1. We refer to _____, _____ and _____; in order to describe the inherent physical properties of electricity.

A) *Inductance, Capacitance, Reactance*
B) *Voltage, Current, Resistance*
C) *Impedance*, *Waveforms*, *Frequency*
D) Phase, Circuits, Applications

2. Resistance is defined as the rate at which Charge is flowing past a particular point at a specific interval of time?

A) *True* B) *False*

3. Voltage is defined as a material's tendency to resist the flow of Charge.

A) *True* B) *False*

4. Without Voltage, no Current can flow, and without Current, there is only static electricity (Voltage). Can meaningful work be done?

A) *Yes* B) *No*

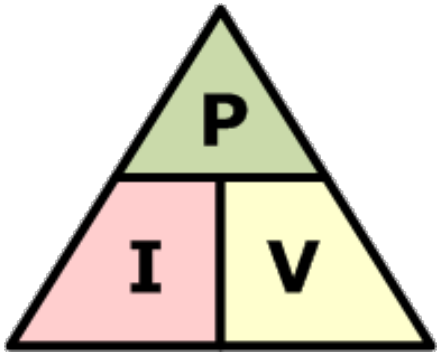
5. Power is defined as the rate at which energy is transferred (or transformed) in a circuit.

A) *True* B) *False*

6. Does the Arduino support both PWM and DAC functionality?

A) *True* B) *False*

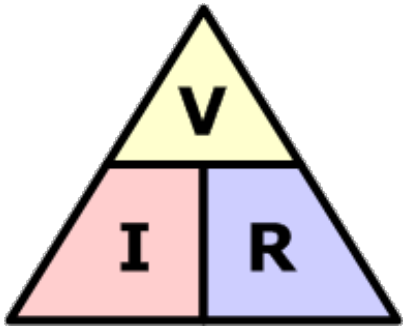
7. Identify:



A) *Power Law B) Ohm's Law C) Kirchoff's Voltage Law*

8. Write the expressions to calculate Voltage, Current and Power with correct units for each.

9. Identify:

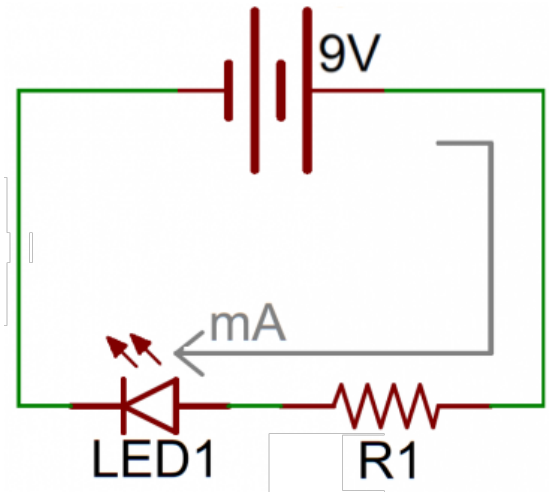


A) *Kirchoff's Voltage Law B) Ohm's Law C) Thévenin's Law*

10. Write the expressions to Calculate Voltage, Current and Resistance with correct units for each.

CART360 I QUIZ ONE - ESSENTIAL ELECTRONICS

11. Given the circuit below: **[3]**



(a) LED1 @ 3.0V 300mA
i) Determine the appropriate value of R1
ii) Determine the Power Rating of LED1
iii) Determine the Power Rating of R1

(b). What is the Voltage Drop of LED1 and R1:

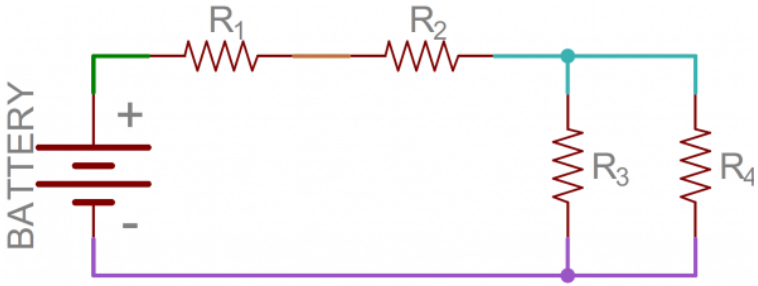
LED1:_____ V

R1: _____ V

(c): Does (LED1 Voltage Drop + R1 Voltage Drop) == 9V

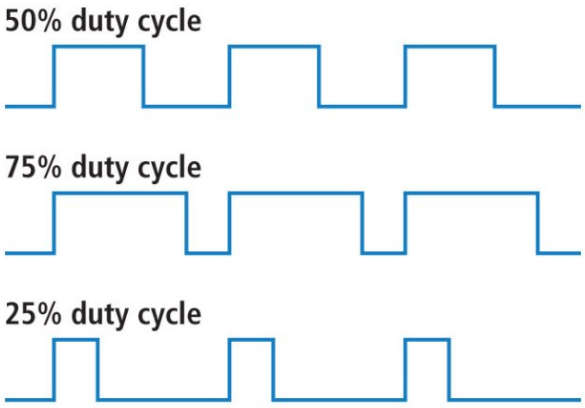
A) *Yes* B) *No*

12. Given the circuit below: Identify all the node(s) and all the components in series and parallel i.e nodes = { … }, series = { C1, C2,…Cn } and parallel = {C1, C1, …, Cn}.



Nodes:
Series:
Parallel:

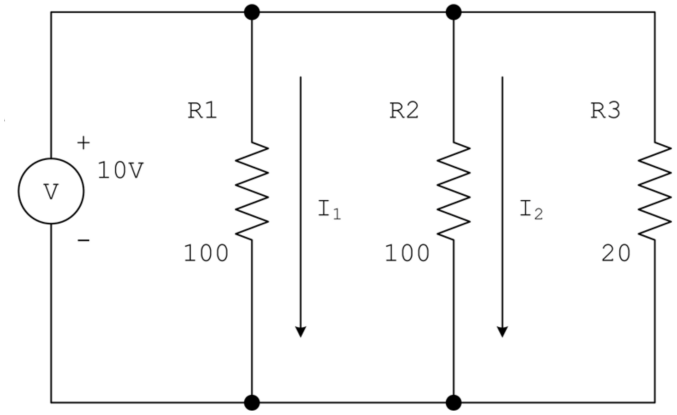
13. What do these cycles represent in the image below?



CART360 I QUIZ ONE - ESSENTIAL ELECTRONICS

14. *Given the circuit below:*

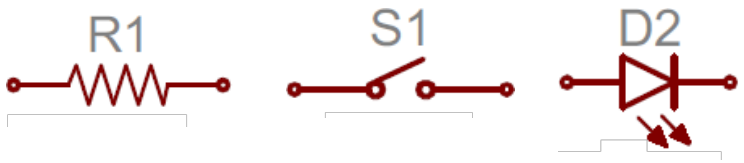
Calculate the total Resistance Rt = 1/R1 + 1/R2 + … + 1/Rn



15. In the realm of electronics, polarity indicates whether a circuit component is symmetric or not. **Select True statement (s)?**

A) *A non-polarised component can be connected in any direction*
B) *A polarised component can only be connected one direction*
C) B*atteries, diodes, integrated circuits etc. are not polarised*
D) *It is not critical to be able to identify polarised components*

16. Identify the schematic symbol(s) below:

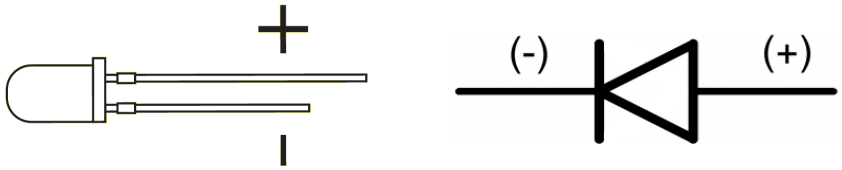


R1) _____

S1) _____

D2) _____

17. The correct terms for [+] and [-] (in that order):



A) *Lead-A, Lead-B* B) *Anode, Cathode* *C) Positive, Negative*

18. Identify the schematic symbol from question 17:

A) *Photocell (LDR)* B) *Diode* *C) LED* *D) Resistor*

CART360 I QUIZ ONE - ESSENTIAL ELECTRONICS

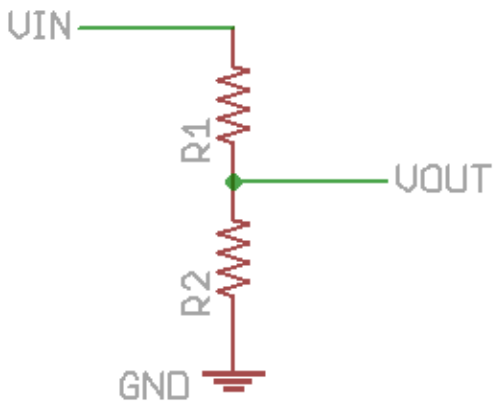
19. A circuit is made to run 9 LEDs (3 RGBs) and a microcontroller. Each LED consumes 10mA and the microcontroller consumes 10mA. The circuit is powered by a fully charged AA alkaline battery, which has a capacity of 1500mAh. Theoretically, how long could it last?

