

## TIMSS 2023 – Restricted Use Items

### Chemistry

Benchmark 3

Content Domain: Chemistry

Cognitive Domain: Knowing

Complete the table below to show the number of atoms of each element needed to form a molecule of nitric acid ( $\text{HNO}_3$ ).

Element	Number of atoms
Hydrogen (H)	<input type="text" value="1"/>
Nitrogen (N)	<input type="text" value="1"/>
Oxygen (O)	<input type="text" value="3"/>

Benchmark 4

Content Domain: Chemistry

Cognitive Domain: Applying

An iron object is changing color and small bits of material are flaking off of the object's surface.

Is the process that is affecting the iron object a physical change or a chemical change?

(Click one box.)

physical change

chemical change

Explain your answer.

The iron changed color and new products are formed.