Unit 1 Practice Test Version 2
Physics 200 (25-26)

Name: Key

Formulas [These will be optional on the test. You get +1% for not using formulas.]:

$\bar{v} = \frac{v_0+v}{2}$ $\bar{v} = \frac{\Delta x}{\Delta t}$ $a = \frac{\Delta v}{\Delta t}$ $speed = \frac{distance}{time}$ $\Delta = final - initial$

Multiple Choice, Matching, and Short Answer

1. Circle **all** of the quantities that are **scalars**.
   Force Displacement Acceleration Distance Position Speed Velocity

2. This tells us whether position increases or decreases during each second, and by how much.
   Position Displacement Velocity Speed Acceleration

3. This [illegible] us the direction of movement.
   Position Displacement Velocity Speed Acceleration

4. This tells us how the velocity of an object changes during each second.
   Position Displacement Velocity Speed Acceleration

#5-9 Answer Choices: A. Drag B. Tension C. Weight D. Normal Force E. Friction

5. A B C D E Resistance between two surfaces sliding across one another

6. A B C D E The pulling force in a rope, cable, or chain

7. A B C D E A force exerted perpendicularly outward by a surface

8. A B C D E ~~Air resistance~~ Force of gravity

9. A B C D E Resistance acting on an object moving through a fluid

10. Average Velocity: v_0 v $\bar{v}$ x Δy a Δt

11. Displacement: v_0 v $\bar{v}$ x Δy a Δt

12. Final Velocity: v_0 v $\bar{v}$ x Δy a Δt

13. Position: v_0 v $\bar{v}$ x Δy a Δt

Fill in the blanks...

14. 1kg = 2.2 pounds
15. 1 m/s = 2.24 mph
16. 1 foot = 0.305 meters
17. 1N = 0.225 pounds

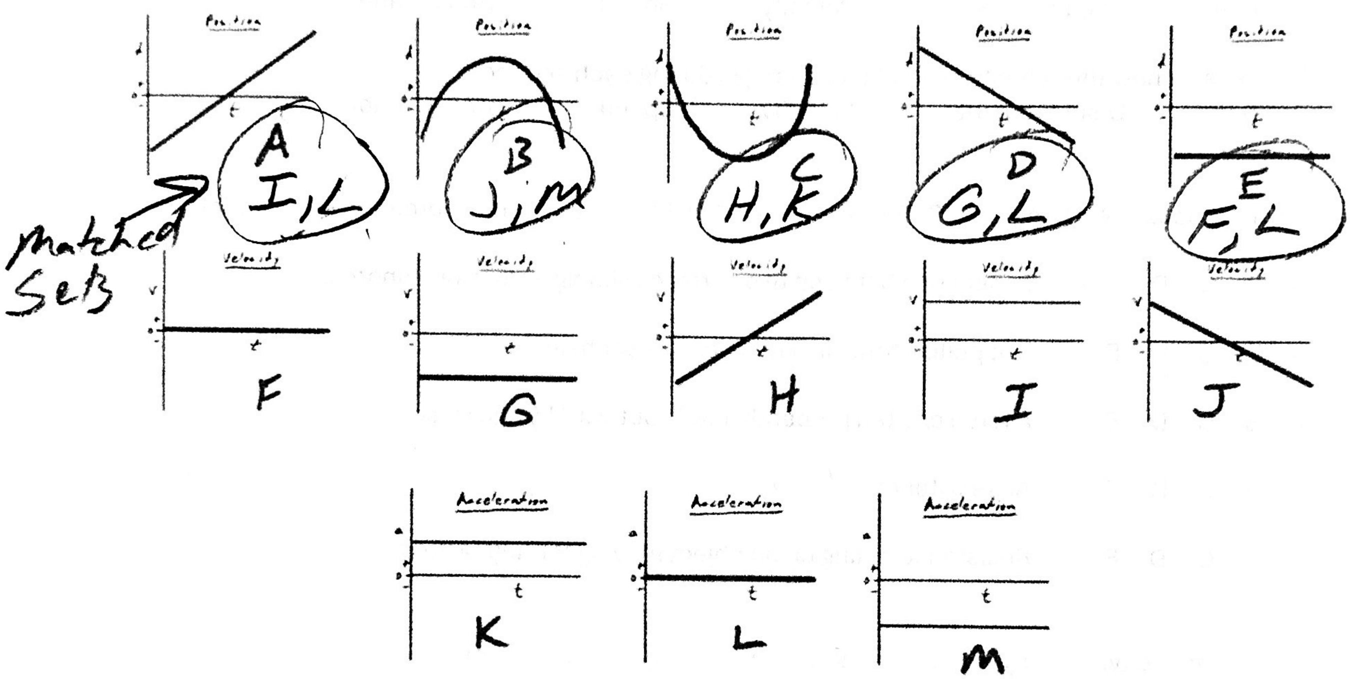
17-20. The top row of graphs below plot position vs. time. The middle row shows velocity vs time, and bottom row shows acceleration vs time.

