Name:_____ Instructor:_____ ENGR 121 - Exam 1
Section:_____ January 16, 2018

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

ExamForm := 11

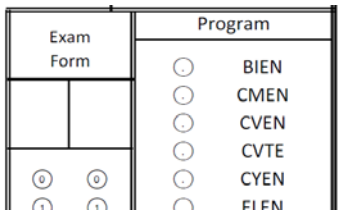
Honor Statement: *On my honor, I promise that I have not received any unauthorized assistance on this exam (I didn't look at another student's paper, I didn't view any unauthorized written materials, I didn't talk or listen to another student, I didn't use an unauthorized calculator, I didn't use any 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:*_____

1. *(2 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 - Easley	TR 8-9:50
92	H02 - Cronk	TR 2-3:50
93	H03 - Swanbom	MW 2-3:50
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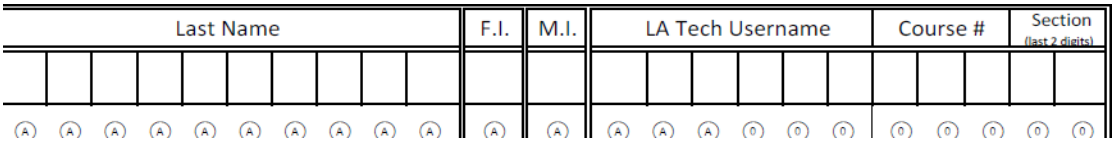
06	006 - Bhattarai	TR 4-5:50



$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"I properly completed all required items in problem 1, so I will not lose these points"} \\ \text{"B"} & \text{"I did not properly complete problem 1 because I am fine with losing these points."} \end{pmatrix}$$

2. (3 points) When executing a sketch on your Arduino, what data type should be used when dealing with decimal numbers (in cases where data truncation is to be avoided)?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"char"} \\ \text{"B"} & \text{"boolean"} \\ \text{"C"} & \text{"pointer"} \\ \text{"D"} & \text{"array"} \\ \text{"E"} & \text{"float"} \\ \text{"F"} & \text{"int"} \\ \text{"G"} & \text{"string"} \\ \text{"H"} & \text{"long"} \end{pmatrix}$$

3. (3 points) Which of the binary numbers shown is the correct representation of the base-10 number 156?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"11001100"} \\ \text{"B"} & \text{"11100100"} \\ \text{"C"} & \text{"10101100"} \\ \text{"D"} & \text{"10011100"} \\ \text{"E"} & \text{"10101010"} \\ \text{"F"} & \text{"11010110"} \\ \text{"G"} & \text{"10010100"} \\ \text{"H"} & \text{"10011010"} \end{pmatrix}$$

4. (3 points) If the calibration equation for a thermistor is:

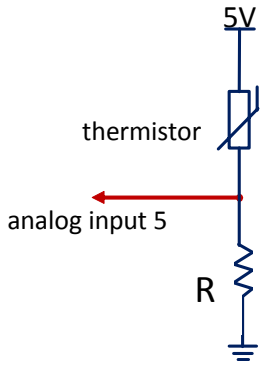
$$\text{AnalogValue} = 9.2025 \cdot \text{Temperature} + 279.83$$

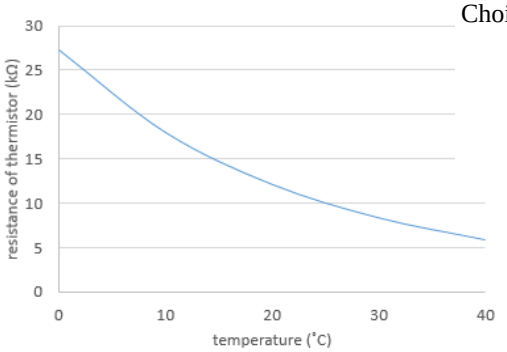
then the temperature (in °C) corresponding to an analog value of 500 is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 16.678 \\ \text{"B"} & 18.104 \\ \text{"C"} & 19.574 \\ \text{"D"} & 21.029 \\ \text{"E"} & 22.471 \\ \text{"F"} & 23.925 \\ \text{"G"} & 25.373 \\ \text{"H"} & 26.837 \end{pmatrix} \text{ °C}$$

5. (3 points) In the circuit below, as the ambient temprature decreases:

the resistance of the thermister_____,
the drop across the resistor R _____, and
the analog read value _____.





