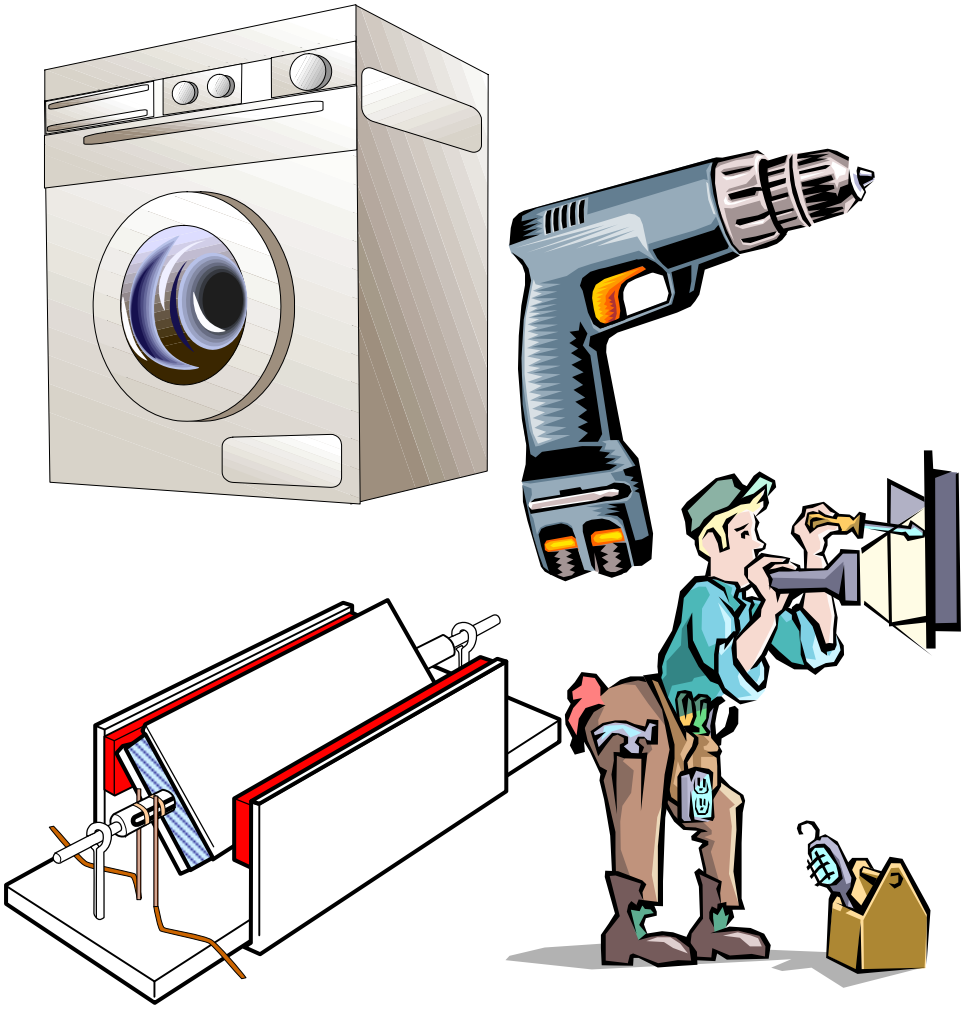
Standard Grade Physics

North Berwick High School

Physics Department

UNIT 2

Measuring Electricity



Homework Sheets

Measuring 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
2.1	Alternating and Direct Current 1			
2.2	Alternating and Direct Current 2			
2.3	Resistance 1			
2.4	Resistance 2			
2.5	Useful Circuits 1			
2.6	Useful Circuits 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.

