Spring Final Review- Physics

Review Momentum

Objectives:

Be able to calculate impulse and momentum of an object
Calculate the velocity of an object in a collision
Describe and calculate values for a system using the Law conservation of momentum

Review Waves

Objectives:

- Explain and calculate spring constant using Hooke's Law
- Use the principles of SHM to solve for variables
- Discuss the characteristics of a wave
- Calculate the speed of a wave
- Draw and label a wave diagram
- Compare mechanical and electromagnetic waves
- Discuss the energy of a wave
- Compare constructive and destructive interference. (Be able to draw examples)
- Explain the results of reflected waves on different surfaces
- Discuss the property of refraction

Review Sound

Objectives-

- Explain how sound waves are produced
- Relate frequency to pitch
- Compare the speed of sound in various media
- Recognize the Doppler Effect
- Define resonance
- Calculate wavelength and frequency of harmonic series for closed, open pipes and vibrating strings
- Calculate beats in a given situation
- Calculate sound intensity

Light

Objectives:

- Identify components of the electromagnetic spectrum
- Describe the wave and particle nature of light.
- Calculate the frequency or wavelength of electromagnetic radiation
- Recognize that light has a finite speed and the experimentation that found this
- Describe how the brightness of a light source is affected by distance
- Know basic uses for each part of the electromagnetic spectrum
- Distinguish between specular and diffuse reflection of light.
- Apply the law of reflection to flat mirrors.
- Describe the nature of images formed by flat mirror

Nuclear

Objectives:

- What are the photoelectric effect and dual nature of light?
- How can the line spectra from different gas discharge tubes be explained?
- Review fission and fusion.
- What is mass-energy equivalence and how does it applies to nuclear stability, fission and fusion?
- What are examples of applications of atomic and nuclear phenomena?
- What is quantum theory and how has the theory evolved over time?

WAVE VELOCITY CALCULATIONS

Name _____

Velocity = Wavelength x Frequency

Solve the following problems.

1. A tuning fork has a frequency of 280 hertz, and the wavelength of the sound produced is 1.5 meters. Calculate the velocity of the wave.

280 (1.5m)

420 m/s

2. A wave is moving toward shore with a velocity of 5.0 m/s. If its frequency is 2.5 he what is its wavelength?

5.0 m/s
2.5 Hz

2 m

3. The speed of light is 3.0×10^8 m/s. Red light has a wavelength of 7×10^{-7} m. What its frequency?

$\frac{3.0 \times 10^8}{7 \times 10^{-7}}$

4.3×10^{14} Hz

4. The frequency of violet light is 7.5×10^{14} hertz. What is its wavelength?

$\frac{3 \times 10^8}{7.5 \times 10^{14}}$

4×10^{-7} m

5. A jump rope is shaken producing a wave with a wavelength of 0.5 m with the cres of the wave passing a certain point 4 times per second. What is the velocity of the wave?

0.5 m (4 Hz)

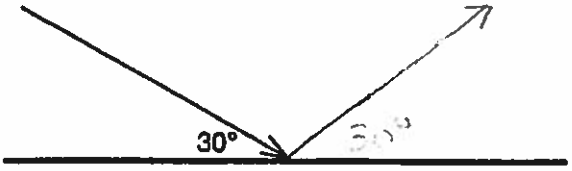
2 m/s

REFLECTION

Name _____

Draw the expected path of the light rays as they reflect off the following plane mirrors.

1.



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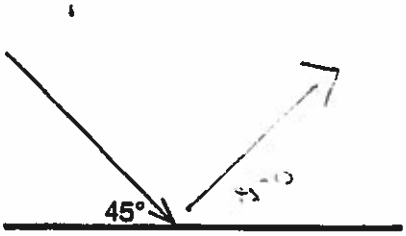

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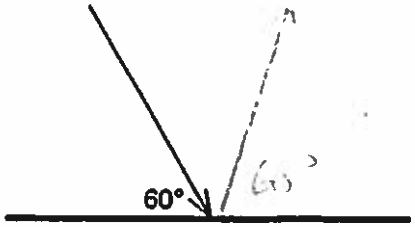

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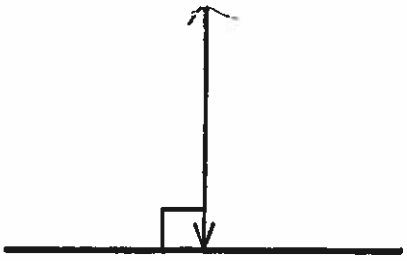
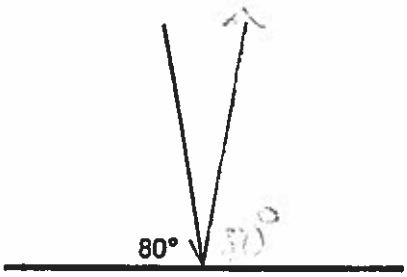


5.

