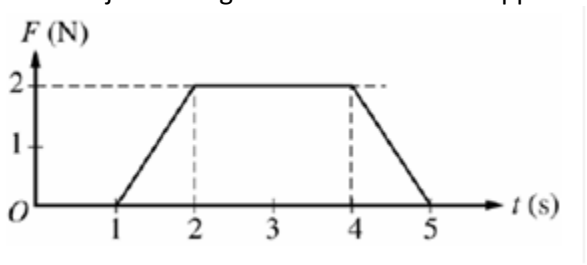
Physics Final Review

Topics:

- Kinetic energy
- Gravitational potential energy
- Elastic potential energy
- Conservation of energy
- Energy equations
- Work
- Work equation
- Momentum
- Elastic collisions
- Inelastic collisions
- Conservation of momentum
- Momentum equations
- Periodic motion
- Pendulums
- Equation for period of a pendulum
- Waves
- Wavelength
- Frequency
- Wave equations
- Sound
- Doppler effect
- Doppler equation
- Light
- Planck's constant
- Light equations
- Electrostatics
- Charges
- Coulomb's law
- Coulomb's law equation
- Universal gravitation equation
- Electric fields
- Electric potential difference
- ΔV equations
- Circuits
- Current
- ampere
- Circuit equations
- Series circuit
- Parallel circuit

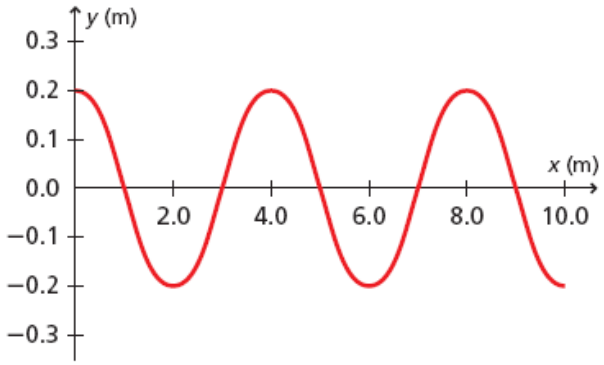
1. What is momentum? What are the units for momentum?
2. What does the impulse-momentum theorem describe?
3. How does the impulse-momentum theorem relate to Newton's laws of motion?
4. Ferdinand the bull is sliding down an icy slope with a velocity of 2 m/s. His mass is 500 kg. If you apply a force of 300 N, how long will it take you to stop his descent?
5. A red ball has a mass of 5.0 kg and is moving with a velocity of 4.5 m/s. It collides with an orange ball, which is stationary and has a mass of 7.5 kg. After the collision, the red ball moves in the opposite direction with a velocity of 6.0 m/s. What is the velocity of the orange ball after the collision?
6. Major Tom the astronaut is floating in space near his shuttle when he realizes he is detached from the ship. His total mass (body and suit and equipment) is 230 kg. He throws an empty oxygen tank away from the shuttle. The tank has a mass of 21 kg and is thrown with a velocity of 9.3 m/s. The ship is 51 m away. What is his resulting velocity? How long will it take for him to reach his ship?
7. A 2 kg object initially moving with a constant velocity is subjected to a force F in the direction of motion. A graph of F as a function of time t is shown. What is the increase, if any, in the velocity

of the object during the time the force is applied?



