

1) The nucleus of a radium-226 atom is unstable, which causes the nucleus to spontaneously

- 1) absorb electrons 3) decay
2) absorb protons 4) oxidize

2) Which isotope will spontaneously decay and emit particles with a charge of +2?

- 1) ^{53}Fe 2) ^{137}Cs 3) ^{198}Au 4) ^{220}Fr

3) Which reaction is an example of natural transmutation?

- 1) $^{239}\text{Pu} \rightarrow ^{235}\text{U} + ^4_2\text{He}$
2) $^{27}\text{Al} + ^4_2\text{He} \rightarrow ^{30}\text{P} + ^1_0\text{n}$
3) $^{238}\text{U} + ^1_0\text{n} \rightarrow ^{239}\text{Pu} + 2\ ^0_{-1}\text{e}$
4) $^{239}\text{Pu} + ^1_0\text{n} \rightarrow ^{147}\text{Ba} + ^{90}\text{Sr} + 3\ ^1_0\text{n}$

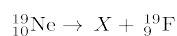
4) Which list of particles is in order of increasing mass?

- 1) proton \rightarrow electron \rightarrow alpha particle
2) proton \rightarrow alpha particle \rightarrow electron
3) electron \rightarrow proton \rightarrow alpha particle
4) alpha particle \rightarrow electron \rightarrow proton

5) Which type of radiation would be attracted to the positive electrode in an electric field?

- 1) $^0_{-1}\text{e}$ 2) ^1_1H 3) ^4_2He 4) ^1_0n

6) Given the nuclear equation:



What particle is represented by X?

- 1) alpha 3) neutron
2) beta 4) positron

7) After decaying for 48 hours, $\frac{1}{16}$ of the original mass of a radioisotope sample remains unchanged. What is the half-life of this radioisotope?

- 1) 3.0 h 2) 9.6 h 3) 12 h 4) 24 h

8) Which radioisotopes have the same decay mode and have half-lives greater than 1 hour?

- 1) Au-198 and N-16 3) I-131 and P-32
2) Ca-37 and Fe-53 4) Tc-99 and U-233

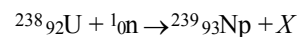
9) What was the original mass of a radioactive sample that decayed to 25 grams in four half-life periods?

- 1) 50 g 2) 100 g 3) 200 g 4) 400 g

10) Which equation is an example of artificial transmutation?

- 1) $^9_4\text{Be} + ^4_2\text{He} \rightarrow ^{12}_6\text{C} + ^1_0\text{n}$
2) $\text{U} + 3\text{F}_2 \rightarrow \text{UF}_6$
3) $\text{Mg}(\text{OH})_2 + 2\text{HCl} \rightarrow 2\text{H}_2\text{O} + \text{MgCl}_2$
4) $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$

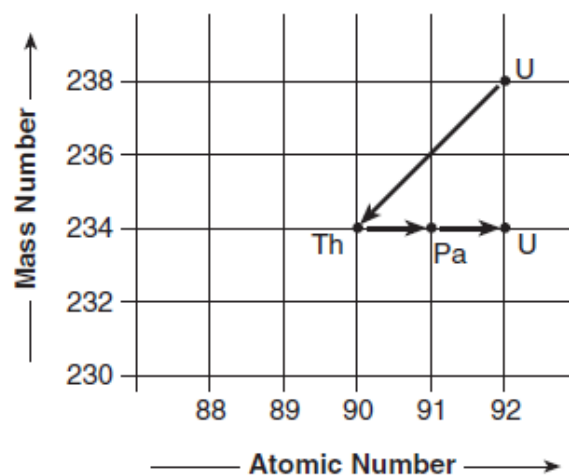
11) In the reaction:



The species represented by X is

- 1) ^1_1H 2) ^1_0n 3) ^4_2He 4) $^0_{-1}\text{e}$

12) The chart below shows the spontaneous nuclear decay of U-238 to Th-234 to Pa-234 to U-234.



What is the correct order of nuclear decay modes for the change from U-238 to U-234?

- 1) β^- decay, γ decay, β^- decay
2) β^- decay, β^- decay, α decay
3) α decay, α decay, β^- decay
4) α decay, β^- decay, β^- decay

13) Which radioactive isotope is used in geological dating?

- 1) uranium-238 3) cobalt-60
2) iodine-131 4) technetium-99

14) Which radioisotope is used in medicine to treat thyroid disorders?

- 1) cobalt-60 3) phosphorus-32
2) iodine-131 4) uranium-238

15) A radioisotope which is sometimes used by doctors to pinpoint a brain tumor is

- 1) carbon-12 3) technetium-99
2) lead-206 4) uranium-238

16) Which isotope is used to treat cancer?

- 1) C-14 3) Co-60
2) U-238 4) Pb-206