$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"increases, decreases, decreases"} \\ \text{"B"} & \text{"decreases, increases, increases"} \\ \text{"C"} & \text{"increases, increases, increases"} \\ \text{"D"} & \text{"decreases, decreases, decreases"} \\ \text{"E"} & \text{"decreases, decreases, increases"} \\ \text{"F"} & \text{"increases, decreases, increases"} \\ \text{"G"} & \text{"decreases, increases, decreases"} \\ \text{"H"} & \text{"increases, increases, decreases"} \end{pmatrix}$$

6. (3 points) N-type semiconductor materials can be obtained by doping silicon (which is in column 14 of the periodic table) with elements in _____ of the periodic table, such as _____.

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"Row 13, Boron "} \\ \text{"B"} & \text{"Column 15, Phosphorus "} \\ \text{"C"} & \text{"Row 14, Arsenic"} \\ \text{"D"} & \text{"Column 15, Boron "} \\ \text{"E"} & \text{"Column 14, Phosphorus"} \\ \text{"F"} & \text{"Column 13, Boron"} \\ \text{"G"} & \text{"Column 13, Arsenic "} \\ \text{"H"} & \text{"Row 15, Phosphorus"} \end{pmatrix}$$

7. (3 points) The electric current required to close the contacts on a relay is called the _____.

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"relay rating"} \\ \text{"B"} & \text{"minimum current"} \\ \text{"C"} & \text{"contact current "} \\ \text{"D"} & \text{"rated current"} \\ \text{"E"} & \text{"contact rating"} \\ \text{"F"} & \text{"coil current"} \\ \text{"G"} & \text{"relay current"} \\ \text{"H"} & \text{"operation threshold current"} \end{pmatrix}$$

8. (3 points) An insulated container is used to mix two liquids A and B of equal weights. Liquid A is initially at 60 °C, while Liquid B is initially at 20 °C. If the specific heat capacity of Liquid A is twice that of Liquid B, then the resulting temprature of the mixture will approximately be equal to _____ .

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"higher than 60"} \\ \text{"B"} & \text{"between to 43 and 55 "} \\ \text{"C"} & \text{"lower than 20"} \\ \text{"D"} & \text{" 40 "} \\ \text{"E"} & \text{"not enough information"} \\ \text{"F"} & \text{" almost 60 "} \\ \text{"G"} & \text{"very close to 20 "} \\ \text{"H"} & \text{"between 23 and 35 "} \end{pmatrix} \quad °C$$

9. (3 points) An engineer needs an Arduino sketch to store the results of calculations which will result in integer values ranging from -100,000 to +250,000. The most appropriate variable type to use for storing these results is:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"string"} \\ \text{"B"} & \text{"long"} \\ \text{"C"} & \text{"char"} \\ \text{"D"} & \text{"boolean"} \\ \text{"E"} & \text{"int"} \\ \text{"F"} & \text{"array"} \\ \text{"G"} & \text{"pointer"} \\ \text{"H"} & \text{"float"} \end{pmatrix}$$

10. (3 points) The primary reason(s) for our class to use the Serial Monitor on the Arduino is/are:

I. To change values of variables while the program is running.
II. To get information from the Arduino, such as a value it has read from a pin or the result of a calculation.
III. To restart the program.
IV. To troubleshoot problems with a program by inserting code to have the program display messages on the serial monitor (such as "I am now in the Turn_Left function").
V. To quickly re-upload the program.

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"V only"} \\ \text{"B"} & \text{"I only"} \\ \text{"C"} & \text{"IV only"} \\ \text{"D"} & \text{"II only"} \\ \text{"E"} & \text{"I and III"} \\ \text{"F"} & \text{"II and IV"} \\ \text{"G"} & \text{"III only"} \\ \text{"H"} & \text{"III and V"} \end{pmatrix}$$

11. (3 points) Which of the following statements are TRUE regarding electrode reduction half-reactions studied in our class?

