

## Exam Practice Problems (3 Point Questions)

Below are practice problems for the three point questions found on the exam. These questions come from past exams as well as additional questions created by faculty. Please note that these are just examples of questions and may not cover all concepts that could be asked in the 3 point section on your exam.

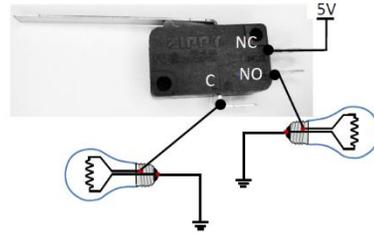
### Electricity/Circuits Questions

- What is the value for a "blue-green-orange" resistor?
  - 65000  $\Omega$
  - 6530  $\Omega$
  - 630  $\Omega$
  - 65  $\Omega$
- If you have 3 resistors in parallel, which of the following are true statements?
  - The current is different in each resistor.
  - The voltage drop is the same across each resistor.
  - The equivalent resistance will be more than any of the values of the 3 resistors.
  - The equivalent resistance will be equal to the sum of the values of the 3 resistors.
  - Not enough information given to decide.
  - Both a. and c. are true.
  - Both a. and b. are true.
  - Both c. and d. are true.
  - Both b. and d. are true.
  - Both b. and d. are true.
- The following image is a schematic for which of the following components?
  - Light emitting diode
  - Photoresistor
  - Current Source
  - Voltage source
  - Resistor
  - Light emitting resistor
  - Peace to the world
  - A hot latte
- Which of the following is an acceptable unit for current?
  - A
  - V A
  - C/s
  - A/ $\Omega$
  - J/s
  - V/ $\Omega$
  - W/V
  - a, c, f, and g
  - a, b, c, and g
  - None of the above



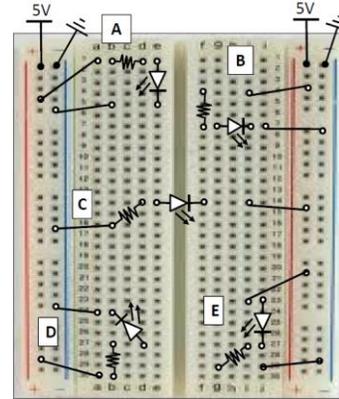
5. When the switch below is pressed, what will happen?

- a. The right light will turn on
- b. Both lights will be off
- c. The left light will turn on
- d. The right light will turn off
- e. Both lights will turn on
- f. The Winter Olympics will start
- g. Nothing because the power source is not connected directly to the common "C" prong



6. Which of these LED circuits is wired correctly?

- a. A
- b. B
- c. C
- d. D
- e. E
- f. D and E
- g. A, B, D, and E
- h. All of them
- i. None of them



7. If a resistor has color stripes of brown, green and red, then the resistance is closest to...

- a. 15  $\Omega$
- b. 152  $\Omega$
- c. 215  $\Omega$
- d. 1500  $\Omega$
- e. 5100  $\Omega$
- f. 15000  $\Omega$
- g. 21500  $\Omega$

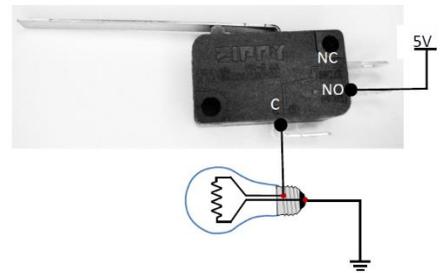
8. The unit of electrical current is an Amp. The basic units which define an Amp are...

- a. meter<sup>3</sup>/second
- b. Joule/Coulomb
- c. Joule/second
- d. Electrons/meter<sup>3</sup>
- e. Electrons/ohm
- f. Coulomb/second
- g. Electrons/bushel

9. Which of the materials or combinations of materials listed below would you expect to be the best conductor of electricity?

- a. dinosaur bones
- b. your robot wheels
- c. a penny (United States coin)
- d. a rubber ducky
- e. your finger
- f. the Great Pyramids of Egypt
- g. a bowl of Froot Loops<sup>®</sup>

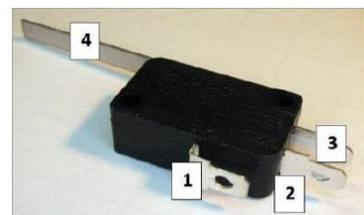
10. The light bulb below is selected so that it will come on when connected to an appropriate 5 V power source. When the switch below is pressed, what will happen to the light bulb?
- it will turn on
  - it will turn off
  - nothing since this switch can't be used to turn the bulb on or off
  - an earthquake will cause the state of California to sink into the sea