Homework 2.1 - Alternating and Direct Current I

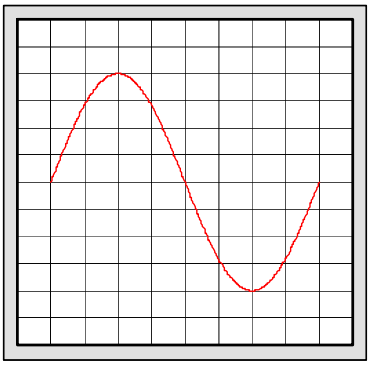
1. Explain what alternating current and direct current mean, and state the type of supply (mains or battery) that produces each. (3)

2. (a) What is the value of the mains voltage in Scotland? (½)
   (b) What is the frequency of the mains supply? (½)

3. Construct a table showing the following components with their correct symbol: (2)

   cell; bulb; resistor; diode

PS 4. Look at this oscilloscope pattern:



(a) Is this trace representing ac or dc input? (1)
(b) If the gain is set at 2 V per division, what is the peak voltage of the trace? (1)
(c) Describe what would happen to the trace on the screen if a 3 V source was used instead. Use the words frequency and amplitude in your answer. (1)

CR 5. How does the ***peak*** value of an alternating voltage compare to its quoted value? (1)

Total 10 marks

Homework 2.2 - Alternating and Direct Current II

1. State the symbol, the correct unit and the shortened form of the unit in the appropriate columns for each of the quantities listed. The first one has been done for you. (2)

QUANTITY	SYMBOL	UNIT	UNIT SYMBOL
time	t	second	s
current			
voltage			

2. What is an electric current? (1)

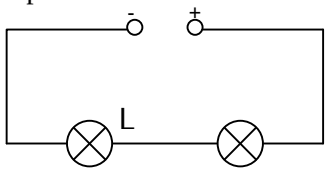
CR 3. (a) Calculate the charge that passes along a wire if a current of 10 A flows for 30 seconds. (2)
(b) Calculate the charge that passes through a bulb if it draws a current of 500 mA for 8 seconds. (2)
(c) 12 Coulombs pass through a lamp in 6 seconds. What is the current flowing through the lamp? (2)

CR 4. What is the definition of the voltage of a supply? (1)

Total 10 marks

Homework 2.3 – Resistance I

1. Draw this circuit diagram carefully in your homework jotter, adding the circuit symbol for an **ammeter** in position to measure the current through lamp L. Then add the circuit symbol for a **voltmeter** in position to measure the voltage across lamp L. (2)



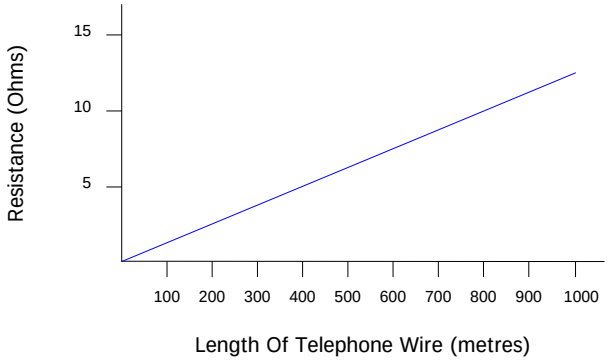
2. What happens to the current in a circuit when the resistance is increased? (1)

3. Variable resistors can be used in two main ways – to alter voltage, or to alter current.

   (a) What do we call the variable resistor when it is set up to alter the size of the current in the circuit? (1)
   (b) What do we call the variable resistor when it is set up to alter the size of the voltage over the resistor? (1)

4. A lamp has a resistance of 960 Ω. It needs to draw a current of 0.25 A to operate at its correct brightness. What size of voltage does it need? Use Ohm's law to calculate the answer. (2)

PS 5. The graph below shows how the resistance of telephone wire varies with length.



   (a) From the graph, what will be the resistance of a length of wire 400 metres long? (1)
   (b) Use this answer to calculate the resistance of a piece of wire 20 000 m long. (1)
   (c) The electrical signals must be boosted at regular intervals in order for the signal to remain strong enough. One amplifier is required for every 50 Ω of resistance.

