Tracking Vitamin C in Pressed Apple Juice

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

A school orchard presses apples and tests equal portions of the juice. The class uses an iodine indicator model. As long as vitamin C remains, it changes added iodine, I_2, into iodide ions, I^-. Once the vitamin C is used up, the first excess iodine makes a blue color with starch. In this simplified model, no other juice component uses up iodine.

$I_2 + 2e^- \rightarrow 2I^-$

1 Explain why vitamin C is oxidized in the model even though the displayed half-reaction shows a reduction. [1]

Answer and work

2 Which interpretation fits the first blue color?

(1) Iodide ions have stopped forming because all the starch has been consumed.

(2) Excess iodine is present because the vitamin C has been used up.

(3) All the iodine has been reduced and excess vitamin C remains.

(4) The juice forms new vitamin C after the starch is added.

The class tests one portion of freshly pressed juice and two portions after one day in closed bottles. The two stored portions started with equal volumes of juice and air above it. Only the storage temperature differed. Each iodine amount in the table is corrected to exclude the small excess that produced the blue color.

Equal juice portion	**Corrected iodine used (µmol)**
Freshly pressed	8.0
Stored cool	7.2
Stored warm	5.6

Vitamin C oxidation: $C_6H_8O_6 \rightarrow C_6H_6O_6 + 2H^+ + 2e^-$

3 Use both half-reactions to determine how many micromoles of vitamin C the warm portion contained when tested. Show the mole ratio. [1]

Answer and work

4 A student says the warm portion kept less than half as much vitamin C as the freshly pressed portion. Use the data to evaluate the claim. [1]

Answer and work

5 The class wants to test whether the amount of air above the juice affects how much vitamin C remains. Describe what to vary and what to compare while keeping storage temperature and duration the same. [1]

Answer and work