Introduction

Answer either question 1 or question 2 below. Each question carries the same number of points, and complete answers (that is, including supporting arguments) will receive the most credit.

Answers should be emailed to me (ilittlewood@csustan.edu) on or before Monday December 19th at noon.

Questions

1. The graph below shows the activity as a function of time for a hypothetical sample of waste from a nuclear power plant. It contains three fission products A (shown in blue), B shown in red, and C (shown in yellow). Initially the sample contains 20% isotope A, 35% isotope B, and the rest isotope C. Also shown (in green) is the total activity of the sample.

   a. From the graph, estimate the half lives of all three isotopes. (Note: you can use these numbers to rank the isotopes in terms of their decay constants.)

   b. Initially the most active isotope is A, even though it has the smallest percentage. Why is this the case?

   c. How long does it take for isotope A to become less active than either of the other isotopes?

   d. Is there a time when isotope B is the most active? If so why does it become the most active, and why to it cease being so?

   e. The activity of the sample is a measure of its potential as a safety hazard. What can you say about safety of this sample for long times, that is beyond 20 years?

   f. Bearing in mind your answers to previous parts of this question, discuss their implication to the handle of nuclear waste which contains multiple isotopes. Some of the common ones are listed in the table to the right.

Isotope	Half life
^{238}U	4.5 billion years
^{239}Pu	24,110 years
^{60}Co	5.26 years
^{131}I	8.02 days
^{137}Cs	30 years
^{90}Sr	28.8 years

Activiity of nuclear waste

Activity (particles per second)

time (years)
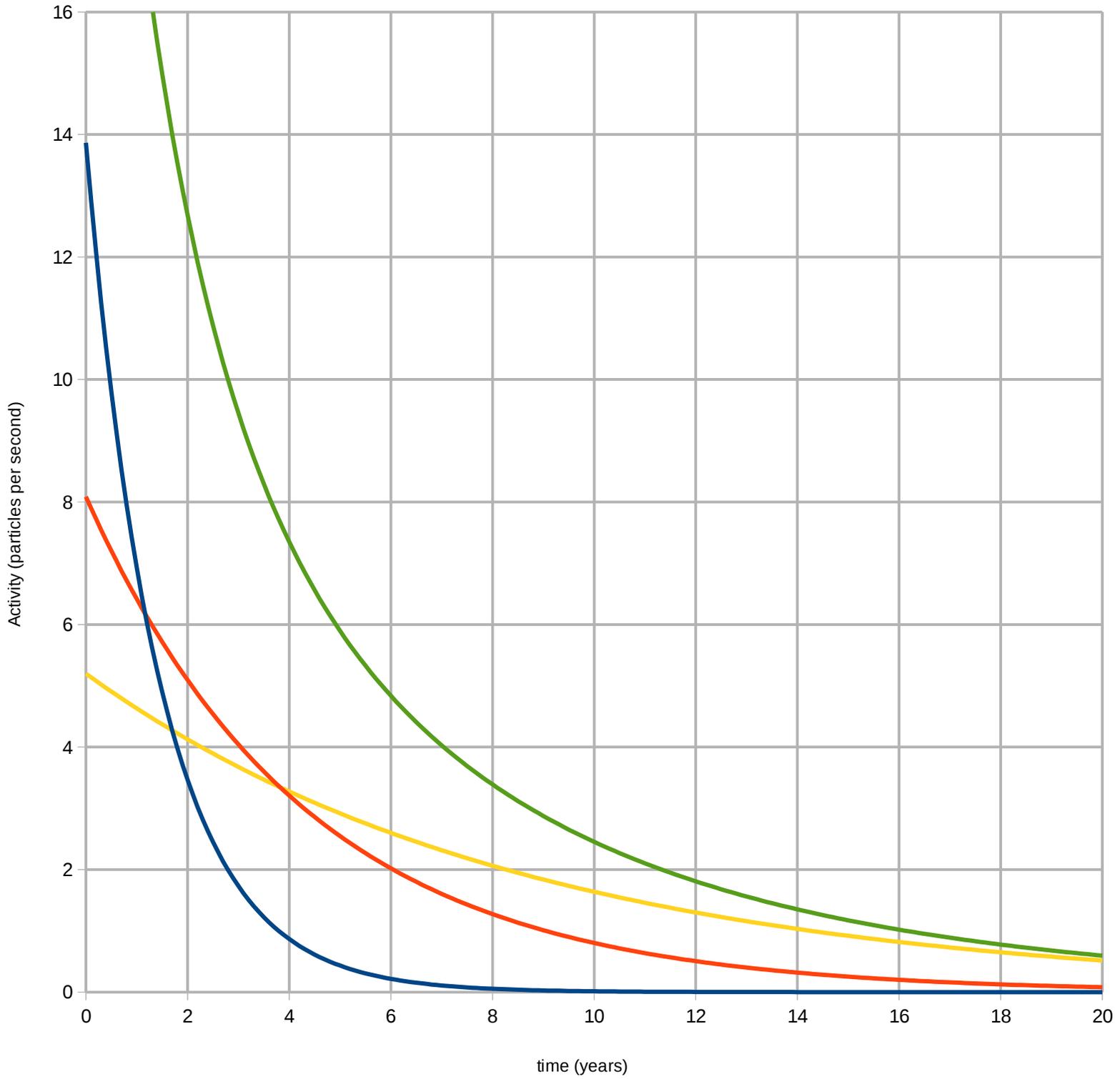
2. Here are some links which make the case for and against nuclear power. Look through them and select one from each to write about. Here are some talking points that might want to include (none are compulsory), and you can introduce your own as you think fit. If you do include new ones make sure that your point is clear before discussing it.
   a. How do your sites manage to promote diametrically opposite views from the same facts?
   b. Discuss the role of bias/dishonesty/credentials in theses web sites.
   c. Can any of the facts quoted n the articles be independently verified?
   d. Can either side be said to be "right" (or more right then the other.)
   e. Since you don't remember incident such as Chernobyl and Three Mile Island, but do remember Fukushima, how does memory affect the way you understand these articles?
   f. Could it be said that by commencing nuclear power in the 1950's we have opened Pandora's Box and there is no going back. (Remember that was the title of the movie with which we commenced the semester.)

   ○ Articles for
     ▪ [Nuclear power is the greenest option, say top scientists](#)
     ▪ [A Path for Nuclear Power](#)
     ▪ [Nuclear power is our future](#)
     ▪ [Nuclear Power Is Too Safe to Save the World From Climate Change](#)
   ○ Articles against
     ▪ [Nuclear Power News Articles](#)
     ▪ [Ten Urgent Reasons to Reject Nuclear Power Now](#)
     ▪ [Ten Strikes Against Nuclear Power](#)
     ▪ [Reject Nuclear Power – Here's Why](#)
     ▪ [End the nuclear age](#)

You might want to make use of some neutral (or nearly neutral) sources. Here are some possibilities
   • [Arguments for and against nuclear power](#)
   • [Cold Hard Facts about Nuclear Power](#)
   • [How Nuclear Power Works](#)
     ○ [Safety Issues](#)
You can also make use of other sites that you might find (providing you cite them) including those we have used earlier in the semester.