



Hilliard City Schools
PHYSICAL SCIENCE 9AB
Course Proficiency Study Guide

I. Course Proficiency Purpose:

The purpose of this study guide is to aid the students who wish to take the proficiency assessment for the credit flex option. Items that the student will be required to know for proficiency will be administered in the form of one two-hour assessment.

II. Description of the Assessment Format:

- A. 200 questions
- B. Multiple Choice / Matching / True or False
- C. Each question is valued at 0.5 points

III. Proficiency Content:

Study Guide - see attached

IV. Suggested Resources:

- A. Textbook: Holt Physical Science
- B. Online Textbook <http://my.hrw.com>
Username: astudent362 Password: b2s9
- C. Online Resources – see attached

Scientific Method

	I can...		
	Yes	No	
1			Identify and recognize key parts of the <u>Scientific Method</u>
2			Define <u>Hypothesis</u> and recognize it needs to be in “If...then...” format
3			Define <u>Independent Variable</u> and know which axis it goes on
4			Define <u>Dependent Variable</u> and know which axis it goes on
5			Define <u>Observation</u> (<u>Qualitative</u> and <u>Quantitative</u>)
6			Define <u>Inference</u>
7			Distinguish between an observation and an inference
8			Recognize in Experimental Design the difference between <u>Bias</u> and <u>Validity</u>
9			Compare: <u>Experimental Conclusion</u> to a <u>Theory</u> or <u>Hypothesis</u>
10			Of the above, determine which one is the most accurate/reliable

Graphing and Measurement

	I can...		
	Yes	No	
1			Create a graph following the TALKS guidelines/rubric
2			Interpret Graphs using the TALKS guidelines/rubric
3			Calculate Slope – and determine what does the rise/run (x/y) give you on a mass vs. volume graph?
4			Tell the difference between <u>Accuracy</u> and <u>Precision</u>
5			Use and understand <u>Significant Figures</u> (calculating and recognizing the proper measurement)
6			Know what Units are for what and what Instruments I use to obtain them

Matter

	I can...		
	Yes	No	
1			Explain what <u>matter</u> is and identify examples of matter
2			Relate the following terms: <u>atoms</u> , <u>elements</u> , <u>compounds</u> , <u>mixtures</u>
3			Compare and contrast <u>pure substances</u> and <u>mixtures</u>
4			Compare and contrast <u>homogeneous</u> and <u>heterogeneous</u>
5			Determine what the <u>solute/solvent</u> is in a given situation
6			Understand the properties, structures, and diagrams of the phases (<u>solid</u> , <u>liquid</u> , <u>gas</u>)
7			Understand which phase changes are <u>endothermic</u> and which are <u>exothermic</u>
8			Compare and contrast <u>chemical properties</u> and <u>physical properties</u>
9			Compare and contrast <u>chemical changes</u> and <u>physical changes</u>
10			Understand what <u>density</u> is, as well as perform calculations, determine if something will sink or float, and have a basic conceptual understanding

Atoms and the Periodic Table

	I can...		
	Yes	No	
1			Identify the subatomic particles – and know their location, calculations, charges
2			Identify the 18 groups/families
3			Use the groups/families to calculate valence electrons
4			Identify the 7 periods
5			Use the period to determine the number of energy levels
6			Create and recognize the proper atomic models for different atoms
7			Understand valence electrons and energy levels
8			Understand how the periodic table is arranged
9			Recognize the role of neutrons and atomic mass, what sub-atomic particle changes, and what stays the same in an <u>Isotope</u>
10			Recognize what the most common isotope of an element will be
11			Understand what an <u>Ion</u> is, know what changes, and why they are formed
12			Create Lewis Dot Diagrams

Chemical Reactions

	I can...		
	Yes	No	
1			Recognize some signs that a chemical reaction may be taking place.
2			Explain chemical changes in terms of the structure and motion of atoms and molecules.
3			Describe the differences between endothermic and exothermic reactions
4			Identify situation involving chemical energy.
5			Distinguish among five general types of chemical reactions.
6			Predict the products of some reactions based on reaction type.
7			Describe reaction that transfer or share electrons between molecules, atoms, or ions.
8			Demonstrate how to balance chemical equations.
9			Explain how the law of definite proportions allows for predictions about reaction amounts.
10			Describe the ionization of strong acids in water and the dissociation of strong bases in water.
11			Distinguish between solutions of weak acids or bases and solutions of strong acids or bases.
12			Relate pH to the concentration of hydronium ions and hydroxide ions in a solution.
13			Identify the products of a neutralization reaction.

