Isotopes in a sample

Atomic identity | constructed isotope data

Name _____ Date _____

A sample contains 75% atoms of isotope X-20 and 25% of X-22. Both isotopes have atomic number 10. Use the stated mass numbers as approximate atomic masses.

1. Find the weighted average atomic mass.

2. State protons and neutrons for each isotope.

3. Explain what changes and what remains fixed between the isotopes.

Use evidence and show the relationships in your reasoning. Additional paper is permitted.

Count the electrons

Oxidation and reduction | half-reaction model

Name _____ Date _____

A proposed half-reaction is Mg -> Mg2+ + electrons. The atom begins electrically neutral.

1. Complete the half-reaction.

2. Classify the process as oxidation or reduction and justify.

3. Explain why charge balance requires that electron count.

Use evidence and show the relationships in your reasoning. Additional paper is permitted.

A gas model has a condition

Gas relationships | constructed gas data

Name _____ Date _____

A fixed amount of gas occupies 2.0 L at 300 K. Pressure stays constant as it warms to 450 K. Treat the gas as ideal for this model.

1. Calculate the final volume.

2. Explain the temperature unit needed for the proportional relationship.

3. State how the conclusion would change if amount or pressure were not held constant.

Use evidence and show the relationships in your reasoning. Additional paper is permitted.

The amount still dissolving

Dynamic equilibrium | constructed rate table

Name _____ Date _____

A closed system can undergo a forward and reverse reaction. Amounts stabilize after 30 seconds. The constructed rates at later times are each 4 particles per second in opposite directions.

1. Explain why stable amounts can coexist with continuing reactions.

2. State the rate relationship at dynamic equilibrium.

3. Explain why equal rates do not require equal amounts of reactants and products.

Use evidence and show the relationships in your reasoning. Additional paper is permitted.

A dilution with a final volume

Solutions and quantities | constructed preparation

Name _____ Date _____

A student takes 25 mL of 2.0 mol/L solution and dilutes it to a final solution volume of 100 mL. No solute reacts or escapes.

1. Find the initial amount of solute in moles.

2. Calculate the final concentration.

3. Explain why the calculation uses final solution volume.

Use evidence and show the relationships in your reasoning. Additional paper is permitted.

Heat in an insulated cup

Energy transfer | constructed calorimetry

Name _____ Date _____

A 50 g water sample warms from 20°C to 26°C. Use c=4.18 J/(g°C). Assume the only relevant transfer is from a hot metal sample to the water, and neglect the cup.

1. Calculate energy gained by water.

2. State the modeled energy change of the metal.

3. Identify a neglected transfer that could affect a real result.

Use evidence and show the relationships in your reasoning. Additional paper is permitted.