   Calculate the number of amplifiers needed for the 20 000 m long piece of wire in part (b). (1)

Total 10 marks

Homework 2.4 – Resistance II

1. Name 3 electrical devices from the home that use resistors to convert electrical energy into heat. You should only list devices that do this on purpose – for instance, televisions heat up, but you don't switch on the TV to heat the room! (1)

2. (a) A 1200 W hair dryer is connected to the mains (230 V). Calculate the current drawn. (2)
   (b) The dryer is used for 5 minutes. How much electrical energy is used in this time? (2)

3. Match the heads and tails of the sentences, and then copy them into your jotter: (2)

The energy transformation in a filament wire occurs in	the gas.
The energy transformation in a discharge lamp occurs in	light.
In a lamp, electrical energy is transformed into	heat.
In a resistive circuit electrical energy is transformed into	the resistance wire.

4. Which is more efficient at transferring electrical energy to light - a filament lamp or a gas discharge lamp? (1)

CR 5. A 100 W light bulb is found to draw a current of 0.43 A when it is operating correctly. Use this information to calculate the resistance of its filament. (2)

Total 10 marks

Homework 2.5 – Useful Circuits I

1. Give one example from your home where two switches are used in series to switch on an appliance. (1)

2. (a) Draw a circuit diagram for a circuit that has three lamps in series attached to a battery pack, and add a switch that controls all three lamps. (1)
   (b) If the three lamps are rated as "6 V, 0.06 A", calculate the **supply voltage** needed to allow them to operate properly. (2)
   (c) What size of current will be drawn from the battery? Explain why it is this value. (2)

3. (a) Draw a circuit diagram for a circuit that has three lamps in parallel attached to a battery pack, and add a switch that controls all three lamps. (1)
   (b) If the three lamps are rated "6 V, 0.06 A", calculate the current drawn from the battery pack. (1)
   (c) What size voltage must the battery be to allow them to operate properly? Explain why it is this value. (2)

Total 10 marks

Homework 2.6 – Useful Circuits II

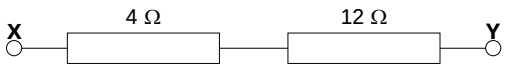
1. (a) Draw a circuit diagram for a simple continuity tester using an L.E.D. and a battery. (2)
   (b) Describe how this equipment would be used to check for faults in a circuit. (1)

2. A pupil uses an ohmmeter to check a circuit for open and short circuits.
   (a) How would a short circuit be identified using the ohmmeter? (1)
   (b) How would an open circuit be identified using the ohmmeter? (1)

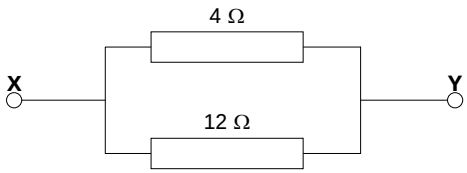
3. Why can connecting too many appliances to one socket be dangerous? (1)

CR 4. Calculate the equivalent resistance between **X and Y** in each of the following networks, showing all the working for each one: (4)

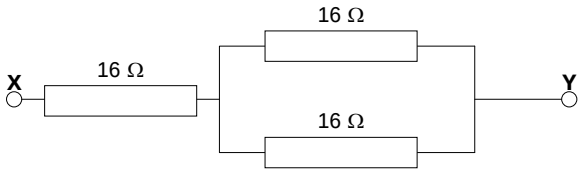
(a)



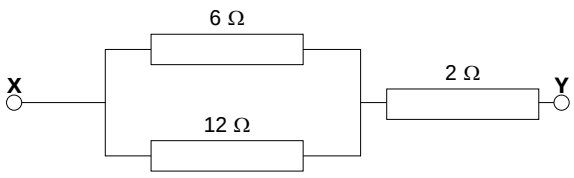
(b)



(c)



(d)

