Name:_____ Instructor:_____ ENGR 120 - Exam 1
Section:_____ 10/6/2014

Allowed Materials: *F.E. approved calculator(s) see syllabus; pencils and/or pens.* ExamForm := 13

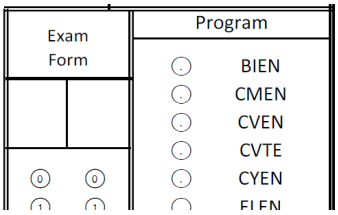
Honor Statement: *On my honor, I promise that I have not received any unauthorized assistance on this exam (I didn't look at another student's paper, I didn't view any unauthorized written materials, I didn't talk or listen to another student, I didn't use an unauthorized calculator, I didn't use any electronic device, any visual or auditory signals, or any other techniques of exchanging information with others.) I have maintained the highest standards of academic integrity while completing this exam.*

*Signed:*_____

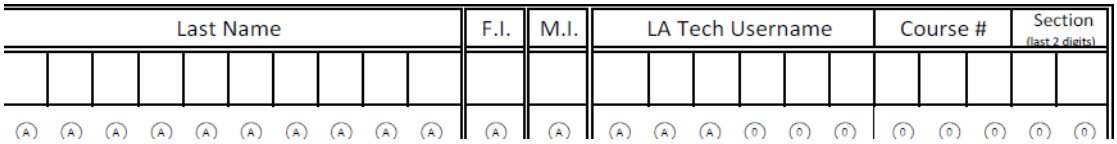
0. *(5 point deduction for failure to complete this problem!)*

- Write in all of the indicated information in the boxes of your response form.
- Darken the appropriate circles to encode the corresponding information.
- Write your name on this exam and sign the Honor Statement.

Notes:
- If your last name is too long, just write the first 10 letters.
- "**F.I.**" and "**M.I.**" are your first and middle initials, respectively
- Your **"Username"** is the first part of your LATech email address
- For **"Section"** use the guide provided to the right
- Your **"Exam Form"** is printed on the upper right corner of this page.
- Indicate "ENGR" as the **"Program"**



Bubble:	For Course Section:	
91	H01 - Cronk	TR 2-3:50
92	H02 - Swanbom	TR 8-9:50
93	H03 - Cronk	MW 2-3:50
94	H04 - Harbour	MW 4-5:50
95	H05 - Reeves	TR10-11:50
96	H06 - Easley	MW10-11:50
97	H07 - Harbour	MW12-1:50
01	001 - Reis	MW10-11:50
02	002 - Orr	MW 2-3:50
03	003 - Hall/Pathak	TR 2-3:50
04	004 - Wallace	MW 8-9:50
05	005 - Reeves	TR 4-5:50
06	006 - Dressel	TR 12-1:50
07	007 - Tranter	MW 12-1:50
08	008 - Reis	MW 4-5:50
09	009 - Wallace	TR 12-1:50



1. (3 points) The color code for a 567 Ω resistor is:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"Red, red, brown"} \\ \text{"B"} & \text{"No color code exists for this number"} \\ \text{"C"} & \text{"Violet, blue, green"} \\ \text{"D"} & \text{"Blue, green, violet"} \\ \text{"E"} & \text{"Yellow, violet, brown"} \\ \text{"F"} & \text{"Green, blue, violet"} \end{pmatrix}$$

2. (3 points) You are given two resistors in parallel with each other. Both resistors have the same value of resistance. Which of the following are true statements?

1. Each resistor carries the same current.
2. Each resistor has the same voltage drop across it.
3. The value of the equivalent resistance is greater than the value of either of the individual resistors.
4. Each resistor has a different current.
5. Each resistor has a different voltage drop across it.
6. The value of the equivalent resistance is less than the value of either of the individual resistors.

