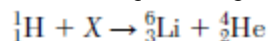


1) In which type of reaction can an atom of one element be converted to an atom of another element?

- 1) addition 3) substitution
2) reduction 4) transmutation

2) Given the equation representing a nuclear reaction:



The particle represented by X is

- 1) ${}^9_4\text{Li}$ 2) ${}^9_4\text{Be}$ 3) ${}^{10}_5\text{Be}$ 4) ${}^{10}_6\text{C}$

3) Which equation represents natural transmutation?

- 1) ${}^{10}_5\text{B} + {}^4_2\text{He} \rightarrow {}^{13}_7\text{N} + {}^1_0\text{n}$
2) ${}^{14}_6\text{C} \rightarrow {}^{14}_7\text{N} + {}^0_{-1}\text{e}$
3) $\text{S} + 2\text{e}^- \rightarrow \text{S}^{2-}$
4) $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$

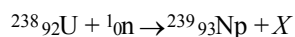
4) Which equation is an example of artificial transmutation?

- 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) $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$

5) The change that is undergone by an atom of an element made radioactive by bombardment with high-energy protons is called

- 1) natural transmutation
2) artificial transmutation
3) natural decay
4) radioactive decay

6) In the reaction:



The species represented by X is

- 1) ${}^1_1\text{H}$ 2) ${}^1_0\text{n}$ 3) ${}^4_2\text{He}$ 4) ${}^0_{-1}\text{e}$

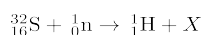
7) Given the nuclear reaction:



What does X represent in this reaction?

- 1) ${}^{31}_{15}\text{P}$ 2) ${}^{32}_{15}\text{P}$ 3) ${}^{31}_{16}\text{P}$ 4) ${}^{32}_{16}\text{P}$

8) Given the nuclear reaction:



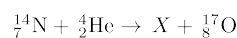
What does X represent in this reaction?

- 1) ${}^{31}_{15}\text{P}$ 2) ${}^{32}_{15}\text{P}$ 3) ${}^{31}_{16}\text{P}$ 4) ${}^{32}_{16}\text{P}$

9) Which isotope is used to treat cancer?

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

10) Given the equation:



When the equation is balanced correctly, which particle is represented by X?

- 1) ${}^0_{-1}\text{e}$ 2) ${}^1_1\text{H}$ 3) ${}^2_1\text{H}$ 4) ${}^1_0\text{n}$

11) Which radioisotope is used to determine the age of once-living organisms?

- 1) carbon-14 3) iodine-131
2) cobalt-60 4) uranium-238

12) Which radioisotope is used in dating geological formations?

- 1) I-131 3) Ca-37
2) U-238 4) Fr-220

13) Which radioisotope is used for diagnosing thyroid disorders?

- 1) U-238 3) I-131
2) Pb-206 4) Co-60

14) Cobalt-60 and iodine-131 are radioactive isotopes that are used in

- 1) dating geologic formations
2) industrial measurements
3) medical procedures
4) nuclear power

15) The course of a chemical reaction can be traced by using a

- 1) polar molecule 3) stable isotope
2) diatomic molecule 4) radioisotope

16) Radioisotopes used for medical diagnosis must have

- 1) long half-lives and be quickly eliminated by the body
2) long half-lives and be slowly eliminated by the body
3) short half-lives and be quickly eliminated by the body
4) short half-lives and be slowly eliminated by the body

17) Radiation used in the processing of food is intended to

- 1) increase the rate of nutrient decomposition
2) kill microorganisms that are found in the food
3) convert ordinary nutrients to more stable forms
4) replace chemical energy with nuclear energy

18) 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