Mixing elements together: constant composition and multiple proportions

Experiment A: Samples of zinc and sulfur are heated and a new compound forms, ZnS

Trial 1

	Zn	S	ZnS
initial mass (g)	1.0000	1.0000	0.0000
final mass (g)	0.0000	0.5096	1.4904

Trial 2

	Zn	S	ZnS
initial mass (g)	1.000	0.5000	0.0000
final mass (g)	0.000	0.0096	1.4904

Trial 3

	Zn	S	ZnS
initial mass (g)	0.5000	1.0000	0.0000
final mass (g)	0.0000	0.7548	0.7452

Critical Thinking Questions

1. a. How much zinc is consumed in experiment A.1?

   b. How much sulfur is consumed in experiment A.1?

   c. What is the Zn:S mass ratio for the compound produced in experiment A.1?

2. a. How much zinc is consumed in experiment A.2 and A.3?

   b. How much sulfur is consumed in experiment A.2 and A.3?

   c. What is the Zn:S mass ratio for the compound produced in experiment A.2 and A.3?

Experiment B: Professor Masi and his clones go bowling, the Masi clones and the bowling balls are combined resulting in a bowling Masi

Trial 1

	Masis	bowling balls	bowling Masis
initial weight (lb)	160	32	0
final weight (lb)	0	16	176

Trial 2

	Masis	bowling balls	bowling Masis
initial weight (lb)	480	32	0
final weight (lb)	160	0	352

Trial 3

	Masis	bowling balls	bowling Masis
initial weight (lb)	480	64	0
final weight (lb)	0	16	528

Critical Thinking Questions

3. a. What weight of Masis get to bowl in experiment B.1?

b. What weight of bowling balls is bowled in experiment B.1?

c. What is the Masi:bowling ball weight ratio for the bowler produced in experiment B.1?

4. a. What weight of Masis get to bowl in experiments B.2 and B.3?

b. What weight of bowling balls is bowled in experiments B.2 and B.3?

c. What is the Masi:bowling ball weight ratio for the bowler produced in experiments 2 and 3?

5. What have you noticed about the ratio of Masi weight to bowling ball in the bowling professors?

6. Explain why the observation that you made in 5 makes sense.

7. What have you noticed about the Zn:S mass ratio in experiments 1, 2, and 3?

8. Explain why the observation that you made in 7 makes sense.

9. Complete the tables below.

Experiment C: Carbon is heated in the presence of oxygen and some of the carbon is converted to a gas

Trial 1

	carbon	oxygen	carbon and oxygen containing gas
initial mass (g)	1.0000	1.0000	0.0000
final mass (g)	0.2493	0.0000	1.7507
mass consumed			
		O:C mass ratio	

Trial 2

	carbon	oxygen	carbon and oxygen containing gas
initial mass (g)	1.0000	0.5000	0.0000
final mass (g)	0.6246	0.0000	0.8754
mass consumed			
		O:C mass ratio	

Trial 3

	carbon	oxygen	carbon and oxygen containing gas
initial mass (g)	0.5000	1.0000	0.0000
final mass (g)	0.0000	0.3340	1.1660
mass consumed			
		O:C mass ratio	

10. Complete the tables drawn below

Experiment D: Carbon is burned in the presence of oxygen and some of the carbon is converted to a gas

Trial 1

	carbon	oxygen	carbon and oxygen containing gas
initial mass (g)	1.0000	1.0000	0.0000
final mass (g)	0.6246	0.0000	1.3754
mass consumed			
		O:C mass ratio	

Trial 2

	carbon	oxygen	carbon and oxygen containing gas
initial mass (g)	1.0000	0.5000	0.0000
final mass (g)	0.8123	0.0000	0.6877
mass consumed			
		O:C mass ratio	

Trial 3

	carbon	oxygen	carbon and oxygen containing gas
initial mass (g)	0.5000	1.0000	0.0000
final mass (g)	0.1246	0.0000	1.3754
mass consumed			
		O:C mass ratio	

11. Complete the following tables.

Experiment E: Professor Masi and his clones leave the bowling alley, on the way out each Masi clone carries away as many bowling balls as possible (they're building a bowling alley at home… the clones feel awkward with all the people staring)

Trial 1

	Masis	bowling balls	ball stealing professor
initial weight (lb)	160	32	0
final weight (lb)	0	0	192
	weight of Masis carrying bowling balls	weight of balls being taken	
		Masi to ball weight ratio	

Trial 2

	Masis	bowling balls	ball stealing professor
initial weight (lb)	480	32	0
final weight (lb)	320	0	192
	weight of Masis carrying bowling balls	weight of balls being taken	
		Masi to ball weight ratio	

Trial 3

	Masis	bowling balls	ball stealing professor
initial weight (lb)	480	64	0
final weight (lb)	160	0	384
	weight of Masis carrying bowling balls	weight of balls being taken	
		Masi to ball weight ratio	

12. Compare the ratio of Masis to bowling balls in experiment E to the ratio of Masis to bowling balls in experiment B. Are they different? Are they the same?

13. What's the obvious explanation for the observation in 12?

14. Compare the mass ratios of O to C in experiment C to those in experiment D. Are they different? Are they the same?

15. How can you explain it?