Contents

Due date: Fri Feb 3 03:00:00 pm 2017 (CST)

Suppose that a **1600 kg** car is accelerated to **65 mph** in **5 s**. *Reference:*Course Notes

How much kinetic energy does the speeding auto contain?
Energy (J) = [ ]

What is the energy stored in units of kilo-calories?
Energy (kcal) = [ ]

Tries 0/6

Suppose that a **73 kg** student runs up the steps of ECEB (16 feet elevation) to visit the advising office. *Reference:*Course Notes

What is the minimum amount of energy expended by the student?
Energy (kcal) = [ ]

Tries 0/6

If a resistor of **9 kOhms** is specified to have a maximum power dissipation of **0.25 Watts**, what is the maximum current it can safely handle without damage?

[ ] (mA)

Tries 0/8

What is the power dissipated by this resistor with a **9-V** drop across it? [ ] (Watts)

Tries 0/8

What is the energy stored in a **1.7 nF** capacitor charged to **4 V**? [ ] Joules

Tries 0/8

At what voltage would a **7 μF** capacitor have the energy to lift **5 grams** by **1 cm**?

[ ] V

Tries 0/8

A resistor of **22 kOhms** has **10 volts** applied across it. What is the value of the current through the resistor?
[ ] amps

Tries 0/6

Problems like those on this page will not appear on any exam in ECE110 this semester.
a) I have read the University Student Code on Academic Integrity (e.g. Article 1, Part 4), and I understand that I must only submit personal work when, for example (but not limited to), submitting answers to online homework problems, or when taking written examinations:

9. **A** YES **B** NO
In the student code, calculators are allowed on exams unless otherwise specified.

10. **A** TRUE **B** FALSE
Tries 0/6

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b) Which item in the IEEE Code of Ethics is most-strongly applicable in each of the following scenarios? **This question is somewhat subjective. There may be more than one related answer. It is an exercise you can answer by focusing on the details given by the scenario. Please do not be put off if it requires several tries before you hit on the answer we selected as most applicable.**

Choices: **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**, **10**.

- Timmy Tesla listens to Tommy Edivan brag that he clicked "YES" to the previous answer without even looking at the Student Code. Timmy says nothing to Tommy.

Tries 0/6

Choices: **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**, **10**.

- Wally Westingshack copies an answer from Timmy Tesla during an exam.

Tries 0/6

Choices: **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**, **10**.

- Sandy Seashore tells her lab partner, Betty, that she should keep her hands off the equipment since Betty only seems to "keep screwing things up". In reality, Betty has shown herself to be just as capable as Sandy. Betty is devastated and is considering dropping the course.

Tries 0/6

At the end of each lab procedure, you will find a rubric where you can do an (un-graded) self-assessment of your performance on that exercise. Which of the following is **not** a section of the lab report rubric?

A. Programming
B. Modeling
C. Measurements
D. Computations
E. Analysis
F. Conclusion

Tries 0/2

A certain relay draws **200 mA** with **9 V** applied.

What is the power consumption of the relay's coil? [ ] (Watts)

Tries 0/6

For how long can an *Energizer 522* 9-V battery operate such a relay? Assume a battery capacity of **500 mAh**. [ ] (seconds)

Tries 0/6

What is a good estimate of the coil's resistance? [ ] (Ohms)

Tries 0/6

If a battery is labeled at **6 V** and **1200 mAh**, how much energy does it store? [ ] J

Tries 0/6

This same battery runs a small DC motor for **120 minutes** before it is drained. How much current does the motor seem to have drawn from the battery?

[ ] mA

Tries 0/6

Comment: Realistic problems often provide values in non-SI units and with varying degrees of precision. You might use a calculator for this problem.

You wish to make **15 ohm** electric heating coil from 18 gauge nichrome wire. The resistivity of nichrome is **1E-4 ohm-cm** and the cross-sectional area of 18 gauge wire is **0.001276 in^2**.

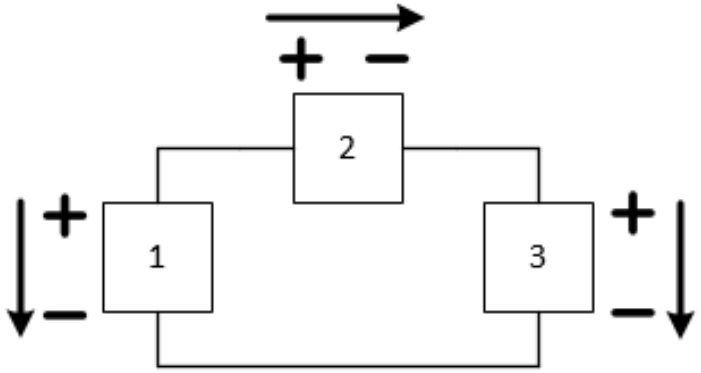
What length of wire in meters is needed? [ ] (meters)

