4.1 Quizlette - Newton's Second Law (turn this in) **Name________________________**

F = ma:

1. What **net force** would accelerate a 2.50 kg mass at a rate of 27.6 m/s/s?

2. What **mass** accelerates at 6.50 m/s/s when a force of 87.0 N acts on it?

3. What is the **acceleration** of a 9.10 kg mass if there is a net force of 3.50 N acting on it?

(weight) $F_g = mg$: (Use g = 9.80 N/kg - round to three digits total)

4. What is the **weight** on earth of a 60.0 kg boy named Brennen?

5. What **mass** on earth weighs 730. N?

6. A 45.0 kg mass weighs 73.0 N on the moon. What is the "**g**" (The gravitational field strength) of the moon?

1) 69.0 N, 2) 13.4 kg, 3) 0.385 m/s/s, 4) 588 N, 5) 74.5 kg, 1.62 N/kg

Kinematics <u>then</u> F = ma:

7. What **net force** would accelerate a 6.80 kg mass from rest a distance of 24.0 m in 5.00 s?

8. A 72.0 kg mass accelerates from 5.70 m/s to 18.0 m/s in 4.00 s. What **net force** acted?

9. A 12.0 kg mass accelerates from 6.20 m/s to 15.0 m/s over a distance of 21.0 m. What **net force** acted?

7) 13.1 N, 8) 221 N, 9) 53.3 N, 10) 42.0 m/s, 11) 3.95 s, 12) 35.6 m

F = ma <u>then</u> Kinematics:

10. A 24.0 N net force acts on a 8.00 kg mass. If it accelerates from rest, what is the **final velocity** in 14.0 s?

11. A net force of 26.0 N acts on a 3.80 kg mass. After what **time** would the mass reach a speed of 27.0 m/s from rest?

12. A net force of 36.0 N acts on a 8.50 kg mass. What will be its **displacement** from rest if it accelerates for 4.10 s?

Physics

FA 4.1 - Newton's Second Law

Name_______________________________ (Do this before the test, **grade it** and **correct it** on the website, turn it in before the test)

Show your work, round to about three total digits, circle your answers, and label them with units. Use the convention that up is positive.

1. What is the acceleration of a 4.39 kg mass if there is an net force of 12.5 N on it?

2. What is the mass of an object that weighs 764 N on earth?

3. What net force would accelerate a 2.10 kg mass at 7.80 m/s/s?

4. What net force would accelerate a 0.145 kg baseball from rest to 38.0 m/s in a distance of 0.985 m?

5. If there is a net force of 42.0 N on a 3.60 kg mass, what time would it cover 37.0 m from rest?

P4.1 Newton's Second Law Questions (Optional)

(Use g = 9.8 m/s/s - round to three digits total)