Motion

Yes	Not Yet	I can...
		Define: motion, displacement, speed, velocity, acceleration, force, and friction.
		Explain the relationship between motion and a frame of reference.
		Relate speed to distance and time.
		Distinguish between speed and velocity.
		Solve problems related to time, distance, displacement, speed, and velocity.
		Describe the concept of acceleration as a change in velocity.
		Explain why circular motion is a continuous acceleration even when the speed is constant.
		Calculate acceleration as the rate at which velocity changes.
		Graph acceleration on a distance – time and on a velocity – time graph.
		Graph speed on a distance – time graph and on a velocity – time graph.
		Explain the effects of unbalanced forces on the motion of objects.
		Describe friction and how it may be harmful, helpful and ways it may be reduced.

Forces

Yes	Not Yet	I can...
		Define: inertia, weight, and momentum.
		State Newton's First, Second, and Third Laws of Motion
		Relate the first law of motion to important applications such as seat belt safety.
		Calculate force, mass, and acceleration by using Newton's 2 nd law ($F=ma$).
		Demonstrate mathematically how free-fall acceleration relates to weight ($W=mg$).
		Explain that when one object exerts a force on a second, the second object exerts a force equal in size and opposite in direction on the first object.
		Show that all forces come in pairs commonly called action reaction pairs.
		Recognize that all moving objects have momentum.

Work and Energy

Yes	Not Yet	I can...
		Define: work, power, kinetic energy, (gravitational) potential energy, and mechanical energy.
		Calculate work done on an object ($W=Fd$) and the rate at which work is done ($P=$
		Explain the relationship between work and energy.
		Calculate kinetic energy ($KE=1/2mv^2$) and gravitational potential energy ($GPE=mgh$)
		Distinguish between mechanical and nonmechanical energy.
		Name the unit used to measure energy
		State the law of energy conservation
		Discuss where energy goes when it seems to disappear.

Nuclear Radiation

Yes	Not Yet	I can...
		Define: radioactivity, nuclear radiation, alpha particle, beta particle, gamma ray, half-life, fission, fusion, background radiation.
		Identify types of nuclear radiation and their properties.
		Calculate the half-life of a radioactive isotope.
		Distinguish between fission and fusion, and provide examples of each.

Heat & Temperature

Yes	Not Yet	I can...
		Define: Absolute zero, temperature, convection current, specific heat, convection, conduction, radiation, conductors, and insulators.
		Predict which molecules will move faster on average based on temperature
		Determine what is happening to the kinetic energy of particles when the temperature of something increases
		Convert between the three temperature scales
		Identify and explain the 3 types of energy transfer
		Explain how a convection current works and why
		Distinguish between insulators and conductors and give examples.
		Determine what it means for an object to have a high specific heat or a low specific heat, and what type of objects fall into each category
		Calculate the Specific Heat of an unknown sample ($Q=mc\Delta T$)

Waves

Yes	Not Yet	I can...
		Define: wave, medium, mechanical wave, electromagnetic wave, transverse wave, longitudinal wave, crest, trough, amplitude, wavelength, period, frequency, Doppler effect, reflection, refraction, diffraction, interference (constructive & destructive), compressions, and rarefactions
		Identify what type of waves do not require a medium
		Explain the difference between transverse and longitudinal waves including examples of each.
		Identify what a wave carries, and through what?
		Distinguish between transverse waves and longitudinal waves.
		Describe how the frequency and period of a wave are related ($f = 1/T$).
		Explain why sound travels fastest in solids.
		Solve problems involving wave speed, frequency, and wavelength ($v =$
		Explain how the amplitude and frequency relates to the volume and pitch.
		Describe how waves behave when they meet an obstacle or pass into another medium.
		Explain what happens when two waves interfere.

Sound and Light

Yes	Not Yet	I can...
		Relate the energy of light to the frequency of electromagnetic waves.
		State the types of waves in the electromagnetic spectrum from the lowest frequency to the highest frequency. What are some uses of these types of waves?
		What are some practical applications of sound and light?
		Explain why objects appear to be different colors.
		Explain the law of reflection.
		Distinguish between the primary colors of light and pigment

The Solar System

Yes	Not Yet	I can...
		Define: solar system, satellite, eclipse, hydrosphere, nebula, nebular model, comet, asteroid, and meteoroids.
		Explain how gravity works within the solar system.
		State 3 characteristics that allow Earth to sustain life.
		Estimate the age of our solar system.
		Contrast ancient models of the solar system with the current model.

The Universe

Yes	Not Yet	I can...
		Define: star, light-year, red giant, white dwarf, supernova, black hole, galaxy, interstellar matter, red-shift, blue-shift, big bang theory and dark matter.
		Describe the basic structure and properties of stars.
		Recognize that all normal stars are powered by fusion reactions that form elements.
		Identify the stages in the evolution of stars.
		Describe 2 characteristics of a spiral galaxy and distinguish it from the other 2 types of galaxies.
		Describe the basic structure of the universe.
		Describe red shift and blue shift, and explain what it tells scientists about our universe.
		State the main features of the big bang theory, and explain the evidence supporting the expansion of the universe.