I. Reactions with positive voltages are more likely to occur spontaneously without the application of any additional energy.
II. Reactions with negative voltges require an external voltage to be placed across the electrodes to force the reaction to take place.
III. Reactions with negative voltages are more likely to occur spontaneously without the application of any additional energy.
IV. Reactions with positve voltages require an external voltage to be placed across the electrodes to force the reaction to take place.
V. The more positive the voltage output of an electrode reduction half-reaction, the more likely it is to occur.
VI. The more negative the voltage output of an electrode reduction half-reaction, the more likely it is to occur.

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"II only"} \\ \text{"B"} & \text{"III only"} \\ \text{"C"} & \text{"I, II, and V"} \\ \text{"D"} & \text{"III and IV only"} \\ \text{"E"} & \text{"I only"} \\ \text{"F"} & \text{"III, IV, and VI"} \\ \text{"G"} & \text{"I and II only"} \\ \text{"H"} & \text{"IV only"} \end{pmatrix}$$

12. (5 points) You are working on developing a temperature pH controlled system for culturing adipose stem cells (ASCs) in a cylindrical container. The cell reservoir's inside $\text{diameter} = 2.5 \cdot \text{in}$ and will be filled to a $\text{depth} = 4 \cdot \text{in}$ with cell structure media that has the same density and properties as water. Compute the volume of the media in this chamber.

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 0.283 \\ \text{"B"} & 0.302 \\ \text{"C"} & 0.322 \\ \text{"D"} & 0.341 \\ \text{"E"} & 0.361 \\ \text{"F"} & 0.381 \\ \text{"G"} & 0.400 \\ \text{"H"} & 0.419 \\ \text{"I"} & 0.439 \\ \text{"J"} & 0.459 \end{pmatrix} \text{L}$$

13. (5 points) Assume you have the amount of water shown below added to 0.7 kg of NaCl. The percentage of NaCl in the mixture is closest to:

$\text{Water} = 3\,\text{kg}$

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 17.769 \\ \text{"B"} & 18.919 \\ \text{"C"} & 20.073 \\ \text{"D"} & 21.224 \\ \text{"E"} & 22.377 \\ \text{"F"} & 23.499 \\ \text{"G"} & 24.642 \\ \text{"H"} & 25.826 \end{pmatrix} \cdot \%$$

14. (5 points) For a given salt water mixture, the wt % $\text{NaCl} = 5.1\%$. GIven that the mixture has a known mass of $\text{salt} = 2.4\text{gram}$, the mass of the water is closest to:

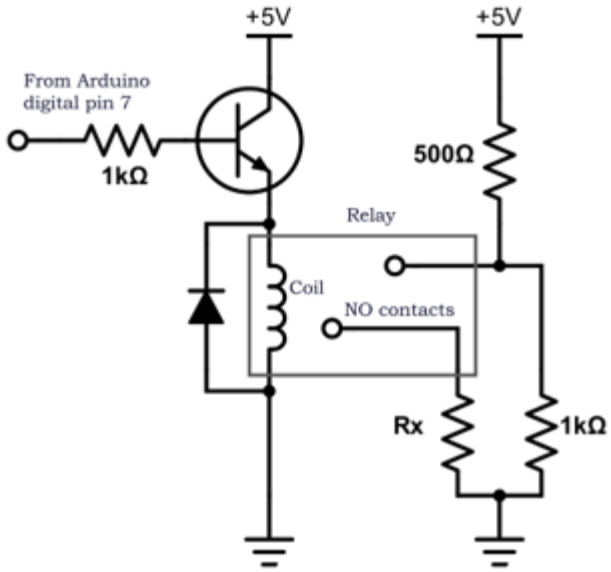
$$\text{Choices} = \begin{pmatrix} \text{"A"} & 42.39 \\ \text{"B"} & 44.66 \\ \text{"C"} & 46.93 \\ \text{"D"} & 49.19 \\ \text{"E"} & 51.44 \\ \text{"F"} & 53.71 \\ \text{"G"} & 55.94 \\ \text{"H"} & 58.20 \end{pmatrix} \cdot \text{gram}$$