63.7 N 12.9 m/s/s 16.7 kg 6.51 N 45.9 m/s	1. a. What is the weight of a 6.50 kg object on earth? b. What is the acceleration of a 2.80 kg object of there is 36.0 N of unbalanced force on it? c. What mass on earth weighs 164 N? d. What net force would accelerate a 1.60 kg mass from rest a distance of 17.1 m in 2.90 s? e. A 15.0 N net force acts on a 4.90 kg mass. If it accelerates from rest, what is the final velocity in 15.0 s?
91.9 N 6.68 kg 637 N 292 N 21.8 m	2. a. What net force would accelerate a 37.5 kg mass at 2.45 m/s/s? b. What mass accelerates at 2.98 m/s/s when a force of 19.9 N acts on it? c. What is the weight on earth of a 65.0 kg boy named Brennen? d. A 58.2 kg mass accelerates from 5.70 m/s to 25.3 m/s in 3.90 s. What net force acted? e. A net force of 46.7 N acts on a 8.80 kg mass. What distance has it covered from rest when it has reached a speed of 15.2 m/s?
65.3 kg 57.6 N 14.5 kg 10.1 s 47.0 N	3. a. What mass on earth weighs 640. N? b. What net force would accelerate a 18.0 kg mass at 3.20 m/s/s? c. What mass would accelerate at 5.30 m/s/s when there is a net force of 77.0 N acting on it? d. A net force of 12.5 N acts on a 2.80 kg mass. After what time would the mass reach a speed of 45.0 m/s from rest? e. A 7.20 kg mass accelerates from 4.10 m/s to 17.8 m/s over a distance of 23.0 m. What net force acted?
2.22 kg 22.0 N 0.704 m/s/s 27.3 N 17.3 m	4. a. What mass accelerates at 8.75 m/s/s when there is a net force of 19.4 N acting on it? b. What is the weight of a 2.24 kg object on earth? c. What is the acceleration of a 6.12 kg mass if there is a net force of 4.31 N acting on it? d. A 5.10 kg mass accelerates from rest to a speed of 23.8 m/s in a distance of 53.0 m. What net force was needed? e. A net force of 14.7 N acts on a 5.80 kg mass. What will be its displacement from rest if it accelerates for 3.70 s?
0.788 m/s/s 4.29 kg 5.925 N 3.14 s 102 N	5. a. What is the acceleration of a 17.0 kg mass if there is a net force of 13.4 N acting on it? b. What mass weighs 42.0 N on earth? c. What net force would accelerate a 1.50 kg mass at 3.95 m/s/s? d. A net force of 47.0 N acts on a 16.5 kg mass. In what time will it cover a distance of 14.0 m from rest? e. A 47.0 kg mass accelerates from 3.90 m/s to 12.8 m/s in 4.10 s. What net force acted?

4.2 Quizlette - Vertical Acceleration **(turn this in)** **Name**______________________

(use the convention that down is negative, g = 9.8 m/s/s)

Unknown Acceleration:

1. A 3.20 kg rocket has engines that deliver 38.0 N of thrust. What is the acceleration of the rocket?

2. A small elevator has a mass of 12.0 kg, and is suspended by a cable that has a tension of 92.0 N. What is its acceleration?

1) 2.08 m/s/s (up), 2) -2.13 m/s/s (down), 3) 250.8 N, 4) 16.4 N

Unknown force:

3. A 6.00 kg rocket accelerates upward at 32.0 m/s/s. What must be the thrust of the engines?

4. A 8.20 kg mass is on a cord and is accelerating downwards at 7.80 m/s/s. What is the tension in the cord?

Kinematics <u>then</u> unknown force

5. A 4.30 kg mass on a cord is moving upwards, and stops in a distance of 6.20 m in 2.10 seconds. What is the tension in the cord as it is stopping?

6. A small 14.0 kg elevator is moving downward at 8.90 m/s, and is stopped in a distance of 7.40 m. What is the tension in the cable supporting the elevator as it is stopping?

5) 30.0 N, 6) 212 N, 7) 63.5 m up, 8) 2.49 m

Unknown Acceleration <u>then</u> Kinematics:

7. A 72.0 kg rocket has engines that generate a thrust of 1250 N. If it starts at rest, what is its elevation in 4.10 seconds?

8. A 62.0 kg climber is falling at 13.0 m/s, and is stopped by a force of 2710 N. In what distance will they stop?

Name______________________________ (Do this before the test, **grade it** and **correct it** on the website, turn it in before the test)

Show your work, round to about three total digits, circle your answers, and label them with units. Use the convention that up is positive.

A 1.60 kg mass hangs on a rope.

1. What does the tension need to be in the rope to accelerate the mass upwards at 3.56 m/s/s?

2. What is the acceleration of the mass if the tension in the rope is 19.3 N?

3. What is the tension in the rope if the mass is accelerating downwards at 7.20 m/s/s?

4. What is the acceleration of the mass if the tension in the rope is 11.0 N?

5. The mass is moving upwards at 5.30 m/s and stops in a distance of 2.80 m. What is the tension in the rope as it is stopping?

