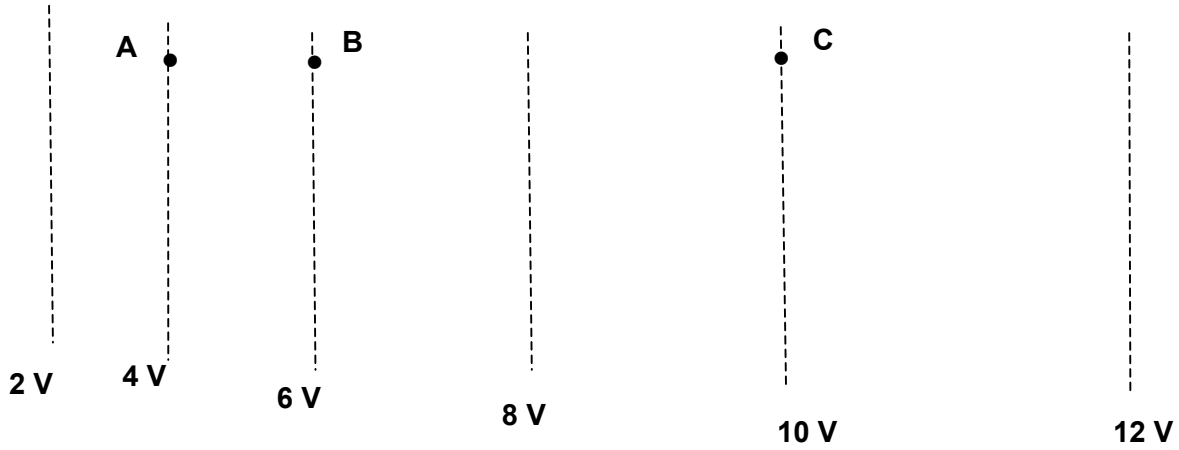
Physics 112
Make-up Exam
December 11, 2000

Put ALL of your answers on the Answer Sheet
#1-7 are NO PARTIAL CREDIT; 4 points each. If you want #5-7 graded out of 4.5 points (–1 [<u>minus one</u>] for wrong answer!!!) mark the indicated box on the Answer Sheet with an "X."
#8-#12 will get partial credit; points as shown on each one. NO EXTRA CREDIT OPTION on these problems. Show <u>ALL</u> answers on the Answer Sheet. NO ANSWERS WRITTEN ON QUESTION SHEET WILL BE CONSIDERED! TOTAL: 50 points.

1. Several equipotential lines are shown, with potential values indicated. A +0.5-C charge is placed at rest at point B, and then released.



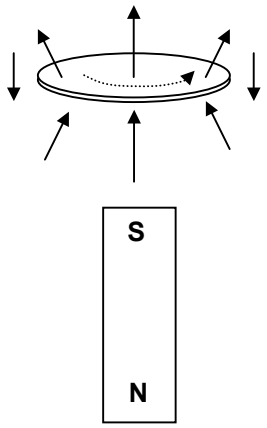
That charge might next be observed:

A. at point A with kinetic energy equal to 1 J
B. at point A with kinetic energy equal to 2 J
C. at point C with kinetic energy equal to 2 J
D. at point C with kinetic energy equal to 4 J
E. at point B with zero kinetic energy

2. A wire carries a current that flows along the x axis toward positive x. A magnetic field pointing toward positive z is switched on. The wire then experiences a force pushing it toward:

A. positive x
B. negative x
C. positive y
D. negative y
E. positive z
F. negative z

3.



The diagram above shows a circular loop directly on top of a bar magnet; the loop carries current in the direction shown, and the magnetic field ***of the loop*** is shown. There is ***no*** external magnetic field. What will happen to loop and the bar magnet?

A. They will attract each other.
B. They will repel each other.
C. They will twist in the same direction.
D. They will twist in opposite directions.
E. They will have no effect on each other.

4. Electrons are located on the x axis at x = –2 m and x = +2 m. Along the x axis, where will the electric field be zero? [Choose from the following three regions]:

1. somewhere between x = –∞ m and x = –2 m
2. somewhere between x = –2 m and x = +2 m
3. somewhere between x = 2 m and x = +∞ m

A. 1 only
B. 2 only
C. 3 only
D. 1 and 3
E. 1 and 2
F. 2 and 3

5. In an electrical circuit with one battery and several resistors, the amount of current flowing ***out*** of the battery:

A) is always larger than the amount of current flowing back ***in*** to the battery.
B) is always equal to the amount of current flowing back ***in*** to the battery.
C) is always less than the amount of current flowing back ***in*** to the battery.
D) will be larger or smaller than the amount of current flowing back in to the battery, depending on whether the circuit is series or parallel.
E) may be larger than, smaller than, or equal to the amount of current flowing back in to the battery, depending on the equivalent resistance of the full circuit.