15. (5 points) A cube with a length, width, and height of 0.25m is filled with water. The amount of salt that must be added to result in the % weight NaCl shown below is closest to:

$$\text{PercentWeight} = 10 \cdot \%$$

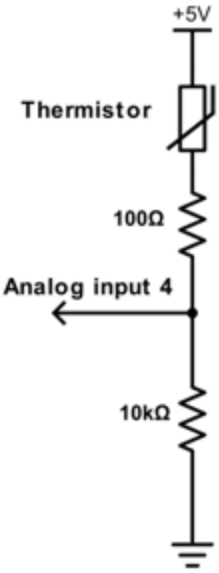
$$\text{Choices} = \begin{pmatrix} \text{"A"} & 1.63 \\ \text{"B"} & 1.74 \\ \text{"C"} & 1.84 \\ \text{"D"} & 1.95 \\ \text{"E"} & 2.05 \\ \text{"F"} & 2.16 \\ \text{"G"} & 2.26 \\ \text{"H"} & 2.37 \end{pmatrix} \cdot \text{kg}$$

16. (5 points) Consider the relay circuit shown below. Given that the command ***digitalWrite(7, HIGH)*** is being executed, the voltage drop across Rx when $Rx = 59\Omega$ is closest to:



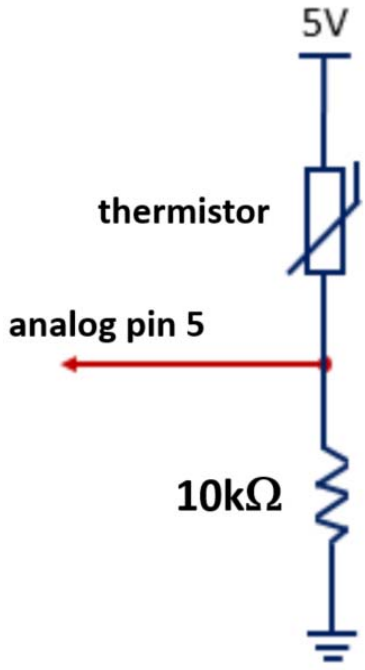
$$\text{Choices} = \begin{pmatrix} \text{"A"} & 0.350 \\ \text{"B"} & 0.400 \\ \text{"C"} & 0.451 \\ \text{"D"} & 0.501 \\ \text{"E"} & 0.552 \\ \text{"F"} & 0.602 \\ \text{"G"} & 0.652 \\ \text{"H"} & 0.703 \\ \text{"I"} & 0.753 \\ \text{"J"} & 0.804 \end{pmatrix} \cdot \text{V}$$

17. (5 points) For the circuit given, if the voltage drop across the 100Ω resistor is $V_{100} = 0.029V$, then the value returned by the ***analogRead(4)*** function is closest to:



$$\text{Choices} = \begin{pmatrix} \text{"A"} & 294 \\ \text{"B"} & 353 \\ \text{"C"} & 414 \\ \text{"D"} & 473 \\ \text{"E"} & 533 \\ \text{"F"} & 593 \\ \text{"G"} & 653 \\ \text{"H"} & 712 \\ \text{"I"} & 772 \\ \text{"J"} & 832 \end{pmatrix}$$

18. (5 points) A thermistor circuit is set up on an Arduino as shown below. If the resistance value of the thermistor is $R_{th} = 17254\Omega$, then the value of the ***analogRead(5)*** function is closest to:



$$\text{Choices} = \begin{pmatrix} \text{"A"} & 280 \\ \text{"B"} & 299 \\ \text{"C"} & 318 \\ \text{"D"} & 337 \\ \text{"E"} & 356 \\ \text{"F"} & 375 \\ \text{"G"} & 394 \\ \text{"H"} & 413 \end{pmatrix}$$

19. (5 points) The time in minutes that it will take for a volume $Vol = 75 \cdot cm^3$ of water that is initially at $T_i = 23 \cdot °C$ to reach a final temperature of $T_f = 47 \cdot °C$ if the voltage $V = 12 V$ of a resistive heater drawing a current of $I = 600 \cdot mA$ is used is closest to:

$$Choices = \begin{pmatrix} "A" & 17.4 \\ "B" & 16.3 \\ "C" & 18.2 \\ "D" & 16.5 \\ "E" & 19.8 \\ "F" & 16.7 \\ "G" & 17.7 \\ "H" & 18.9 \\ "I" & 18.4 \\ "J" & 15.1 \end{pmatrix} \cdot min$$

