

6. (30 pts)

a) (10 pts) What are some of the ways that the energy of an object may be manifested? (i.e. what about the object or what it is doing could change if the energy of the object changes?) List at least three for full credit.

The three ways I was looking for that we have discussed several times are:

- As speed: kinetic energy.
- As altitude: gravitational potential energy.
- As temperature: thermal energy.

There are others, however.

b) (10 pts) The Earth receives energy from the sun and radiates energy into space. What must be true about these two energy transfers if the average temperature on the Earth is to remain (relatively) constant?

If the temperature is to remain constant, then the total energy of the Earth must remain constant. Since there is energy coming in (from the sun) and going out (radiation), these two must be equal if the total is to remain constant.

c) (10 pts) A ball is released from rest at a height of 2 m. Is it possible for this ball to overcome a 2.2 m high obstacle (measured from the same vertical origin) with no further energy input? Explain your reasoning.

Without an additional source of energy, the ball will *not* be able to make it over the barrier.