## HIGH SCHOOL EARTH SCIENCE
## INVESTIGATION 2
## WHAT IS RADIOACTIVITY?

**CCS 4.1**    (Number and numerical operations) All students will develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways.

B.2 Grade 12    Develop, apply, and explain methods for solving problems involving rational and negative exponents.

C.1 Grade 12    Recognize the limitations of estimation, assess the amount of error resulting from estimation, and determine whether the error is within acceptable tolerance limits.

**CCS 4.2**    (Geometry and measurement) All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe and analyze phenomena.

D.2 Grade 12    Choose appropriate tools and techniques to achieve the specified degree of precision and error needed in a situation.
· Degree of accuracy of a given measurement tool
· Finding the interval in which a computed measure (e.g., area or volume) lies, given the degree of precision of linear measurements

**CCS 4.4**    (Data analysis, probability, and discrete mathematics) All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

A.2  Grade 8    Make inferences and formulate and evaluate arguments based on displays and analysis of data.

B.4  Grade 8    Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models.
· Frequency, relative frequency

B.5  Grade 8    Estimate probabilities and make predictions based on experimental and theoretical probabilities.

A.2  Grade 12    Evaluate the use of data in real-world contexts.
· Accuracy and reasonableness of conclusions drawn
· Bias in conclusions drawn (e.g., influence of how data is displayed)
· Statistical claims based on sampling

A.4  Grade 12    Estimate or determine lines of best fit (or curves of best fit if appropriate) with technology, and use them to interpolate within the range of the data.

**CCS 4.5**   (Mathematical processes) All students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.

A.1  Grade All   Learn mathematics through problem solving, inquiry, and discovery.

A.3  Grade All   Select and apply a variety of appropriate problem-solving strategies (e.g., "try a simpler problem" or "make a diagram") to solve problems.

D.5  Grade All   Make and investigate mathematical conjectures.
· Counter examples as a means of disproving conjectures
· Verifying conjectures using informal reasoning or proofs

F.1  Grade All   Use technology to gather, analyze, and communicate mathematical information.

F.2  Grade All   Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information (cf. workplace readiness standard 8.4-D).

F.4  Grade All   Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).

**CCS 5.1**   (Scientific Processes) All students will develop problem-solving, decision-making and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.

A.1  Grade 12   When making decisions, evaluate conclusions, weigh evidence, and recognize that arguments may not have equal merit.

B.2  Grade 12   Show that experimental results can lead to new questions and further investigations.

**CCS 5.3**   (Mathematical applications) All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.

D.4  Grade 8   Use computer spreadsheets, graphing and database applications to assist in quantitative analysis of data (See mathematics standard 4.5-F).

B.1  Grade 12   When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the input data.

**CCS 5.6**  (Chemistry) All students will gain an understanding of the structure and behavior of matter.

B.1  Grade 4  Combine two or more materials and show that the new material may have properties that are different from the original material.

B.1  Grade 8  Show how substances can chemically react with each other to form new substances having properties different from those of the original substances.

A.2  Grade 12  Know that the number of protons in the nucleus defines the element.

A.3  Grade 12  Know that an atom's electron arrangement, particularly the outermost electrons, determines how the atom can interact with other atoms.

A.6  Grade 12  Know that many biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.


**CCS 5.7**  (Physics) All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.

A.4  Grade 12  Recognize that electrically charged bodies can attract or repel each other with a force that depends upon the size and nature of the charges and the distance between them and know that electric forces play an important role in explaining the structure and properties of matter.

A.5  Grade 12  Know that there are strong forces that hold the nucleus of an atom together and that significant amounts of energy can be released in nuclear reactions (fission, fusion, and nuclear decay) when these binding forces are disrupted.

B.3  Grade 12  Recognize that whenever mechanical energy is transformed, some heat is dissipated and is therefore unavailable for use.

B.4  Grade 12  Explain the nature of electromagnetic radiation and compare the components of the electromagnetic spectrum from radio waves to gamma rays.