20. (5 points) If the amount of energy E=10kJ is required to increase a particular material with a mass $m = 1.2 kg$ from an initial temperature of $T_i = 45 \cdot degC$ to a final temperature of $T_f = 67 \cdot degC$, then the material's specific heat is closest to:

$$Choices = \begin{pmatrix} "A" & 378.8 \\ "B" & 319.3 \\ "C" & 373.2 \\ "D" & 320.4 \\ "E" & 313.4 \\ "F" & 284.6 \\ "G" & 397.4 \\ "H" & 347.7 \\ "I" & 333.9 \\ "J" & 345.7 \end{pmatrix} \cdot \frac{J}{kg \cdot degC}$$

21. (5 points) How much power, in Watts, is needed for a resistive heater to heat a volume $Vol = 5 \cdot in^3$ of water that is initially at $T_i = 66 \cdot °F$ to reach a temperature of $T_f = 123 \cdot °F$ in a period of $t = 23 \cdot min$?

$$Choices = \begin{pmatrix} "A" & 12.5 \\ "B" & 7.3 \\ "C" & 6.5 \\ "D" & 8.5 \\ "E" & 8.8 \\ "F" & 9.9 \\ "G" & 7.9 \\ "H" & 8.2 \\ "I" & 9.4 \\ "J" & 7.1 \end{pmatrix} \cdot W$$

22. (5 points) You are trying to heat up a hot dog in a pot of water. You know that the hot dog has a mass of $m_h = 100 \cdot gram$ and a specific heat of $c_{ph} = 2890 \cdot \frac{J}{kg \cdot degC}$. When filling the pot with water you measured out a volume $Vol = 1.75 \cdot quart$. How much energy will it take to heat the hot dog and water from an initial temperature of $T_i = 10 \cdot degC$ to the desired final temperature of $T_f = 60 \cdot degC$?

$$Choices = \begin{pmatrix} "A" & 349.4 \\ "B" & 320.7 \\ "C" & 351.5 \\ "D" & 368.4 \\ "E" & 383.6 \\ "F" & 302.2 \\ "G" & 349.2 \\ "H" & 360.6 \\ "I" & 380.2 \\ "J" & 372.6 \end{pmatrix} \cdot kJ$$

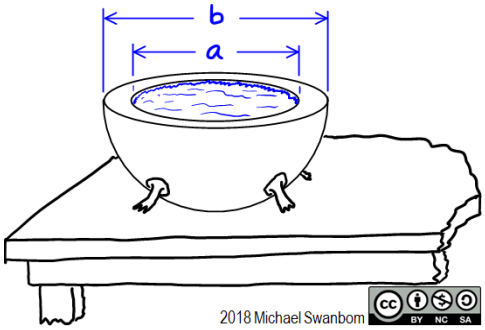
23. (5 points) You are re-designing the cell culture media reservoir for the temperature and pH controlled system for culturing adipose stems cells (ASCs). You need a $\text{volume} = 0.0002\,\text{m}^3$ of media which has the same properties as water. Before the media can be exposed to the ASCs it needs to be heated from room temperature (20 °C) to a 37 °C and you would like to be able to heat it within $\text{time} = 12\cdot\text{min}$. Using a 12V power supply, the value of the resistor needed to heat the media is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 6.41 \\ \text{"B"} & 6.85 \\ \text{"C"} & 7.30 \\ \text{"D"} & 7.74 \\ \text{"E"} & 8.18 \\ \text{"F"} & 8.63 \\ \text{"G"} & 9.06 \\ \text{"H"} & 9.51 \\ \text{"I"} & 9.96 \\ \text{"J"} & 10.39 \end{pmatrix} \cdot \Omega$$

24. (5 points) A silver bowl was sitting in the cold attic before being brought down to be used to hold canola oil for bread dipping (olive oil was too expensive). The bowl is initally at a $\text{temperature} = -4\cdot\text{degC}$ before the canola oil with an initial $\text{temperature} = 73\cdot\text{degC}$ is added to the bowl. The bowl and the oil reach an equilibrium temperature quickly, so a negligible amount of heat is transferred to the surroundings. The bowl is constructed as two concentric half-spheres with diameters shown. If the bowl is completely filled with oil, then the equilibrium temperature that the bowl and oil reach is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 19.98 \\ \text{"B"} & 21.91 \\ \text{"C"} & 23.79 \\ \text{"D"} & 25.74 \\ \text{"E"} & 27.63 \\ \text{"F"} & 29.55 \\ \text{"G"} & 31.46 \\ \text{"H"} & 33.37 \\ \text{"I"} & 35.27 \end{pmatrix} \cdot \text{degC}$$

