

# **Introduction to sodium technology – Neutronic characteristics of sodium and complexities**

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## 1 Quiz

### 1.1 Questions

1. What are the isotopes formed due to neutron irradiation of sodium?
2. Which of the following is formed due to sodium-air reaction at the lowest oxygen availability?  
(a) NaO      (b) Na<sub>2</sub>O      (c) Na<sub>2</sub>O<sub>2</sub>      (d) NaO<sub>2</sub>
3. Which of the following is formed due to sodium-air reaction at higher oxygen (partial) pressures?  
(a) NaO      (b) Na<sub>2</sub>O      (c) Na<sub>2</sub>O<sub>2</sub>      (d) NaO<sub>2</sub>
4. Determine the quantity of heat released when 1 g of sodium reacts with water. The heat of reaction is -162 kJ/mole.
5. Which among the two reactions is faster than the other one?  
(a) sodium-water reaction (b) sodium-air reaction
6. Name of the final products of sodium-water reaction.
7. Why is the detection of hydrogen's presence in sodium is considered essential?
8. What is the function of economizer in cold trap?
9. Why is the heat exchanger in cold trap called 'economizer'?

### 1.2 Answers

1. Na-24 and Na-22
2. (b) Na<sub>2</sub>O
3. (d) NaO<sub>2</sub>
4. 1 g of sodium corresponds to (1/23) mole. Therefore energy released when 1 g of sodium reacts with water is 162/23 kJ/g (~ 7 kJ/g).
5. (a) sodium-water reaction
6. Na<sub>2</sub>O and NaH

**7.** Hydrogen is the by-product of the first stage of reaction between water and sodium. Hence hydrogen detection is used to detect the leakage of water into sodium, to prevent escalation of large scale, exothermic reaction between sodium and water.

**8.** It is used to cool impurities-laden sodium for separation of impurities like  $\text{Na}_2\text{O}$  and  $\text{NaH}$ .

**9.** Sodium, after removal of  $\text{Na}_2\text{O}$  and  $\text{NaH}$  is heated by thermal contact with incoming impurities-laden sodium thereby utilizing its heat content and partially cooling the same. This reduces the requirement of utilities for the cold trap.