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L4 Quiz: Solar Electrical Safety

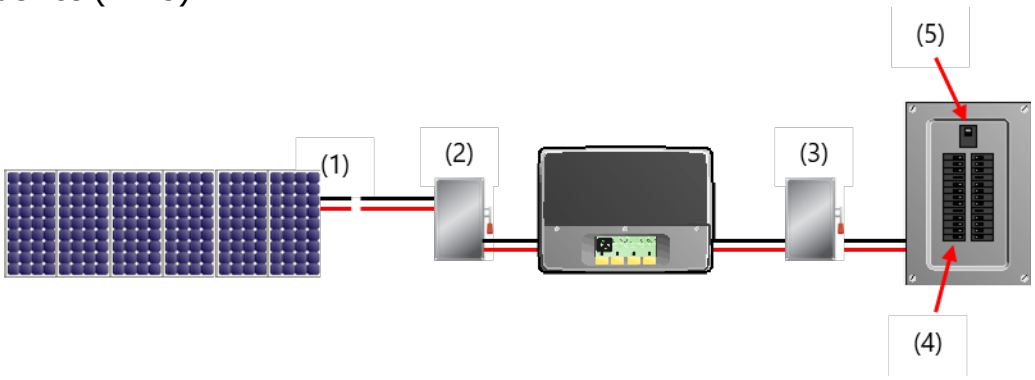
1) NFPA 70E provides guidance for which of the following?
   a) Electrical System Design
   b) Roof Safety and Worker protection
   c) Electrical Safety in the Workplace
   d) PV Installation Best Practices

2) According to NFPA 70E, employers have the responsibility to do which of the following if employees are working on electrical systems? (**choose three**)
   a) Establish lockout/tagout (LOTO) procedures
   b) Provide equipment necessary to execute LOTO
   c) Meet employee LOTO health insurance requirements
   d) Adequately train employees to design electrical systems
   e) Provide LOTO training to employees

3) On a grid-direct residential PV installation site (no energy storage), what **two** power sources will always be present?
   a) Wind generator
   b) Fossil fuel generator
   c) Utility grid
   d) PV array

4) A residential home has an existing multimode PV system (utility grid-connected with batteries). The system also includes a back-up generator. The workers will be installing an additional 4kW PV array. Which **five** sources of electricity must the worker identify and ensure an electrically safe work area?
   a) Utility grid
   b) Battery bank
   c) Back-up generator
   d) Wind generator
   e) Existing PV array
   f) New PV array

5) In the PV system depicted, use the list below to identify locations for each lock-out/tag-out device (1 – 5).



a) DC Disconnect 1) ___
b) PV source circuit (home runs) 2) ___
c) Inverter output circuit breaker 3) ___
d) Main circuit breaker 4) ___
e) AC Disconnect 5) ___

Using a PV module with the following parameters, answer questions 6) and 7).

STC Specifications	
Voc	**42.5**
Vmp	**34.4**
Imp	**8**
Isc	**8.8**
Pmax	**275**

6) What is the expected open-circuit voltage for a PV system with one PV source circuit of 13 modules in series, operating under standard test conditions (STC)?
a) 42.5 Vdc
b) 552.5 Vdc
c) 240 Vac
d) 600 Vdc
e) 447.2 Vdc

7) For a PV system with two source circuits of 13 modules in series, what is the expected maximum power current (Imp) and maximum power voltage (Vmp) of the PV output circuit, after the source circuits are wired in parallel?
a) 8 amps, 447.2 volts
b) 16 amps, 447.2 volts
c) 8.8 amps, 552.5 volts
d) 17.6 amps, 42.5 volts

8) PV technicians should only work on energized circuits when (**choose three**):
   a) Testing for PV array voltage
   b) Wiring PV modules in parallel
   c) Commissioning the PV system
   d) Explaining to the homeowner how to operate the PV system
   e) Troubleshooting the PV system
   f) Wiring the inverter output circuit to the utility grid
   g) Wiring PV modules in series

9) When using a meter to test PV array voltage of a residential grid-direct system, a worker should wear appropriate PPE, including which **one** of the following?
   a) Steel toe boots
   b) Electrically insulated gloves
   c) Hard hat
   d) Kevlar pants

10) A series arc-fault in a PV system can be caused by which of the following? (choose three)
   a) Loose wire terminations
   b) Low voltage
   c) Manufacturer defects within the PV module
   d) Loose PV module quick connectors
   e) Extreme irradiance
   f) Extreme temperature

11) PV circuits inside a building must be in a _____ raceway from point of building penetration to the first readily accessible disconnecting means.
   a) PVC
   b) PV
   c) Metal
   d) Schedule 80
   e) Disconnecting

12) True or False: Short circuiting a battery bank is not a safety hazard if operating at less than 50V.

13) Electric shock risk and severity depend on a variety of factors. Choose **four** from the list below.
   a) Voltage
   b) Current
   c) Path of current through the body
   d) Time of day
   e) Duration of current through the body
   f) Height of worker

14) A worker who has experienced an electric shock may experience:

a) Electrical burns
b) Heart attack or irregular heartbeat
c) Headaches
d) Problems with breathing, swallowing, vision, hearing
e) Loss of consciousness
f) All of the above

15) An arc-flash hazard, caused by the release of energy from an electric arc, will likely consist of which **three** of the following?

a) Extreme temperatures
b) PV array over voltage
c) Blinding light
d) Intense pressure and sound
e) Radioactive material

16) A ground fault occurs when a PV circuit conductor makes contact with which of the following?

a) Equipment grounding conductor
b) PV module frame
c) Metal Enclosure
d) Metal Conduit
e) Racking system
f) All of the above

17) Ground faults in a PV system are commonly caused by _____ and _____.

a) Faulty inverters
b) Compromised conductor insulation
c) Pinched wires between module frames and mounting structure
d) Workers prepping module wiring while on the ground
e) Microinverters

18) What can be used to isolate the PV array from the inverter? Choose **two**.

a) Blanket
b) DC disconnect
c) Reflective Tarp
d) AC Disconnect
e) PV module quick connectors

19) Workers should always check for _____ in all circuits before opening a non-load break rated device, such as a fuse holder or PV module quick connectors.

a) voltage
b) wind
c) irradiance
d) current
e) heat

20) True or False: Unqualified persons are permitted past the restricted approach boundary only if they are supervised.