Material	Density g/cm^3	Specific Heat $J/(kg\cdot°C)$
Canola Oil	0.915	1913
Motor Oil	0.873	1890
Diesel	0.832	2050
Ethylene Glycol	1.11	2360
Nickel	8.90	445
Aluminum	2.71	905
Silver	10.52	236
Copper	8.945	384



$a = 9\cdot\text{cm}$ $b = 11\cdot\text{cm}$

$$V_{\text{sphere}} = \frac{4}{3}\pi\cdot r^3$$

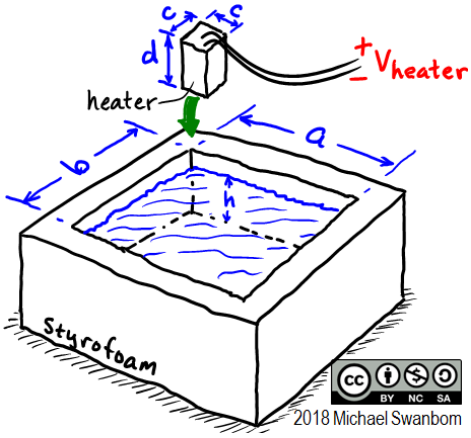
25. (5 points) A heater is constructed by embedding a resistor with a resistance $= 32 \cdot \Omega$ into a block of aluminum with dimensions defined by c and d below. Assume the heater unit can be modeled as a solid block of aluminum. The heater is immersed into a reservoir of liquid ethylene glycol (like the antifreeze in your car).

The rectangular reservoir holding the ethylene glycol has dimensions of a, b and h as shown. After the heater is inserted into the ethylene glycol, they both reach an initial equilibrium temperature $=24 \cdot \text{degC}$. At this point, the heater is turned on by applying the voltage given below. The heater is left on for a period of time, then the voltage is removed.

After the heater is turned off, the heater and the ethylene glycol eventually reach a final equilibrium temperature $= 73 \cdot \text{degC}$.

Assuming no heat is transferred to the styrofoam reservoir or to the surroundings during the process, the amount of time that the voltage was applied to the heater was closest to:

Material	Density g/cm^3	Specific Heat $J/(kg \cdot °C)$
Canola Oil	0.915	1913
Motor Oil	0.873	1890
Diesel	0.832	2050
Ethylene Glycol	1.11	2360
Nickel	8.90	445
Aluminum	2.71	905
Silver	10.52	236
Copper	8.945	384



$$\text{Choices} = \begin{pmatrix} \text{"A"} & 8.14 \\ \text{"B"} & 8.63 \\ \text{"C"} & 9.13 \\ \text{"D"} & 9.62 \\ \text{"E"} & 10.12 \\ \text{"F"} & 10.61 \\ \text{"G"} & 11.10 \\ \text{"H"} & 11.59 \\ \text{"I"} & 12.09 \end{pmatrix} \cdot \text{min}$$

$V_{heater} = 58\,V$

$b = 11 \cdot cm$ $\quad d = 4 \cdot cm$

$a = 7 \cdot cm$ $\quad c = 2 \cdot cm$ $\quad h = 5 \cdot cm$

26. (5 points) Dr. Hartmann preheats $= 25 \cdot \text{gallons}$ of water in his well-insulated alligator skull cleaning basin to 99 °C. He then adds $= 4$ alligator heads, each having a mass $= 11 \cdot \text{kg}$ and a temperature $= 1 \cdot \text{degC}$. He would like the mixture of water and alligator heads to reach a final temperature $= 74 \cdot \text{degC}$ at the time he comes back to check on it in $= 14 \cdot \text{minutes}$.

His heater plugs into a source voltage $= 110 \cdot \text{V}$ and he has the ability to set its heat output with a knob that controls the electrical current that the heater consumes.