P4.2 Vertical Acceleration Questions (Optional)

Use the convention that up is positive. The assessments will have each only one problem with kinematics.

+96.1 N +44.9 N +10.8 m/s/s +85.0 N -35.1 m	**1. A 6.32 kg flour baby hangs on a cord.** a. What is the tension in the cord if the flour baby is accelerating upwards at 5.40 m/s/s? b. If the flour baby is accelerating downwards at 2.70 m/s/s, what is the tension in the cord? c. If the tension in the cord is 130. N, what is the acceleration of the flour baby? d. If the flour baby is moving downwards at 5.50 m/s, and stops in 1.51 s, what was the tension in the cord during this time? e. There is a tension in the cord of 40.0 N. If the flour baby is initially at rest, what is the displacement of the flour baby 4.50 s later?
+32.5 m/s/s +19.5 N +9.82 N +3.60 N 1.20 s	**2. A 1.30 kg giant gerbil hangs on a cable.** a. If the upward force exerted by the cable is 55.0 N, what is the acceleration of the giant gerbil? b. What tension in the cable would cause the giant gerbil to accelerate upwards at 5.20 m/s/s? c. What is the tension in the cable if the giant gerbil has a downward acceleration of 2.26 m/s/s? d. The giant gerbil accelerates from rest to a downward velocity of 9.56 m/s in a distance of 6.50 m. What was the tension in the cable as it was doing this? e. There is a tension of 32.0 N in the cable. In what time can the giant gerbil change its velocity from rest to 17.8 m/s upwards?
+29.7 N +5.58 m/s/s +84.6 N +28.4 N +6.37 m/s	**3. A 5.20 kg baby koala hangs from a rope.** a. What is the tension in the rope if the koala is accelerating downwards at 4.10 m/s/s? b. If the tension in the rope is 80.0 N, what is the acceleration of the koala? c. What tension in the rope would effect an upward acceleration of 6.45 m/s/s? d. From rest, the koala displaces itself downward 7.20 m in 1.82 s. What is the tension in the rope as this is happening? e. If there is a tension of 58.0 N in the rope, what is the final velocity of the koala when it has risen 15.0 m if the koala started from rest?
-2.07 m/s/s +8.60 N +53.9 N +37.4 m/s +7.17 N	**4. A 2.20 kg giant cockroach rappels on a very strong string.** a. What is the acceleration of the cockroach if the tension in the string is 17.0 N? b. If the cockroach is accelerating downwards at 5.90 m/s/s, what is the tension in the string? c. What tension in the string would cause an upward acceleration of 14.7 m/s/s? d. If the tension in the string is 38.0 N, and the cockroach is initially at rest, what is the final velocity of the cockroach after 5.00 s? e. The cockroach is moving upwards at 6.45 m/s and stops in a distance of 3.18 m. What is the tension in the string as he is stopping?
+55.9 N -3.50 m/s/s +16.7 N -11.6 m +72.3 N	**5. A 4.60 kg gourd hangs on a cord.** a. What is the tension in the cord if the gourd is accelerating upwards at 2.35 m/s/s? b. What is the acceleration of the gourd if the tension in the cord is 29.0 N? c. If the gourd is accelerating downwards at 6.19 m/s/s, what is the tension in the cord? d. If the gourd starts from rest, and the tension in the cord is 28.0 N, what is the displacement of the gourd in 2.50 s? e. If the gourd accelerates from an upward velocity of 1.12 m/s to 6.57 m/s in a distance of 3.54 m, what is the tension in the cord?

4.3 Quizlette - Friction **(turn this in)**

Name________________________

Basic Friction:

(1-4) A 6.80 kg block of wood has a static coefficient of 0.340 and a kinetic of 0.170 between it and a desk.

1. Calculate the maximum force of static friction

2. Calculate the force of kinetic friction

3. If the block is at rest, and I exert a force of 27.0 N to make it move, does it slide?
Why or why not? Explain your answer with numbers and words.

4. If the block is at rest, and I exert a force of 20.0 N to make it move, does it slide?
Why or why not? Explain your answer with numbers and words.