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"2 and 6"} \\ \text{"B"} & \text{"1, 2, and 6"} \\ \text{"C"} & \text{"4, 5, and 6"} \\ \text{"D"} & \text{"1 and 6"} \\ \text{"E"} & \text{"3 and 5"} \\ \text{"F"} & \text{"4 and 5"} \\ \text{"G"} & \text{"1 and 3"} \\ \text{"H"} & \text{"3, 4, and 5"} \\ \text{"I"} & \text{"4 and 6"} \\ \text{"J"} & \text{"1, 2, and 3"} \end{pmatrix}$$

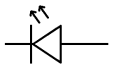
3. (3 points) The feature you use in SolidWorks to setting dimensions of a part is:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{Fillet} \\ \text{"B"} & \text{Set Measurements} \\ \text{"C"} & \text{Revolve} \\ \text{"D"} & \text{Smart Dimensions} \\ \text{"E"} & \text{Dimensional Analysis} \\ \text{"F"} & \text{Assembly} \\ \text{"G"} & \text{Set Dimensions} \\ \text{"H"} & \text{Extrude} \end{pmatrix}$$

4. (3 points) A friend of yours is reporting a measurement using the units of (volts*volts)/ohms. As you chuckle at his naiveté, you gently point out that the measurement should instead be reported in units of :

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"Coulombs/second"} \\ \text{"B"} & \text{"Seconds"} \\ \text{"C"} & \text{"Volts"} \\ \text{"D"} & \text{"Joules"} \\ \text{"E"} & \text{"Electrons"} \\ \text{"F"} & \text{"Coulombs"} \\ \text{"G"} & \text{"Watts"} \\ \text{"H"} & \text{"Ohms"} \\ \text{"I"} & \text{"Amps"} \end{pmatrix}$$

5. (3 points) When you see a schematic diagram that contains the following element, you know that it would physically be represented by a:



$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"Battery"} \\ \text{"B"} & \text{"Resistor"} \\ \text{"C"} & \text{"Voltage source"} \\ \text{"D"} & \text{"Photoresistor"} \\ \text{"E"} & \text{"Don't know; we haven't covered this in ENGR 120"} \\ \text{"F"} & \text{"Multimeter set to measure voltage"} \\ \text{"G"} & \text{"Multimeter set to measure current"} \\ \text{"H"} & \text{"LED"} \end{pmatrix}$$

6. (3 points) Which of the following is NOT a true statement about the Arduino Uno:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"Digital pins can be used for both input and output."} \\ \text{"B"} & \text{"Analog pins can only be used for input."} \\ \text{"C"} & \text{"All Gnd (ground) pins do the same thing."} \\ \text{"D"} & \text{"A circuit can be powered from the Arduino with 3.3 V or 5 V."} \\ \text{"E"} & \text{"The Arduino can only be powered by a volltage of 9 V."} \\ \text{"F"} & \text{"The Arduino has more digital pins than analog pins."} \\ \text{"G"} & \text{"It is a bad idea to connect a 5 V pin directly to a Gnd (ground) pin."} \end{pmatrix}$$

7. (3 points) You want to make your robot turn to the LEFT as quickly as possible. The best way to do that under program control is:

Choices =

"A"	"Use writeMicroseconds(1000) to both servos"
"B"	"Pick up the robot and turn it yourself."
"C"	"Use writeMicroseconds(2000) to both servos"
"D"	"Don't use writeMicroseconds at all; that just makes them mad."
"E"	"Use writeMicroseconds(1000) to the right servo and (2000) to the left"
"F"	"Use writeMicroseconds(2000) to the right servo and (1000) to the left"
"G"	"Don't know; we just like to watch the robots go straight."

8. (3 points) You have just been shipwrecked on a deserted island, and need a conductor to complete a circuit that will let you send a distress signal via Morse code wirelessly to the mainland. Looking at your available resources, which would be the best choice?

Choices =

"A"	"Fedex package that washed ashore"
"B"	"Gold wedding ring"
"C"	"Not enough information; we haven't covered shipwrecks in ENGR 120 yet."
"D"	"Coconut from a coconut tree"
"E"	"Glass from your telescope"
"F"	"Piece of a rubber raft"
"G"	"Piece of a paper treasure map that you bought off Ebay, like an idiot"
"H"	"Piece of bark from a coconut tree"
"I"	"Volleyball with a faded but still somewhat creepy face drawn on it"
"J"	"Banana"

