Standard Grade Physics

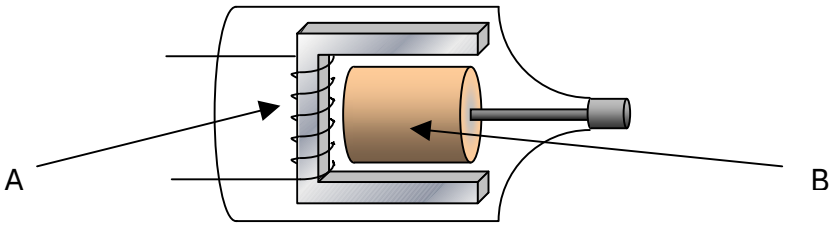
North Berwick High School

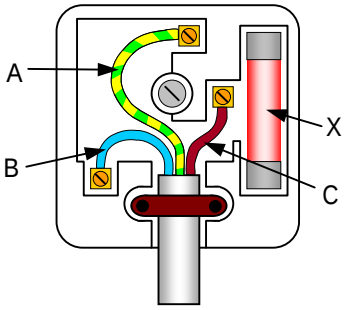
Physics Department

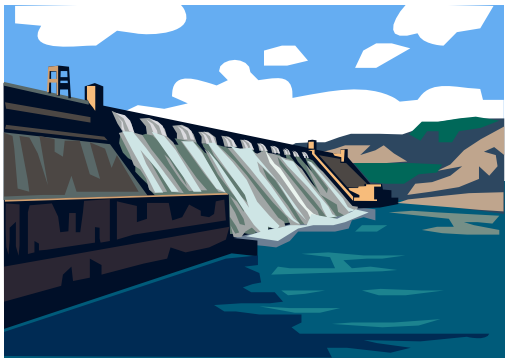
UNIT 8

Supplying Electricity

PUPIL PACK







Homework Sheets

Supplying Electricity
Working at Home

TO THE PUPIL

Each day you have physics at school, you should set aside time for work at home. By this stage you should be accepting more responsibility for your own learning and should undertake the following tasks on a regular basis:

- Tackle the supplied homework sheets as each section of work is completed in class.
- Check your own progress in the homework sheets by referring to the homework answer files available in class. Discuss any difficulties that arise with your class teacher.
- Complete any formal homework tasks that your teacher may issue from time to time and hand them in on the due date for marking.
- Revise the work you have covered in class activities by referring to your classwork jotters.

TO THE PARENT

Your co-operation would be appreciated in ensuring that pupils are encouraged to complete homework. It would be helpful if you could talk over the work given for homework and sign the homework record sheet on this page after they have completed each exercise.

The physics department hopes that this record of your child's achievement will be of interest to you, and we would welcome any comments on this or other areas related to the work of the department.

Please sign here to confirm that you have seen the homework record sheet: _____

HOMEWORK RECORD SHEET

HOMEWORK	SECTION OF WORK	MARK	CHECK	PARENTAL SIGNATURE
8.1	Source to Consumer 1			
8.2	Source to Consumer 2			
8.3	Behind the Wall			
8.4	From the Wall Socket 1			
8.5	From the Wall Socket 2			

Some questions in the pack are marked with symbols to give you specific information. Here is the key:

Credit Level question. This relates directly to the Credit Level learning outcomes.

Problem Solving question. This puts the knowledge you have gained into new contexts.

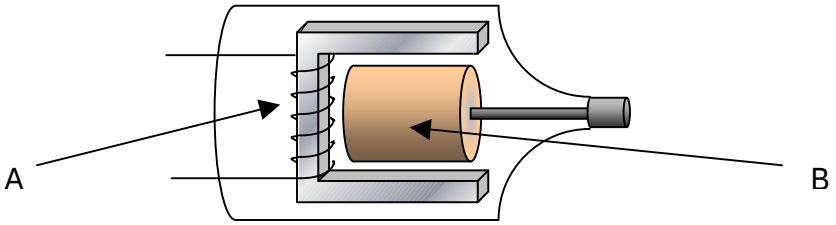
Supplying Electricity
Homework Exercises

Homework 8.1 – Source to Consumer I

1. While doing an experiment, Jane connects a coil of wire to a voltmeter. With the aid of a permanent magnet, she produces a reading on the meter.

   There are two ways Jane could have used the equipment to produce a voltage. What are they? (2)

2. (a) The diagram shows the inside of a bicycle dynamo. Name the parts labelled '**A**' & '**B**'. (2)



   (b) What type of voltage does this dynamo produce, *ac* or *dc*? (1)

PS (c) As '**B**' turns, the magnetic field around it changes.
   How would a cyclist produce a bigger output voltage from the dynamo? (1)

   (d) What is '**B**' replaced by in a generator? (1)

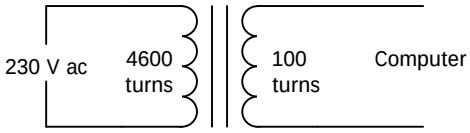
CR 3. Name the three factors that affect the size of the induced voltage and explain the effect of each. (3)

Total 10 marks

Supplying Electricity
Homework Exercises

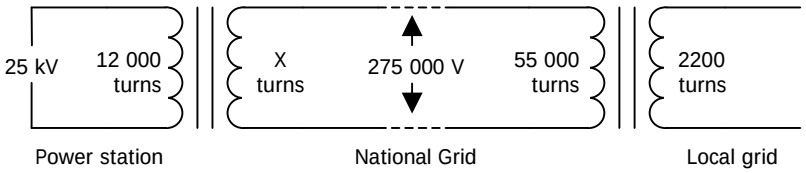
Homework 8.2 - Source to Consumer II

1. The transformer shown below allows a computer to operate properly from the 230 V mains.



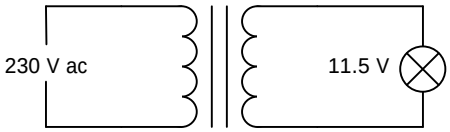
(a) State a transformer's function. (1)
(b) Copy the above diagram and label the core, primary coil & secondary coil. (1)
(c) Calculate the computer's operating voltage. (2)

2. A power station generates electricity at 25 kV. This voltage is stepped up to 275 000 V for the National Grid by a transformer as shown below. A few hundred miles away, another transformer in a substation steps the voltage back down for the local grid.