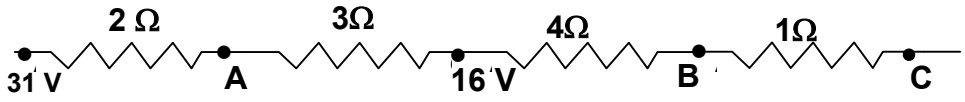
6. Resistor A has half the resistance of resistor B. They are connected in parallel to a battery. Then:

A) Resistor A dissipates four times as much power as resistor B.
B) Resistor A dissipates twice as much power as resistor B.
C) Resistor A dissipates the same amount of power as resistor B.
D) Resistor A dissipates half as much power as resistor B.
E) Resistor A dissipates one fourth as much power as resistor B.

7. Two identical resistors are carrying an electric current; the electric potential at the left end of each resistor is 6 V. The potential at the right end of resistor "A" is 8 V, and the potential at the right end of resistor "B" is 10 V. If 4 A flows through resistor "A," how much current flows through resistor "B"?

A. 1 A
B. 2 A
C. 3 A
D. 4 A
E. 5 A
F. 6 A
G. 8 A
H. 10 A
I. 12 A
J. 16 A

8. *[3 points]* A current is flowing along this section of a circuit. Find the potential at points A, B, and C.



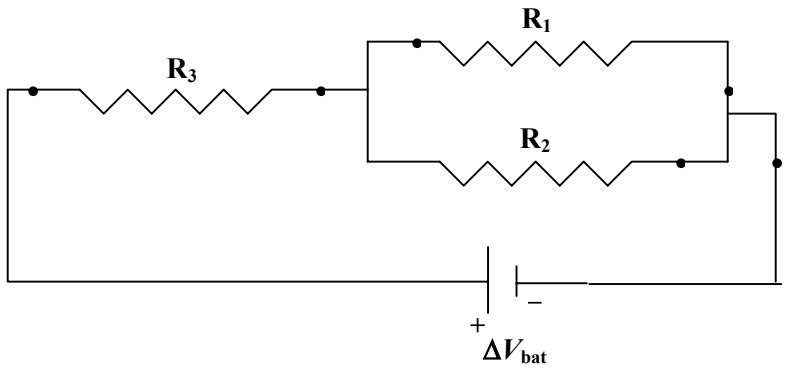
9. *[five points]* A conducting loop is fixed in position in the presence of a magnetic field; the direction of the field does not change, but the magnitude does.

A. Magnetic field has constant magnitude of zero teslas.
B. Magnetic field has constant magnitude of 4 teslas.
C. Magnetic field has constant magnitude of 8 teslas.
D. Magnetic field increasing at 2 teslas per second.
E. Magnetic field increasing at 4 teslas per second.
F. Magnetic field decreasing at 2 teslas per second.
G. Magnetic field decreasing at 4 teslas per second.

For each of these cases of loop current, choose a letter corresponding to the appropriate choice for the field. ***Note: There is more than one possible set of choices, but your set should be consistent with each other.***

i) 5 A, clockwise
ii) 10 A, clockwise
iii) 5 A, counterclockwise
iv) 10 A, counterclockwise
v) 0 A

10. *[five points]*



In this circuit, $\mathbf{R_1 = 3\ \Omega}$, $\mathbf{R_2 = 9\ \Omega}$, and $\mathbf{R_3 = 6\ \Omega}$. Find the current, power, and ΔV for each resistor *[0.5 points each]* and find ΔV_{bat} *[1 point]*. $I_3 = 12$ A, as shown on the answer sheet.

11. *[five points]* A charged particle (positive or negative, as indicated) is shot into a region containing ***either*** a uniform magnetic field or uniform electric field. On the five diagrams, the direction of the particle's velocity as it enters the region is shown, as is the direction of the field. Draw a dotted line to indicate the path that the particle will follow in each case.

12. *[four points]* A +3-C charge is fixed at the origin. A +2-C charge with mass 3 kg is held motionless 4 m away from the origin, and then released. Find the velocity of the +2-C charge when it is infinitely far away from the origin. ***Show all your work.***

Make-up Exam ANSWER SHEET
December 11, 2000
Name: _____

1. _____

2. _____

3. _____

4. _____

5. _____ ***Grade out of 4.5? Mark "X" here:*** _____

6. _____ ***Grade out of 4.5? Mark "X" here:*** _____

7. _____ ***Grade out of 4.5? Mark "X" here:*** _____

8. A) _____ B) _____ C) _____

9. i) _____ ii) _____ iii) _____ iv)_____ v)_____

10.

