

Select the best answer for each of the statements or questions:

- A 1. During the process of electron capture, an electron from outside the nucleus combines with a proton to form ...
 A. a neutron. B. another proton.
 C. a positron. D. a gamma ray.
- C 2. What is the symbol used for a neutron in balancing nuclear equations?
 A. ${}_{-1}^1\text{n}$ B. ${}_{1}^1\text{n}$ C. ${}_{0}^1\text{n}$ D. ${}_{1}^0\text{n}$
- D 3. Which of the following is a nucleon?
 A. electron. B. beta particle.
 C. positron. D. neutron.
- B 4. The isotope least likely to be found in the band of stability among the following is ...
 A. ${}_{6}^{13}\text{C}$. $\frac{n^0}{p^+} = \frac{7}{6} = 1.17$ B. ${}_{13}^{32}\text{Al}$. $\frac{n^0}{p^+} = \frac{19}{13} = 1.46$ C. ${}_{8}^{17}\text{O}$. $\frac{n^0}{p^+} = \frac{9}{8} = 1.13$ D. ${}_{14}^{29}\text{Si}$. $\frac{n^0}{p^+} = \frac{15}{14} = 1.17$
- A 5. Between protons in a ^{stable} nucleus, ...
 A. attraction due to nuclear force is greater than repulsion due to the electrical force.
 B. repulsion due to the electrical force is greater than attraction due to nuclear force.
 C. nuclear and electrostatic forces are balanced.
 D. electrical forces are negligible.
- C 6. Which of the following radioactive decay processes *increases* the atomic number of a nucleus?
 A. electron capture B. positron emission
 C. beta decay D. alpha decay
- C 7. Which of the following particles has the same mass as an electron but a positive charge?
 A. alpha particle B. beta particle
 C. positron D. neutron
- C 8. Alpha particles are ...
 A. electrons. B. high-energy light waves.
 C. helium nuclei. D. neutrons.
- B 9. Gamma rays are ...
 A. electrons. B. high-energy light waves.
 C. helium nuclei. D. neutrons.
- C 10. The process involved in the conversion of ${}_{37}^{82}\text{Rb}$ to ${}_{36}^{82}\text{Kr}$ is ... [Hint: write the reaction]...
 A. alpha decay. ${}_{37}^{82}\text{Rb} \rightarrow {}_{36}^{82}\text{Kr} + {}_{+1}^0\beta$ B. beta decay.
 C. positron emission. D. neutron bombardment.
- A 11. The process involved in the conversion of ${}_{27}^{57}\text{Co}$ to ${}_{26}^{57}\text{Fe}$ is [Hint: write the reaction]...
 A. electron capture. ${}_{27}^{57}\text{Co} + {}_{-1}^0\text{e} \rightarrow {}_{26}^{57}\text{Fe}$ B. neutron bombardment.
 C. alpha decay. D. beta decay.

- B 12. The isotope formed by the beta decay of ${}^{40}_{19}\text{K}$ has an atomic number of ... ${}^{40}_{19}\text{K} \rightarrow {}^0_{-1}\beta + {}^{40}_{20}\text{Ca}$
 A. 18. B. 20. C. 39. D. 21.
- A 13. The isotope formed by the alpha decay of ${}^{238}_{92}\text{U}$ has a mass number of ... ${}^{238}_{92}\text{U} \rightarrow {}^4_2\alpha + {}^{234}_{90}\text{Th}$
 A. 234. B. 238. C. 236. D. 240.
- D 14. When the isotope ${}^{238}_{91}\text{Pa}$ decays by beta emission, the isotope formed is ... ${}^{238}_{91}\text{Pa} \rightarrow {}^0_{-1}\beta + {}^{238}_{92}\text{U}$
 A. ${}^{234}_{89}\text{Ac}$. B. ${}^{237}_{92}\text{U}$. C. ${}^{238}_{90}\text{Th}$. D. ${}^{238}_{92}\text{U}$.
- D 15. The half-life of calcium-47 is 5 days. Starting with 64 g of this isotope, what amount remains after 20 days? $n = 20 \text{ d} / 5 \text{ d} = 4 \text{ half-lives}; (64 \text{ g})(\frac{1}{2})^4 = 4 \text{ g}$
 A. 32 g B. 8 g C. 16 g D. 4 g
- D 16. The process that changes the identity and number of protons in a nucleus is ...
 A. fusion. B. fission. C. transmutation. D. all of these
- A 17. Artificial radioactive elements are produced by ...
 A. bombarding stable nuclei with particles. B. alpha emission from stable nuclei.
 C. beta emission from stable nuclei. D. fission of stable nuclei.
- D 18. Which are NOT products of the fission of uranium?
 A. neutrons B. energy
 C. medium-weight nuclei D. alpha particles
- C 19. One product of *all* stellar nuclear fusion reactions is ...
 A. protons. B. electrons. C. energy. D. neutrons.
- A 20. One of the biggest problems surrounding the use of nuclear power plants is ...
 A. finding a way to dispose of spent fuel rods.
 B. the high cost of coolant needed.
 C. a lack of uranium.
 D. initiating a chain reaction in the fuel.
- A 21. At present, fusion reactions...
 A. cannot be used to produce energy in reactors.
 B. produce the energy in some nuclear power plants.
 C. produce the energy in most nuclear power plants.
 D. produce the energy in all recent nuclear power plants.
- C 22. During nuclear fission, the products have a lower average mass per nucleon because ...
 A. they are less stable. B. they lose neutrons.
 C. mass is converted to energy. D. energy is converted to mass.
- C 23. Which nuclei are the most stable (have the lowest average mass per nucleon)?
 A. light elements only B. heavy elements only
 C. medium-weight elements D. both heavy and light elements