

- 14.** Suppose the catabolism of a given amount of glucose produces 95 moles of ATP during cellular respiration. How many moles of ATP could be produced by the same amount of glucose during fermentation?

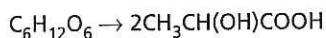
$$\frac{(95 \text{ mol ATP}_{\text{CR}})(2 \text{ mol ATP}_{\text{F}})}{38 \text{ mol ATP}_{\text{CR}}} = 5.0 \text{ mol ATP}_{\text{F}}$$

- 15.** How many grams of glucose are needed to produce 102 g of ethanol during alcoholic fermentation?

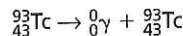
$$(102 \text{ g ethanol}) \left(\frac{1 \text{ mol ethanol}}{46 \text{ g ethanol}} \right) \left(\frac{1 \text{ mol glucose}}{2 \text{ mol ethanol}} \right)$$

$$\left(\frac{180 \text{ g glucose}}{1 \text{ mol glucose}} \right) = 2.00 \times 10^2 \text{ g glucose}$$

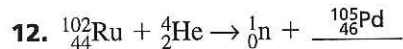
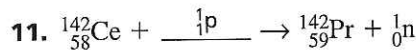
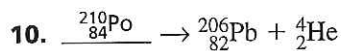
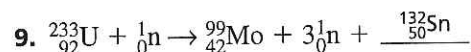
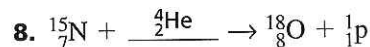
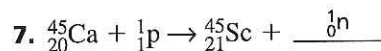
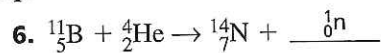
- 16.** Write a balanced equation for lactic acid fermentation. The formula for lactic acid is $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$.



- 5.** The decay of ${}^{93}_{43}\text{Tc}$ by gamma emission.



Provide the missing term in each of the following equations.



Answer the following questions about half-life.

- 13.** The half-life of ${}^{115}_{51}\text{Sb}$ is 32 minutes. How much of a 16.0-g sample of this isotope will remain at the end of 3.0 hours?

$$0.34 \text{ g } {}^{115}_{51}\text{Sb}$$

Solution:

$$3 \text{ hours} \times \frac{60 \text{ minutes}}{1 \text{ hour}} = 180 \text{ minutes}$$

$$\text{Amount remaining} = \text{Initial amount } (1/2)^{t/T}$$

$$\text{Amount remaining} = 16.0 \text{ g} \times (1/2)^{\frac{180 \text{ minutes}}{32 \text{ minutes}}}$$

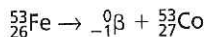
$$\text{Amount remaining} = 16.0 \text{ g} \times (1/2)^{5.6}$$

$$\text{Amount remaining} = 16.0 \text{ g} \times 0.021 = 0.34 \text{ g}$$

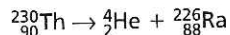
Chapter 25

Write a complete nuclear equation for each of the following.

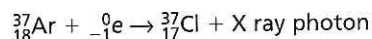
- 1.** The decay of ${}^{53}_{26}\text{Fe}$ by beta emission.



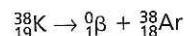
- 2.** The decay of ${}^{230}_{90}\text{Th}$ by alpha emission.



- 3.** The decay of ${}^{37}_{18}\text{Ar}$ by electron capture.



- 4.** The decay of ${}^{38}_{19}\text{K}$ by positron emission.



14. The half-life of ${}^{182}_{72}\text{Hf}$ is 9.0×10^6 years. How much of a 1.0-g sample of this isotope will remain at the end of 40.0 million years?

$$0.047 \text{ g } {}^{182}_{72}\text{Hf}$$

Solution:

$$40 \text{ million years} = 4.0 \times 10^7 \text{ years}$$

$$\text{Amount remaining} = \text{Initial amount } (1/2)^{t/T}$$

$$\text{Amount remaining} = 1.0 \text{ g} \times (1/2)^{\frac{4.0 \times 10^7 \text{ yr}}{9.0 \times 10^6 \text{ yr}}}$$

$$\text{Amount remaining} = 1.0 \text{ g} \times (1/2)^{4.4}$$

$$\text{Amount remaining} = 1.0 \text{ g} \times 0.047 = 0.047 \text{ g}$$

15. The isotope strontium-90 is produced during the testing of nuclear weapons. If 100.0 mg of strontium-90 was released in the atmosphere in 1960, how much of the radioisotope remains 85 years later? The half life of strontium-90 is 29 years.

$$13 \text{ mg strontium-90}$$

Solution:

$$\text{Amount remaining} = \text{Initial amount } (1/2)^{t/T}$$

$$\text{Amount remaining} = 100.0 \text{ mg} \times (1/2)^{\frac{85 \text{ years}}{29 \text{ years}}}$$

$$\text{Amount remaining} = 100.0 \text{ mg} \times (1/2)^{2.9}$$

$$\text{Amount remaining} = 100.0 \text{ mg} \times 0.13 = 13 \text{ mg}$$

16. The radioisotope technetium-99 is often used as a radiotracer to detect disorders of the body. It has a half-life of 6.01 hours. If a patient received a 25.0-mg dose of this isotope during a medical procedure, how much would remain 48.0 hours after the dose was given?

$$1.05 \text{ mg technetium-99}$$

Solution:

$$\text{Amount remaining} = \text{Initial amount } (1/2)^{t/T}$$

$$\text{Amount remaining} = 25.0 \text{ mg} \times (1/2)^{\frac{48.0 \text{ hours}}{6.01 \text{ hours}}}$$

$$\text{Amount remaining} = 25.0 \text{ mg} \times (1/2)^{7.99}$$

$$\text{Amount remaining} = 25.0 \text{ mg} \times 0.00419$$

$$\text{Amount remaining} = 1.05 \text{ mg}$$