17. Which **velocity graph** represents the same motion as **position graph B**?
F G H I J

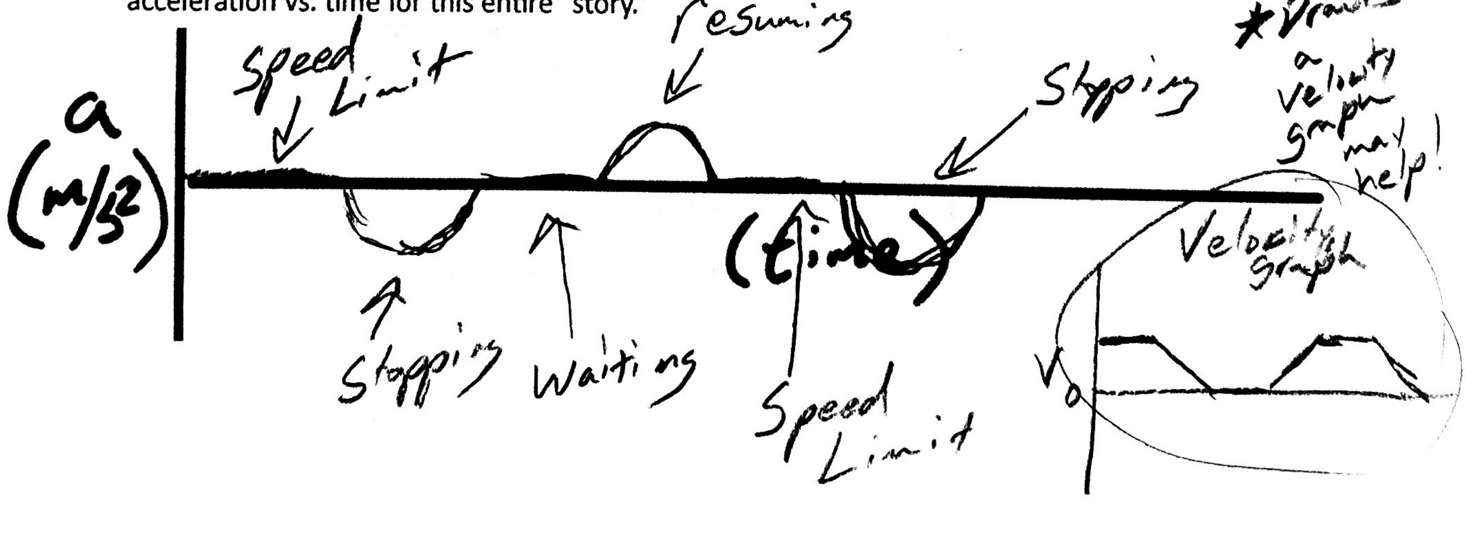
18. Which **position graph** represents the same motion as **velocity graph G**?
A B C D E

19. Which **position graph** represents the same motion as **acceleration graph K**?
A B C D E

20. Which **acceleration graph** represents the same motion as **position graph A**?
K L M



21. A car travels rightward at the speed limit. The driver sees a stop sign and stops the car. The car waits for its turn at the intersection and then resumes traveling rightward at the speed limit. Then the car stops at another stop light, and that is where this story ends. Sketch a graph of the car's acceleration vs. time for this entire "story."



