Physics 112: Answers to Exam #2

1. **I**

2. **D** Current is larger in both parallel branches than it is in the series circuit; therefore, power dissipated by two-ohm in parallel is larger than power dissipated by two-ohm in series (using $P = I^2R$), and same is true for the five-ohm resistors. In the parallel circuit, ΔV is the same for both resistors, so more power is dissipated in the two-ohm resistor [using $P = (\Delta V)^2/R$] .

3. **D** $\Delta V_{AB} = \Delta V_{bat}$ = constant.

4. **D** $I_2 = \Delta V_{bat}/R_2$ = constant.

5. **A** Initial distance between charges is 5 m, final distance is 4 m.
$W = \Delta TE = \Delta PE = PE(final) - PE(initial) = kQq/r_{final} - kQq/r_{initial} = kQq/4 - kQq/5 = (1/20)\, kQq = (1/4)\,(kQq/5) = (1/4)\,(40\ J) = 10J.$

6. **A** The force is toward the north because the electric field points toward lower potential, and is perpendicular to the equipotential lines. The force is stronger at point B because the field is stronger there, as indicated by the tighter spacing of the equipotential lines.

7. **C** The current through R_3 is 3 A ($=\Delta V_3/R_3$), which is the same as the current throughout the whole segment including point B.

8. **A = D = E > B = C**

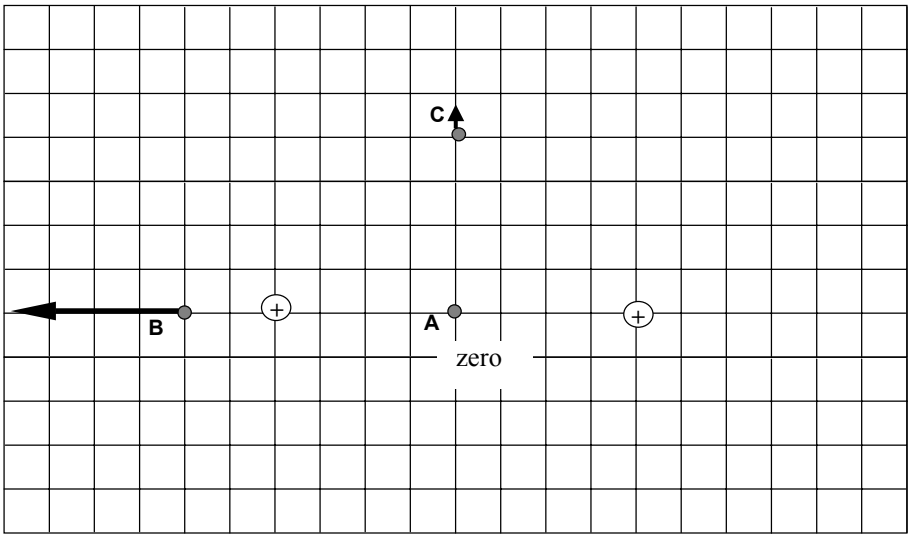
9. The potential drop across bulbs A, D, and E is the same (equal to the battery voltage), so the current through all three of them will be the same. The potential drop across bulbs B and C are both equal to half the battery voltage, so the current through those bulbs will be smaller than the other three (but equal to each other).

10. A) $I_{R3} > I_{R1} > I_{R2}$ [current splits after going through R_3, more than half goes through R_1]

    B) $\Delta V_3 > \Delta V_1$ because those two resistances are equal, and so potential difference will be proportional to the amount of current through them.

    C) $\Delta V_{bat} = \Delta V_3 + \Delta V_1$ and $\Delta V_{bat} = \Delta V_3 + \Delta V_2$, according to Kirchoff's loop rule.

11.



12. PE = qV = 0 V at left plate, so gain in PE is one box for a potential change of one volt. Therefore, the charge gains two boxes of PE, and loses two boxes of KE, for each 2-V change in potential as it moves.