Physics 261: Random Questions 3

These are questions from the end of chapters in Halliday and Resnick's book (used for the 130 series).

1. Does kinetic energy depend on the direction of the motion involved? Can it be negative? Does its value depend on the reference frame of the observer?

2. Sally is riding up in an elevator at constant speed and holding a book. Steve, standing on a facing balcony, observes her as the cab rises through a height h. What is the work-energy situation of the book as viewed from these two reference frames?

3. Why is it tiring to hold a heavy weight even though no work is done?

4. Give an example in which positive work is done by a frictional force. (Think about static versus sliding friction.)

5. The displacement of a body depends on the reference frame of the observer. It follows that the work done on a body should also depend on the observer's reference frame. You drag a crate across a rough floor by pulling on it with a rope. Identify reference frames in which the work done on the crate by the tension in the rope would be (a) positive, (b) zero, and (c) negative.

6. Suppose that the earth revolves around the sun in a perfectly circular orbit. Does the sun do any work on the earth?

7. You slowly lift a bowling ball from the floor and put it on a table. Two forces act on the ball: its weight, $m\mathbf{g}$, and your upward force, $-m\mathbf{g}$. These two forces cancel each other so that it would seem that no work is done. On the other hand, you know that you have done some work. What is wrong?

8. In picking up a book from the floor and putting it on a table, you do work. However, the kinetic energy of the book does not change. Is there a violation of the work–energy theorem here?

9. What happens to the potential energy that an elevator loses in coming down from the top of a building to a stop at the ground floor?

10. You see a duck flying by and declare it to have a certain amount of kinetic energy. However, another duck, flying alongside the first one, declares it to have no kinetic energy at all. Who is right, you or the second duck? How does the conservation of energy principle fit into this situations?