Unknown acceleration: (Label all accelerations either **accel** - speeding up, or **decel** - slowing down)

(5-8) A 5.00 kg box of chocolates has a coefficient of static friction of 0.360, and a kinetic of 0.140 between it and the table. (label all your accelerations **accel** - speeding up, or **decel** - slowing down)

5. If the box is sliding to the right and there is a force of 11.0 N to the right, what is the acceleration of the box?

6. If the box is sliding to the right, and there is a force of 5.00 N to the right, what is the acceleration of the box?

7. If the box is sliding to the left, and there is a force of 23.0 N to the left, what is the acceleration of the box?

8. If the box is sliding to the left, and there is a force of 4.00 N to the right, what is the acceleration of the box?

1) 22.7 N, 2) 11.3 N, 3) Yes it will slide, because 27.0 N is bigger than the maximum static force of 22.7 N, 4) No, applied force of 20.0 N is smaller than the maximum static friction of 22.7 N, 5) 0.828 m/s/s **accel**, 6) -0.372 m/s/s **decel** 7) -3.23 m/s/s **accel**, 8) +2.17 m/s/s **decel**

Unknown force: **(Use the convention that right is +, left is -)**

(9-12) A 3.80 kg block of cheese has a coefficient of static friction of 0.830, and a kinetic of 0.250 between it and the table. (label all forces **left** or **right**)

9. What outside force would cause it to slide to the right, and accelerate to the right at 5.90 m/s/s?

10. What outside force would cause it to slide to the right and decelerate at 1.80 m/s/s?

11. What outside force would cause it to slide to the left and accelerate left at 2.70 m/s/s?

12. What outside force would make it slide to the left and decelerate at 5.00 m/s/s?

9) 31.7 N right, 10) 2.47 N right,
11) -19.6 N (left), 12) 9.69 N right

13. In the space below, draw a cartoon of Mr. Duggan and Mr. Osborn playing pin the tail on the Drumhiller while wearing ballerina outfits: (optional)

Physics
FA 4.3 - Friction

Name_______________________________ (Do this before the test, **grade it** and **correct it** on the website, turn it in before the test)

Show your work, round to about three digits total, circle your answers, and label them with units.

Label every force **right** or **left**; Label every acceleration as either **accel** - speeding up or **decel** - slowing down

A 4.25 kg block of wood has a kinetic coefficient of friction of 0.120 and a static of 0.330 between it and the level floor.

0. Calculate the **kinetic friction force**, and the **maximum static friction force**. If the block were at rest, and you exerted a force to the right of 15.0 N, **would the block begin to move**? What if the force was 12.0 N? Support your answer with numbers.

1. If the block is sliding to the right, and I exert a force of 7.80 N to the right, what is the acceleration of the block?

2. If the block is sliding to the left, and I exert a force of 3.50 N to the right, what is the acceleration of the block?

3. If the block is sliding to the right, and accelerating to the right at 2.35 m/s/s, what must be the outside force acting on the block?

4. If the block is sliding to the left, but is decelerating at 3.12 m/s/s, what must be the outside force acting on the block?

P4.3 Physics - Friction Questions (Do the ones indicated on Canvas)

Use the convention that to the right is positive, and to the left is negative.

Label every force **right** or **left**; Label every acceleration as either **accel** - speeding up or **decel** - slowing down

Part e from every question is not on the summative assessment, they are there for a challenge (The assessments are like 0. and a. through d.)