A) *15.00 hours*
B) *10.21hours*
C) *55.53 hours*
D) *3.147 hours*

20. A PWM 100% duty cycle signal on the Arduino would equate to:

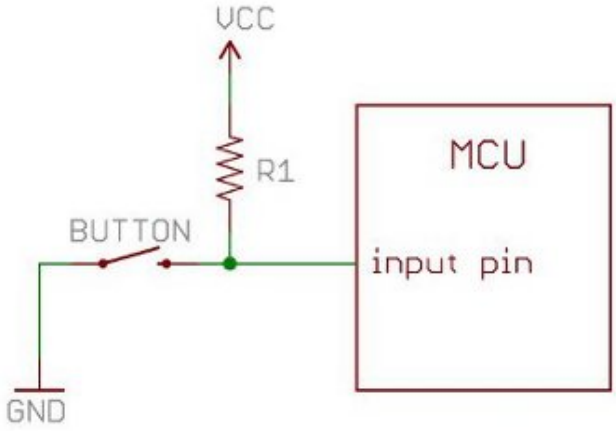
A) 0.0 Volts
B) 12.0 Volts
C) 5.0 Volts
D) 3.3 Volts

21. Voltage Dividers are useful for:



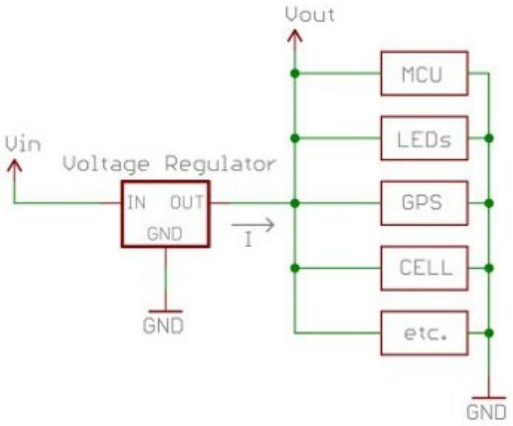
A) Powering High-Current Devices
B) Amplifying Voltages
C) Doing Long Division
D) Scale a Voltage Output

22. You need to limit the Current to 50mA on **input pin**. VCC is 3V. What is the best pull-up resistor value to use ?



A) 60 Ohm B) 1k Ohm C) 60k Ohm D) 10k Ohm

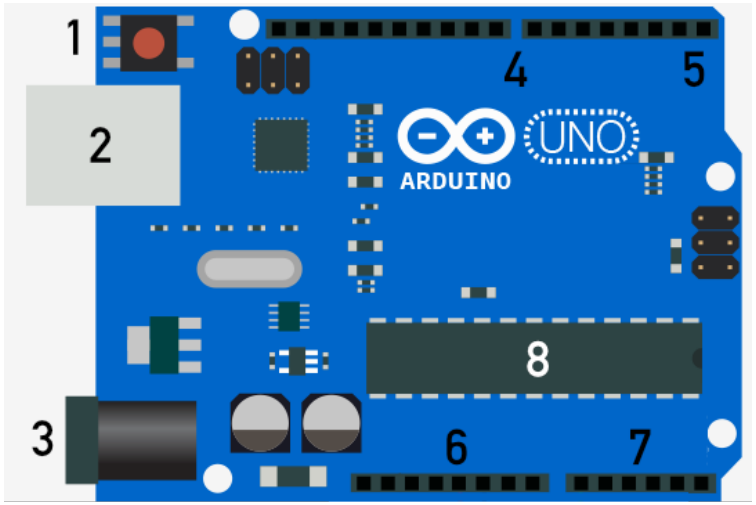
23. Calculate the maximum Power dissipated by the regulator given **Vin = 12V**, **Vout = 3.0V**, and **I = 500mA**.



A) 4.50 Watts *B)* 18.0 Watts *C)* 5.0 Amps *D)* 5.0 Watts

CART360 I QUIZ ONE - ESSENTIAL ELECTRONICS

24.Identify numbered elements and where applicable state intended function: **[4]**



1.

