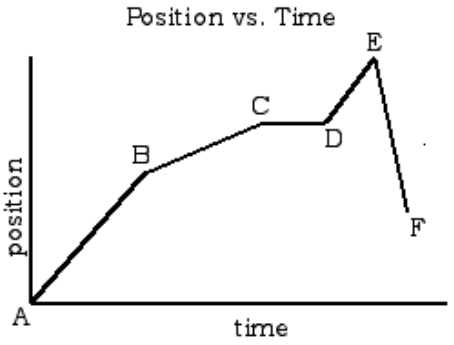
PHYSICS 112 **EXAM REVIEW ASSIGNMENT – JUNE 2017** **MRS. LOGAN**

TO BE HANDED IN ON THE DAY OF THE EXAM (MONDAY JUNE 12th)

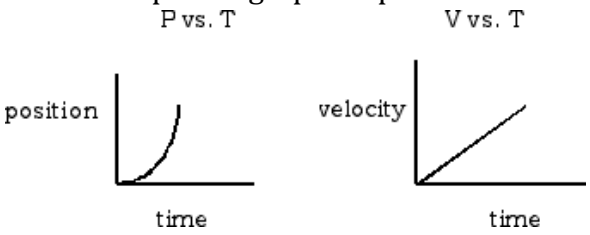
Kinematics

1. How do scalar and vector quantities differ?
2. Distance is to displacement as speed is to _____.
3. Draw a sketch of a graph that illustrates (a)uniform motion, and (b) non-uniform motion
4. What does the slope on a position- time graph indicate?
5. What does the slope on a velocity -time graph indicate?
6. What does the area under a velocity -time graph indicate?
7. On a bright sunny afternoon, Hamilton decided to go on a bicycle ride. Study the position-time graph on the right for part of his trip.
   a. Between which points did Hamilton travel the fastest?
   b. What probably happened between C and D?
   c. Between which points did he travel the slowest?
   d. Did Hamilton change direction at any point?

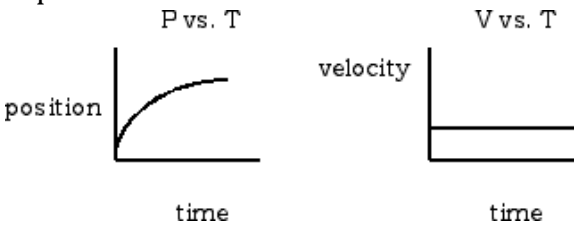


8. Could each pair of graphs represent the same motion? Explain.

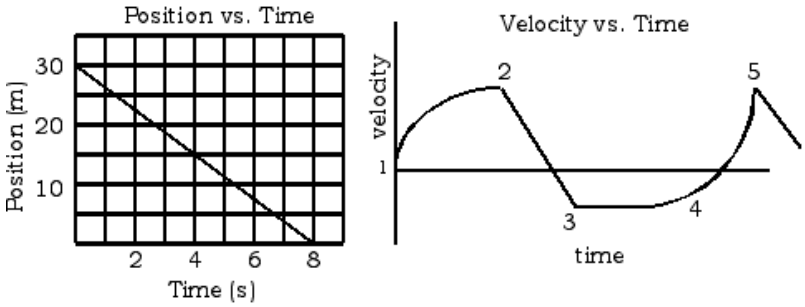
a)



b)



13. If a Boeing 747 travels 3677 km from Birmingham, Alabama to Reno, Nevada at an average velocity of 251 m/s, how long will it take to get to Reno?
14. Calculate the velocity of the object whose position-time graph is shown on the right.
15. Study the velocity-time graph on the right. Describe the acceleration between…
    a. Points 1 and 2.
    b. Points 2 and 3.
    c. Points 3 and 4.
    d. Points 4 and 5.

