Physics Exam Review

1. Draw the field lines for a magnet. Show where the field density is highest.

2. Explain where the electrical charge's field direction for a negative charge and positive charge.

3. Write how the science, technology and society projects helped you understand concepts in the class. Please make sure that I read this before you leave.

4. Draw a free body diagram for all of these examples:
   a. an elevator going down an elevator shaft
Review for Energy and Gravity Concepts
Formula Analysis for Energy (p. 230)

1. Energy

<table>
<thead>
<tr>
<th>Concept</th>
<th>Formula</th>
<th>Definition</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Energy</td>
<td>$E_p = mgh$</td>
<td>Energy stored in a spring or an object</td>
<td>$J$, $N\cdot m$</td>
</tr>
<tr>
<td>Work</td>
<td>$W = F \cdot D$</td>
<td>Energy transferred by a force acting on an object</td>
<td>$J$, $N\cdot m$</td>
</tr>
<tr>
<td>Kinetic Energy</td>
<td>$E_k = \frac{1}{2}mv^2$</td>
<td>Energy possessed by a moving object</td>
<td>$J$, $N\cdot m$</td>
</tr>
</tbody>
</table>

2. Define terminal velocity (p. 43).
   When a person on a parachute in free fall (parachutist) is equal to the force of gravity, the parachute will stop accelerating.

3. Define and explain sliding friction, p. 169
   Sliding friction is a force that resists the motion of an object as it slides across a surface.

4. Define fluid friction or also known as air resistance (p. 169, at the top of the page)
   Fluids, such as water, can resist the motion of an object.

5. Define and explain what happens when an object is under free fall (p. 162)
   Free fall occurs when the only force acting on an object is gravity.

6. Draw a free body diagram of an object under free fall (p. 163)

7. Show gravitational field strength and a force field (p. 164)
   
8. Compare the gravitational field strength to a magnetic and an electric field.

9. What is the difference between mass and weight? (p. 165)
   Mass is a measure of the quantity of matter in an object, while weight is the force of gravity acting on an object, $F_g = m\cdot g$.
Exam Review

<table>
<thead>
<tr>
<th>Concept</th>
<th>Formula</th>
<th>Is work Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>When an applied force does not result in any motion</td>
<td>$W = F \Delta d$</td>
<td>None</td>
</tr>
<tr>
<td>Uniform motion exists in the absence of a force</td>
<td>$W = F \Delta d \cos \theta$</td>
<td>None</td>
</tr>
<tr>
<td>The applied force is perpendicular to the displacement</td>
<td>$W = F \Delta d \cos \theta$</td>
<td>No work is complete</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Wave length</th>
<th>Wave form together</th>
</tr>
</thead>
<tbody>
<tr>
<td>increases</td>
<td>decreases</td>
<td>MM</td>
</tr>
<tr>
<td>decreases</td>
<td>increases</td>
<td>MM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concept</th>
<th>Does it affect resistance in a conductor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of a conductor</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Material of the conductor</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Temperature of the circuit</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>
Calculate Energy in Joules:

A ball dropped at 39 m: \[ E_g = mgh = (1.0 \times 39 \times 9.81) = 382.59 \text{ Joules}. \]

A 100 kg car moving at 4.5 m/s [E]: \[ E_k = \frac{1}{2}mv^2 = \frac{1}{2} (100)(4.5)^2 = 1012.5 \text{ Joules}. \]

What is the heat required to evaporate 23 g of water?
\[ Q = mL_v = (0.023 \text{ kg})(2.3 \times 10^6 \frac{J}{\text{kg}}) = 52900 \text{ Joules}. \]

What is the energy required to freeze 124 g of water?
\[ Q = mL_f = (0.124)(3.4 \times 10^5 \frac{\text{Joules}}{\text{kg}}) = 42160 \text{ Joules}. \]

Calculate the cost of energy used for one family 249 hr of off peak (0.075 $/ON) 566 hr of mid peak $0.112 kWh, and 355 of on peak usage $0.135? What advice would you give a family to help reduce their energy bill. Assume that the family does not know the exact prices.

\[
\begin{align*}
249 \text{ hr} \times 0.075 &= 18.675 \text{ off peak} \\
566 \text{ hr} \times 0.12 &= 68.32 \text{ mid peak} \\
355 \text{ hr} \times 0.135 &= 47.925 \text{ on peak} \\
\end{align*}
\]

18.675 Total off peak
63.392 Total mid peak
47.925 = Total on peak

I would use the AC less often.
Also, I would turn off appliances during on peak hours.
1. What is the \( R \) equivalent for a 3\( \Omega \) lamp, 4\( \Omega \) lamp and 24\( \Omega \) lamp.

\[
\frac{1}{R_{eq}} = \frac{1}{3} + \frac{1}{4} + \frac{1}{24} = \frac{8}{24} + \frac{6}{24} + \frac{1}{24} = \frac{15}{24} = \frac{15}{15} = \frac{24}{15} = \frac{16}{2} = 8.
\]

2. Given a battery is 6.0 V, determine the current of the whole circuit.

\[
\frac{V}{R} = \frac{6}{16} = \frac{3.75}{15} \text{ Amps}
\]

3. Determine the current though the 4\( \Omega \) lamp.

\[
\frac{V}{4} = \frac{1}{1.5} \text{ Amps}
\]

5. Compare the longitudinal and transverse wave, name all the parts of the wave.

<table>
<thead>
<tr>
<th>Longitudinal Wave</th>
<th>Transverse Wave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavefront</td>
<td>Wavelike</td>
</tr>
<tr>
<td>Amplitude</td>
<td>Crest</td>
</tr>
<tr>
<td>Compression</td>
<td>Equilibrium</td>
</tr>
</tbody>
</table>

6. Draw a free body diagram of the following scenarios:

A person walking

\[
\text{\( \vec{F}_N \), \( \vec{F}_T \), \( \vec{F}_g \) forces.}
\]

An elevator moving

\[
\text{\( \vec{F}_T \), \( \vec{F}_g \) forces.}
\]

A person holding an phone air

\[
\text{\( \vec{F}_{\text{applied}} \) forces.}
\]
A ball is thrown in the air, show the range and height of the ball's path.

Given a ball is thrown for 2.3 seconds in the air with a velocity initial of 12.3 m/s, what is the height of the ball?

\[ \Delta d = V_i \Delta t + \frac{1}{2} a y (\Delta t^2) \]
\[ = (12.3)(2.3) + \frac{1}{2} (9.81)(2.3^2) = 3 m \]
\[ 28.29 + 25.94 = 54 \text{ m/above horizontal} \]

What is power rating of an iPod if it has a 1.4 V and a current runs through it is 0.23 Amp.

\[ P = IV \]
\[ = 0.322 \text{ watts} \]