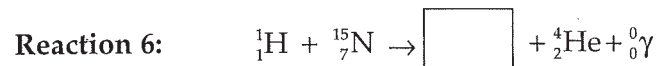
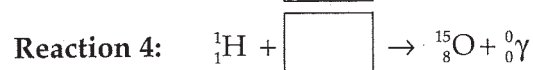
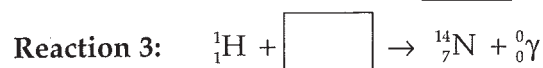
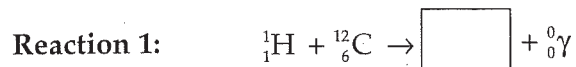


## 3-4 Apply

### The Carbon-Nitrogen Cycle

Hydrogen nuclei are involved in a process known as the carbon-nitrogen cycle. The six reactions in this decay series are presented below. The net result of the carbon-nitrogen cycle is that four hydrogen atoms are combined to produce one helium atom. Reactions 2 and 5 involve decay particles called positrons ( ${}^0_{+1}e$ ). Positrons are essentially positively charged beta particles.



- Use your knowledge of radioactive decay to fill in the missing parts of each nuclear equation above.
- Which type of radioactive particle was emitted by the following isotopes?
  - ${}^{13}_7\text{N}$  \_\_\_\_\_
  - ${}^{15}_7\text{N}$  \_\_\_\_\_
- In the cycle, what happens to the nitrogen-13 nuclei produced in the first reaction?
   
\_\_\_\_\_
   
\_\_\_\_\_
   
\_\_\_\_\_
- What happens to the atom produced in the sixth reaction?
   
\_\_\_\_\_
   
\_\_\_\_\_
   
\_\_\_\_\_
- Why is the process called a cycle?
   
\_\_\_\_\_
   
\_\_\_\_\_
   
\_\_\_\_\_

## 3-4 Practice Problems

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1. Write a nuclear equation for the alpha decay of  ${}_{91}^{231}\text{Pa}$ .
2. Write a nuclear equation for the beta decay of  ${}_{87}^{223}\text{Fr}$ .
3. Write a nuclear equation for the alpha decay of  ${}_{62}^{149}\text{Sm}$ .
4. Write a nuclear equation for the beta decay of  ${}_{61}^{165}\text{Pm}$ .
5. Write a nuclear equation for the alpha decay of  ${}_{101}^{249}\text{Md}$ .
6. Write a nuclear equation for the alpha decay of  ${}_{62}^{146}\text{Sm}$ .
7. Write a nuclear equation for the beta decay of  ${}_{85}^{198}\text{At}$ .
8. Write a nuclear equation for the alpha decay of  ${}_{64}^{150}\text{Gd}$ .
9. Write a nuclear equation for the beta decay of  ${}_{54}^{152}\text{Xe}$ .
10. Write a nuclear equation for the beta decay of  ${}_{55}^{120}\text{Cs}$ .