4. You throw a ball into a box and close the lid. You hear the ball bouncing around inside as the ball’s energy changes from gravitational potential energy to kinetic energy, to elastic potential energy, and so on. If you wait a minute or two, what will have happened to the ball’s energy?

   E.4 The ball’s energy will eventually become thermal energy.

5. Why do meats and vegetables cook much more quickly when there are metal skewers sticking through them?

   E.5 Foods are poor conductors of heat. The metal skewer carries heat better.

6. Why do aluminum pans heat food much more evenly than stainless steel pans when you cook on a stove?

   E.6 Aluminum is a better conductor of heat than stainless steel, so heat disperses more quickly in an aluminum pan and the food cooks more evenly on that pan.

Additional questions:

1. List the 3 limitations of propellers.
   a. The torque of the propeller tends to flip the plane.
   b. Thrust diminishes as the plane’s speed increases.
   c. As the speed of a plane increases, the propeller speed must increase to prevent drag. The tip speed of the propeller must be below the speed of sound. Therefore, the drag can be significant at high speed.

2. The torque of a propeller can flip an airplane. How is this problem overcome?
   a. The propeller is placed in the front of the plane. The spinning air must then pass over the wings and return angular momentum to the plane.

3. Describe the basic operation of a turbojet (jet engine).
   a. Incoming air is compressed to a high pressure. Fuel is added to the compressed air and ignited. The expanding gas travels out the back of the engine (after powering a turbine for the compressor.) The backward momentum of the gas powers the engine forward.

4. What is thermal energy?
   a. It is internal energy. Energy due to the vibration of atoms and molecules.

5. What is chemical potential energy?
   a. Energy stored in the chemical bond forces between atoms.

6. What is heat?
   a. Heat is the transfer of thermal energy.

7. If you pour liquid nitrogen (very cold) on your hand, which direction will heat flow?
   a. From your hand to the liquid nitrogen.

8. Explain the heat transfer method of “conduction.”
   a. The flow of thermal energy through a stationary material. It is due to vibrating atoms exciting their neighbors causing thermal energy to move from hot areas to cold.

9. What is a heat exchanger?
   a. A device that transfers heat between materials without the materials touching.