9. (3 points) The code below should make an LED connected to Pin 2 blink four times per second. Identify the line(s) with mistakes that will keep the code from working correctly.

```
1    void setup()
2       {
3      pinMode(2, INPUT);
4      }
5    void loop()
6       {
7       digitalWrite(2, HIGH);
8       delay(125);
9       digitalWrite(2, LOW);
10      delay(125);
11      }
```

Choices =

"A"	"Line 5"
"B"	"We haven't covered blinking LED's"
"C"	"Lines 3, 7, and 9"
"D"	"Line 11"
"E"	"Lines 8 and 10"
"F"	"Line 1"
"G"	"Line 3"
"H"	"No mistakes"

10. (3 points) Identify the reason we should put a large resistor in series with the whisker on our robots:

1. It costs the same as a small resistor, so why not?
2. We aren't supposed to use a large resistor in the circuit; this must be a trick question.
3. We want to limit the voltage drop across the resistor to extend the life of the battery.
4. We want to limit the current through the resistor to extend the life of the battery.
5. The resistors are all the same size, aren't they? Are you trying to confuse us?
6. The whiskers are pretty large, so a small resistor would just be too intimidated to work.
7. Don't know; we haven't covered this in ENGR 120 yet.

Choices =

"A"	5
"B"	6
"C"	4
"D"	7
"E"	2
"F"	3
"G"	1

11. (5 points) A researcher has lost her scale in the lab and needs to know the mass of tissue samples collected. Each of the samples, once pulverized, fills up a small petri dish with a radius of 5 cm and a height of 10 cm. What formula could the researcher enter into cell C6, that can be copied downward to cells C7 through C9, to correctly calculate the mass for each sample?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"=B2*B3^2*B4*\$B\$6"} \\ \text{"B"} & \text{"=B2*B3^2*B4*B6"} \\ \text{"C"} & \text{"=\$B\$2*\$B\$3^2*\$B\$4*B6"} \\ \text{"D"} & \text{"=\$B2*\$B\$3^2*\$B4*B6"} \\ \text{"E"} & \text{"=B\$2*B\$3^2*B\$4*B\$6"} \\ \text{"F"} & \text{"=\$B2*\$B3^2*\$B4*B6"} \end{pmatrix}$$

$$Volume = \pi \cdot (radius)^2 \cdot height$$

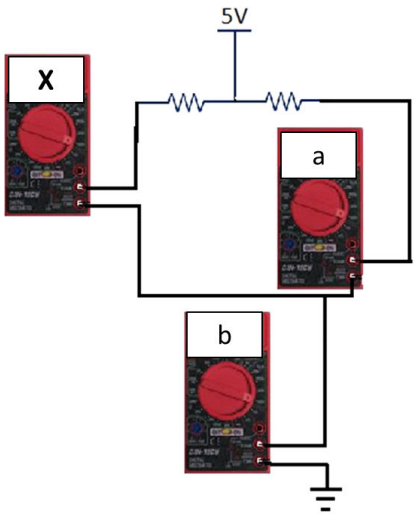
$$Mass = density \cdot volume$$

	A	B	C
1	constants		
2	Pi	3.14159265359	
3	Radius (cm)	5	
4	Height (cm)	10	
5	**Type**	**Average Density (g/cm^3)**	**mass (g)**
6	Blood	1.0428	819.01
7	Bone	1.75	
8	Fat	0.9094	
9	Muscle	1.0599	
10			
11			

12. (5 points) Using the circuit and information given below, the value you expect to be displayed by "X" is closest to: :

$a = 53.2 \cdot mA$

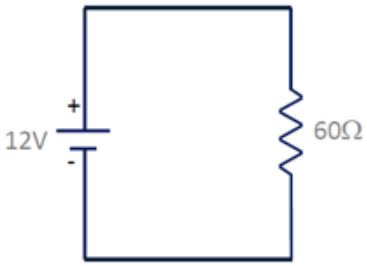
$b = 99 \cdot mA$



$$\text{Choices} = \begin{pmatrix} \text{"A"} & -45.8 \\ \text{"B"} & 45.8 \\ \text{"C"} & 1.9 \\ \text{"D"} & 152.2 \\ \text{"E"} & 5.3 \times 10^3 \\ \text{"F"} & \text{"0 because the fuse will blow"} \end{pmatrix} \cdot mA$$