7.13 N, 9.68 N Yes: 15.0 N > 9.68 N +2.43 m/s/s (decel) -2.70 m/s/s (decel) -10.0 N (left) -32.6 N (left) +39.7 N (right)	**1. There is a coefficient of kinetic friction of 0.140 and a static of 0.190 between a 5.20 kg box and the level floor.** 0. Calculate the **kinetic friction force**, and the **maximum static friction force**. If the block were at rest, and you exerted a force to the right of 15.0 N, **would the block begin to move**? Support your answer with numbers. a. If the box is sliding to the left, and we exert a force of 5.50 N to the right, what is the acceleration? b. If the box is sliding to the right, and we exert a force of 6.90 N to the left, what is the acceleration? c. The box is sliding to the right, but is decelerating at 3.30 m/s/s, what outside force besides friction is acting on it? d. If the box is sliding and accelerating to the left at 4.90 m/s/s, what force must be acting on it? Optional: e. The box slides from rest to the right reaching a velocity of 14.5 m/s in a distance of 16.8 m. What outside force was acting?
4.89 N, 20.9 N No: 19.0 N < 20.9 N +0.697 m/s/s (accel) +0.461 m/s/s (decel) +25.3 N (right) +28.8 N (right) +6.75 m/s (right)	**2. There is a coefficient of kinetic friction of 0.105 and a static of 0.450 between a 4.75 kg block of wood and the level floor.** 0. Calculate the **kinetic friction force**, and the **maximum static friction force**. If the block were at rest, and you exerted a force to the right of 19.0 N, **would the block begin to move**? Support your answer with numbers. a. If there is a force of 8.20 N to the right, and the block is sliding to the right, what is the acceleration? b. If the block is sliding to the left, and there is a force of 2.70 N to the left, what is the acceleration of the block? c. What applied force would make the block accelerate and slide to the right at 4.30 m/s/s? d. If the block is sliding to the left, but is decelerating at 7.10 m/s/s, what force must be applied to it? Optional: e. If you apply 8.90 N to the right and the block starts to slide to the right from rest, what will be the velocity in 8.00 seconds?
25.4 N, 38.5 N Yes: 45.0 N > 38.5 N -1.48 m/s/s (decel) -4.52 m/s/s (decel) -1.99 N (left) -36.1 N (left) +72.4 N (right)	**3. There is a coefficient of kinetic friction of 0.310 and a static of 0.470 between an 8.35 kg block of wood and the level floor.** 0. Calculate the **kinetic friction force**, and the **maximum static friction force**. If the block were at rest, and you exerted a force to the right of 45.0 N, **would the block begin to move**? Support your answer with numbers. a. If the block is sliding to the right, and there is a force of 13.0 N to the right, what is the acceleration? b. If the block is sliding to the right, but there is a force of 12.4 N to the left, what is the acceleration? c. If the block is sliding to the left, but is decelerating at 2.80 m/s/s, what outside force must be acting? d. If the block is sliding to the right, but is decelerating at 7.36 m/s/s, what is the force acting on the block? Optional: e. From rest the block reaches a speed of 15.0 m/s from rest in a distance of 20.0 m. What force was acting?
4.71 N, 7.90 N No: 6.00 N < 7.90 N -2.87 m/s/s (decel) -0.520 m/s/s (accel) +18.5 N (right) -10.1 N (left) -13.7 N (left)	**4. There is a coefficient of kinetic friction of 0.155 and a static of 0.260 between a 3.10 kg block of wood and the level floor.** 0. Calculate the **kinetic friction force**, and the **maximum static friction force**. If the block were at rest, and you exerted a force to the right of 6.00 N, **would the block begin to move**? Support your answer with numbers. a. If the block is sliding to the right, and you exert a force of 4.19 N to the left, what is the acceleration? b. If the block is sliding to the left, and you exert a force of 6.32 N to the left, what is the acceleration? c. If the block is sliding and accelerating to the right at 4.45 m/s/s, what force must be applied? d. If the block is sliding to the left and accelerating to the left at 1.75 m/s/s, what force must be applied? Optional: e. The block displaces itself to the left 12.0 m from rest in 2.87 s. What force must have acted?
20.4 N, 33.4 N Yes: 34.0 N > 33.4 N +0.778 m/s/s (decel) +1.62 m/s/s (accel) -37.1 N (left) -8.97 N (left) +10.9 m/s (right)	**5. There is a coefficient of kinetic friction of 0.235 and a static of 0.385 between an 8.85 kg box and the level floor.** 0. Calculate the **kinetic friction force**, and the **maximum static friction force**. If the block were at rest, and you exerted a force to the right of 34.0 N, **would the block begin to move**? Support your answer with numbers. a. If the box is sliding to the left, and there is a force of 13.5 N to the left, what is the acceleration? b. If the box is accelerating to the right, and there is a force of 34.7 N to the right, what is the acceleration? c. If the box is sliding to the right, but is decelerating at 6.50 m/s/s, what force must be acting on the box? d. If the box is sliding to the left, but is decelerating at 1.29 m/s/s, what must be the force acting on the box? Optional: e. If the box is sliding to the right, and there is a force of 32.0 N to the right, what will be its final velocity from rest when is has gone 45.0 m?