21. Astronauts orbiting the Earth feel weightless, but they're not. Explain why this is not true weightlessness.

Earth's gravity is acting on them, keeping them in orbit. Weight = force of Gravity.

22. Describe what something could be ~~doing if it has~~ negative acceleration and positive velocity.

Moving rightward (or upward) slowing down

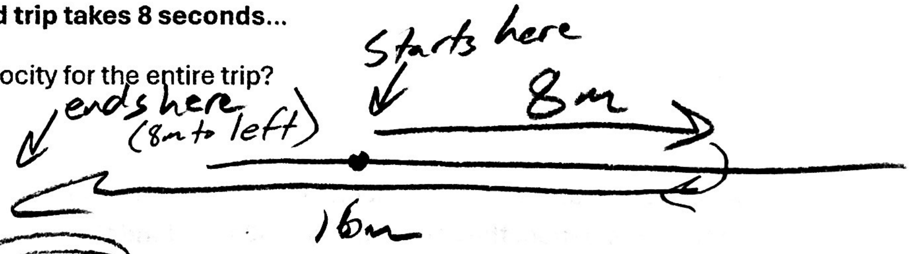
23. Describe what something could be doing if it has negative acceleration and zero velocity.

Not moving, but beginning to move downward (or leftward) (like a ball at the top of its flight)

Problems: For possible partial credit, clearly show useful starting formulas and intermediate answers.

1. A car travels **8m to the right** (positive direction). Then it drives in reverse, traveling **leftward for 16m**. Assuming that **the entire round trip takes 8 seconds...**

a. What is the car's average velocity for the entire trip?



$\Delta x = -8m$

$\bar{v} = \frac{\Delta x}{\Delta t} = \frac{-8m}{8s} = -1 m/s$

b. What is the car's average speed for the entire trip?

$Speed = \frac{distance}{\Delta time} = \frac{24m}{8s} = 3 m/s$

2. Wile E. Coyote drops an anvil in the absence of air resistance. After falling for a short time, the anvil's **velocity is -49m/s.** The anvil continues to fall for **8 more seconds** until it hits the ground (somehow missing the road runner and landing on Wile E. Coyote). During this 8 second time period...

Givens:
$v_0 = -49 m/s$
$\Delta t = 8 s$
$a = -9.8 m/s^2$

a. What is the anvil's change in velocity?

$a = \frac{\Delta v}{\Delta t}$ $\quad -9.8 m/s^2 = \frac{\Delta v}{8s} \Rightarrow \Delta v = -78.4 m/s$

b. What is the anvil's final velocity?

$\Delta v = v - v_0$ $\quad -78.4 m/s = v - (-49 m/s)$

$v = -127.4 m/s$

c. What is the anvil's average velocity?

$\bar{v} = \frac{v_0 + v}{2}$ $\quad = \frac{-49 m/s + (-127.4 m/s)}{2} = -88.2 m/s$

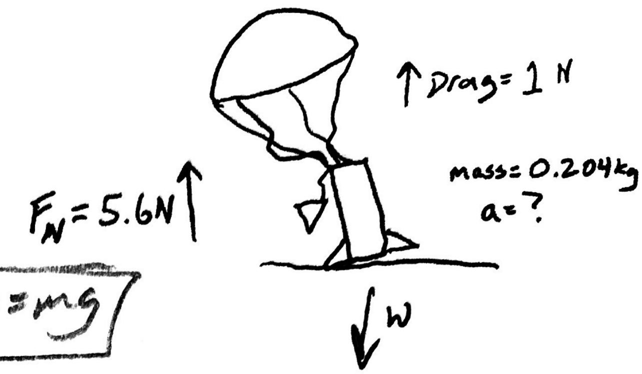
d. How far does the anvil fall?

