1 Midterm Re-exam v1

(1) **1**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

Which of the following statements about electric charge is correct?

a. Protons and neutrons have the same charge magnitude.
b. Electrons have a positive charge.
c. Charge is quantized in units of 1.60 x 10^{-19} C. ✓
d. Coulombs are a base SI unit of charge.

(2) **2**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

What is the electrostatic force between two charges of +2 C and -3 C separated by a distance of 2 meters?

a. 1.35×10^{10} N
b. 2.7×10^{9} N ✓
c. 8.99×10^{9} N
d. 4.5×10^{10} N

(3) **3**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

The electric field at a point due to a point charge is proportional to:

a. The charge's magnitude and the distance squared.
b. The inverse square of the distance only.
c. The charge's magnitude and inversely proportional to the square of the distance. ✓
d. None of the above.

(4) **4**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

A parallel plate capacitor has a plate area A and a separation d. Its capacitance is proportional to:

a. d^2/A

b. A/d ✓
c. d/A
d. $1/A$

(5) **5**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

Which statement about magnetic fields is true?

a. Magnetic field lines begin at the north pole and end at the south pole.
b. Magnetic forces act along the field lines.
c. A charged particle at rest in a magnetic field experiences a force.
d. The magnetic force on a particle depends on the angle between its velocity and the field. ✓

(6) **6**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

What is the magnetic force on an electron moving with velocity v in a uniform magnetic field B, if v and B are parallel?

a. Zero ✓
b. $e \cdot v \cdot B$
c. $e \cdot v \cdot B \cdot \sin(90°)$
d. $-\, e \cdot v \cdot B$

(7) **7**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

The energy stored in a capacitor is given by:

a. $\frac{1}{2}Q \cdot V$
b. $\frac{1}{2}C \cdot V^2$
c. $Q^2/(2 \cdot C)$
d. All of the above. ✓

(8) **8**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

For two parallel wires carrying current in the same direction, the force between the wires is:

a. Attractive. ✓
b. Repulsive.
c. Zero.
d. Proportional to the square of the currents.

(9) **9**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

If an electron is moving in a circle due to a magnetic field, the radius of the circle is proportional to:

a. Its velocity.
b. The magnetic field strength. ✓
c. The inverse of its velocity.
d. Its charge.

(10) **10**

MULTIPLE CHOICE | marked out of 1.0 | penalty 0 | One answer only | Shuffle

In a series circuit, the equivalent resistance is:

a. The sum of the individual resistances. ✓
b. The reciprocal of the sum of reciprocals of the individual resistances.
c. Always less than the smallest resistance.
d. Equal to the product of all resistances.

(11) **11**

NUMERICAL | marked out of 1.0 | penalty 0

Calculate the electric field 1 m away from a point charge of $5 \times 10^{-6}, C$.

- $4.495 \times 10^4, N/C \pm 1$ (0%)

(12) **12**

NUMERICAL | marked out of 1.0 | penalty 0

Two charges, $q_1 = 2 \times 10^{-6}, C$ and $q_2 = -3 \times 10^{-6}, C$, are placed 4 m apart. Find the force between them.

- $3.375 \times 10^{-3}, N \pm 1$ ✓

(13) **13**

NUMERICAL | marked out of 1.0 | penalty 0

A parallel plate capacitor with area $0.02, m^2$ and plate separation of $0.01, m$ is filled with a dielectric of constant $\kappa = 5$. Calculate its capacitance.

- $8.85 \times 10^{-11}, F \pm 1$ ✓

(14) **14**

NUMERICAL | marked out of 1.0 | penalty 0

A wire of resistance $R = 10, \Omega$ and length $L = 2, m$ has a cross-sectional area $A = 0.001, m^2$. Determine the resistivity of the material.

- $5 \times 10^{-3}, \Omega \cdot m$ ✓

(15) **15**

NUMERICAL | marked out of 1.0 | penalty 0

An electron travels at $2 \times 10^6, m/s$ perpendicular to a magnetic field of $0.1, T$. Find the force acting on the electron.

- $3.2 \times 10^{-14}, N \pm 1$ ✓

(16) **16**

NUMERICAL | marked out of 1.0 | penalty 0

Determine the energy stored in a capacitor with $C = 50\mu F$ and $V = 10, V$.

- $2.5 \times 10^{-3}, J \pm 1$ ✓

(17) **17**

NUMERICAL | marked out of 1.0 | penalty 0

A solenoid has 1000 turns, a length of $0.5, m$, and carries a current of $3, A$. Calculate the magnetic field inside the solenoid.

- $7.54 \times 10^{-3}, T \pm 1$ ✓

(18) **18**

NUMERICAL | marked out of 1.0 | penalty 0

Find the equivalent resistance of three resistors $R_1 = 2\Omega$, $R_2 = 3\Omega$, and $R_3 = 6\Omega$ connected in parallel.

- $1\Omega \pm 1$ ✓

(19) **19**

NUMERICAL | marked out of 1.0 | penalty 0

A circuit contains a $12, V$ battery and two resistors, 6Ω and 3Ω, connected in series. Determine the current in the circuit.

- $2, A \pm 1$ ✓

(20) **20**

NUMERICAL | marked out of 1.0 | penalty 0

An alpha particle ($q = 2e$) is moving with speed $5 \times 10^5, m/s$ in a magnetic field of $0.2, T$. Calculate the radius of its circular path.

- $2.6 \times 10^{-2}, m \pm 1$ ✓

Total of marks: 20