Lesson / Homework

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APP: Electromagnet Strength

Cameron wanted to make an electromagnet that would pick up about 50 paperclips at a time.

Cameron carried out a trial investigation to find out how changing the voltage affected the strength of an electromagnet. He used a 15 cm iron nail, a 2 m length of wire and a power pack that went up to 12 V. He investigated the effect the voltage had on the strength of the electromagnet:

Voltage / V	Number of paperclips picked up			Average number of paperclips
	Repeat 1	Repeat 2	Repeat 3	
2	1	1	1	
4	11	15	10	
6	17	18	23	
8	37	38	28	
10	too hot	too hot	too hot	

TASK

1. Use Cameron's data (in the table) to work out the average.
2. Plot a graph of Cameron's results.
3. Use the table and the graph, identify the pattern and describe the relationship between the two variables.
4. Use scientific ideas to explain your conclusion.
5. Consider how the data could be improved and suggest improvements.

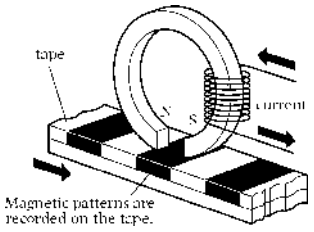
LEVEL 3: State the pattern shown in the table. Describe what you have found out and answer the question. Suggest how the data used could be improved.
LEVEL 4: State the pattern shown in the graph. Describe the relationship between the voltage and the strength of the electromagnet. Identify the scientific evidence you have used. Suggest how the data used could be improved, stating a reason.
LEVEL 5: Interpret the graph you have drawn. Highlight any anomalous (odd) results. Explain simply why there is variation in the repeat measurements. Use both the graph and table as evidence to support your conclusion. Evaluate how the data was collected and used. Suggest how the data collected and used could be improved.

Tape recorders

Many people listen to music that has been recorded onto cassettes.

A microphone converts sound energy into electrical energy. Different sounds are converted into different patterns of electrical signals. If a singe is at a concert, the signals are sent to a loudspeaker so that everyone can hear them. These signals can also be recorded onto magnetic tape. When the tape is played the sounds are converted back into electrical signals, and a loudspeaker turns these signals into sound.

A magnetic tape is a thin layer of plastic with a coating of tiny magnetic particles. The motor in the cassette player moves the tape at a steady speed past the head inside the recorder, which is a small electromagnet. The electrical signals go through the coil of wire in the electromagnet. The magnetic field from the electromagnet magnetizes bits of the tape as it moves past. The particles on the tape are magnetized in different directions, making a magnetic pattern on the tape.



When someone is playing the tape, the magnetic patterns on the tape magnetize the ring, and this causes a current in the wire. The strength and direction of the current depends on the magnetic pattern on the tape. This electric current goes to a loudspeaker, which converts it into sound.

In cheap cassette players, one head can do the job of recording and playback, whereas expensive tape recorders have separate heads for recording and playing sound.

Draw a diagram of how a cassette player works in your book. Then answer the following questions:

1. What do microphones and loudspeakers do?
2. What is the tape in a cassette made from?
3. What is the head inside a cassette recorder?
4. What happens to the tape when music is being recorded?
5. Copy these sentences and fill in the gaps:

   > When you play a ... a motor in the cassette player moves the tape past the ... . There is an ... in the head, which detects the ... patterns on the tape. The head converts these ... into electrical ... . The electrical signals are sent to a ..., which converts them into sound.

6. Why should you never put a strong magnet near cassettes?