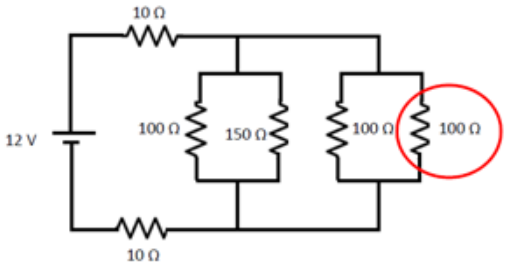
13. (5 points) Suppose the net number of electrons that leave the negative side of the battery is 1.87 x10^{20} The length of time that this circuit is in operation is closest to ...

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 2.0 \\ \text{"B"} & 1.0 \\ \text{"C"} & 1.5 \\ \text{"D"} & 0.5 \\ \text{"E"} & 4.5 \\ \text{"F"} & 3.0 \\ \text{"G"} & 3.5 \\ \text{"H"} & 4.0 \\ \text{"I"} & 2.5 \end{pmatrix} \text{minutes}$$



14. (5 points) The voltage across the circled resistor in the circuit shown below is closest to:

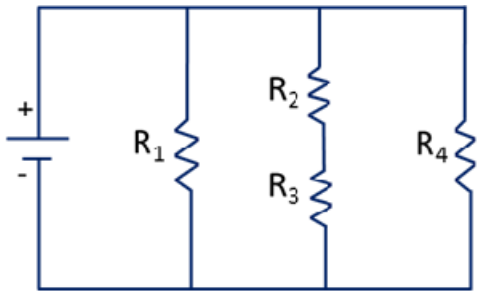
$$\text{Choices} = \begin{pmatrix} \text{"A"} & 18 \\ \text{"B"} & 12 \\ \text{"C"} & 6.9 \\ \text{"D"} & 14 \\ \text{"E"} & 4.5 \\ \text{"F"} & 1.8 \\ \text{"G"} & 7.2 \\ \text{"H"} & 9.0 \end{pmatrix} \text{V}$$



15. (5 points) With the given resistor values, what is the power being dissipated by R_3?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 106.4 \\ \text{"B"} & 116.1 \\ \text{"C"} & 125.6 \\ \text{"D"} & 135.2 \\ \text{"E"} & 144.7 \\ \text{"F"} & 154.2 \\ \text{"G"} & 163.8 \\ \text{"H"} & 173.4 \end{pmatrix} \cdot \text{mW}$$

$V_{source} = 16\,V$



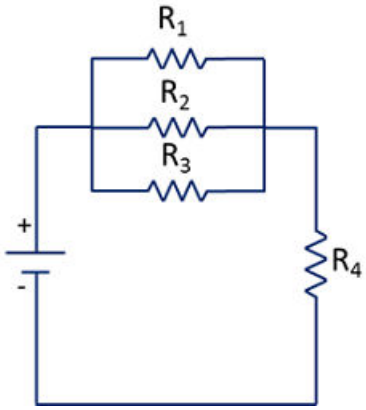
$R_1 = 230\,\Omega$ $R_3 = 230\,\Omega$

$R_2 = 430\,\Omega$ $R_4 = 440\,\Omega$

16. (5 points) With the given resistor values, what is the voltage drop across R_1?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 1.904 \\ \text{"B"} & 2.071 \\ \text{"C"} & 2.237 \\ \text{"D"} & 2.404 \\ \text{"E"} & 2.569 \\ \text{"F"} & 2.735 \\ \text{"G"} & 2.902 \\ \text{"H"} & 3.067 \end{pmatrix} \text{V}$$