11. The definition of a volt, based on fundamental units or quantities, is:
- Amps per coulomb
  - Coulomb per second
  - Joules per coulomb
  - Joules per second
  - Ohms
  - Volts per coulomb
12. Examples of materials that are good conductors are...
- Gold, silver, and plastic
  - Copper, aluminum, and air
  - LEDs, gold, and copper
  - Copper, gold, and glass
  - Aluminum, integrated circuits, and glass
  - Glass, wood, and plastic
  - Gold, aluminum, and copper

13. If you need a resistor with  $850 \Omega$ , you would look for one with has the following color code:
- Black-green-gray
  - Black-green-brown
  - Brown-green-black
  - Gray-green-black
  - Gray-green-brown
  - Gray-green-red
  - Red-green-gray

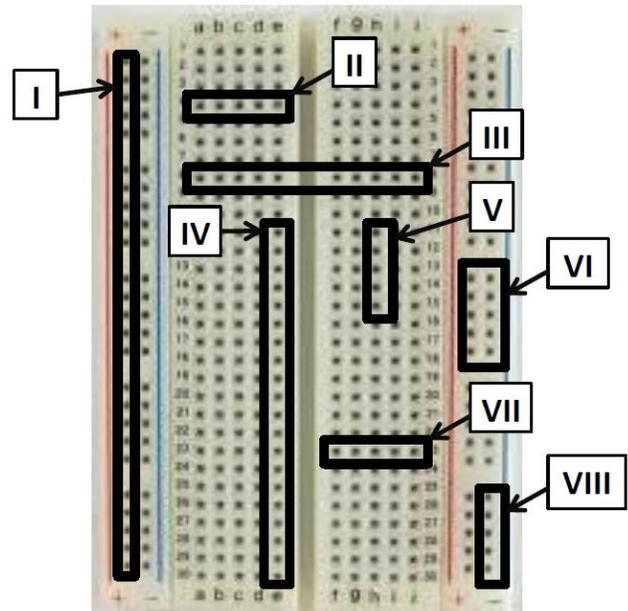
14. For the switch shown, terminal 1 is labeled C, terminal 2 is labeled NO and terminal 3 is labeled NC. When the switch is pressed, the resistance between which two terminals will change from almost infinite resistance to almost zero ohms?
- 1 and 2
  - 1 and 3
  - 1 and 4
  - 2 and 3
  - 2 and 4
  - 3 and 4



15. One thing that will always be true about a group of resistors in parallel is that:
- Only one end of the resistors will be connected to each of the others.
  - The current will be the same in all the resistors.
  - The equivalent resistance will be smaller than any of the values of resistors.
  - The equivalent resistance will be the sum of the resistor values, no matter how many.
  - The power dissipated by each resistor will be equal to the square of the current leaving the voltage source times the value of each resistor.
  - We can place no more than 8 resistors in parallel.

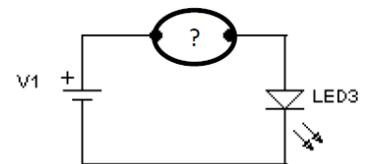
16. For the breadboard shown below, the following boxed areas depict interconnected electrical terminals (i.e., same node strictly within each box) for regions...

- I, V, VI, and VIII
- I, II, III, VII, and VIII
- II, III, VII, and VIII
- VI, VII, and VIII
- I, IV, V, and VI
- I, II, VII, and VIII
- I, VI, and VIII



17. Given the circuit below, what is the optimal electrical component you would include in the place of the missing component based on the reasoning provided...

- a switch because it will turn the LED on
- a resistor because it will increase the current to the LED
- a resistor because it will decrease the current to the LED
- a connection to an analog input pin because it can control the LED with the Arduino
- a connection to a digital output pin because it can control the LED with the Arduino
- a second LED so both can be controlled separately with the Arduino
- a photoresistor because the LED can be controlled with the Arduino using an IF statement



## Arduino and *Programming Questions*

18. Identify the line(s) where errors exist in the program. Your servo should turn full speed clockwise continuously. Assume the white wire of the servo is connected to Digital Pin 2 on the Arduino.

- a. 2
- b. 1
- c. 4
- d. 7
- e. 2 and 6
- f. 3 and 4
- g. 2 and 7
- h. 3, 7, and 9
- i. 3 and 9
- j. 4, 5, and 8

```
1 void setup() {  
2   pinMode (2, INPUT);  
3 }  
4 void loop() {  
5   digitalWrite(2, HIGH);  
6   delayMicroseconds(1700);  
7   digitalWrite(2, LOW);  
8   delay(20);  
9 }
```

19. Which pulse width will make the servo turn full speed counter-clockwise (CCW)?

- a. 2000 milliseconds
- b. 1500 microseconds
- c. 1500 milliseconds
- d. 1000 microseconds
- e. 1000 milliseconds
- f. 2000 microseconds

20. If you power your Arduino using a barrel jack connected to six AA batteries (which are not rechargeable), then the voltage at Vin will be closest to...

