Inquiry into Radioactivity

Radiation Literacy for Non-Science Majors
Fall 2013 Version

These folders contain the latest **Inquiry into Radioactivity** materials as of Fall 2013.

These materials were created by the IiR project, directed by Andy Johnson of CAMSE at Black Hills State University. The purpose is to enable teaching radiation to students using inquiry approaches and to promote radiation literacy. The materials have been under increasingly intense development for 7 years and they are working pretty well! An early version was used in a workshop for teachers at the Sanford Lab in Lead in 2008 and got a positive reception. At least one teacher subsequently used some of these materials in her own class, and found that they worked with high school students as well.

These materials are available for free at http://www.camse.org/radiation

1) You will want to be patient with yourself and your class when using these materials for the first time if you have not already encountered guided inquiry activities and trained yourself to take an "inquiry teacher" role in your classroom. Most of the ideas that students are expected to develop in these materials really can and really do come from student thinkers in the class. The job of the teacher is to introduce activities, focus the students on relevant questions, and to model a scientist's emphasis on evidence and sense-making. If you have not taught this way, give these materials a try! They are designed to help you get started, with a lot of information about what questions to ask and what questions not to answer early in the unit. And what do you have to lose, it's about radiation!

2) These materials are loosely based on the Constructing Physics Understanding (CPU) scheme. There are four cycles of inquiry activity that involve special discussions - Elicitation discussions at the beginning and Main Ideas discussions at the end. If you are not familiar with CPU, you will want to read the document "About CPU Pedagogy.pdf" It takes awhile to learn to teach using CPU or any other inquiry approach but the teacher's manual should help.

3) There is a teacher's guide to help you bring up all the details that you will need to bring up. It is not complete but should be helpful.

4) A lot of special equipment is needed:

- Radiation monitors
- Vernier computer interfaces - Labpro or Labquest. Setup files are included.
- Radiation sources
- Electromagnetic field detectors
- Access to computers for simulators
- A giant lecture hall sized cloud chamber
- A Cs/Ba137 radioisotope generator
- The Chart of the Nuclides
- Lots of dice

See the document "Extensive equipment list.doc"

5) The activities are designed to be used in a classroom with computers. Groups of students sit around tables and work on electronic documents while doing experiments, making predictions, developing ideas, and so on. The students answer every place there is a blue box, and they print out their documents when

they have finished. If you don't have this setup, you can modify all the documents to pencil and paper format for students to write on in class.

6) Through extensive classroom observations and research, we have identified and largely fixed spots where students run into difficulties. Our students used to have serious problems with atoms, the basics of atomic structure, ionization, nuclei, molecules, and isotopes. They also had difficulty thinking of radiation as subatomic particles moving at high speed. We found how to use the three IiR simulators to help with these things and fixed many other problems as well!

If you use these activities, please let me know!
I would like to know if and how they are useful.

In addition, if you make any modifications that seem to work better, please let me know - I would want to include your improvements in later versions.

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