Physics - Fall Mock Final (EC for final!)

Name____________________________

Show your work, circle and label your answers with units.

Page 1 - Speed and Acceleration

1. A baseball is going 35.0 m/s. What distance does it travel in 0.522 s? (18.3 m)

2. A car goes 45 m in 8.00 s. What is its velocity? (5.63 m/s)

3. Convert 13.0 m/s to feet/second (42.7 f/s)

4. A car going 12.0 m/s accelerates at 1.20 m/s/s for 3.2 s. What is its final velocity? (15.8 m/s)

5. A car going 24.0 m/s is going 17.0 m/s 11.0 seconds later. What was its acceleration? (-0.636 m/s/s)

Page 2 - Linear Kinematics and Free Fall

1. A moving giant lizard stops in 3.10 m in 1.20 s. What was its acceleration? (-4.31 m/s/s)

2. A car is going 26.0 m/s after traveling 145 m in 7.80 s. What was its initial velocity? (11.2 m/s)

3. A runner accelerates uniformly from 1.30 m/s to 4.70 m/s with an acceleration of 5.20 m/s/s. What was their displacement? (1.96 m)

4-5. An air rocket leaves the ground going straight up with a velocity and reaches a height of 37.0 m before coming back down.
Neglect air friction and use g = 9.8 m/s/s

4. What was its launch velocity? (26.9 m/s)

5. What total time was it in the air? (5.50 s)

Page 3 - Projectile Motion

Ignore air friction, use the convention that down is negative, and use g = 9.8 m/s/s.

1-3: A ball is projected sideways from the top of a 12.0 m tall cliff. It lands having traveled a horizontal distance of 23.0 m.

1. What time is the ball in the air? (1.56 s)

2. What horizontal velocity did it have? (14.7 m/s)

3. Draw a picture of its velocity of impact and express it as an angle and a magnitude. (21.2 m/s 46.2^o below horiz.)

4-5: A ball is launched at 26.0 m/s at an angle of 65.0^o above horizontal on a level field.

4. What time is it in the air? (4.81 s)

5. What horizontal distance does it travel before striking the ground again (52.8 m)

Page 4 - Dynamics

1. A 13.0 kg mass accelerates along a frictionless track covering 45.0 m of distance in 2.30 s from rest. What net force was acting on the mass? (221.2 N)

2-3: A 2.50 kg mass hangs on a cord.

Use the convention that <u>up</u> is positive.

2. If the tension in the cord is 12.0 N, what is the acceleration of the mass? (-5.00 m/s/s)

3. If the mass is accelerating downwards at 4.20 m/s/s, what is the tension in the cord? (14.0 N)

4-5: There is a coefficient of kinetic friction of 0.150 between a 8.00 kg block of wood and the level floor.

Use the convention that <u>right</u> is positive.

4. If there is a force of 9.20 N to the right, and the block is sliding to the right, what is the acceleration? Is it speeding up or slowing down? (Answer both questions) (-0.320 m/s/s, decelerating, or slowing down)

5. What in what direction force is needed to make it slide and accelerate to the right at 4.90 m/s/s? (Answer both questions) (51.0 N to the right)