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

**See page 2 for formulas.**

1. A \_\_\_\_\_\_\_\_\_\_\_\_ detects insulation deterioration by measuring high resistance values under high test voltages.
	1. multimeter
	2. megohmeter
	3. ammeter
	4. continuity tester
2. Equipment designed to measure single-phase loads, such as appliances must be rated at least \_\_\_\_\_\_\_\_\_\_.
	1. CAT I
	2. CAT II
	3. CAT III
	4. CAT IV
3. An ammeter is used to measure \_\_\_\_\_\_\_\_\_\_.
	1. Voltage
	2. Current
	3. Resistance
	4. Power
	5. Insulation Resistance
4. When a breaker has been opened to remove energy from a circuit, the circuit will be safe to work on without testing for other energy sources.
	1. True
	2. False
5. Shields are provided on instrumentation control wiring to protect the wiring / signals from \_\_\_\_\_\_\_\_\_\_\_.
	1. moisture
	2. physical damage
	3. electrical interference / noise
	4. vibration
6. Typically, shielding in instrumentation circuits is grounded \_\_\_\_\_\_\_\_\_\_\_\_ .
	1. at both ends to eliminate noise.
	2. to a neutral return wire.
	3. at the source.
	4. at one end, to avoid a circulating flow of induced current.
7. A sine wave has a period (1 cycle) of 20 milliseconds. What is its frequency?
	1. 30 Hz
	2. 40 Hz
	3. 50 Hz
	4. 60 Hz
8. A multimeter used to measure AC voltage will readout \_\_\_\_\_\_\_\_\_\_.
	1. peak voltage
	2. RMS voltage
	3. average voltage
	4. voltage difference between max and min values
9. A Clamp-On Ammeter measures current by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. sensing the magnetic field generated by current passing through the wire.
	2. clamping on to the ends to two wires to complete a circuit and measure the current.
	3. determining the voltage in the cable and computing the current.
	4. measuring capacitance in the circuit.
10. If a conductor has a low resistance, it
	1. has a high conductivity.
	2. will conduct poorly.
	3. cannot be used for a service entrance.
	4. will make a poor ground connection.
11. Control and communication wiring most commonly uses \_\_\_\_\_\_\_\_\_\_\_\_ insulation.
	1. Silicone
	2. Rubber
	3. Nylon
	4. Polyethylene
12. A conductor’s ampacity is the \_\_\_\_\_\_\_\_\_\_\_\_.
	1. current it can carry under maximum load at 75° C.
	2. current it can carry without tripping a breaker.
	3. Peak current it can carry under ambient conditions.
	4. current it can carry continuously under conditions of use without exceeding its temperature rating.
13. In selecting a wire/power cable, an electrician must consider \_\_\_\_\_.
	1. ambient temperature
	2. termination point
	3. correct size
	4. all of the above
14. Select the AWG wire size below that has the least cross-sectional area, and therefore the least ampacity under the same ambient conditions.
	1. 16
	2. 12
	3. 10
	4. 8
15. To ensure safety when measuring unknown (low) voltages with a meter that has selectable ranges, you should first \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. measure the circuit resistance.
	2. measure the current.
	3. turn off the breaker
	4. test for higher voltages
16. A 120 V (*RMS*) AC source is connected to a 50Ω load: Find the power delivered. **Show work**.

**Match the tool with its common (electrical worker) usage: Place CAPITAL letter answers in boxes on right.**

|  |  |  |
| --- | --- | --- |
|  | Tighten box connectors, lock nuts, small couplings. |  |
|  | Bending and cutting wire and positioning small components. |  |
|  | Cutting cable, removing knockouts, twisting wire, deburring conduit. |  |
|  | Remove insulation from small-diameter wire. |  |
|  | Make circular cuts in walls. |  |
|  | Pull wires through conduit. |  |
|  | Cut holes in walls, floors, and ceilings to install boxes and conduit. |  |
|  | Drill into masonry, concrete, wood, metal. |  |
|  | Measure current in large cables. |  |
|  | Detect insulation deterioration. |  |
|  | Measure and observe electrical signals. |  |
|  | Test for a complete path for current to flow. |  |
|  | Apply heat shrink to electrical connections. |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A | Continuity Tester | I | Voltage Tester | Q | Soldering Iron |
| B | Heat Gun | J | Oscilloscope | R | Hole Saw |
| C | Hammer Drill | K | Clamp-On Ammeter | S | Megohmeter |
| D | Hacksaw | L | Hand Conduit Bender | T | Reciprocating Saw |
| E | Cable Tie Gun | M | Ratcheting PVC Pipe Cutter | U | Pipe Vise |
| F | Fish Tape | N | Wire Crimper | V | Wire Stripper / Cutter |
| G | Pipe Wrench | O | Needle-Nose Pliers | W | Side-Cutting Pliers |
| H | Tongue-and-Groove Pliers | P | Slip-Joint Pliers | X | Locking Pliers |

 $F=\frac{cycles}{s}$ $V\_{RMS}= \frac{1}{\sqrt{2}}(Peak Voltage)$ $P=\frac{V\_{RMS}^{2}}{R}$