*DO NOT use this as your only way of studying, this study guide does not include everything you have to know for the exam.

*For best results try replicating the exam environment as close as possible

1. A defibrillator is used to restore the resting heart rate of a patient in cardiac arrest.
    a. What current flows through a 4500 V defibrillator with a resistance of 350 Ω?
    b. How much charge moves through the defibrillator in 12 μs?
    c. How many electrons in that time?
    d. What is the power dissipated?

2.
    a. What will be the effective resistance of a 2 V circuit where 125 mA of current flows?
    b. If there are 8 resistors connected in series (all equal magnitude) what would the individual resistance of each resistor be?
    c. What if there are 4 resistors connected in parallel?

3. The molar mass of copper is 63.55 g and the density is 8.8×10^3 kg/m^3
    a. Calculate the drift velocity of a copper wire, with a diameter of 5 mm, carrying a current of 35 A, given there is one free electron per copper atom.
    b. What would be the drift velocity if the diameter was half of the original?
    c. The drift velocity of a 10 mm thick copper wire was 8.5×10^{-4} m/s, given there is one free electron per copper atom, what would the current be?

4.
    a. What is the resistance of a 200m Iron rod, having a radius of 400 cm?
    b. By what factor would the resistance change if the radius doubled?
    c. By what factor would the resistance change if the wire was cut in half?
    d. By what factor would the resistance change if both the radius doubled and the length of the wire doubled?

5. A resistor made of Gold wire is used in an application where its resistance cannot change more than 5% from its value at 15˚C. Over what temperature range can it be used?

6. To what temperature must you raise a copper wire, originally at 32˚ C, to double its resistance, neglecting any changes in dimensions?

7. What is the power dissipated by a lightbulb with an equivalent resistance of 500 Ω, where 125 C of charge move in 5 μs?

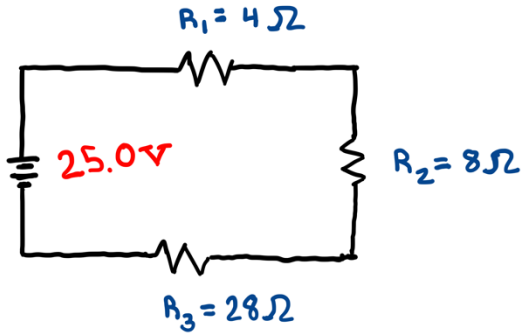
8. A 900 kg electric car is using 20 V batteries, assuming 98% efficiency for the conversion of electrical power find the following:
    a. Find the power dissipated if the car travels 40 m/s for 2 minutes.
    b. Find the current needed to be supplied from the batteries to accelerate from rest to 45 m/s in 1 minute.
    c. Find the current the battery must supply to climb a 600 m high hill in 10 minutes, while traveling at a constant velocity of 25 m/s while exerting 750 N of force to overcome air resistance and friction.
9. Every night you watch Netflix for 3 hours when you get home. Your TV consumes 250 W per hour. What is your weekly cost for running your TV if electricity costs 11 cents/kW•H?

10. Find the power loss of a a 1 Km copper wire, with a diameter of 8mm, carrying a current of 5×10^{-4} MA (Mega amps)?

Chapter 21

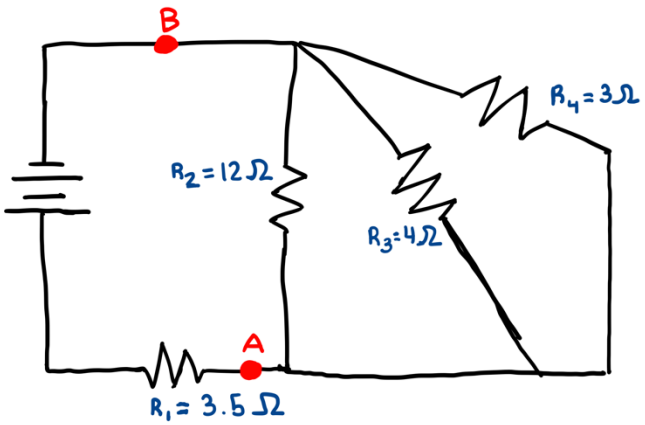
11.
    a. A car's headlight and starter are connected in parallel to one another in a 15 V system. If the headlight dissipates 50 W and the starter dissipates 3.12 kW, what current would flow through the system?
    b. If the system was connected in series, how much power would the system consume?

12. Given the circuit:



    a. What direction does the current flow?
    b. Find equivalent resistance:
    c. Find total current:
    d. Find the potential drops across R1, R2, and R3:

13. Given a circuit with an emf of 12 V:



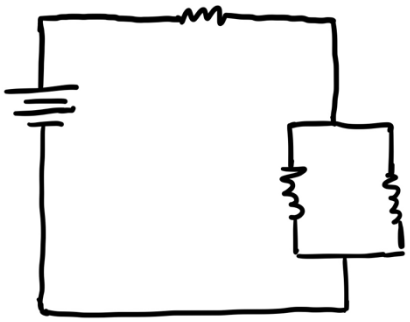
a. Find the equivalent resistance:
b. Find the current supplied in the system
c. Calculate potential drops across each resistor
d. Calculate the current flowing through each resistor
e. Is potential drop greater at A or B?

14. From the circuit above, Find the total power of the system, and the power of each individual resistor.

15. What will the output voltage be of a 5 V calculator, that draws 0.5 mA, if the internal resistance is 10 Ω?

16. A car battery has an emf of 45 V and an internal resistance of 100 mΩ
    a. Calculate the current when connected to a 15 Ω load?
    b. Calculate the terminal voltage when connected to the same 15 Ω load?

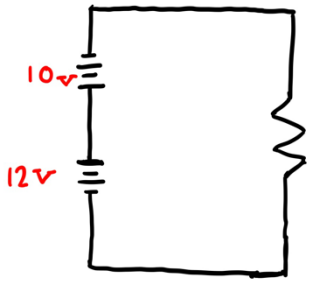
17. Given the circuit:



    a. Draw where I should connect a voltmeter across resistor 2?
        i. Why?
    b. Draw where I would connect an Ammeter to find the current after resistor 1?

i. Why?

18. What direction will the current flow in the given circuit?



19. A defibrillator has an RC time constant of 2.0 ms, what would the resistance be when the defibrillator has 15 μF capacitance?