

Physics Paper 2 Test: Capacitors and Electrostatics

Duration: 1.5 hours

Total Marks: 100

Section A: Multiple Choice Questions (20 marks)

Instructions: Answer all questions. Each question carries 1 mark.

1. What is the SI unit of capacitance?

- a) Ohm
- b) Farad
- c) Volt
- d) Coulomb

2. When a capacitor is fully charged, what is the relationship between the voltage across the capacitor plates and the charging current?

- a) Voltage and current are zero
- b) Voltage is maximum, current is zero
- c) Voltage and current are both maximum
- d) Voltage is zero, current is maximum

3. How does the capacitance of a parallel plate capacitor change if the distance between the plates is increased?

- a) Increases

- b) Decreases
- c) Remains unchanged
- d) Depends on the area of the plates

4. What happens to the energy stored in a capacitor if the voltage across it is doubled?

- a) Halved
- b) Doubled
- c) Quadrupled
- d) No change

5. Which of the following materials is a good conductor of electricity?

- a) Glass
- b) Rubber
- c) Copper
- d) Plastic

6. What is the function of a dielectric material in a capacitor?

- a) Increase the capacitance
- b) Decrease the capacitance
- c) Increase the voltage
- d) Decrease the voltage

7. What is the principle behind a Van de Graaff generator?

- a) Magnetic induction
- b) Electrostatic induction
- c) Charge transfer by contact

d) Charge accumulation by friction

8. What is the electric field intensity at a point due to a charge of $+2 \mu\text{C}$ located 4 cm away?

- a) $9 \times 10^9 \text{ N/C}$
- b) $4.5 \times 10^3 \text{ N/C}$
- c) $1.8 \times 10^5 \text{ N/C}$
- d) $4.5 \times 10^6 \text{ N/C}$

9. Two charges of $+3 \mu\text{C}$ and $-5 \mu\text{C}$ are placed 10 cm apart. What is the magnitude of the electrostatic force between them?

- a) $3 \times 10^4 \text{ N}$
- b) $1.5 \times 10^5 \text{ N}$
- c) $1.8 \times 10^4 \text{ N}$
- d) $6 \times 10^5 \text{ N}$

10. What happens to the magnitude of the electric field between two parallel plates if the distance between them is increased?

- a) Increases
- b) Decreases
- c) Remains unchanged
- d) Depends on the charge on the plates

Section B: Short Answer Questions (30 marks)

Instructions: Answer all questions. Each question carries 5 marks.

1. Explain how a capacitor works and its applications in electronic circuits.
 2. Calculate the capacitance of a capacitor with an area of 10 cm^2 and plate separation of 0.2 mm , given the permittivity of the dielectric material is $8.85 \times 10^{-12} \text{ F/m}$.
 3. Describe the process of charging and discharging a capacitor in a circuit.
 4. What are the factors affecting the capacitance of a parallel plate capacitor?
 5. Explain why lightning occurs during thunderstorms and how it relates to electrostatics.
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Section C: Essay/Long Answer Questions (50 marks)

Instructions: Answer all questions. Each question carries 10 marks.

1. Discuss the advantages and disadvantages of using capacitors in electronic devices.
 2. Explain Gauss's law in electrostatics and how it can be applied to calculate electric fields.
 3. Describe the function and operation of a Van de Graaff generator.
 4. Discuss the safety measures and practical applications of electrostatics in everyday life.
 5. Explain the concept of electric potential and how it relates to capacitors and electrostatics.
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End of Exam Paper