1 Midterm Re-exam v2

(1) **1**

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

A proton moving along the positive x-axis enters an electric field that is directed along the positive y-axis. What is the direction of the electric force acting on the proton after it enters the electric field?

a. Along the negative z-axis
b. Along the positive z-axis
c. Along the negative y-axis
d. Along the positive y-axis ✓
e. The direction cannot be determined since the magnitude of the electric field is not known.

(2) **2**

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

Three particles having charges of $+q$, $+Q$, and $-Q$ are placed at the corners of an equilateral triangle of side a. The net force on the particle with charge $+q$ due to the other two charges is in the plane of the page and directed:

a. vertically upward
b. vertically downward
c. horizontally to the right ✓
d. horizontally to the left
e. toward the charge $-Q$

(3) **3**

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

The magnitude of the force on the particle with charge $+q$ due to the other two charges is:

a. $\frac{kqQ}{a}$
b. $\frac{2kqQ}{a}$
c. $\frac{2kqQ}{a^2}$
d. $\frac{2kqQ}{a^2}\sin 60^\circ$ ✓

e. $\frac{2kqQ}{a^2}\cos 60°$

(4) **4**

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

The potential energy of the particle with charge $+q$ due to the other two charges is:

a. zero ✓
b. $-\frac{2kQ}{a}$
c. $\frac{kqQ}{a}$
d. $\frac{2kqQ}{a}$
e. $\frac{2kqQ}{a^2}$

(5) **5**

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

All the following statements about an isolated, solid charged conductor are correct EXCEPT:

a. All parts of the conductor are at the same potential.
b. All excess charge resides on the outer surface.
c. The net charge enclosed by any surface lying entirely within the conductor must equal zero.
d. The electric field E just outside the conductor is directed parallel to the surface. ✓
e. The electric field intensity inside the conductor is zero.

(6) **6**

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

Two long, straight, parallel wires are held fixed. A voltage is applied to wire X, creating a current I_X to the right, and the wire experiences a magnetic force of magnitude F_B toward wire Y. Assuming the resistance of wire X is constant, which of the following graphs correctly illustrates the magnitude of the magnetic force F on wire X as a function of the voltage V applied to the wire?

a. (A)
b. (B)

c. (C)
d. (D) ✓
e. (E)

(7) **7**

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

Which of the following could be true of wire Y?

a. It carries a current in the same direction as the current in wire X.
b. It experiences a force directed away from wire X.
c. It experiences a force of different magnitude than the force on wire X.
d. I or II ✓
e. None

(8) **8**

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

If the distance between the two wires is tripled, what is the magnitude of the new magnetic force exerted on wire X?

a. $F_B/9$
b. $F_B/3$ ✓
c. F_B
d. $3F_B$
e. $9F_B$

(9) **9**

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

A proton moving to the right at constant speed v enters a region containing uniform magnetic and electric fields and continues to move in a straight line. The magnetic field B is directed toward the top of the page. The direction of the electric field must be:

a. into the page ✓
b. out of the page
c. to the left
d. toward the top of the page
e. toward the bottom of the page

(10) **10**

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

Suppose all three capacitors have charge $+Q$ on the top plate and charge $-Q$ on the bottom plate. Which of the following is true of the potential difference across the plates of the three capacitors?

a. It is greatest for I.
b. It is greatest for II. ✓
c. It is greatest for III.
d. It is the same for II and III and least for I.
e. It is the same for all three capacitors.

(11) **11**

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

Suppose all three capacitors are connected in parallel with a 9 V battery. Which of the following is true of the electric field between the plates?

a. It is greatest for I.
b. It is greatest for II.
c. It is greatest for III.
d. It is the same for I and III and least for II. ✓
e. It is the same for I and II and least for III.

