**Circle the letter of the correct response(s).**

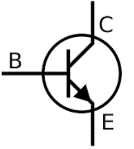
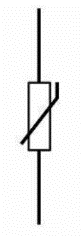
1. \_\_\_\_\_\_\_\_\_\_ capacitors must be forward biased to avoid overheating which can cause them to burst?
   1. Ceramic
   2. Electrolytic
   3. Variable
   4. Filter
2. A \_\_\_\_\_\_\_\_\_\_\_ is a semiconductor device that can be used as an “electrical switch” or as an amplifier.
   1. Transistor
   2. LED
   3. Relay
   4. Capacitor
   5. Inductor
3. Transistors can be used to have a small current control a larger current.
   1. True
   2. False
4. In a \_\_\_\_\_\_\_\_\_\_\_\_\_ relay, the contacts are closed when no current is passed through the coil and passing a current through the coil causes the contacts to open.
   1. Normally open
   2. Normally closed
   3. Consistently open
   4. Consistently closed
   5. Mainly closed
5. The amount of current that can pass through the contact leads without damaging the relay is called the:
   1. Coil voltage
   2. Contact current
   3. Coil current
   4. Contact output
   5. Contact coefficient
6. Why are flyback diodes used in a circuit?
   1. To provide more current to the coil.
   2. To hold the contacts in the ON state.
   3. Relays will not work without them.
   4. To help protect circuit elements from induced current.
   5. Both b and c
7. General purpose diodes are designed to allow current to flow in one direction and block the flow of current in the opposite direction.
   1. True
   2. False
8. A component that has the ability to store electrical charge is a/an:
   1. Resistor
   2. Inductor
   3. Diode
   4. Capacitor
   5. Transistor
9. AnaolgRead returns a value of 762 from a voltage divider wired between 5V and ground. What is the voltage measured?
   1. 1.4V
   2. 2.6V
   3. 3.7V
   4. 4.1V
10. Electric capacitance is measured in:
    1. Ohms
    2. Farads
    3. Volts
    4. Henrys
    5. Flux
11. The working voltage indicates the maximum allowable voltage that may be applied to the capacitor without damaging it.
    1. True
    2. False
12. What factors affect capacitance in a parallel plate capacitor? (circle all that apply)
    1. Plate area
    2. Distance between plates
    3. Dielectric material between plates
    4. Applied voltage
    5. Applied current
    6. All of the above
    7. None of the above
13. The higher the dielectric constant, the more capacitance.
    1. True
    2. False
14. In and RC circuit, as capacitance \_\_\_\_\_\_\_\_\_\_\_, discharge time increases.
    1. Decreases
    2. Increases
    3. Remains constant
15. On a capacitor charge plot, once the voltage reaches \_\_\_\_% of the entire charged voltage, the amount of time that has elapsed is equal to the time constant.
    1. 5.5%
    2. 10.2%
    3. 63.2%
    4. 75.4%
    5. 80.0%
    6. 100%
16. The value of a process variable (e.g. temperature, pressure, depth, rpm…) that a process control system attempts to maintain is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
17. A device that can store electrical energy in a magnetic field is a/an \_\_\_\_\_\_\_\_\_.
    1. Capacitor
    2. Transistor
    3. Inductor
    4. Resistor
    5. Diode
18. If a constant DC current is flowing through an RL circuit, the voltage drop across the resistor will \_\_\_\_\_\_\_\_\_\_.
    1. Decrease over time
    2. Remain constant
    3. Increase over time.
    4. Be zero.
19. Factors that influence inductance of an inductor are \_\_\_\_\_\_\_. (circle all that apply)
    1. Number of turns of coil wire
    2. Spacing of coil windings
    3. Coil wire insulation material
    4. Cross-sectional area of the core
    5. Permeability of the core

**Constructed Response:** (Formulas are on the bottom of page 3)

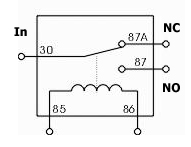
1. Determine the amount of charge stored on either plate of a capacitor, 4.0 x 10-6 F, when connected across an 18 volt battery.
2. A parallel plate capacitor is constructed of metal plates, each with an area of 0.7 m2. The capacitance is 9.876 nF (). Determine the plate separation distance, if teflon (permittivity of 2.1) is used as the dielectric.
3. What is the capacitance in an RC circuit if 𝝉=2.4s and R= 1kΩ?

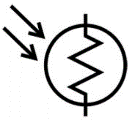
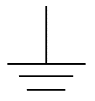
**Constructed Response:** (Formulas are on the bottom of page)

1. Name the following components from their schematic symbols. Be specific:

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



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Wire this circuit on a breadboard.

Diagram, schematic

Description automatically generated

5V