

## FINAL EXAM, IPSH SEMESTER 1, 2009-10

The following items are listed as a guide for what to focus on during your studies. You must bring a calculator and no.2 pencil to the exam. An equations sheet and periodic table will be provided.

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### MECHANICS

- Be able to convert between metric units. Be able to convert between imperial and metric units.
- Be able to express numbers in scientific notation.
- Understand and be able to apply Newton's 1<sup>st</sup> Law of Motion & inertia.
- Be able to apply the Equilibrium Rule to different situations, including free body diagrams. Be able to determine the net forces of a system using a free body diagram.
- Be able to interpret graphs of velocity, acceleration, and distance.
- Be able to calculate acceleration without given force or mass.
- How are speed and velocity different from each other? Be able to apply and give examples. Be able to calculate speed/velocity.
- Be able to apply Newton's 2<sup>nd</sup> Law.
- Be able to explain and apply free fall and terminal velocity.
- Understand and be able to explain mass vs. weight. Be able to convert between kg, N, and pounds.
- Be able to explain and apply Newton's 3<sup>rd</sup> Law of Motion.
- What is momentum (mathematically and operationally)?
- Be able to calculate momentum.
- Understand and be able to solve problems using the conservation of momentum.
- What is impulse? How do you calculate impulse?
- Understand the difference between the two types of collisions.
- Know that energy of a system = PE + KE
- Know how potential energy and kinetic energy are related and how to calculate each.
- Understand and be able to explain how energy is transferred using the conservation of energy.
- What is work, power? How are they related & calculate them?
- Be able to explain and identify the six different types of simple machines.
- Be able to identify input & output forces, input & output distances when using simple machines. Use that information to quantify mechanical advantage.
- Understand that work input = work output for ideal simple machines. Apply that knowledge when quantifying mechanical advantage.

### CHEMISTRY

- Be able to describe an atom and its components (protons, neutrons, electrons).
- Know the relative size and charges of protons, neutrons, electrons.
- Be able to interpret an element key (atomic #, symbol, atomic mass, # protons, # electrons in an atom, # neutrons).
- How is atomic mass different from mass number?

- How and why are periods and groups/families different?
- Know the different characteristics of metals, nonmetals, metalloids. Be able to identify on the periodic table.
- Ductile vs. malleable.
- Understand physical vs. chemical properties and changes.
- Be able to identify and draw Bohr models of atoms.
- Periodic patterns of valence shells, valence electrons, periods, groups.
- Know the differences between alpha, beta, and gamma decay.
- How are alpha, beta, and gamma particles different (sizes, charges, harmfulness).
- Be able to determine the product of alpha or beta decay.
- Be able to explain why some elements are radioactive.
- How are atoms, elements, and compounds different?
- What is a chemical bond? What are the three types of chemical bonds and how are they formed?
- Be able to identify number of atoms of elements in chemical formulas.
- What are the diatomic elements? Why are they called "diatomic"?
- How do you write a chemical equation? Reactants vs. products.
- Be able to balance chemical equations using coefficients. How does this relate to the Law of Conservation of Matter?
- Know the differences between and be able to identify synthesis, decomposition, single-replacement, and double-replacement reactions.
- Understand and be able to apply the Rules of Ionization. What are ionic charges? Be able to identify an element's ionic charge and understand why that is.
- Ions vs. cations vs. anions.
- Given different elements, be able to write their chemical formula once bonded.
- Be able to draw, interpret, and identify Lewis structures for elements.
- Be able to draw Lewis structures for ionic compounds and molecules.
- Ionic compounds vs. molecules vs. metals.
- Be able to identify polyatomic ions within a chemical formula. Be able to write chemical formulas using polyatomic ions.

### HEAT

- How are thermal energy, temperature, and heat different?
- Be able to convert between Kelvin, Celsius, and Fahrenheit.
- Understand the molecular differences between solids, liquids, and gases. How does heat affect molecular speed, spacing, and density?
- Understand and apply the Laws of Thermodynamics.
- Be able to interpret a phase change diagram for an unknown substance.
- Understand the 6 different phase changes.
- How is boiling different from evaporation?
- Why doesn't temperature change during a phase change?
- Which phase changes are cooling vs. warming processes and why?
- Understand and be able to apply the three different types of heat transfer.
- How does pressure effect phase change?