Standardized Test Prep

MULTIPLE CHOICE

1. Which of the following statements correctly describes a nucleus with the symbol ${}^{14}_{6}\mathrm{C}$?

A. It is the nucleus of a cobalt atom with eight protons and six neutrons.

B. It is the nucleus of a carbon atom with eight protons and six neutrons.

C. It is the nucleus of a carbon atom with six protons and eight neutrons.

D. It is the nucleus of a carbon atom with six protons and fourteen neutrons.

2. One unified mass unit (u) is equivalent to a mass of 1.66×10^{-27} kg. What is the equivalent rest energy in joules?

F. 8.27×10^{-46} J

G. 4.98×10^{-19} J

H. 1.49×10^{-10} J

J. 9.31×10^{8} J

3. What kind of force holds protons and neutrons together in a nucleus?

A. electric force

B. gravitational force

C. binding force

D. strong force

4. What type of nuclear decay most often produces the greatest mass loss?

F. alpha decay

G. beta decay

H. gamma decay

J. All of the above produce the same mass loss.

5. A nuclear reaction of major historical note took place in 1932, when a beryllium target was bombarded with alpha particles. Analysis of the experiment showed that the following reaction took place: ${}^{4}_{2}\mathrm{He} + {}^{9}_{4}\mathrm{Be} \longrightarrow {}^{12}_{6}\mathrm{C} + \mathrm{X}$. What is X in this reaction?

A. ${}^{0}_{1}e$

B. ${}^{0}_{-1}p$

C. ${}^{1}_{0}n$

D. ${}^{1}_{1}p$

6. What fraction of a radioactive sample has decayed after two half-lives have elapsed?

F. $\frac{1}{4}$

G. $\frac{1}{2}$

H. $\frac{3}{4}$

J. The whole sample has decayed.

7. A sample of organic material is found to contain 18 g of carbon-14. Based on samples of pottery found at a dig, investigators believe the material is about 23 000 years old. The half-life of carbon-14 is 5715 years. Estimate what percentage of the material's carbon-14 has decayed.

A. 4.0%

B. 25%

C. 75%

D. 94%

8. The half-life of radium-228 is 5.76 years. At some instant, a sample contains 2.0×10^{9} nuclei. Calculate the decay constant and the activity of the sample.

F. $\lambda = 3.81 \times 10^{-9}\ \mathrm{s}^{-1}$; activity $= 2.1 \times 10^{-10}$ Ci

G. $\lambda = 3.81 \times 10^{-9}\ \mathrm{s}^{-1}$; activity $= 7.8$ Ci

H. $\lambda = 0.120\ \mathrm{s}^{-1}$; activity $= 6.5 \times 10^{-3}$ Ci

J. $\lambda = 2.6 \times 10^{8}\ \mathrm{s}^{-1}$; activity $= 1.4 \times 10^{7}$ Ci