Planet Earth

Yes	Not Yet	I can...
		Define: crust, mantle, core, lithosphere, plate tectonics, asthenosphere, magma, subduction, convergent, divergent, rifts, mid-oceanic ridge, trench, volcano, earthquake, fault, focus, epicenter, surface waves, seismology, vent, and Richter scale.
		Identify Earth's different geologic layers.
		Explain 3 evidences supporting the theory of plate tectonics.
		Describe the movement of the Earth's lithosphere using the theory of plate tectonics and convection currents.
		Identify the 3 types of plate boundaries and the principal structures that form at each of these boundaries.
		Identify the causes of earthquakes.
		Distinguish between primary, secondary, and surface waves in earthquakes.
		Explain how and where volcanoes occur.
		Describe the different types of common volcanoes.

The Atmosphere

Yes	Not Yet	I can...
		Define: climate, weather, ozone, troposphere, stratosphere, mesosphere, thermosphere, water cycle, transpiration, precipitation, humidity, dew point, Coriolis effect, air mass, front, climate.
		Identify the primary layers of the atmosphere and give characteristics of each.
		Describe various severe weather situations, including thunderstorms, tornadoes, and hurricanes.
		Distinguish between weather and climate.
		Describe the different types of fronts and how they affect weather patterns.

Online Resources

Chemistry

<http://www.SciAmEarth3.com>

<http://www.strangematterexhibit.com/properties.html>

<http://sv.berkeley.edu/showcase/flash/juicebar.html>

Motion, Forces and Graphing

<http://graphs.mathwarehouse.com/lab/distance-time-interactive-parnters-activity.php>

http://dev.physicslab.org/Document.aspx?doctype=5&filename=Kinematics_ConstantVelocityPositionTimeGraphs1.xml

http://dev.physicslab.org/Document.aspx?doctype=5&filename=Kinematics_UniformAccelerationVelocityTimeGraphs1.xml

<http://www.physicsclassroom.com/Class/newtlaws/U2L2c.cfm>

Energy

<http://science.howstuffworks.com/roller-coaster.htm/printable>

<http://phet.colorado.edu/en/simulation/energy-skate-park>

http://inventors.about.com/od/astartinventions/a/atomic_bomb.htm

http://go.hrw.com/resources/go_sc/ssp/HK1MSW35.PDF

Heat and Temperature

education.jlab.org/jsat/powerpoint/0708_conduction_convection_radiation.ppt

<http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/spht.html>

<http://www.helium.com/items/462461-the-history-of-fahrenheit-celsius-and-kelvin-temperature-scales>

Properties of Sound and Light Waves:

<http://www.msu.edu/user/brechtjo/physics/waves/waves.html>

<http://www.fi.edu/fellows/fellow2/apr99/soundvib.html>

<http://mchi.mcallenisd.org/www/mchi/site/hosting/ipc/ipcch12htm/ipcch12sec1.htm>

<http://health.howstuffworks.com/hearing.htm>

Waves

Types of Waves (<http://paws.kettering.edu/~drussell/Demos/waves/wavemotion.html>)

Parts of a wave

<http://zonalandeducation.com/mstm/physics/waves/partsOfAWave/waveParts.htm>

Doppler Effect –

<http://sakshat.amrita.ac.in/VirtualLab/?sub=PHY&brch=ACS&sim=DopplerEffect&cnt=theory>

Interactions of Waves:

(<http://phet.colorado.edu/en/simulation/wave-interference>) and

(<http://www.falstad.com/ripple/>)

Reflection & Refraction - (<http://www.cs.dartmouth.edu/farid/sciencekids/wetdark.html>)

Electromagnetic Spectrum –

(http://www.visionlearning.com/library/flash_viewer.php?mid=138&oid=3505)

Properties of Sound and Light Waves:

<http://www.msu.edu/user/brechtjo/physics/waves/waves.html>

<http://www.fi.edu/fellows/fellow2/apr99/soundvib.html>

<http://mchi.mcallenisd.org/www/mchi/site/hosting/ipc/ipc/ipcch12htm/ipcch12sec1.htm>

<http://health.howstuffworks.com/hearing.htm>

Continental Drift and Plate Tectonics

<http://www.learner.org/interactives/dynamicearth/>

www.scotese.com/pangeanim.html

http://volcano.und.nodak.edu/vwdocs/vwlessons/plate_tectonics/introduction.html

Universe and Space

<http://history.wisc.edu/sommerville/351/351-182.htm>

<http://dsc.discovery.com/videos/how-the-universe-works-big-bang/>

<http://www.universetoday.com/74568/blue-shift/>