Reading Two Signals at the Same Detector Mark

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

A classroom detector places an ion at a mark equal to its mass number divided by the size of its charge. A +1 charge has size 1 and a +2 charge has size 2. The display compares neon-20 ions with argon-40 ions. The label at a mark gives the ratio, not the mass number by itself.

Ion	Mass number	Charge
Neon-20	20	+1
Argon-40	40	+2
Argon-40	40	+1

1 Which ions appear together at mark 20 under the stated model?

(1) The two argon ions only

(2) Neon-20 with charge +1 and argon-40 with charge +2

(3) Neon-20 with charge +1 and argon-40 with charge +1

(4) All three ions

2 Explain why two ions with different mass numbers can produce one mark in this model. [1]

Answer and work

An unknown sample initially gives just one peak at 20. The simulation reruns it with a setting that gives every ion charge +1. It keeps the same atoms and reports peaks at 20 and 40.

3 Use the new setting to explain why the two marks reveal more than the single mark at 20 did. [1]

Answer and work

4 Use the periodic table to compare the electron counts of the original neon-20 +1 ion and argon-40 +2 ion. [1]

Answer and work