when switch is off, the appliance would not be live**
Plugs and Sockets	**3-pin plugs are used to connect appliances to socket** **Live wire carries electric current to the appliance** **Neutral wire completes circuit by forming a path for the current back to the supply.**	**Earth pin of plug is longer and thicker than the live and neutral pins and is usually connected to the metal casing of an appliance. It conducts current to earth when theres a leakage**

Earthing  	**Earth wire is connected to the metal casing of an appliance. When there is a leakage, the fuse will blow to protect the appliance. Leaked current will flow from the metal casing to the ground through the Earth wire. This protects the user from electric shock**	**Earth wire is connected to the metal casing of an appliance. When there is a leakage, the fuse will blow to protect the appliance. Leaked current will flow from the metal casing to the ground through the Earth wire. This protects the user from electric shock**
Double Insulation 		

Example 5

An electric oven is rated 5 kW, 240 V. The fuses provided are rated 13 A, 20 A, 25 A, and 30 A. Which is the most suitable fuse for the oven?

P=IV

5000=240I

20.833 A of current passes through the circuit

Therefore I will use 25A fuse