$V_{source} = 16\,V$

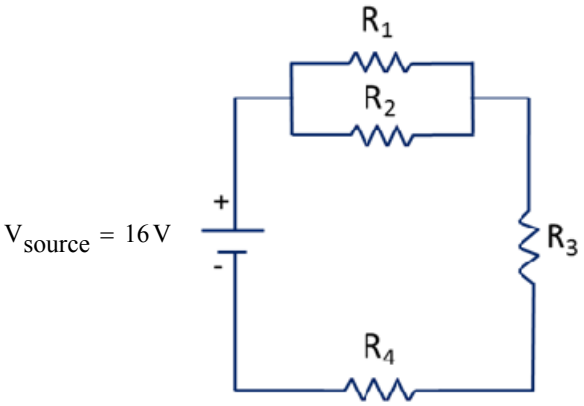


$R_1 = 230\,\Omega$ $R_3 = 230\,\Omega$

$R_2 = 430\,\Omega$ $R_4 = 440\,\Omega$

17. (5 points) With the following resistor values, what is the current through R3?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 12.4 \\ \text{"B"} & 13.6 \\ \text{"C"} & 14.76 \\ \text{"D"} & 15.95 \\ \text{"E"} & 17.15 \\ \text{"F"} & 18.33 \\ \text{"G"} & 19.52 \\ \text{"H"} & 20.7 \end{pmatrix} \cdot \text{mA}$$



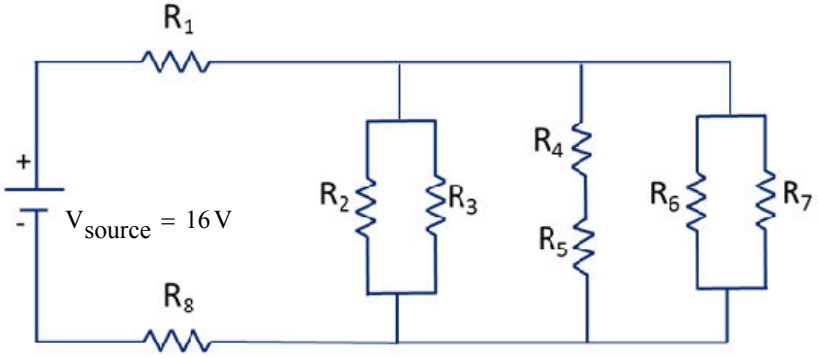
$V_{source} = 16\,V$

$R_1 = 230\,\Omega$ $R_3 = 230\,\Omega$

$R_2 = 430\,\Omega$ $R_4 = 440\,\Omega$

18. (5 points) With the given resistor values, what is the power being dissipated by R_7?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 4.283 \\ \text{"B"} & 4.582 \\ \text{"C"} & 4.877 \\ \text{"D"} & 5.172 \\ \text{"E"} & 5.471 \\ \text{"F"} & 5.768 \\ \text{"G"} & 6.058 \\ \text{"H"} & 6.358 \end{pmatrix} \cdot \text{mW}$$



$R_1 = 230\,\Omega$ $R_3 = 430\,\Omega$ $R_5 = 230\,\Omega$ $R_7 = 440\,\Omega$

$R_2 = 230\,\Omega$ $R_4 = 430\,\Omega$ $R_6 = 230\,\Omega$ $R_8 = 440\,\Omega$

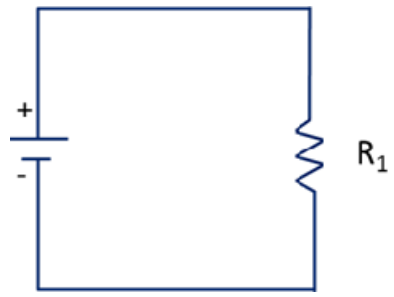
19. (5 points) You build the circuit shown below on your arduino and breadboard. The battery pack provides the steady voltage given below. If you leave the circuit closed while you spend "h" hours at the football game, how many electrons will have left the negative battery terminal during that time period?

The number of electrons is closest to . . .

