Radioactivity Review Questions

1. a) Fill in the blank and identify the particle which is used in PET scans (a technique used for medical imaging).

$$^{11}C \rightarrow {}^{11}B \quad + \text{energy}$$

b) If you look at the difference between ^{11}C and ^{11}B, you'll notice the following:

^{11}C	^{11}B
6 protons 5 neutrons	5 protons 6 neutrons

What is happening to one of carbon's protons in this nuclear reaction? Write a balanced nuclear equation that shows the transformation.

2. Explain the difference between fusion and fission.
3. Why are some foods naturally more radioactive than others?
4. What are the differences between alpha particles and gamma rays?

Answers

1. a) ${}^{0}_{1}e$ = positron
   b) one of the protons is turning into a neutron:

$${}^{1}_{1}p \rightarrow {}^{1}_{0}n + {}^{0}_{1}e$$

2. **Nuclear fusion** is nuclear reaction in which atomic nuclei join together to form a heavier nucleus.
   Nuclear fission is a nuclear reaction in which the nucleus of an atom splits into smaller parts, often producing free neutrons and lighter nuclei, which may eventually produce gamma rays. Fission of heavy elements is an exothermic reaction which can release large amounts of energy.

3. Some foods are richer in potassium and will consequently have more ^{40}K, which is a radioactive isotope. Which foods are richer in K?—

Here's a list, but don't avoid them, the amount of radioactivity in them is extremely small!

Highest Sources of Potassium (mg/100 g)

RDA(recommended daily allowance) = 2000 mg

- 1. lima beans (1724)
- 2. kidney beans (1406)
- 3.pistachios (1093)
- 4. lentils (905)
- 5. almonds (732)
- 6.peanuts (705)
- 7. avocado (634)
- 8. brazil nuts (600)
- 9. chestnuts (592)
- 10. cashews (565)
- 11. spinach (558)
- 12. parsley (554)
- 13. walnuts (502)
- 14. chestnuts (484)
- 15.hazelnuts (445)
- 16. potatoes (413)
- 17. bananas (396)
- 18.pecans (392)
- 19. Swiss chard (379)
- 20.atrichokes (370)
- 21. kiwi (332)
- 22. broccoli (325)

4. **Alpha particles** (named after first letter in the Greek alphabet, α) consist of two protons and two neutrons bound together into a particle identical to a helium nucleus; hence, it can be written as $^{4}He^{2+}$ but often we leave out the charge and simply write ^{4}He. Alpha particles are a highly ionizing form of particle radiation but have low penetration depth.