Honors Physical – Earth Science 1st Quarter Objectives Review **Answer Key**

1. Sketch graphs to represent the motion of a car traveling at a constant speed on a straight road. Graphs must be:

a. Position – Time **b. Velocity – Time** **and c. Acceleration – Time**

straight line w/positive slope **horizontal line** **horizontal line along x axis (zero)**

2. Sketch graphs to represent the motion of a ball rolling down a ramp, starting from rest. Graphs must be:

a. Position – Time **b. Velocity – Time** **and c. Acceleration – Time**

curving line **straight line with positive slope** **horizontal line**

(curving upward if it's getting faster)

3. A magnet causes a steel ball to accelerate to the right at 4 m/s2 for 3 seconds. If the ball initially was moving to the right at 2 m/s, what is its final velocity? (Use diagram to solve)

0s 1s 2s 3s

--> ------> ----------> ---------->

2 m/s 6 m/s 10 m/s 14 m/s

4. Two model rockets are built, both with the same size of rocket engine to propel them. One rocket is 1.5 times the mass of the other. Explain the relationship between their motions when they are fired.

The rocket with greater mass will accelerate less. (2/3 the acceleration of the smaller rocket)

5. Ned pushes on a box with 300N of force. Friction between the floor and the box acts with 200N of force. If the box has a mass of 40kg, how much will the box accelerate?

Net force = 300N-200N = 100N

F = m*a, so 100N = 40kg*a

a= 2.5 m/s2

6. A ball is thrown horizontally. The only force acting on the ball is gravity. Describe the path of the ball (you may use a picture)

Curved path downward; will curve immediately upon leaving hand.

7. A car traveling forward slows to a stop before a red light. Describe the car's acceleration and the direction of the net force on the car.

Acceleration: negative **Net force: Negative (toward the back of the car)**

8. Is the Earth pulled toward the Moon? Explain.

Yes; it is pulled to the Moon with a force equal and opposite to the force the Earth pulls on the Moon with. (newton's 3rd law)

9.. John weighs 500N on the Earth's surface. If he climbs to the top of a high mountain, so that his distance from the center of the Earth is 1.1 times what it was, will he weigh the same amount?

(this example is exaggerated; no mountains exist that are anywhere near 10% of the Earth's radius.)

$Fg = (Gm1m2)/(r)^2$ Normal: $1g = 1*1/(1)^2$.

If the radius is changed to 1.1, $g = 1*1/(1.1)^2 = .82$

(john will only weigh 82% as much has he did at normal radius, so 500N * .82 = 410N

10. Liz drops a pencil off her desk. At the same time, a marble rolls off Francis's desk. Which (if any) will hit the floor first, and why?

Neither; objects fall at the same rate due to gravity; regardless of horizontal motion. The only factors that influence falling rate are air resistance and any initial vertical velocity.

11. A ball, while moving through the air at an upward angle, has two forces acting on it. Draw a diagram and use arrows to represent these forces.

Gravity: straight down

Air resistance: Exactly opposite the ball's direction of motion at any given point

12. Why is gravity important to the arrangement of our solar system, and what would happen if gravity suddenly disappeared?

Gravity maintains planets in their orbits, and holds planets together. If it disappeared, planets would continue in straight paths out into space, in whatever direction they were moving just before gravity disappeared. - like a tangent line to their orbit.

13. An Olympic diver jumps off the high – dive board and splashes into the water. Contrast the forces acting on her at two times during her jump, and label arrows to represent the forces acting on her (2 forces in each scenario)

a. Just before she hits the water (gravity and air resistance – gravity is larger) (she would be accelerating downward)

and

b. Just after she enters the water (gravity remains the same, but resistance of the water is greater than air resistance, so she accelerates upward)

14. An airboat is a boat that is used in swampy areas with heavy wildlife, algae, mud, etc. where a water propeller would get stuck. It moves by spinning a huge fan that blows air backward. Explain how this moves the boat forward. You may use a diagram.

According to Newton's 3rd law, force pairs are:

Force of fan on air

Force of air on fan --> this force pushes boat forward.

15. A 2.0kg ball is dropped from a tower. How fast will it be traveling after 3.0s? (you may use a diagram to solve, and you may have some unnecessary information)

2.0kg is unnecessary / irrelevant. After 3s, the ball will be moving at -30 m/s

16. If a 1000kg car is slowed from 20 m/s to a stop in 3.0s, what force acted on the car?

Acceleration: -20m/s divided by 3s = 6.67m/s2…… Fnet = m*a, so 1000kg * 6.66 m/s2 = 6,666N

17. Ashley weighs 450N. What would she weigh on a planet whose size was the same as the Earth, but its mass was half as much?

Half as much! 225N

18. Engineers are measuring the gravitational force between the Earth and the Moon. If the Moon were suddenly moved to twice its current distance from the Earth, how would the force between the Moon and Earth change?

The force would be ¼ since radius is squared in the gravity equation.

19. Sumo wrestling is a sport where participants attempt to stay inside a ring and knock their

opponent to the outside. Why is it advantageous for sumo wrestlers to be quite large?
Larger mass = larger inertia, so harder to accelerate you out of the ring.