6.



CALCULATING POWER

Name _____

P = V x I
Power (watts) = Voltage (volts) x current (amperes)

Solve the following problems.

1. A 6-volt battery produces a current of 0.5 amps. What is the power in the circuit?

6V (.5A)

3 W

2. A 100-watt light bulb is operating on 1.2 amperes current. What is the voltage?

100W / 1.2A

83.3 V

3. A potential difference of 120 volts is operating on a 500-watt microwave oven. What is the current being used?

500W / 120V

4.16 Amp

4. A light bulb uses 0.625 amperes from a source of 120 volts. How much power is used by the bulb?

0.625A (120V)

75 W

5. What voltage is necessary to run a 500-watt motor with a current of 200 amperes?

500V / 200A

2.5 V

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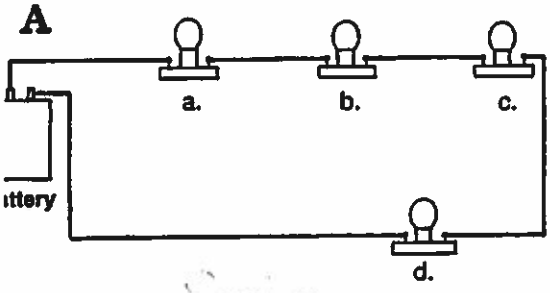
SERIES AND PARALLEL CIRCUITS

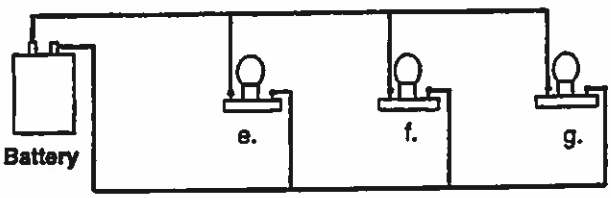
Name _____

A



Series

B

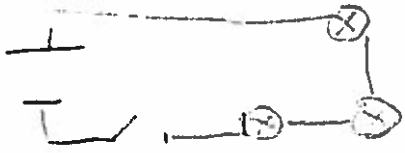


Parallel

Answer the following questions regarding circuits A and B above.

1. Label circuits A and B as series or parallel.
2. If bulb a burns out, will bulb d still light? No
3. If bulb f burns out, will bulb g still light? Yes
4. If bulbs b, c and d are burned out, will bulb a still light? No
5. If bulbs f and g are missing, will bulb e still light? Yes
6. Draw a diagram of a parallel circuit having 3 light bulbs, 3 switches and a battery. Each light bulb is on a separate switch.

7. Draw a diagram of a series circuit having 3 light bulbs, one switch and a battery.



8. Would series or parallel circuits be better for wiring light in a house? Parallel

   Why? Different pathways

Name: _____ Date: _____ Per: _____

Conservation of Momentum Problems

1. A large truck and a Volkswagen have a head-on collision.
   a. Which vehicle experiences the greatest force of impact? Same
   b. Which vehicle experiences the greatest impulse? Same
   c. Which vehicle experiences the greatest momentum change? Same
   d. Which vehicle experiences the greatest acceleration? Volkswagen

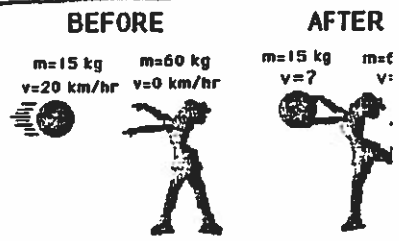
2. If a ball is projected upward from the ground with ten units of momentum, what is the momentum of recoil of the Earth? Do we feel this? Explain.

   10 units No ... massive

3. If a 5kg bowling ball is projected upward with a velocity of 2.0m/s, then what is the recoil velocity of the Earth (mass = 6.0×10^{24}kg).