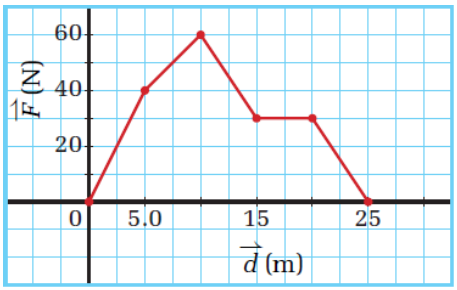


16. Does the object in the velocity-time graph above reverse its direction at any time? Explain.
17. A car traveling at 13.8 m/s accelerates uniformly at 1.94 m/s^2 for 2.26 s. What is its final velocity?
18. A truck traveling 30.6 m/s takes 1.4 s to slow to 27.2 m/s. What was the truck's acceleration?
19. A ball rolls down a hill with a constant acceleration of 3.0 m/s^2. If it starts from rest, what is its final velocity after 2.4 s? How far did it move?
20. A car traveling at 30 .0 m/s is brought to rest at a constant rate in 30 s by applying the brake. What is its acceleration and how far did it go after he breaks were applied?
21. An object, dropped from a balloon descending at 3.6 m/s, lands on the ground 13 s later. What was the altitude at the time the object was dropped?
22. During a 30.0 sec interval, the speed of a rocket rose steadily from 100 m/s to 500 m/s. How far did the rocket go during this time?

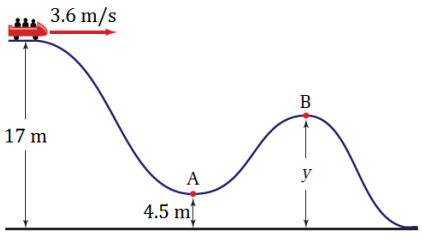
Dynamics

1. Define inertia and give one every day example.
2. How do kinematics and dynamics differ?
3. What does the value of "a_g" represent?
4. What are the two types of friction and how do they differ?
5. What are the two things that influence static friction?
6. What does the coefficient of friction (μ) indicate?
7. Draw an FBD for each situation below.
   a) A curling stone is sliding along a horizontal ice surface to the left and slowing down due to friction.
   b) A lawnmower being pushed across the road at constant speed.
8. An astronaut who's mass is 95 kg lands on an asteroid. He finds that his weight is 35 N. What is the acceleration of gravity on this asteroid?
9. You are helping a friend push a piano across the floor. It has a mass of 450 kg. Calculate the normal force supporting the piano, and if the coefficient of friction is 0.35 calculate the minimum force necessary to get the piano moving.
10. You push a wooden crate across the wood floor with a constant velocity. If you are exerting a force of 385 N, what is the mass of the crate? (μ_k= 0.20 for wood on wood)
11. What is the difference between Newtonian and Quantum Mechanics?
12. Write 1-2 sentences to explain each of Newton's 3 Laws
13. As it moves through the water, a 400 kg boat experiences a resistance force of 2500 N from the air and 3200 N force of resistance from the water. If the motor provides a forward force of 6000 N determine the net force and acceleration of the boat.
14. What is the acceleration of a 68.0 kg crate that is pushed across the floor by 425 N force, if the coefficient of kinetic friction between the box and the floor is 0.50?
15. A 2200 kg car is traveling at 45 km/h when its brakes are applied and it skids to a stop. If the coefficient of friction between the road and the tires is 0.70, how far does the car go before stopping?
16. A 1700 kg car starting from rest reaches a speed of 20.0 m/s in 45.0 s. Calculate the car's acceleration and the net force acting on it.
17. An elevator that weighs 3.5×10^3 N is accelerated upward at 2.0 m/s. What force does the cable exert to give this acceleration (tension)?
18. Define momentum, impulse and explain the momentum–impulse theorem.
19. What impulse results from a person knocking on a door with a force of 9.1 N [E] for 2.5×10^{-3} s?
20. What is the impulse of a 0.300 kg hockey puck slap shot that strikes the goal post at a velocity of 44 m/s [N] and rebounds straight back at 9.2 m/s [S]?
21. A bullet of mass of 15.0 g strikes a wooden block of mass 5.00 kg. The bullet becomes embedded in the block. The block with the bullet in it then flies off at 1.50 m/s.
    a. What was the original velocity of the bullet?
    b. If the bullet was fired from a 4kg rifle what was the velocity of the rifle's recoil?
22. A bomb, sitting at rest, having a mass of 15.0 kg explodes into two pieces that fly out horizontally in opposite directions. One piece was found to have a mass of 3.00 kg and flew off with a speed of 80 m/s. If the mass of the other piece was 12.0 kg, with what speed did it fly off?