(a) Calculate the number of turns in the secondary coil of the step-up transformer (marked **x** in the diagram). (1)
PS (b) Calculate the size of the voltage used in the local grid. (1)
(c) Why are such large voltages used for the National Grid? (1)

CR 3. A transformer used to allow a projector to run from a 230 V mains is shown below:



(a) The current drawn from the mains is 0.1 A. Calculate the output current, assuming the transformer is 100% efficient. (2)
(b) In practice, transformers are not 100% efficient. Give one reason why not. (1)

Total 10 marks

Supplying Electricity
Homework Exercises

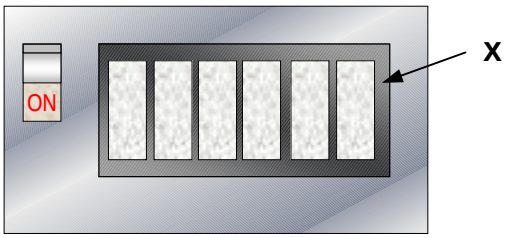
Homework 8.3 – Behind the Wall

1. Answer the following questions about household wiring:

   (a) How are appliances connected in household wiring – in series or in parallel? (1)
   (b) What is the purpose of the mains fuses? (1)
   (c) What is a circuit breaker? (1)
   (d) Electricity bills are made up based on a unit called the *kilowatt-hour*. What physical quantity is measured in kilowatt-hours? (1)

CR 2. (a) Give two reasons why the ring circuit is the preferred method for wiring sockets in parallel. (2)
   (b) Sketch a circuit diagram of a ring circuit with three sockets connected to it. Label each wire drawn. (2)

3. Look at this diagram. It is a piece of equipment placed in every home by the Electricity Board.



   (a) Name this piece of equipment. (1)
CR (b) The part labelled **X** in the diagram holds several fuses or circuit breakers.
   Give one reason why a circuit breaker would be preferable to a fuse. (1)

Total 10 marks

Supplying Electricity
Homework Exercises

Homework 8.4 - From the Wall Socket I

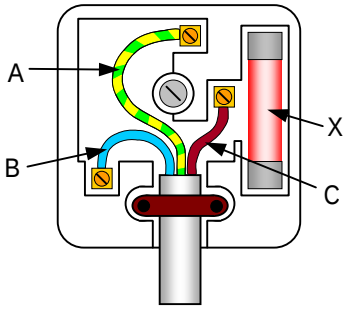
1. For each appliance, fill in the correct energy change. (3)

APPLIANCE	MAIN ENERGY TRANSFORMATIONS
Lamp	Electrical →
Vacuum Cleaner	Electrical →
Iron	Electrical →
Fan Heater	Electrical →
Television	Electrical →
Hi-fi	Electrical →

2. Copy and complete the table below: (2)

APPLIANCE	POWER RATING	FUSE
Clock	10 W	
Table lamp	60 W	
Iron	1200 W	
Kettle	2000 W	

3. The questions below refer to this diagram:



(a) Make a table to show which wires (A, B or C) are the live, neutral and earth wires. (1½)

(b) Add another column to your table to show which colours of insulation each wire should have. (1½)

(c) Name the part of the plug labelled 'X', and say what its function is. (2)

Total 10 marks

Supplying Electricity
Homework Exercises

Homework 8.5 - From the Wall Socket II

1. What does water do to the human body's ability to conduct electricity? (1)

PS 2. Information about flex sizes is given in the table below:

Conductor Size	Maximum Power (W)	Flex Used For	Maximum Current (A)
0.50 mm^2	750	Lamps, hairdryers, hi-fi	3
0.75 mm^2	1500	Fridges, TVs, cleaners	6
1.00 mm^2	2400	Electric drills, kettles	10
1.25 mm^2	3200	Electric fires, extensions	13
1.50 mm^2	4000	Lighting circuits	16
2.50 mm^2	7200	Sockets, immersion heaters	30
10.00 mm^2	6000 - 12 000	Cookers, instant showers	60

(a) What is the maximum current that a 1.00 mm^2 flex is expected to carry? (1)
(b) What size of flex would be needed for an appliance rated at 13.5 A? (1)
(c) A pupil states that if the size of a flex is doubled, it will be able to carry double the current. Do you agree with this? Use values from the table to justify your answer. (1)
(d) If a flex of cross-sectional area 0.75 mm^2 were to be used with an appliance rated at 13 A, what energy transformation could take place in the flex? Explain your answer. (1)

3. (a) Draw the double insulation symbol. (1)
(b) Which wire is not required in the flex of these appliances? (1)

CR 4. Fuses, switches and earth wires are all safety devices.

(a) Explain **how** the earth wire acts as a safety device. (2)
(b) Why must the fuse and any switches be placed in the live lead? (1)

Total 10 marks