$\bar{v} = \frac{\Delta y}{\Delta t}$ $\quad -88.2 m/s = \frac{\Delta y}{8s} \Rightarrow \Delta y = -706 m$

Fall Distance → 706m

3. A car accelerates at a constant rate for a time of 5 seconds over a displacement of +50m. By the end of this time period, the car's velocity is 50m/s. **Find the car's acceleration.**

3. The rocket on the right has just touched the ground, but it is still moving downward. There are three forces acting on the rocket, and they are all shown in the diagram. The rocket's mass is 0.204kg. What is the rocket's **current acceleration?**



$$\Sigma F = ma$$

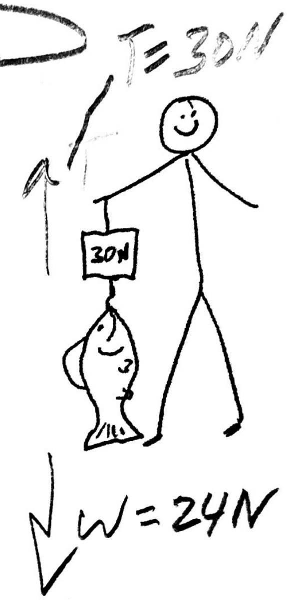
$$\Sigma F = 5.6N + 1N - W \qquad W = mg$$

$$ma = 6.6N - mg$$

$$0.204kg(a) = 6.6N - 0.204kg(9.8m/s^2)$$

$$a = 22.6 m/s^2, \text{ upward}$$

4. A bass weighing **24 Newtons** is hanging from a scale. The scale works perfectly, but it reads **30N**, because the person holding the scale is causing the bass to accelerate.



a. What is the bass' mass?

$$W = mg \qquad 24N = m(9.8m/s^2)$$

$$m = 2.45kg$$

b. What are the magnitude and direction of the bass' acceleration?

$$\Sigma F = ma$$

$$\Sigma F = T - W$$

$$ma = T - W$$

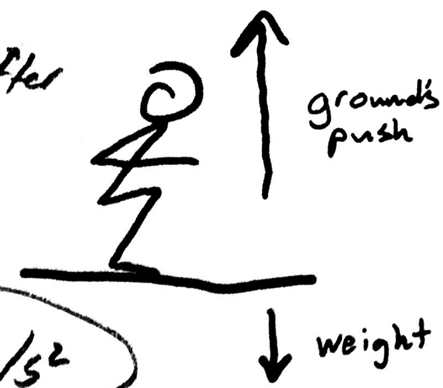
$$2.5kg(a) = 30N - 24N$$

$$a = 2.4m/s^2 \text{ upward}$$

5 ✱

The diagram on the right shows the only two forces acting on a student as she jumps (we're ignoring air resistance). **She starts her jump from rest, and** [redacted] after [redacted] **in a time of 0.12 seconds. Her mass is 50kg.**

her velocity is 5 m/s



a. What is her acceleration?

$$a = \frac{\Delta V}{\Delta t} = \frac{5\,m/s}{0.12\,s} = 41.7\,m/s^2$$

b. What is the magnitude of the net force acting on the student?

$$\Sigma F = ma = 50kg\,(41.7\,m/s^2) = 2{,}085\,N$$

c. We haven't learned about Newton's 3rd Law yet, but the reason that the ground is pushing up is that the student is pushing down with an equal force. What is the magnitude of the student's push (same as the ground's push)?

ΣF = ground's push − Weight

2,085N = ground's push − mg

2,085N = grounds push − (50kg)(9.8m/s²)

grounds push = 2,580 N