Assuming the water and alligator skulls are at the same temperature by the time he returns, the current consumption setting he should choose for his heater is closest to:

Choices = $\begin{pmatrix} \text{"A"} & 8.42 \\ \text{"B"} & 9.31 \\ \text{"C"} & 10.18 \\ \text{"D"} & 11.07 \\ \text{"E"} & 11.98 \\ \text{"F"} & 12.86 \\ \text{"G"} & 13.75 \\ \text{"H"} & 14.64 \\ \text{"I"} & 15.52 \end{pmatrix}$ A

Assume alligator heads have a specific heat of 3500 J/(kg°C)

While you are waiting to begin your test:

- Please write and bubble your name and initials on your response sheet
- Please write and bubble your LATech username (e.g. abc567) on your response sheet
- Please write and bubble your section number on your response sheet using the guide shown here
- Please write and bubble your ExamForm number. This is your ExamForm:

ExamForm= 11

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Notes:

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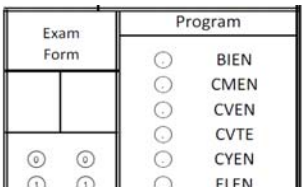

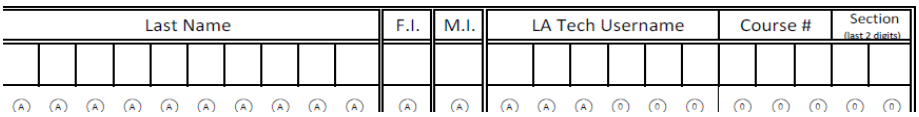

Also Note:

- Mobile phones or other electronic devices (other than FE-approved calculators and plain timepieces) are not allowed on this exam. If you have non-approved devices including smartwatches, please deposit them at the front of the room for the duration of the exam. Don't forget to retrieve them when you prepare to depart.
- Please deposit any bags you might have brought in the front of the room for the duration of the exam.
- Please note the reference information given below.
- If you need additional scratch paper, please ask your proctor. Turn in any scratch paper with your exam, even if unused.
- If you have questions during the exam, please remain in your seat and raise your hand. A proctor will come to you.
- Please use a restroom now if you need it so as to minimize potential disruptions during the exam.

1 coulomb = $6.24(10)^{18}$ electrons Avogadro's Number: $6.022(10)^{23}$

Density of water at 4°C (maximum density) = 1 g/mL = 1g/cm³ = 1000 kg/m³ = 8.33 lbs/gal

$C_{p\,H_2O} = 4180\frac{J}{kg \cdot C}$ $1ton = 2000lb$

1L = 0.001m³ = 1.0567quarts = 0.264gal = 61.02in³ 1 gal = 0.1337 ft³ = 3.785 L

1 pound = 16 ounces = 453.592 grams 1 inch = 25.4 mm 1 foot = 12 inches

$°C = \frac{5}{9} \cdot (°F - 32)$

$°F = \frac{9}{5} \cdot °C + 32$

Conductivity Sensor Reactions:

$2Cl^-_{(aq)} \longrightarrow Cl_{2\,(g)} + 2e^-$ and $2H_20_{(l)} + 2e^- \longrightarrow H_{2\,(g)} + 2OH^-_{(aq)}$

Atomic Weights:

Na = 23.0 g/mol Cl = 35.5 g/mol C = 12.0 g/mol H = 1.0 g/mol O = 16.0 g/mol

$R = \frac{\rho \cdot L}{A}$ $\alpha = \frac{R_2 - R_1}{R_1(T_2 - T_1)}$ $V \cdot I \cdot t = \rho \cdot Vol \cdot C_p \cdot \Delta T$

Volume of Cylinder = $\frac{\pi \cdot diameter^2}{4} \cdot height$ $\Delta E = Q - W$ $V_{sphere} = \frac{4}{3}\pi \cdot r^3$

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ExamForm = 11 ind = 1

Key =

	1
1	"A"
2	"E"
3	"D"
4	"F"
5	"A"
6	"B"
7	"F"
8	"B"
9	"B"
10	"F"
11	"C"
12	"C"
13	"B"
14	"B"
15	"B"
16	"D"
17	"F"
18	"F"
19	"A"
20	"A"
21	"G"
22	"H"
23	"C"
24	"G"
25	"A"
26	"H"
27	