2.

3.

4.

5.

6.

7.

8.

25. Given the following Arduino Code: **[2]**

```
int num =  analogRead(A0);
```

a) What is the range of possible values for the variable **num** **[0.5]**
b) What Arduino Hardware layer is responsible for computing **num** **[0.5]**
c) Write the Arduino Code to convert **num** into an effective **Voltage** **[1]**

26. Given the following Arduino Code **[2]**

```
analogWrite ( 3, num );
```

a) What is the range of possible values for the variable **num** **[0.5]**
b) What Arduino Hardware layer is responsible for computing **num** **[0.5]**
c) Write the Arduino Code to scale **num** for analogWrite(…) **[0.5]**
d) Convert the following **num % values** into effective **Arduino Values**
20 % and 75 % **[0.5]**

27. Provide 2 ways of defining a constant called LED_PIN to be mapped to pin 9:

A:

B:

28. Explain expected functionality of pinMode(10,OUTPUT); and how it differs from pinMode(10, INPUT_PULLUP);

CART360 I QUIZ ONE - ESSENTIAL ELECTRONICS

29.Given the following: **[5]**

```
void setup() { }

void loop() {
        int analog = analogRead(0);
        analogWrite (9, 255);
        delay(1000);
        analogWrite(9,0);
        delay( analog % 255 );
}
```

(a) If an LED is connected to pin 9, explain how the state of the LED changes over time? **[2]**

(b) How would the code change if we put delay(200) in the second delay() statement? **[1]**

(c) Rewrite the code to have the LED affected only when a button is pressed on Pin 4. Hint: you need to add code both in the setup() { } and the loop() { } **[2]**

30. Given the following: **[5]**

```
switch ( testVal ) {
        case 1: { Serial.println("Sun is shining"); break; }
        case 2: { Serial.println("It is windy"); break; }
        case 3: { testVal += 5; Serial.println(testVal); }
        default: { testVal = testVal*2; Serial.println(testVal-4); }
}
```

(a) What does the Break Statement do?

(b) When will the **default** case be called?

(c) What is printed to the Serial Monitor when **testVal** is 2?:

(d) What is printed to the Serial Monitor when **testVal** is 3?:

CART360 I QUIZ ONE - ESSENTIAL ELECTRONICS

31. Given the following: **[5]**

```
int myVars = { 2, 4, 6, 8, 9, 10 };
```

(a) Write the appropriate function that will: **[2]**
i) Multiply each element by its array (Ordinal) Position and then
ii) Output (print) the result in reverse order
iii) Write out the new Sequence

(b) Write the instruction that would compute the size of **myVars** **[0.5]**

(c) Will the contents of **myVars** be altered after executing the function defined in (a)? (YES /NO) **[0.5]**

(d) Write the appropriate statement(s): **[2]**
i) To access the 3rd element in **myVars** and then
ii) Assign the result of **(element / 10)** at that index value instead
iii) What is the result of **(element / 10),** will **myVars** be altered?

32. Given the following: **[5]**

```
uint8_t calculateNumberOfStars( int points ) {
    return points % 256;
}
```

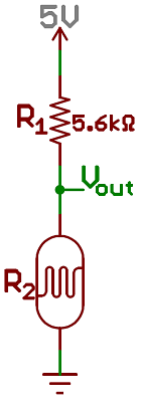
(a) What does the function return when invoked?

(b) What is the Range of returned numbers?

(c) Write a statement calling the function defined above

(d) What is the bit size of an int, what is the largest value that can be expressed by an int (Arduino)?

33. Given the following circuit: **[10]**



You will have to utilise and implement the following formula in code in the Arduino program to calculate the results.

$$V_{out} = V_{in} \cdot \frac{R_2}{R_1 + R_2}$$

Write a complete and functional Arduino program such that one can calculate and ultimately print the following to the serial output:

i) Resistance value of R2
ii) Discrete Voltage value of V-OUT
iii) Actual Voltage of V-OUT

34. Explain what the code in the void setup() accomplishes, what would be done to improve the reliability and output of the coded routine? **[5]**

```
int sensorMin = 0;
int sensorMax = 1023;
int sensorValue = 0;

void setup() {

while (millis() < 5000) {
  sensorValue = analogRead(sensorPin);

  if (sensorValue > sensorMax) {
    sensorMax = sensorValue;
  }

  if (sensorValue < sensorMin) {
    sensorMin = sensorValue;
  }
}

}
```