(12) **12**

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

The electric potential along an x-axis is given by the expression $V = ax - bx^2$, where a and b are constants. At what point on the x-axis is the electric field zero?

a. $x = 0$
b. $x = a/2b$ ✓
c. $x = ab$
d. $x = 3a/2b$
e. At no point

(13) **13**

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

A uniform magnetic field B of magnitude 1.2 T passes through a rectangular loop of wire, which measures 0.10 m by 0.20 m. The field is oriented 30° with respect to the plane of the loop. What is the magnetic flux through the loop?

a. Zero
b. 0.012 T·m^2 ✓
c. 0.02 T·m^2
d. 0.024 T·m^2
e. 0.048 T·m^2

(14) **14**

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

A metal sphere with radius r_1 has a total electric charge of magnitude q. An uncharged metal sphere with radius r_2 (with $r_1 > r_2$) is then connected by a wire to the first sphere. When equilibrium is reached, the spheres will have:

a. charges on their surfaces of equal magnitude and the same sign
b. charges on their surfaces of equal magnitude and opposite sign
c. equal electric fields at their surfaces
d. equal capacitances
e. equal electric potentials ✓

(15) **15**

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

A negatively charged conductor attracts a second object. The second object could be which of the following?

a. A conductor with positive net charge
b. A conductor with zero net charge
c. An insulator with zero net charge
d. I, II, or III ✓
e. None

(16) **16**

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

Three resistors having resistances of 3 Ω, 6 Ω, and 9 Ω, respectively, are connected in parallel with a 10 V battery. True statements about the circuit include which of the following?

a. The current in the 9 Ω resistor is three times the current in the 3 Ω resistor.
b. The potential difference across each resistor is the same. ✓
c. The power dissipated in the 9 Ω resistor is greater than the power dissipated in either of the other two resistors.
d. I only
e. II only

(17) **17**

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

When two resistors having resistances R_1 and R_2 are connected in parallel, the equivalent resistance of the combination is 10 Ω. Which of the following statements about the resistances is true?

a. Both R_1 and R_2 are greater than 10 Ω. ✓
b. Both R_1 and R_2 are equal to 10 Ω.
c. Both R_1 and R_2 are less than 10 Ω.
d. The sum of R_1 and R_2 is 10 Ω.
e. One of the resistances is greater than 10 Ω, and the other is less than 10 Ω.

(18) **18**

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

Two particles each with a charge $-Q$ are fixed a distance L apart. Each particle experiences a net electric force F. A particle with a charge $+q$ is now fixed midway between the original two particles. As a result, the net electric force experienced by each negatively charged particle is reduced to $F/2$. The value of q is:

a. Q
b. $\frac{Q}{2}$
c. $\frac{Q}{4}$
d. $\frac{Q}{8}$ ✓
e. $\frac{Q}{16}$

(19) **19**

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

Two objects on a horizontal frictionless surface each have charge $+Q$ and each are fixed in place on the x axis at the same distance d from the origin. A particle of charge $-q$ constrained to move along the y axis is released from rest. After release, the particle will:

a. stay where it is
b. exhibit oscillatory motion ✓
c. move in the direction of increasing y
d. move in the direction of decreasing y and stop at the origin
e. move in the direction of decreasing y and keep going to negative infinity

(20) **20**

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

A uniform electric field E exists between the two large, oppositely charged plates. If the distance between the plates is increased without changing the charges on the plates, which of the following statements can be justified?

a. The electric field strength decreases.
b. The electric field strength increases.
c. The potential difference between the plates decreases.
d. The potential difference between the plates increases. ✓
e. There will be no change in either the electric field strength or the potential difference.

(21) **21**

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

When two identical resistors are connected in series to a battery, the total power dissipated is P. When the same two resistors are connected in parallel to the same battery, the total power dissipated is:

a. $\frac{1}{4}P$
b. $\frac{1}{2}P$
c. P

d. $2P$
e. $4P$ ✓

(22) **22**

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

A positively charged particle in a uniform magnetic field is moving in a circular path of radius r perpendicular to the field. How much work does the magnetic force F do on the charge for half a revolution?

a. $\pi r^2 F$
b. $2\pi r F$
c. $\pi r F$
d. $2r F$
e. Zero ✓

(23) **23**

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

For which two points can a negatively charged particle be moved from rest at one point to rest at the other with no work being done by the electric field?

a. A and B
b. A and C ✓
c. A and D
d. B and C
e. B and D

(24) **24**

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

A positively charged particle is moved by an external force from rest at one point to rest at another. For which of the following motions would net positive work be required by the external force?

a. From A to D
b. From B to A
c. From C to A
d. From C to D
e. From D to B ✓

(25) **25**

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

The electric potential shown in the diagram could be created by which of the following?

a. A ring of positive charge
b. A large sheet of positive charge
c. Two negative point charges
d. Two long lines of charge: one positive and one negative ✓
e. A long line of positive charge and a negative point charge

Total of marks: 25