Reading an Equilibrium With a Total-Particle Sensor

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A reversible model converts particle A to particle B and back. One particle of A becomes one particle of B. At this temperature, the equilibrium state contains two B particles for every A particle. A broad sensor reports the combined count, while a color sensor counts B only.

Time of reading	Combined sensor count	B-only sensor count
At the start	90	30
During the change	90	48
After the readings settle	90	60

1 Complete the response table with the number of A particles for each reading. Explain how the two sensors are used. [1]

Time of reading	A particles
At the start	
During the change	
After the readings settle	

Explain how you used the sensors

2 Which reading first fits the stated equilibrium ratio?

(1) At the start

(2) During the change

(3) After the readings settle

(4) All three readings

3 A student says the combined sensor proves the mixture was at equilibrium from the start. Evaluate the claim using both records. [1]

Answer and work

After the mixture settles, a separator removes 30 B particles without removing any A. The temperature stays the same and the separator is then turned off.

4 Predict the B-only sensor reading when the system settles again. Use the new total count. [1]

Answer and work

5 Explain what is happening to individual A and B particles once the new readings stay steady. [1]

Answer and work