- a. 4 V
- b. 5 V
- c. 6 V
- d. 7 V
- e. 8 V
- f. 9 V
- g. 10 V
- h. 11 V
- i. 12 V

21. Identify the line(s) where errors occur in the program.

- a. 1
- b. 2
- c. 3
- d. 4
- e. 6
- f. 7
- g. 1 and 5
- h. 3 and 10
- i. 7 and 8

```
1 void setup() {  
2   //initialize the digital pin as an output  
3   pinMode(0, OUTPUT)  
4 }  
5 void loop(){  
6   digitalWrite(0, HIGH); //set the LED on  
7   delay(1000); //wait for a second  
8   digitalWrite(0, LOW); //set the LED off  
9   delay(500); //wait for 500ms  
10 }
```

22. If the battery pack connected to the power jack of the Arduino Uno board contains 6 fresh AA batteries, then  $V_{in}$  should be equal to:
- 3.3 V
  - 5 V
  - 6 V
  - 7 V
  - 7.5 V
  - 9 V
  - 9.5 V
  - 12 V
  - We don't use AA batteries with the Arduino.

23. In a sketch with the statement "int LWTL = 5", the "int" means that the Arduino should:
- Allocate enough storage space to store an integer value
  - Create a variable using SI (system international) units
  - Intercept the statement "LWTL = 5"
  - No meaning; it's just part of the statement we use to create a variable
  - Pause for an interval to create a variable

24. The Arduino sketch below is meant to cause an LED connected to pin 6 to blink ON for 5 seconds and OFF for 2 seconds. The code has errors on either 2 or 3 lines. Choose the answer with the line numbers that contain errors that will cause the LED not to blink as desired and/or that will prevent the program from being downloaded successfully.

```
1 void setup() {  
2   pinMode(6, INPUT);  
3 }  
4 void loop() {  
5   digitalWrite(6, HIGH);  
6   dleay(5000);  
7   digitalWrite(6, LOW);  
8   delay(2000)  
9 }
```

- 1 and 4
- 1 and 4 and 8
- 2 and 7
- 2 and 8
- 4 and 9
- 5 and 7
- 6 and 8
- 7 and 8 and 9

The following 15 questions are fill in the blank. We have moved to multiple choice questions. However, these are questions that address concepts presented in class and will benefit you when studying.

### Excel Questions

1. When you want a formula in EXCEL to refer to a specific cell, you must either give the cell or use \_\_\_\_\_ addressing.

### Electricity and Circuits Questions

2. A resistor with color markings of “blue-green-red” has an approximate resistance of \_\_\_\_\_ ohms.
3. A conductor easily releases its \_\_\_\_\_ electrons.
4. A material that conducts electricity well is called a \_\_\_\_\_.
5. Modern materials designed to conduct electricity only under certain conditions are called \_\_\_\_\_.
6. \_\_\_\_\_ is a measure of the strength of an electron supply and the severity of the electron shortage.
7. The definition of an amp, based on fundamental units or quantities, is \_\_\_\_\_.
8. Water pressure is the mechanical analogous to what electrical quantity? \_\_\_\_\_
9. \_\_\_\_\_ Current Law says that the sum of currents entering a node in a circuit is zero (no electrons are created).
10. A resistor with a yellow-violet-orange stripe pattern would have a resistance of approximately \_\_\_\_\_.
11. Draw a circuit containing a 5V power source with 220  $\Omega$  and 470  $\Omega$  resistors in parallel. Using the image of a multimeter provided below, indicate how one would measure the current through the 470  $\Omega$  resistor.



### **Arduino and Programming Questions**

12. The Arduino Duo has \_\_\_\_\_ digital I/O pins and \_\_\_\_\_ analog input pins.
13. The device that we stuck to the aluminum plate on our robots beside our Arduino boards is called a \_\_\_\_\_. This device allows you to quickly prototype circuits without soldering or special connectors.
14. The electrical component on the Arduino Duo that reduces  $V_{in}$  down to 5V is called a \_\_\_\_\_. What is the maximum current output of this device? \_\_\_\_\_
15. Write a sequence of commands used to make an LED attached to digital pin 13 blink continually. The commands should make the LED stay on for 0.25 seconds and off for 0.25 seconds. Please don't include the `pinMode()` function needed to define the pin as a digital output (just include the commands that would go in the `loop()` structure).

```
loop()
```

```
{
```

```
}
```