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 7.786 \times 10^{21} \\ \text{"B"} & 8.223 \times 10^{21} \\ \text{"C"} & 8.665 \times 10^{21} \\ \text{"D"} & 9.103 \times 10^{21} \\ \text{"E"} & 9.545 \times 10^{21} \\ \text{"F"} & 9.984 \times 10^{21} \\ \text{"G"} & 1.043 \times 10^{22} \\ \text{"H"} & 1.086 \times 10^{22} \end{pmatrix}$$

$V_{source} = 3\,V$

$h = 4.5 \cdot hr$



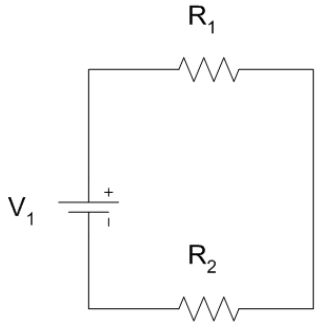
$R_1 = 35\,\Omega$

20. (5 points) If $I = 211 \cdot mA$ leaves the voltage source, the voltage drop across R_1 is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 8.020 \\ \text{"B"} & 8.576 \\ \text{"C"} & 9.117 \\ \text{"D"} & 9.674 \\ \text{"E"} & 10.217 \\ \text{"F"} & 10.761 \\ \text{"G"} & 11.305 \\ \text{"H"} & 11.854 \\ \text{"I"} & 12.397 \\ \text{"J"} & 12.945 \end{pmatrix} \cdot V$$

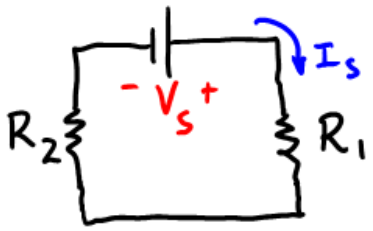
$R_1 = 51\,\Omega$

$R_2 = 110\,\Omega$



21. (5 points) The equivalent resistance of the resistor network shown is closest to:

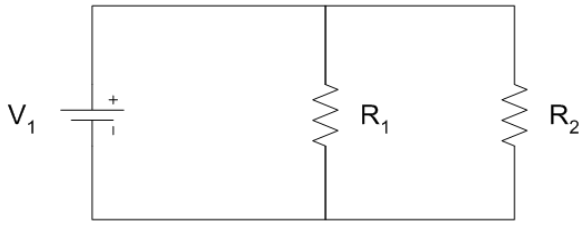
$$\text{Choices} = \begin{pmatrix} \text{"A"} & 541 \\ \text{"B"} & 637 \\ \text{"C"} & 733 \\ \text{"D"} & 829 \\ \text{"E"} & 2729 \\ \text{"F"} & 2884 \\ \text{"G"} & 3038 \\ \text{"H"} & 3192 \\ \text{"I"} & 3345 \\ \text{"J"} & 3500 \end{pmatrix} \cdot \Omega$$



$R_2 = 908\,\Omega$ $R_1 = 2.13 \cdot k\Omega$

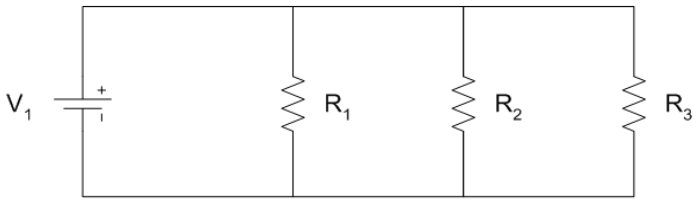
22. (5 points) The equivalent resistance of the resistor network shown is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 55.0 \\ \text{"B"} & 57.9 \\ \text{"C"} & 60.8 \\ \text{"D"} & 63.8 \\ \text{"E"} & 66.7 \\ \text{"F"} & 205.5 \\ \text{"G"} & 218.0 \\ \text{"H"} & 230.1 \\ \text{"I"} & 242.5 \\ \text{"J"} & 254.9 \end{pmatrix} \cdot \Omega$$



$R_1 = 147\,\Omega$ $R_2 = 95.5\,\Omega$

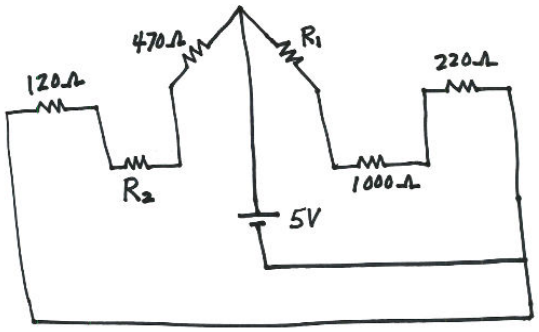
23. (5 points) The resistor network shown consumes $P = 4 \cdot W$ of power. The voltage of the battery (V_1) is closest to:



