



Physics
Leaving Certificate
Higher Level

Past Exam Questions on
Potential Differences and Capacitance

Q4 Section A 2013

4. A student was asked to investigate the variation of current with potential difference for a thin metallic conductor. The student set up a circuit using appropriate equipment. The student recorded the values of the current I passing through the conductor for the corresponding values of potential difference V . The recorded data are shown in the table.

V/V	1.0	2.0	3.0	4.0	5.0	6.0
I/A	0.17	0.34	0.50	0.64	0.77	0.88

Draw and label the circuit diagram used by the student.

Name the device in the circuit that is used to vary the potential difference across the conductor.

Explain how the student used this device to vary the potential difference. (18)

Use the data in the table to draw a graph on graph paper to show the variation of current with potential difference. Use your graph to find the value of the resistance of the conductor when the current is 0.7 A. (15)

Explain the shape of your graph. (7)

Q5 Part (f) Section B 2013

- (f) Define the volt.

Q4 Section A 2011

4. A student investigated the variation of the current I through an electrolyte as the potential difference V across the electrolyte was changed. The electrolyte used was a solution of copper sulfate. The electrodes used were made of copper.

The student recorded the following data:

V/V	0	1	2	3	4	5	6
I/mA	0	30	64	93	122	160	195

Draw a suitable circuit diagram for this investigation and label the components.

How was the potential difference changed during the investigation? (12)

Draw a suitable graph to show the relationship between the current and the potential difference in this investigation.

Use your graph to calculate the resistance of the electrolyte. (18)

What was observed at the electrodes as current flowed through the electrolyte? (10)

Q9 Section B 2009

9. Define (i) potential difference, (ii) capacitance. (12)

A capacitor stores energy.

Describe an experiment to demonstrate that a capacitor stores energy. (14)

The ability of a capacitor to store energy is the basis of a defibrillator. During a heart attack the chambers of the heart fail to pump blood because their muscle fibres contract and relax randomly. To save the victim, the heart muscle must be shocked to re-establish its normal rhythm. A defibrillator is used to shock the heart muscle.

A $64 \mu\text{F}$ capacitor in a defibrillator is charged to a potential difference of 2500 V .

The capacitor is discharged through electrodes attached to the chest of a heart attack victim.

Calculate

- (i) the charge stored on each plate of the capacitor;
- (ii) the energy stored in the capacitor;
- (iii) the average current that flows through the victim when the capacitor discharges in a time of 10 ms ;
- (iv) the average power generated as the capacitor discharges. (30)

Q12 Part (d) Section B 2008

- (d) Define capacitance. (6)



Describe how an electroscope can be charged by induction. (10)

How would you demonstrate that the capacitance of a parallel plate capacitor depends on the distance between its plates? (12)

Q5 Part (f) Section B 2007

- (f) Calculate the energy stored in a $5 \mu\text{F}$ capacitor when a potential difference of 20 V is applied to it. (7)

Q12 Part (b) Section B 2006

- (b) List the factors that affect the capacitance of a parallel plate capacitor. (6)

The plates of an air filled parallel plate capacitor have a common area of 40 cm^2 and are 1 cm apart. The capacitor is connected to a 12 V d.c. supply.

Calculate

- (i) the capacitance of the capacitor;
(ii) the magnitude of the charge on each plate. (15)

What is the net charge on the capacitor?

Give a use for a capacitor. (7)

(permittivity of free space = $8.85 \times 10^{-12} \text{ F m}^{-1}$)

Q5 Part (e) Section B 2005

- (e) A capacitor of capacitance $100 \mu\text{F}$ is charged to a potential difference of 20 V. What is the energy stored in the capacitor? (7)