**Nuclear Chemistry**

6. Which type of reaction releases the greatest

amount of energy per mole of reactant?

(1) combustion

(2) decomposition

(3) nuclear fusion

(4) oxidation-reduction

7. Which balanced equation represents natural transmutation?



8. Which radioisotope is matched with its decay mode?

(1) H-3 and γ (3) N-16 and α

(2) K-42 and β+ (4) P-32 and β−

9. Which reaction is accompanied by the release of the greatest amount of energy?

(1) combustion of 10. g of propane

(2) electrolysis of 10. g of water

(3) nuclear fission of 10. g of uranium

(4) oxidation of 10. g of iron

10.Which nuclides are used to date the remains of a once-living organism?

(1) C-14 and C-12 (3) I-131 and Xe-131

(2) Co-60 and Co-59 (4) U-238 and Pb-206

1 .Compared to the mass and the penetrating

power of an alpha particle, a beta particle has

(1) less mass and greater penetrating power

(2) less mass and less penetrating power

(3) more mass and greater penetrating power

(4) more mass and less penetrating power

2. During a nuclear reaction, mass is converted

into

(1) charge (3) isomers

(2) energy (4) volume

3. Which equation represents natural transmutation?



4. Energy is released during the fission of Pu-239

atoms as a result of the

(1) formation of covalent bonds

(2) formation of ionic bonds

(3) conversion of matter to energy

(4) conversion of energy to matter

5. Atoms of I-131 spontaneously decay when the

(1) stable nuclei emit alpha particles

(2) stable nuclei emit beta particles

(3) unstable nuclei emit alpha particles

(4) unstable nuclei emit beta particles

**Base your answers to questions 11-14 on the information below:**

Nuclear fission has been used to produce electricity. However, nuclear fusion for

electricity production is still under development. The notations of some nuclides used in nuclear reactions are shown in the table below.



11. Compare the atomic masses of nuclides used in fusion to the atomic masses of nuclides

used in fission. [1]

12. Complete the table *below* that compares the total number of protons

and the total number of neutrons for the hydrogen nuclides used for fusion. [1]



13. Complete the nuclear equation *below* for the fission of U-235 by writing the notation of the missing product. [1]



14. State *one* potential benefit of using nuclear fusion instead of the current use of nuclear

**Base your answers to question 15-17 on the information below:**

Polonium-210 occurs naturally, but is scarce. Polonium-210 is primarily used in devices

designed to eliminate static electricity in machinery. It is also used in brushes to remove dust from camera lenses. Polonium-210 can be created in the laboratory by bombarding bismuth-209 with neutrons to create bismuth-210. The bismuth-210 undergoes beta decay to produce polonium-210. Polonium-210 has a half-life of 138 days and undergoes alpha decay.

15. State *one* beneficial use of Po-210. [1]

16. Complete the nuclear equation *below* for the decay of Po-210, by

writing a notation for the missing product. [1]



17. Determine the total mass of an original 28.0-milligram sample of Po-210 that remains unchanged after 414 days. [1]

**Base your answers to question 18-20 on the information below:**

When a uranium-235 nucleus absorbs a slow-moving neutron, different nuclear

reactions may occur. One of these possible reactions is represented by the complete,

balanced equation below.



For this reaction, the sum of the masses of the products is slightly less than the sum of the masses of the reactants. Another possible reaction of U-235 is represented by the incomplete, balanced equation below.



18. Identify the type of nuclear reaction represented by equation 1. [1]

19. Write a notation for the missing product in equation 2. [1]

20. Determine the half-life of krypton-92 if only 6.0 milligrams of an original 96.0-milligram

sample remains unchanged after 7.36 seconds. [1]