Tries 0/6

What is the power dissipated with a current of 11 amps drawn through this wire? [ ] (Watts)

Tries 0/6

The polarities of the voltage and current for elements 1-3 are shown in the figure below.



v_1 = -15 V v_3 = 2 V i_2 = -4 A

a) Use Kirchhoff's Voltage Law to determine the voltage v2 in the circuit above (in volts). ☐ V

Tries 0/6

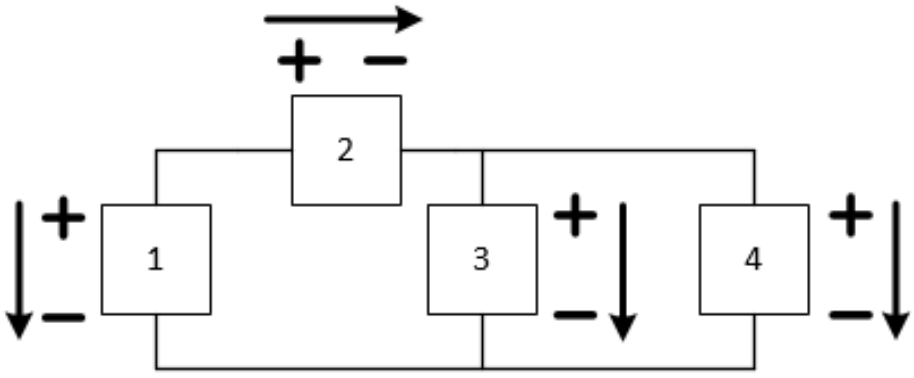
b) Use Kirchhoff's Current Law to determine the current i1 in the circuit above (in amps). ☐ A

Tries 0/6

c) Use Kirchhoff's Current Law to determine the current i3 in the circuit above (in amps). ☐ A

Tries 0/6

The polarities of the current and voltage are indicated for each circuit element, 1-4, below. Answer the following questions with respect to the indicated polarities.



v_1 = -10 V, v_4 = 21 V i_2 = 5 A, i_3 = 3 A

a) Use Kirchhoff's Voltage Law to determine the voltage v_3 in the circuit above (in volts). ☐ V

b) Use Kirchhoff's Voltage Law to determine the voltage v_2 in the circuit above (in volts). ☐ V

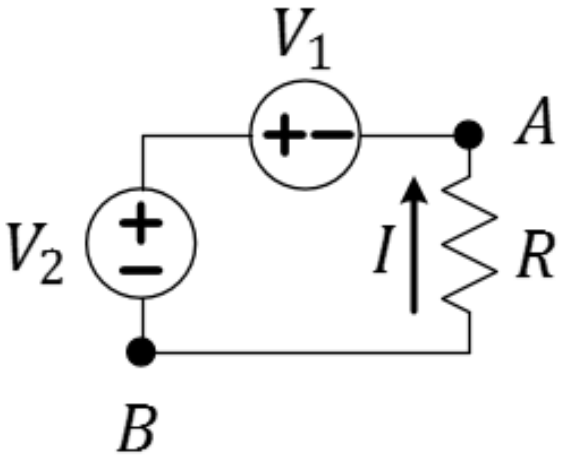
Tries 0/6

c) Use Kirchhoff's Current Law to determine the current i_1 in the circuit above (in amps). ☐ A

c) Use Kirchhoff's Current Law to determine the current i_4 in the circuit above (in amps). ☐ A

Tries 0/6

The circuit below contains two ideal voltage sources:



V_1 = 4 V V_2 = -11 V R = 3 ohm

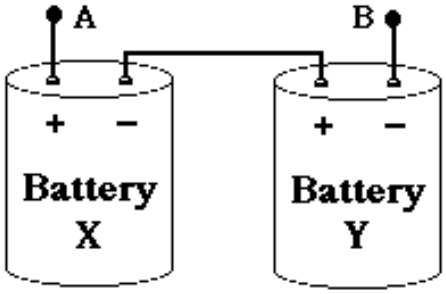
a) Use Kirchhoff's Voltage Law to determine the voltage V_{AB} in the circuit above (in volts). V_{AB} is the voltage drop from node A to node B, also stated as "the voltage at node A *relative* to node B".
V_{AB} = ☐ V

Tries 0/6

b) Use Ohm's Law to determine the current I in the circuit above (in amps).
I = ☐ A

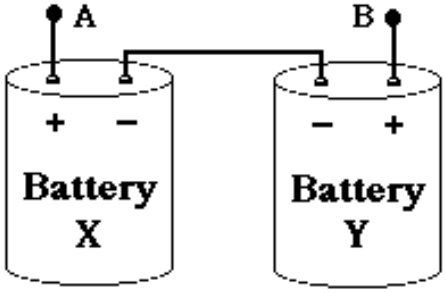
Tries 0/6

The figures below show battery X and battery Y connected together two different ways. Battery X is a **13 volts** battery and battery Y is a **12 volts** battery. Determine the voltage v_{AB} for each configuration. HINT: It may help to label the wire connecting the two batteries as node 'C'.



