

ADVANCED KIDWIND DESIGN CHALLENGE KEY



One point each.

- T 1. True or False All the energy in the universe that has ever existed is the same amount of energy that exists today.
- T 2. True or False The wind is not blowing. The blades on a turbine that are still represent potential energy.
- D 3. Some areas of the Earth have dependable strong winds while other areas do not. The direction and strength of the wind are modified by:
- A. the Earth's terrain
 - B. bodies of water
 - C. vegetative cover
 - D. All of these
- D 4. To generate electricity in a wind turbine, electricity is produced when the rotating electrical generator is placed between two _____.
- A. Blades
 - B. Rotors
 - C. Gears
 - D. Magnets
- B 5. All of these are true of wind turbines, except:
- A. It is a clean, renewable energy source.
 - B. It is the top killer of birds in the wild.
 - C. The wind energy field creates jobs and U.S. competitiveness.
 - D. It is a sustainable, domestic energy source.
- C 6. This is the sequence of the Engineering Design Process.
- A. Create, Ask, Plan, Imagine, Improve
 - B. Imagine, Create, Plan, Ask, Improve
 - C. Ask, Imagine, Plan, Create, Improve
 - D. Plan, Improve, Ask, Imagine, Create

___C___ 7. Two forces are acting on the blades when they are rotating in the wind. Identify them and whether they are a positive or a negative force.

- A. Lift = negative, Drag = positive
- B. Gravity = positive, Thrust = negative
- C. Lift = positive, Drag = negative
- D. Thrust = positive, Lift = negative

___A___ 8. To create more voltage,

- A. Make your rotor spin faster.
- B. Make your rotor spin slower.
- C. Increase the number of blades.
- D. Increase the weight of the blades.

___D___ 9. Which angle of the blade, to the wind, would cause the greatest amount of drag?

- A. 90°
- B. 60°
- C. 30°
- D. 0°

___A___ 10. The units used to measure electrical output of the wind turbine are;

- A. Watts
- B. Millivolts
- C. Coulombs
- D. Joules

Short Answer

Explain the energy transfer in a wind turbine beginning at the sun and ending with a light bulb.

Be sure to use these terms in your answer. (3 points)

Electrical, Mechanical, Radiant, Thermal - These can be used more than once.

The radiant energy from the sun warms the atmosphere unevenly causing different air pressures. Warm air rises, being less dense and cool air sinks. This causes wind. Wind energy turns the turbine blades (mechanical). The rotor is connected to the shaft which spins a magnet in the generator (mechanical). The magnet spins between coils of wire causing electrons to flow (electrical). The electricity travels to bulb and light it (radiant & thermal).

Many variables are taken into consideration when designing your blades and placement in the rotor. List a minimum of four. (2 points)

Number, shape, weight, pitch, length