

Chemical Reactions and Equation Balancing

Given and Introduction

Given statement: Sodium metal reacts with water to produce sodium hydroxide and hydrogen.

Goal: Identify the reactants and the products with balanced coefficients.

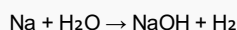
Identification of Reactants and Products

Reactants: Sodium metal (Na) and water (H₂O).

Products: Sodium hydroxide (NaOH) and hydrogen gas (H₂).

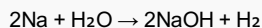
Step-by-Step Solution

Step 1: Write the unbalanced chemical equation



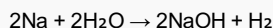
The reactants (sodium metal and water) and the products (sodium hydroxide and hydrogen gas) are placed in the equation but not yet balanced.

Step 2: Balance the sodium (Na) atoms



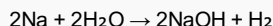
Two Na atoms are required on the reactant side to balance the two Na atoms in the product side since each NaOH contains one Na atom.

Step 3: Balance the hydrogen (H) atoms



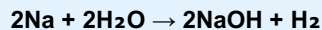
The product side has a total of 4 hydrogen atoms (2 in 2NaOH and 2 in H₂). Thus, the reactant side also needs 4 hydrogen atoms, which are achieved by using 2 H₂O molecules.

Step 4: Balance the oxygen (O) atoms



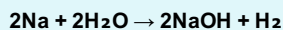
The left side has 2 oxygen atoms from 2 H₂O molecules, and the right side also has 2 oxygen atoms from 2 NaOH molecules.

Final Solution



This final balanced chemical equation represents the reaction of sodium metal with water, producing sodium hydroxide and hydrogen gas.

Correct Option:



All atoms (Na, H, and O) are balanced, satisfying the law of conservation of mass.