$R_1 = 48\,\Omega \qquad R_2 = 21\,\Omega \qquad R_3 = 48\,\Omega$

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 6.35 \\ \text{"B"} & 6.69 \\ \text{"C"} & 7.03 \\ \text{"D"} & 7.37 \\ \text{"E"} & 7.71 \\ \text{"F"} & 8.05 \\ \text{"G"} & 8.39 \\ \text{"H"} & 8.72 \\ \text{"I"} & 9.07 \\ \text{"J"} & 9.40 \end{pmatrix} \cdot V$$

24. (5 points) The current leaving the 5V source is closest to:

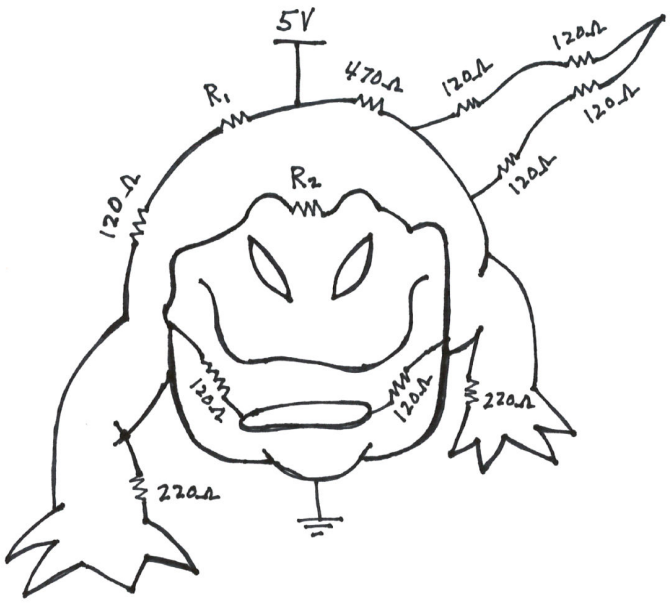


$R_2 = 530\,\Omega \qquad R_1 = 580\,\Omega$

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 7.24 \\ \text{"B"} & 7.61 \\ \text{"C"} & 7.98 \\ \text{"D"} & 8.34 \\ \text{"E"} & 8.72 \\ \text{"F"} & 9.08 \\ \text{"G"} & 9.45 \\ \text{"H"} & 9.80 \\ \text{"I"} & 10.19 \\ \text{"J"} & 10.56 \end{pmatrix} \cdot mA$$

25. (5 points) Sparky the electric alligator is a circuit represented by this diagram. The amount of electrical energy this hungry alligator consumes over a $t = 5 \cdot \text{min}$ period is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 17.7 \\ \text{"B"} & 18.7 \\ \text{"C"} & 19.7 \\ \text{"D"} & 20.7 \\ \text{"E"} & 21.7 \\ \text{"F"} & 22.7 \\ \text{"G"} & 23.7 \\ \text{"H"} & 24.7 \\ \text{"I"} & 25.7 \\ \text{"J"} & 26.7 \end{pmatrix} \cdot \text{J}$$



$R_1 = 510\,\Omega$ $R_2 = 440\,\Omega$

YOUR EXAM FORM IS:

ExamForm = 13

Reference Information:

1 coulomb = $6.24(10)^{18}$ electrons

Avogadro's Number = $6.022(10)^{23}$ per mol

1 inch = 2.54 cm

$Cu = 1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^{10}\ 4s^1$

color	digit
black	0
brown	1
red	2
orange	3
yellow	4
green	5
blue	6
violet	7
gray	8
white	9

151 ENGR120 Exam 1

ExamForm = 13

Key =

	1
1	"B"
2	"B"
3	"A"
4	"G"
5	"D"
6	"E"
7	"A"
8	"B"
9	"G"
10	"C"
11	"C"
12	"B"
13	"D"
14	"G"
15	"D"
16	"F"
17	"G"
18	"C"
19	"C"
20	"F"
21	"G"
22	"B"
23	"B"
24	"A"
25	"C"