   $5kg\left(2.0\frac{m}{s}\right) = 6.0 \times 10^{24} kg\,(v)$ $\quad 1.67 \times 10^{-24}\ \frac{m}{s}$

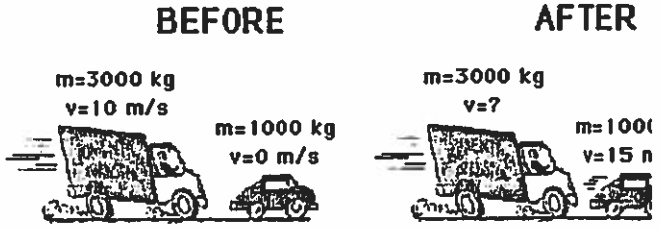
4. A 15kg medicine ball is thrown at a velocity of 20km/hr to a 60kg person who is at rest on ice. The person catches the ball and subsequently slides with the ball across the ice. Determine the velocity of the person and the ball after the collision.



   $15kg\left(20\frac{km}{hr}\right) = 60kg\,(v)$

   $\frac{300}{60} = 5\ m/s$

5. A 3000kg truck moving with a velocity of 10m/s hits a 1000kg parked car. The impact causes the 1000kg car to be set in motion at 15m/s. Assuming that momentum is conserved during the collision, determine the velocity of the truck after the collision.



Heat Practice Problems: *Complete all work on a separate sheet of paper and staple this to the front. Be sure to show all work.*

$3000kg\left(10\frac{m}{s}\right) + 1000kg\left(0\frac{m}{s}\right) = 3000kg\,(v) + 1000\,(15$

$30{,}000 = 3000(v) + 15000$

$15{,}000 = 3000v$

$v = 5\ \frac{m}{s}$

CALCULATING ELECTRICAL ENERGY AND COST

Name _____

One kilowatt hour is 1,000 watts of power for one hour of time. The abbreviation for kilowatt hour is kWh.

Example: A coffee pot operates on 2 amperes of current on a 110-volt circuit for 3 hours. Calculate the total kWh used.

1. Determine power: $P = V \times I$
   $= 110 \text{ volts} \times 2 \text{ amps}$
   $= 220 \text{ watts}$

   $kWh = P \times \text{hours}$

   $kWh = \frac{V \times I \times \text{hour}}{1{,}000}$

2. Convert watts to kilowatts:

   $220 \text{ watts} \times \frac{1 \text{ kilowatt}}{1{,}000 \text{ watts}} = 0.22 \text{ kW}$

3. Multiply by the hours given in the problem:
   $0.22 \text{ kW} \times 3 \text{ hrs} = 0.66 \text{ kWh}$

Solve the following problems.

1. A microwave oven operates on 5 amps of current on a 110-volt circuit for one hou Calculate the total kilowatt hours used. .550 kw. hr

2. How much would it cost to run the microwave in Problem 1 if the cost of energy is $0.10 per kWh? $ .055

3. An electric stove operates on 20 amps of current on a 220-volt circuit for one hour Calculate the total kilowatt hours used. 4.4 kw. hr

4. What is the cost of using the stove in Problem 3 if the cost of energy if $0.10 per kW $ .44

5. A refrigerator operates on 15 amps of current on a 220-volt circuit for 18 hours per day. How many kilowatt hours are used per day? 59.4 kw hr

6. If the electric costs are 15¢ per kWh, how much does it cost to run the refrigerator i Problem 5 per day? $ 8.91

7. The meter reading on June 1 was 84502 kWh. On July 1, the meter read 87498 kWl If the cost of electricity in the area was 12¢ per kWh, what was the electric bill for t month of June? $ 359.52

8. A room was lighted with three 100-watt bulbs for 5 hours per day. If the cost of electricity was 9¢ per kWh, how much would be saved per day by switching to 60-watt bulbs? _____ $.045 - .027 = $.018

Rubric

Group Grade: Boat – 70 Points Total

- Construction (20 Points)
  - Boat meets all design parameters in the Cardboard Boat Challenge rules.

- Theme (10 Points)
  - A creative theme meeting the requirements in the Cardboard Boat Challenge rules.

- Boat Performance (40 Points Total)
  - Boat floats independently with no passengers. (5 Points)
  - Boat floats when holding two passengers. (10 Points)
  - Can paddle forward so the boat gains forward momentum. (5 Points)
  - Boat traverses ¼ of the way across the pool. (5 Points)
  - Boat traverses ½ of the way across the pool. (5 Points)
  - Boat traverses ¾ of the way across the pool. (5 Points)
  - Boat traverses the entirety of the pool. (5 Points)

Points: _____ / 70

Individual Grade: Project Report - 30 Points Total

- Blueprint (10 Points)

- Volume calculation (5 Points)

- Buoyancy calculation (10 Points)

- Discussion of design strengths/weaknesses (5 Points)

Points: _____ / 30

Total Grade: _____ / 100