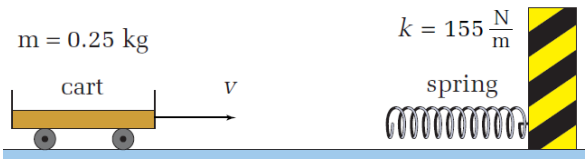
Work, Energy and Power



1. Define work. What unit is used for work?
2. Explain the 3 special situations in which no work is done.
3. Find the work done in the graph shown on the right.
4. Why is it harder to run up a flight of stairs than walk?
5. Which force positive work on your as you climb a ladder? Which force does negative work?
6. How many joules does a 60 watt light bulb use per second?
7. Starting with $P = W/t$ show that $P = Fv$.
8. A motor exerting a steady force of 20 N on an object moves it forward at a speed of 2.0 m/s for 20 s. How much work is done?
9. A crane is capable of doing 1.50 x 10^5 J of work in 10.0 s. What is the power of the crane?
10. Rubbing your hands together requires 450 J of energy and results in a thermal energy increase in your palms of 153 J. Calculate how efficiently the kinetic energy is converted to thermal energy.
11. What is the difference between kinetic and potential energy?
12. State the work-energy theorem.
13. What is the difference between the two types of potential energy that we studied?
14. A 6.30 kg rock is pushed horizontally across a 20.0 m frictionless frozen pond with a force of 30.0 N. Find the velocity of the rock once it has traveled 13.9 m.
15. How high would you have to raise a 0.2000 kg baseball in order to give it 20.0 J of gravitational potential energy?
16. An unruly student pulls an elastic band that has a spring constant of 48 N/m, producing a 2.2 J increase in its elastic potential energy.
    a. How far did the student stretch the elastic band?
    b. How fast will the elastic be moving just after it is released?
17. A 10 kg block slides from rest down a frictionless ramp. If it has a speed of 5.2 m/s at the bottom of the incline, what was the incline's height?
18. Jodie's mass is 34 kg. She climbs a 5.0 m ladder, and starts down a slide without pushing herself forward. She reaches a velocity of 3.4 m/s at the bottom of the slide. How much work was done by the friction on Jodie?
19. The roller coaster car on the right has a mass of 245 kg, including its three riders.
    a. How fast would the car be moving at Point A, ignoring friction?
    b. How high off the ground is Point B if the car moves 10 m/s there, ignoring friction?
    c. How much work is done by friction if the car is actually moving 7.1 m/s at Point A?



20. A low-friction cart shown in the image on the right travels along a horizontal track and collides head on with a spring. If the spring compresses by 6.0 cm to bring the cart to a stop, how fast was the cart initially travelling?



Waves

1. Explain 2 different ways that waves can be categorized. Name & describe the 4 categories.
2. Are the particles of the medium carried along with the energy in waves?
3. Draw a transverse wave and label amplitude, crest, trough, wavelength, equilibrium (rest) position.
4. Define wavelength, frequency and period, give the symbol and unit for each.
5. When a wave enters a new medium which of the following will change: v, f, and/or λ?
6. When an incident waves enters a new medium that has a higher density, is the reflected wave upright or inverted? Will the wavelength and velocity increase or decrease?
7. What basic behaviours are exhibited by all types of waves?
8. State the law of reflection and draw a diagram to support your answer.
9. Explain how interference can cause a special type of wave called a standing wave.
10. Explain how sound waves are created and travel through a room. What kind of wave is sound?
11. What is the speed of sound if the temperature of the air is 30 °C?
12. What is the period of a wave if the frequency equals 458 kHz?
13. Determine the frequency and period of a human heart that beats 30 times in 12 s.
14. What is the wavelength of radio waves whose frequency is 6.4×10^6 Hz? Hint: Radio waves are electromagnetic waves, and therefore travel at the speed of light *(**c** on your formula sheet)*.
15. A wave has a frequency 0.64 Hz and a wavelength of 40 cm. What is the speed of the wave?
16. The period of the sound wave emitted by a vibrating guitar string is 3.00×10^{-3} s. If the speed of the sound in the air near the guitar is 331 m/s, what is the wavelength of the sound wave?
17. John hears his echo return from the bottom of a well 5.0 s after he yells down "I'm the king of the World". How deep is the well if the temperature inside the well is 25 ^{o}C?
18. How long will it take sound to travel 10.0 km, when the air temperature is 20 °C?
19. A boy shoots a paint gun at a target 70 m away. If the paint ball has a velocity of 220 m/s, how long after he shoots does he hear the ball hit the target if the air temperature is 10 ^{o}C?
20. Determine the path of a ray of light going from air, through a layer of crown glass, and then into water. The angle of incidence in the air was 30°. Sketch and solve for each unknown angle.
21. As light goes from air into an unknown medium the angle of incidence was found to be 50° and the angle of refraction was found to be 58°. What is the index of refraction? Is this possible? Explain
22. Determine the critical angle for light going from water to air.