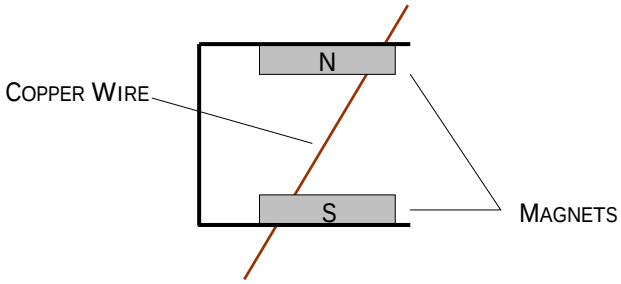


Total 10 marks

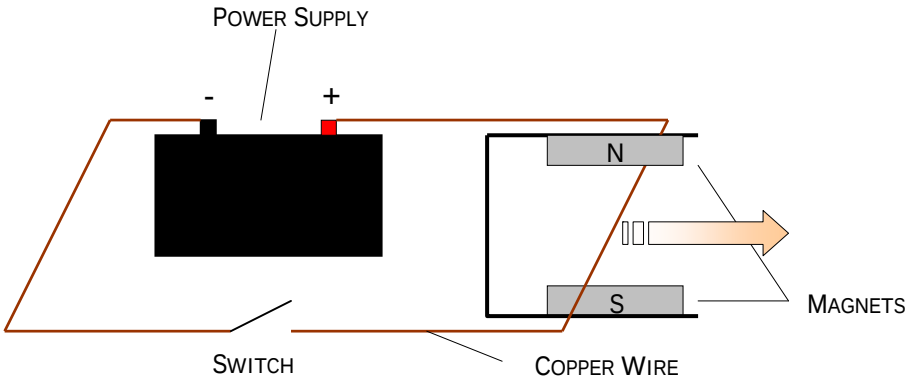
Homework 2.7 – Movement from Electricity I

1. (a) What exists around a wire when an electric current flows through it? (1)
   (b) If the wire is wrapped into a coil, what does the coil become when a current flows through it? (1)
   (c) List two practical applications that make use of this effect. (2)

2. A wire is placed in a magnetic field as shown. When a current flows through the wire, what happens to it? Why does this happen? (2)



CR 3. In the diagram below, the copper wire moves to the right when the switch is closed. Describe **two** ways of getting the wire to move to the left when the switch is closed. (2)



4. Draw the circuit symbol for a reed relay. (1)

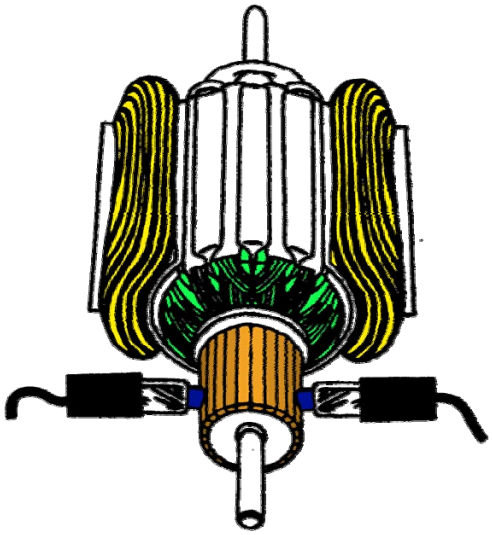
PS 5. A magnet can destroy data stored on a computer floppy disc. This is because the floppy disc stores data magnetically.

Why could placing the disc on a piece of electrical equipment destroy the data? (1)

Total 10 marks

Homework 2.8 – Movement from Electricity II

1. Label this diagram to show the four main parts of an electric motor. The parts are listed in the table for *question 2*. (2)



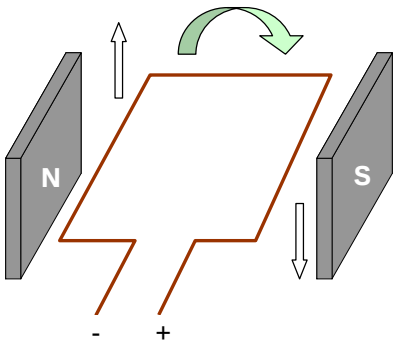
CR 2. Copy the following table, and complete it to show the function of each part of an electric motor: (4)

PART	FUNCTION
Rotating coil	
Field coil	
Brushes	
Commutator	

CR 3. Commercial motors use improved components to offer a better performance. Instead of wire brushes, carbon is used. The split-ring commutator is replaced with a multi-segment commutator.

Explain the benefit gained from each of these changes. (2)

CR 4. A simple DC motor comprises a loop of current-carrying wire in a magnetic field. Explain why the loop of wire rotates as shown. You must mention the current direction and the force on each part of the loop in your answer. (2)



Total 10 marks