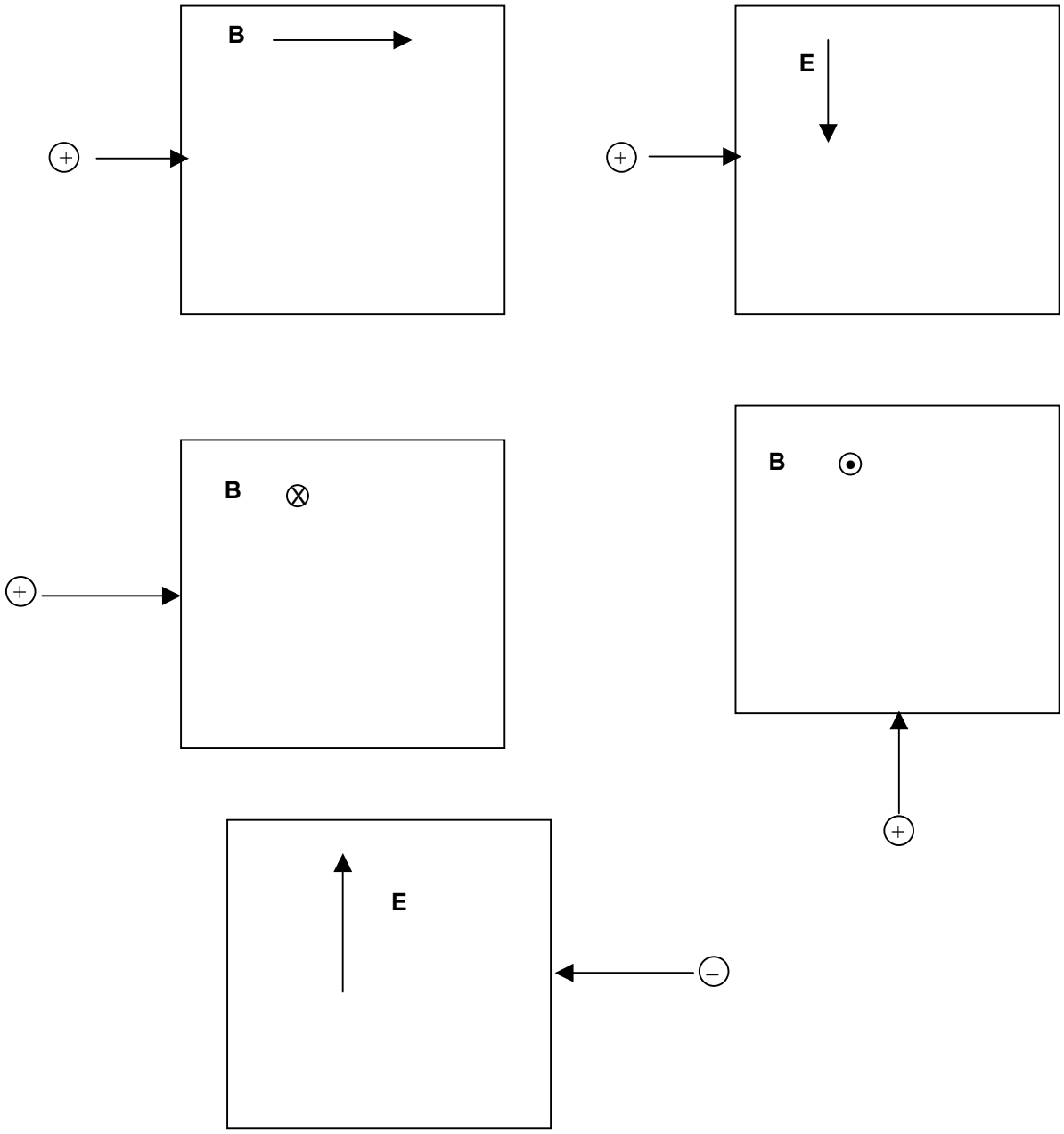
I_1 = _____ P_1 = _____ ΔV_1 = _____

I_2 = _____ P_2 = _____ ΔV_2 = _____

$I_3 = 12\ A$ P_3 = _____ ΔV_3 = _____

ΔV_{bat} = _____

11.



12.