Question 1

Consider the following situations regarding a basketball (consists of a rubber shell with air inside):

A. A basketball rests on the surface of Earth.

B. A basketball floats on the surface of a lake.

C. A basketball flies upwards through the air.

D. A basketball, submerged beneath the surface of a lake, rises.

According to Aristotle's system for understanding the physical world, which of these are unnatural motions and require a force on the ball?

1. All of them.
2. Only B.
3. Only C.
4. Only C and D.
5. Only B, C, and D.

Question 2

An object slides down ramp, starting from rest $1\,\mathrm{m}$ from the bottom of the ramp. It takes $4\,\mathrm{s}$ to reach the bottom of the ramp.

Suppose that the same object slides, starting from rest $2\,\mathrm{m}$ from the bottom of the ramp. How much time will it take to reach the bottom?

1. Less than $4\,\mathrm{s}$.
2. Between $4\,\mathrm{s}$ and $8\,\mathrm{s}$.
3. Exactly $8\,\mathrm{s}$.
4. More than $8\,\mathrm{s}$.

Question 3

An astronaut is very distant from any objects including spacecraft, planets and stars. The astronaut throws a ball horizontally.

Which of the following is true after the ball has left the hand of the astronaut?

1. The ball eventually slows to a stop regardless of the speed with which it was thrown.
2. The ball continues to move in the same direction and with the same speed regardless of how it was thrown.
3. The ball will speed up.
4. The ball will speed up if it is thrown fast enough, but slow down if it is thrown too slowly.

Question 4

An object can slide along a rough horizontal surface, such as in the PhET animation "Forces and Motion". Keeping it moving at a constant speed appears to require a force exerted by a person. Which if the following is true?

1. The Law of Inertia is incorrect since the sliding object does not naturally move with a constant speed.
2. The Law of Inertia is correct but it will never work in situations like this.
3. The Law of Inertia is correct since there is still no overall external influence on the object.