SUGGESTED REPORT TOPICS

1. NUCLEAR WASTE DISPOSAL: Discuss the kind and amount of nuclear waste from a typical power reactor. Indicate the possible methods of disposal, the advantages and disadvantages of each and the method most likely to be chosen by the United States.

2. $^{14}$C DATING WITH ACCELERATORS: Outline the basic method of $^{14}$C dating using accelerators and compare this with the more common low-level proportional counting approach with regard to size of sample needed, time required, cost and sensitivity.

3. DOSIMETRY AT HIGH DOSE RATES: Indicate how high gamma dose rates (eg. Mrad/hr) are measured using a chemical dosimeter. Discuss the radiation chemistry involved and indicate how reliable these chemical dosimeters are.

4. FUSION AS A VIABLE ENERGY SOURCE: Describe the basic fusion process. Indicate possible methods of controlling this reaction and indicate the method currently thought to most likely succeed.

5. RADIOISOTOPE IMAGING TECHNIQUES IN NUCLEAR MEDICINE: Describe the principles behind absorption and emission tomographic scanning techniques. Indicate what information is uniquely available via these methods and the limitations of this approach.

6. RADIATION CHEMISTRY: Outline the basic chemistry of the interaction of radiation with biological material, including water, and indicate the radiation doses at which various biological responses occur.

7. DIRECT CONVERSION: Describe the construction and use of low-energy power supplies (such as pacemakers) relying on the direct conversion of radioactive decay energy into electrical energy.

8. NATURAL REACTOR AT OKLO: Describe the evidence that suggests the occurrence of a natural reactor at Oklo in Gabon. Indicate how it is possible that a self-sustaining chain reaction could occur with natural (non-enriched) uranium. Discuss the information gained about the migration of fission products in geological formations as it pertains to nuclear waste storage.

9. DIAGNOSTIC RADIOPHARMACEUTICALS: List some uses of radionuclides in diagnostic nuclear medicine, and indicate the advantages and disadvantages to the use of radionuclides as opposed to other non-radioactive means of diagnosis.
10. INHERENTLY SAFE NUCLEAR REACTORS: Discuss proposed changes in reactor design that should remove many of the dangers currently associated with loss-of-coolant accidents. Identify any problems associated with the use of such reactors for power generation.

11. SYNTHESIS OF TRANSURANIC ELEMENTS: Describe how selected transuranic elements are synthesized using heavy-ion accelerators, and indicate the criteria used to positively identify such elements.

12. RADIOISOTOPE LABELING TECHNIQUES: For a labeled compound of your choice, indicate the synthetic route for incorporating a radioactive label in the desired position. Point out the difficulties encountered and any changes this synthesis requires over the synthesis of the unlabeled compound.

13. BREEDER REACTORS: Describe the basic "breeding" process. Indicate any significant differences between breeder and nonbreeder reactors. Indicate why breeder reactors have received so much negative press.

14. RADIATION STERILIZATION OF FOODSTUFFS: Discuss the use of radiation to sterilize foods pointing out the doses and sources used, types of food commonly irradiated, the concerns about this process and how this method compares costwise to other means of sterilization.

15. NUCLEAR WEAPONS: Indicate the basic nuclear chemistry occurring in an atomic bomb, in a hydrogen bomb and in a neutron bomb. Comment on the destructive effects associated with a nuclear blast, and on the fall-out problem for atmospheric testing.

16. CHERNOBYL: Briefly describe the events that led to the nuclear reactor accident at Chernobyl. Indicate the amounts of various radionuclides released in the explosion and the consequences of these releases for the population of Europe and the world.

17. NUCLEAR DATING METHODS: Describe at least two dating methods, other than $^{14}$C dating, which are based on radioactive decay. Indicate the radionuclides involved, the methods used to prepare and count samples, and the type of problems to which the methods can be successfully applied.