Relativity [Classical vs. Special]

Speed of light in a vacuum: $c = 3.0 \times 10^8$ m/s [Pre-Unit Diagnostic]

Classical Notions of Relativity: Knowledge Inventory

1. Jack and Kayla are on the deck of a boat moving forward at 16m/s relative to the shore. Kayla throws a ball to Jack, who is down the deck near the rail. Why is it not accurate to say, "The ball is moving at 16 m/s?"

2. You are riding a motorcycle at 15 m/s. You throw a ball off the front of the bike at 5 m/s relative to you. What is the speed of the ball relative to a stationary observer watching you pass by?

3. Again, on the bike travelling at 15 m/s you pass by the observer, but this time you throw the ball behind you at speed of 5 m/s relative to you. What is the speed of the ball relative to the stationary observer?

4. It is dark out and miraculously you are traveling at *0.5c* (half the speed of light). You are on your bike and in order for you to see you turn on your headlight.
   a) What speed do you measure for the speed of the light coming out of the front of your motorbike?
   b) What speed does the stationary observer on the ground measure for the speed of light of the headlight as you pass by?

5. Again, you shine a flashlight off the back of your bike.
   a) What speed do **you** measure for the light?
   b) What speed does the **stationary observer** measure?

6. Do you think it is possible for you "catch up" to a beam of light?

7. If you could catch up to it, would the beam be stationary, relative to you?