

Scientific Method -

Physical Science-Energy Opt-out Exam Study Guide

Identify/write observations; both quantitative & qualitative.

Understand the order of a scientific method's stages: Observations --> Question --> Hypothesis -->

Prediction --> (Do the) Experiment --> Analyze data --> Conclusion

In the description of an experiment, be able to pick out the manipulated variable, the responding variable and several controls

Metric System Unit

Know metric system basic units.

Know the sizes of cm, m. Know the size of a cube with volume 1 liter and another of volume 1 ml.

Be able to convert from one metric prefix to another

Motion Unit

Be able to draw the Speed Distance Time triangle and use it to calculate average speed, or distance or time (showing all your work.)

Be able to calculate acceleration ($a = \text{change in velocity} / \text{elapsed time}$)

Be able to describe how to walk to match a distance vs time graph, and to answer questions based on a distance vs time graph.

Density & Buoyancy Unit

Be able to use a formula to find either density, volume or mass, when given the values of two of variables.

Be able to explain the concepts of mass, volume and density in common language / simple terms.

Explain whether different size pieces of the same material should have the same, or different, densities.

Know your buoyancy vocab and Archimedes principle!

Forces Unit

Review types of forces. Also, you will be given " $g = 10\text{m/s}^2$ "—the strength of Earth's gravity field.

Review how to draw and read force diagrams

Know how to calculate acceleration of an object, given its mass and a force (Newton's 2nd Law, $F=ma$)

Newton's 3 Laws: I'll describe a situation—you tell which law it best demonstrates. (Example: why does a person who is standing, & not paying attention, move backward in a bus accelerates suddenly? Which law does that demonstrate?)

Energy Unit

Review types of energy, especially KE & GPE (gravitational potential energy). While a pendulum swings, when does KE or GPE increase and where is it decreasing? Where is each type of energy greatest and least?

Could a pendulum swing forever, reaching the same height it was dropped from, going back and forth infinitely? Under what conditions could this happen?

How does friction affect a pendulum or a rollercoaster?

Law of Conservation of Energy: energy is neither created nor destroyed, it just changes from one form to another. Apply that to a falling object—we will generally not take air resistance into account.

Identify the energy transformation given a description of some kind of activity. For example: "while a ball falls from the basket to the ground, _____ energy turns into _____ energy".

Electromagnetic (EM) Spectrum

Know a couple characteristics of each of the seven types of EM radiation (radio waves, ultraviolet, visible light, etc.), and know at least two ways we use each type of ray.

Take the seven types of EM waves: order them according to energy, or frequency, or wavelength.

Waves & Sound:

Be able to draw and measure waves' amplitude and wavelength correctly. Know basic waves vocabulary.

Physical Science-Matter (Chemistry) “Opt-out” exam Study Guide.

Chemistry

- Know how to use all info on your PT, plus patterns in the PT (understanding period numbers & family numbers). Know names & properties of neutrons, protons & electrons,
- Understand all basic vocabulary (element, atom, ion, atomic #, mass #, isotopes, ions.)
- Be able to determine an atoms' ionic state (will it become a positive or negative ions, and with what charge?) Be able to find appropriate ionic bonding partners for ions in families 1A, 2A, 3A (+ ions), and 5A, 6A and 7A (-ions).
- Practice drawing dot diagrams and structural diagrams for covalent bonding. Practice bonding examples
- Know the names & properties of alpha, beta and gamma radiation and be able to describe the transmutation happens when a specific atom emits one of the two particles (alpha & beta). Practice radioactive transmutation problems.
- Review the half life concept, and be able to solve half-life problems.
- Know facts about the four states of matter: solid liquid, gas and plasma.
- Be able to balance chemical (reaction) equations.

Resources:

<https://phet.colorado.edu/en/simulation/build-an-atom>