8. A 2.0-kilogram block initially hangs at rest at the end of two 1.0-meter strings of negligible mass as shown on the diagram. A 0.0030-kilogram bullet, moving horizontally with a speed of 1.0×10^3 meters per second, strikes the block and becomes embedded in it. After the collision, the bullet/block combination swings upward but does not rotate. Calculate the maximum vertical height above the initial resting position reached by the bullet/block combo.
9. What is work? What are the units for work?
10. What is power? What are the units for power?
11. Together, two students exert a force of 825 N on a stationary car. If the car does not move, how much work is done on the car?
12. In the previous problem, how much work is done if the car moves 20.0 m?
13. A hockey player exerts a 9.00 N force on a puck for 0.075 m. This contact lasts 0.50 s. What is the power of the player?
14. Bob wants to stop a slow-moving train. He applies a force of 150 N. If he performs 250 000 J of work to stop, how many meters did it take Bob to bring the train to a complete stop?
15. A force of 300.0 N is used to push a 145 kg mass for 30.0 m horizontally in 3.00 s. Calculate the average power output needed.
16. Bradley drops his broccoli out of the car window. If the broccoli weighs 0.25 kg and falls 1.5 m to the ground, how much work is done by gravity?
17. What is mechanical energy? List several forms of mechanical energy.
18. What is gravitational potential energy? The GPE of a rock will depend on…
19. What is elastic potential energy? The elastic PE of a spring will depend on…
20. What is kinetic energy? On what does KE depend?
21. Describe the law of conservation of energy. Explain using one example.
22. If a 1.8 kg brick sits at the top of 6.7 m high chimney, what is the potential energy of this brick?
23. If this brick falls to the ground, with what velocity is it moving the instant it hits the ground?
24. Sandy lifts a 7.3 kg bowling ball from the ground to her shoulder, 1.2 m above the ground. What is the gravitational potential energy of the ball before she lifts it? After the ball is lifted to shoulder height?
25. Brian is racing along on his bicycle. If he has a mass of 75 kg and is moving at 15 m/s, what is Brian's kinetic energy?
26. An empty roller coaster car at Elitch's is sitting at the top of the track, 62 m above the ground. The car then rolls down the track. What velocity does the car have at the bottom?
27. A young man exerted a force of 9000 N on a stalled car but was unable to move it. How much work was done? Explain your answer.
28. Not-so-bright Johnny dropped a penny off the Empire State Building and onto the head of an unfortunate pedestrian. The mass of the penny is 0.0030 kg. The Empire State Building in New York is 380 meters tall. The pedestrian is 1.5 m tall. Ignoring friction and air resistance, at what speed is the penny traveling when it hits the pedestrian?

29. You, the super cool physics student, complete a lab on the conservation of energy using a pendulum. Describe the energy of the bob at different points in its path.
30. Label the amplitude, crest, trough, and wavelength on the following wave:



31. What is the wavelength of the above wave?
32. What is the amplitude of this wave?
33. A wave has a period of 2.5 s. What is the frequency?
34. A sound wave has a frequency of 192 Hz (cycles per second). What is the period of this wave?
35. A wave has a frequency of 510 hertz and a velocity of 343 m/s. What is the wavelength?
36. A wave has a wavelength of 550 m and a frequency of 1600 kHz. What is the speed of this wave?
37. What is the Doppler effect?
38. What happens to the sound of a siren when the ambulance is moving away from you? Toward you?
39. What is the force of gravity between the sun and Jupiter? Look up the masses and average distances.
40. What kind of force exists between two negatively charged spheres? Between one negative and one positive sphere?
41. One object has a charge of 2.0×10^{-4} C and another has a charge of 8.0×10^{-4} C. The two objects are separated by a distance of 25 cm. Calculate the force between them.
42. What happens to the force when the distance is doubled? Quadrupled? When one charge is tripled?
43. A test charge of 5.0 microcoulombs is in an electric field that exerts a force of 2.0×10^{-4} N. What is the magnitude of the electric field?
44. What work is done when 4.0×10^{-3} C is moved through an electric potential difference of 6.0 V?
45. Draw a circuit that contains a 1.5 V battery and a light bulb with a 50 ohm resistance. Calculate the current in this circuit.
46. A 10.0Ω, 15.0 Ω, and 20.0 Ω resistor are connected to a 9.0 V power source. Draw the circuit if the resistors are all connected in series. Calculate the equivalent resistance and the current in the circuit.
47. A 10.0Ω, 15.0 Ω, and 20.0 Ω resistor are connected to a 9.0 V power source. Draw the circuit if the resistors are all connected in parallel. Calculate the equivalent resistance and the current in the circuit.