(a)

v_{AB} (V) = [ ]
Tries 0/6



(b)

v_{AB} (V) = [ ]
Tries 0/6

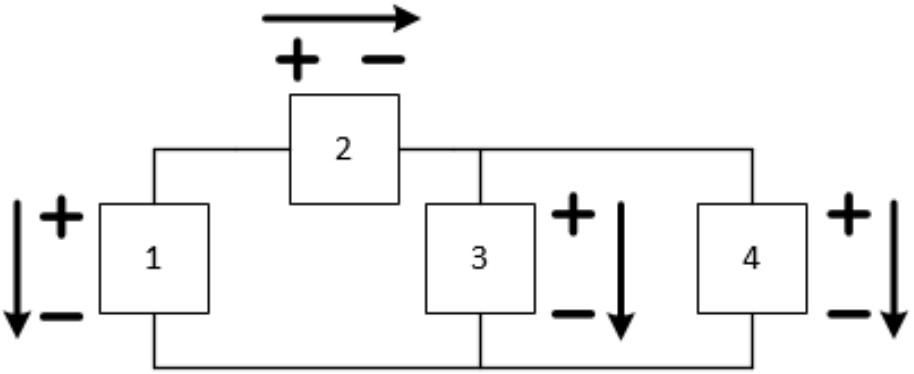
An electric wheelchair is powered by **two 12 V** lead acid batteries. Each battery has an energy capacity of **600 W-hrs**. These two batteries operate an electric motor rated at a maximum output power (useful power to the wheels) of **1 hp** (horsepower). The motor has an efficiency rating of **72%**. Assuming that the batteries are fully charged and that the motor is running at maximum power, how many minutes can the batteries power the motor before they must be recharged?
In this problem, we are asking all intermediate steps. In later problems, you will need to recognize useful intermediate steps on your own.
a) When operating from fully charged to fully discharged, what is the energy produced by the source?
Energy produced = [ ] (in Watts-hour)
Tries 0/6

b) What is the useful energy dissipated by the motor? (take the efficiency ratio into account!)
Useful energy dissipated = [ ] (in Watts-hour)
Tries 0/6

c) What is the useful output power of the motor in Watts?
Power = [ ] (in Watts)
Tries 0/6

d) For how long will the motor run?
Time = [ ] (in minutes)
Tries 0/6

In the laboratory, and for many topics in the lecture, it will be very useful to recognize series and parallel connections.



Answer the following questions for the circuit above.

Element 1 and Element 2 are in series:

A. Yes
B. No

Element 2 and Element 3 are in series:

A. Yes
B. No

Tries 0/6

Element 1 and Element 3 are in parallel:

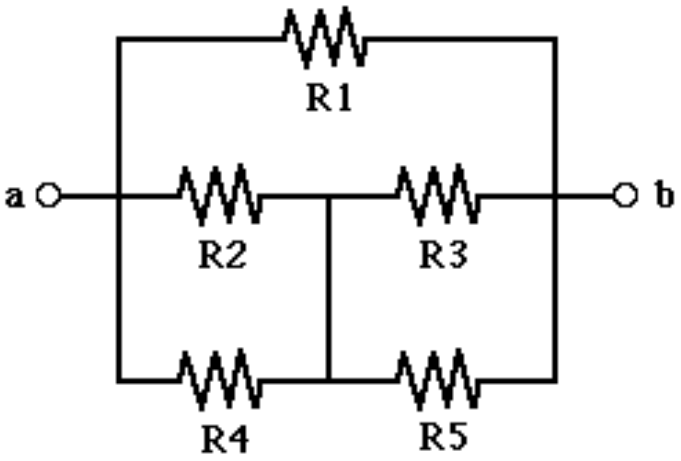
A. Yes
B. No

Element 3 and Element 4 are in parallel:

A. Yes
B. No

Tries 0/6

One could imagine a voltage source (battery) is connected between the nodes a and b to supply power to the set of resistances.



Answer the following questions for the circuit above.

Element R1 and Element R2 are in series:

A. Yes
B. No

Element R2 and Element R3 are in series:

A. Yes
B. No

Tries 0/6

Element R1 and Element R3 are in parallel:

A. Yes
B. No

Element R2 and Element R4 are in parallel:

A. Yes
B. No

Tries 0/6

