

Fall 2008 Final Exam Review Guide- Freshman Physics (Fall)

Introduction

- 1) Determine correct procedures for collecting data and interpreting data
- 2) Apply the principles of the scientific method
- 3) Apply correct procedures for measuring quantities of time, linear distance and mass with emphasis on accuracy and precision of measurements.
- 4) Determine and follow basic lab safety
- 5) Convert units using dimensional analysis.

Vocabulary

physics	metric system	experimental group
independent variable	English system	control group
dependent variable	hypothesis	conclusion
experiment		
variable		

Graphing

- 1) Properly construct and label a data table and graph.
- 2) Distinguish between strong, weak, inverse and direct relationships.

Vocabulary

slope	x-axis	y-axis
line of best fit		

Newton's Laws

- 1) State Newton's Laws (1st, 2nd and 3rd) of motion.
- 2) Apply Newton's three laws of motion to actual situations
- 3) Distinguish between mass and weight.
- 4) Describe and explain how inertia is related to mass.
- 5) Recognize and provide examples of forces.
- 6) Identify and explain cause-effect relationship between force, mass and acceleration (in terms of direct and indirect relationships)
- 7) Recognize graph of constant speed, acceleration, no acceleration
- 8) Relate gravitational force to object mass and distance between objects.
- 9) Compare the rates at which different objects fall on Earth & in space.
- 10) Perform calculations using problem solving boxes or LGRS for the following: (a) force, mass, acceleration ($F = ma$) (b) mass, velocity, momentum ($p = mv$)
- 11) Demonstrate equilibrium situations with objects at rest or moving with constant speed.
- 12) Identify action/reaction force pairs and the objects they act on.
- 12) Explain Law of Conservation of Momentum.
- 13) Recognize units for acceleration, mass, force, weight, momentum, & velocity.

Vocabulary

speed	mass	friction
velocity	weight	air resistance
acceleration	gravity	momentum
deceleration	acceleration due to gravity	Law of Conservation of Momentum
constant velocity	force	elastic collision
terminal speed	Newton	inelastic collision
free fall	net force	
inertia		

Formulas

$$V = d / t$$

$$a = \Delta v / t$$

$$F = m \cdot a$$

Work and Machines

1. Explain how machines make work easier.
2. Name the six types of simple machines.
3. Calculate mechanical advantage of machines.
4. Compare input and output forces and arms.
5. Calculate the amount of work done by a simple machine.
6. Calculate the efficiency of a machine.
7. State and Explain the law of conservation of Energy.
8. Identify units for work, energy and power.
9. Calculate power in machines.
10. Differentiate between potential and kinetic energy and calculate both in a system.

Vocabulary

fulcrum	machine	Watt
simple machine	work	input work/energy
input force/effort force	energy	output work/energy
output force/resistance	Joule	efficiency
mechanical advantage	power	

Formulas: $MA = F_o / F_i$ $MA = d_i / d_o$ $P = W/t$

$$\text{Efficiency} = W_o / W_i \times 100$$

$$E_p = m \times g \times h$$

$$E_k = \frac{1}{2} m v^2$$

Thermal Energy

1. Distinguish between elements, compounds, & mixtures.
2. Describe the relationship between temperature and states of matter.
3. Interpret a graph of changes of state with water. Know where the physical states exist and where on the graph is the melting, freezing, condensation, and boiling stages.
4. Convert between Celsius/Fahrenheit temperature scales, & Celsius/Kelvin temperature scales.

- Describe the difference between heat, temperature and thermal energy
- Analyze the direction of transfer of heat between two objects.
- Calculate changes in thermal energy using the heat equation and perform calculations involving specific heat.
- Recognize units for energy, heat, mass, temperature and specific heat.
- Analyze how energy is transferred by conduction, radiation, and convection.
- List various types of materials that are heat conductors and insulators and explain why.

Vocabulary

temperature	element	plasma
thermal energy	compound	evaporation
heat	mixture	absolute zero
calorie	molecule	thermal equilibrium
specific heat	atom	convection
Delta(Δ)	intermolecular forces	conduction
		radiation

Formulas: $Q = mc\Delta T$ or $E = mC_p(T_2 - T_1)$

$$T_{\text{celsius}} = 5/9 (T_{\text{Fahrenheit}} - 32) \quad T_{\text{Fahrenheit}} = 9/5 T_{\text{celsius}} + 32$$

Physical Properties of matter

- Recognize examples of physical & chemical properties of matter.
- Calculate the density of a substance with correct units.
- Explain why liquids are generally less dense than solids.
- Explain why solid water (ice) is less dense than liquid water.
- Distinguish between saturated, unsaturated, and supersaturated solutions.
- List factors that influence the solubility of a substance.
- Be able to interpret a solubility curve.
- Relate temperature, pressure, and volume of gases to the behavior of gases. (Boyles' law, Charles' law, & pressure-temperature relationship)
- Understand why objects float.
- Recognize the units for pressure, volume, & temperature.

Vocabulary

density	solvent	pressure
hardness	solute	viscosity
elasticity	solubility	Boyle's Law
brittleness	physical property	Charles' Law
tensile strength	chemical property	Bernoulli's principle
stress	crystalline	Archimedes' principle
	amorphous	buoyancy
	thermal expansion	

Formulas: $d = m/v$, $P_1V_1 = P_2V_2$ $P_1/T_1 = P_2/T_2$ $V_1/T_1 = V_2/T_2$

Atomic Structure

1. Identify John Dalton's and Ernest Rutherford's contributions to the modern atomic theory.
2. Describe the electron cloud theory.
3. Describe the forces that hold the atoms together
4. Identify the 3 subatomic particles, their charges, mass, location and purpose in the atom.
5. Identify quarks as a subatomic particle.
6. Understand how atoms of each element differ.
7. Identify isotopes of common elements.
8. Describe the forces that hold an atom together.
9. Calculate the number of protons, neutrons and electrons of an atom.
10. Write out element and isotopic notations.
11. Compare and contrast atomic mass and mass number for an element.
12. Explain the difference between fusion and fission nuclear reactions.
13. Calculate half-lives of radioactive elements.
14. Explain what happens during radioactive decay
15. Identify the three particles of radioactive elements alpha, beta and gamma.

Vocabulary

atomic mass	isotopes	alpha particles
atomic number	mass number	beta particle,
atomic theory	neutrons	gamma radiation
electrons	nucleus	strong nuclear forces
energy levels	protons	electromagnetic forces
electron cloud	quarks	fission
		fusion

Energy Transformations

1. Understand different forms of energy.
2. Identify energy flow diagrams for different systems.
3. Recognize the role of energy and power in technology.
- 4.

Vocabulary

energy	electrical energy	energy of pressure
mechanical energy	chemical energy	energy flow diagram
radiant energy	nuclear energy	

Formulas: $P = W/t$

Efficiency = $W_o / W_i \times 100$

Physics Equation Page

$$V = d / t$$

$$a = \Delta v / t$$

$$F = m \cdot a$$

$$W = F \cdot d$$

$$MA = F_o / F_i$$

$$MA = d_i / d_o$$

$$\text{Efficiency} = W_o / W_i \times 100$$

$$P = W / t$$

$$PE = m \cdot g \cdot h$$

$$KE = 1/2 m \cdot v^2$$

$$Q = mc\Delta T$$

$$D = m / V$$

$$P_1 V_1 = P_2 V_2$$

$$V_1 / T_1 = V_2 / T_2$$

$$P_1 / T_1 = P_2 / T_2$$