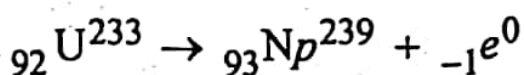
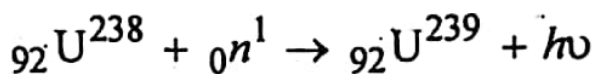


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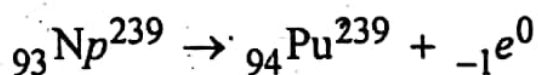
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(h) **Trans-uranic elements** : A number of elements having atomic number more than the heaviest naturally occurring element, uranium, $Z = 92$, have been produced. These elements having Z number more than 92 are known as **Trans-uranic elements**.

(1) **Neptunium** : $Z = 93$. When uranium ($A = 238$) is bombarded with slow energy neutrons neptunium is formed according to the reaction

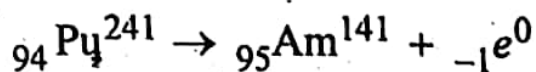
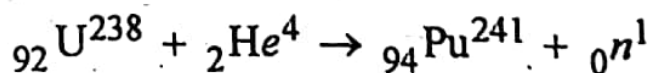


(2) **Plutonium** : $Z = 94$. Neptunium itself emits β -particle and produces plutonium according to the reaction

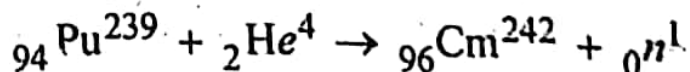


Pu emits α -particles and has a half-period = 24,000 years.

(3) **Americium** : $Z = 95$. Uranium 238 is bombarded with high energy α -particles from a cyclotron to give plutonium $A = 241$, $Z = 94$. Plutonium decays and Americium is formed as,

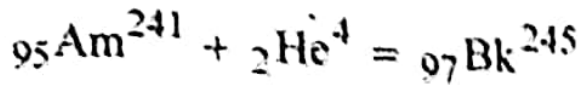


(4) **Curium** : $Z = 96$. It was first produced by Curie by the α -particles bombardment of plutonium $A = 239$, $Z = 94$.

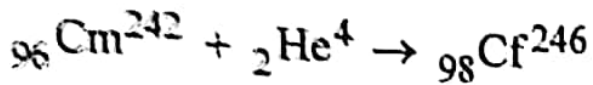


Curium A = 242, Z = 96 has a half-life period of 152 days and decays to give ${}_{94}\text{Pu}^{238}$.

(6) **Berkelium** : Z = 97. When Americium A = 241 and Z = 95 is bombarded by high energy α -particles from a cyclotron, berkelium A = 245 and Z = 97 is formed. Its half-life period is 5 days and decays form Americium.

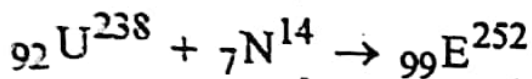


(6) **Californium** : Z = 98. It was first produced at the university of California in 1950. Curium Z = 96 is bombarded by high energy α -particles from a cyclotron and californium is formed.

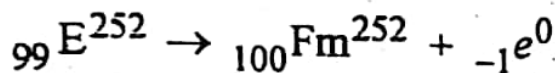


Cf has a half-life period of 30 hours and decays to form ${}_{96}\text{Cm}^{242}$.

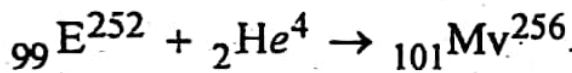
(7) **Einsteinium** : Z = 99. ${}_{92}\text{U}^{238}$ is bombarded by nitrogen nucleus containing 7 protons. Nitrogen is accelerated in a synchro-cyclotron and is used to bombard



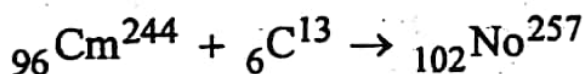
(8) **Fermium** : Z = 100. This element is named after the famous scientist Fermi. ${}_{99}\text{E}^{252}$ decays by emitting negative β -particle and Fm is produced.



(9) **Mendelevium** : Z = 101 (${}_{101}\text{Mv}^{256}$). This element has been prepared by bombarding ${}_{99}\text{E}^{252}$ with α -particles.



(10) **Nobelium** : Z = 102 (${}_{102}\text{No}^{257}$). This element was produced by an international team of Stockholm. Nuclei of carbon A = 13, Z = 6 were fired from a synchro-cyclotron at a target of curium, A = 244 and Z = 96.



Nobelium has a half-life period 10 minutes and gives out an α -particle. In most of the advanced research laboratories in U.S.A., Russia (then U.S.S.R) and U.K. attempts are being made to produce transuranic elements with Z more than 102. ✓

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