

## Physics Investigation 1 Task Sheet

### Observation

Joan opened up the case of a radio and found inside a variable air capacitor and an inductive coil. She noticed that when she tuned the radio to channels of different frequencies, she was actually adjusting the variable air capacitor.

### Problem

How does the air capacitor affect the frequency of the radio circuit? Does the resistance of the circuit affect the frequency of the radio circuit?

### Hypothesis

### Aim

### Principle

When a capacitor is charged by a battery and then discharged through an inductor and a resistor, the current (voltage) in the circuit oscillates with a frequency, say  $f_o$ . The frequency of the oscillation can be studied by measuring the voltage across the inductor, capacitor or resistor.

The process of tuning a radio circuit involves changing the frequency of the oscillation in the circuit so that it is the same as the frequency of a particular radio station. Resonance is said to occur and the current in the circuit is maximum. A strong signal is then received.

In this investigation, the following variables are involved :

Independent variables - \_\_\_\_\_

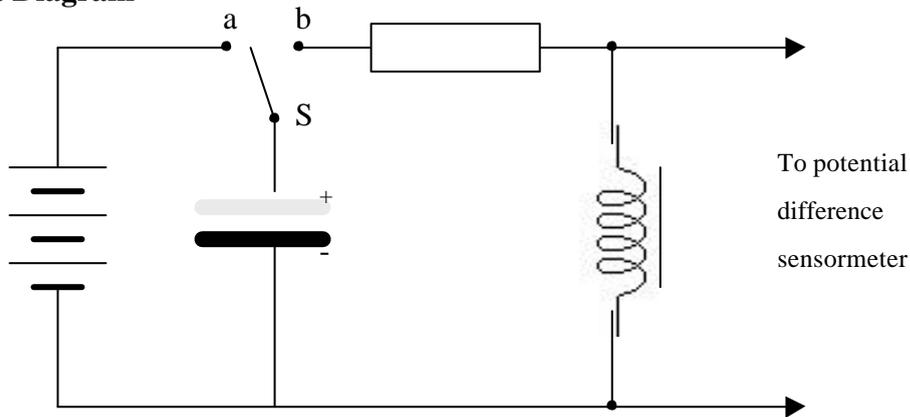
Dependent variable - \_\_\_\_\_

### Equipment and materials

- One desktop computer
- One datalogging interface
- One potential difference sensormeter
- Capacitors (47  $\mu$  F, 220  $\mu$  F, 470  $\mu$  F, 1000  $\mu$  F)
- One high inductance coil (1100 turns)

- One resistance substitution box
- One double C-core and clip
- One clip component holder
- One two-way switch
- One battery 4.5V
- Connecting leads

### Circuit Diagram



### Procedure

1. Connect up a circuit as shown above;
2. Set up the computer and the interface. Connect the leads of the potential difference sensor meter across the inductor;
3. Load and run the Datadisc 32 program;
4. Set the switch S to a to charge the capacitor, then set the switch to b to discharge it through the inductor. At the same time start recording;
5. Display the voltage-time graph. Measure the frequency of the oscillation;
6. Repeat step 4 and step 5 using different capacitors, keeping the resistance of resistance substitution box unchanged;
7. Repeat step 4 and step 5 by increasing the resistance in the resistance substitution box, keeping the capacitance of the capacitor unchanged.

### Precautions

1. In order to study the effect of the capacitance on the oscillation frequency, the resistance of the resistance box should not be too high (not more than a few ohms).

### Results

### Interpretation

### Possible errors

### Improvement

### Conclusion