Renewable Energy

Use this key to check answers and read the explanations.

1. A visitor sees mirrors concentrating sunlight to heat a fluid that helps generate electricity. Which resource powers the plant?

A. Solar energy
B. Geothermal energy
C. Tidal energy
D. Biomass energy

Correct answer: A. Solar energy
The mirrors collect energy from sunlight. A concentrating solar-thermal plant uses it to heat a fluid.

2. A working demonstration uses the natural heat of hot water rising from deep underground. Which source is the display about?

A. Biomass energy
B. Wind energy
C. Geothermal energy
D. Solar energy

Correct answer: C. Geothermal energy
Geothermal uses heat from Earth. Deep hot water can carry that heat to the surface.

3. Which material on a loading dock belongs in a demonstration of biomass rather than fossil fuel?

A. Coal from a mine
B. Dry corn stalks left after harvest
C. Diesel refined from crude oil
D. Natural gas from a fossil reserve

Correct answer: B. Dry corn stalks left after harvest
Leftover plant stalks are a crop residue and a potential biomass source.

4. A small photovoltaic cell powers a model fan in direct sunlight. What does the cell convert into electricity?

A. Heat from a separate boiler
B. Rotation of the fan blades
C. Sound from the fan
D. Light reaching the cell

Correct answer: D. Light reaching the cell
A photovoltaic cell converts light into electricity. That electricity can then run the fan.

5. At a conventional river hydropower station, which moving material turns the turbine?

A. Steam from a coal boiler
B. Water flowing past it
C. Air rising through a cooling tower
D. Liquid fuel moving down a pipe

Correct answer: B. Water flowing past it
Water moving through the station turns its turbine. A generator converts the rotation into electricity.

6. A wind turbine and an electric fan both have blades. In the wind turbine, which event comes first in normal operation?

A. Moving air drives the blades
B. Electricity drives the blades to produce the wind
C. The blades cool a fluid that powers the generator
D. The generator creates sunlight to drive the blades

Correct answer: A. Moving air drives the blades
The wind sets the turbine blades in motion. A fan reverses the role of the moving air and the electricity.

7. A solar water heater and a photovoltaic panel sit side by side on a roof. Which one directly supplies electricity?

A. Neither system can directly supply electricity
B. The solar water heater
C. Both systems directly supply electricity
D. The photovoltaic panel

Correct answer: D. The photovoltaic panel
The photovoltaic panel directly converts sunlight to electricity. The other system uses sunlight to heat water.

8. A museum labels a system ‘geothermal heat pump’ and describes its use for heating and cooling a building. Which source does the system use?

A. Electricity collected by a water turbine
B. Moving air high above the building
C. The relatively steady temperature below the surface
D. Sunlight concentrated in a rooftop mirror

Correct answer: C. The relatively steady temperature below the surface
A ground-source heat pump exchanges heat with the soil or rock, whose temperature varies less than the outdoor air.

9. A two-reservoir plant has surplus electricity available at noon. Which action stores energy for use later?

A. Pump water into the upper reservoir
B. Let both reservoirs drain downstream
C. Send water through the turbine into the lower reservoir
D. Release the upper reservoir so the water bypasses the turbine

Correct answer: A. Pump water into the upper reservoir
Pumping water upward stores energy. Later the plant can release water downhill through the turbine to generate electricity.

10. A solar garden charges a battery at midday and discharges it after sunset. What purpose is the battery serving?

A. Keeping the panels at maximum output overnight
B. Collecting sunlight after sunset
C. Increasing the nameplate capacity of each panel
D. Making some earlier solar generation available later

Correct answer: D. Making some earlier solar generation available later
The battery stores some of the electricity generated in daylight for use when sunlight is unavailable.

11. A wind unit supplies a steady 7.5 MW for two hours in a classroom model. How much energy does it produce during those hours?

A. 7.5 MWh
B. 3.75 MWh
C. 15 MWh
D. 9.5 MWh

Correct answer: C. 15 MWh
Electrical energy equals power multiplied by elapsed time. Multiply 7.5 MW by 2 hours to get 15 MWh.

12. A 2.5 MW array delivers 18 MWh over a 24-hour day. What is its capacity factor for that day?

A. 18%
B. 30%
C. 42%
D. 72%

Correct answer: B. 30%
Running at full capacity all day would produce 60 MWh. Divide 18 by 60 to get a capacity factor of 0.30.

13. Wind site A has 4 MW of capacity and a 25% capacity factor. Site B has 2 MW and a 60% capacity factor over the same month. Which statement is correct?

A. The capacity factors are enough to tell that site A generates more
B. Site A generates exactly twice as much energy
C. Both sites generate equal energy
D. Site B generates more energy

Correct answer: D. Site B generates more energy
Average power is 4 × 0.25 = 1 MW for A and 2 × 0.60 = 1.2 MW for B. The two periods have equal length, so B generates more energy.

14. A battery stores energy from 3 MWh of incoming electricity and later delivers 2.4 MWh, with no other charging. What fraction of the incoming electrical energy does it return?

A. 80%
B. 20%
C. 60%
D. 125%

Correct answer: A. 80%
Divide 2.4 MWh out by 3 MWh in. The ratio is 0.8, or 80%.

15. A diagram shows hot geothermal water warming a second liquid across a barrier. Vapor from the second liquid spins the turbine. Which label fits the diagram?

A. Pumped-storage hydropower plant
B. Dry-steam geothermal plant
C. Binary-cycle geothermal plant
D. Photovoltaic solar plant

Correct answer: C. Binary-cycle geothermal plant
A binary-cycle plant uses geothermal heat to vaporize a separate fluid. The geothermal water transfers heat without passing through the turbine.