This is BCE#10.

I recommend you print out this page and bring it to class. Click here to show a set of five BCE10 student responses randomly selected from all of the student responses thus far in a new window.

john , here are your responses to the BCE and the Expert's response.

1. Most of Chapter 3 REALLY depends on using the concept of a mol. Based on our Exam I results the average score (out of 10) on this problem was 5.7. So some of you are having trouble with these calculations. So here is some more practice.

Complete the following table

Formula	Molar Mass ($g\ mol^{-1}$)	mass	moles	number of atoms, molecules or Fu's
$AgNO_3$	169.87 91% (170)	54.9	0.323 (0.325) 66%	1.95e23 64% (1.96×10^{23} fu)
NaCl	58.45 7%58 (58.5) 85~~83~~%	0.400 (0.400) 57%	6.84e-3 (6.84×10^{-3}) 64%	4.12×10^{21} f.u.'s

2. How do you 'read' the following equation?

$$Mg(s) + Cl_2(g) \text{ ---> } MgCl_2(s)$$

one atom of Mg reacts with one molecule of chlorine to produce 1 formula unit of MgCl2, or one mol of Mg reacts with one mol of chlorine to produce 1 mol of MgCl2.

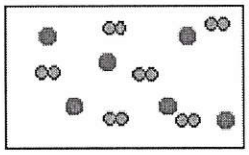
(1 atom of Mg reacts with one molecule of Cl_2 to form one formula unit of $MgCl_2$. 1 mol of Mg reacts with one mol of Cl_2 to form one mol of $MgCl_2$.)

3. The equation for a reaction between sulfur atoms and oxygen molecules is

$$2S + 3O_2 \text{---> } 2SO_3$$

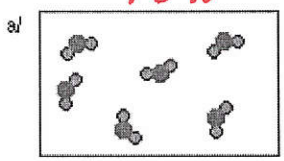
Consider a mixture of sulfur atoms and dioxygen molecules in a closed container

below:



Which of the following diagrams best represents the container after the reaction is complete?

7%



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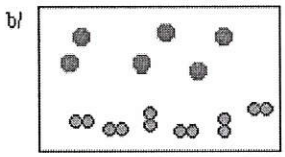

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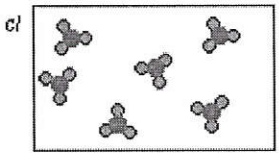

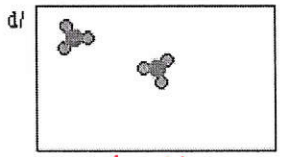

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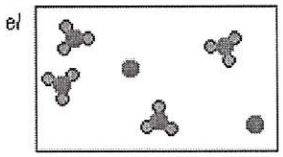

59%

Explain:

e. oxygen is the limiting reagent in this case so only four molecules of SO3 can be produced, leaving excess sulfur atoms.

(The best choice is diagram e. Since the product is SO_3 diagrams 'a' and 'b' are eliminated. Neither diagram 'a' or 'b' contain any SO_3 molecules. Diagrams 'c' and 'd' do not conform to the number of sulfur and oxygen atoms that were originally in the container. Only diagram 'e' has the same number of sulfur atoms and oxygen atoms as we started with. It looks like there is some excess sulfur atoms when the reaction s complete.)

4. In the reaction below;

$$4KO_2(s) + 2CO_2(g) \text{ ---> } 2K_2CO_3(s) + 3O_2(g)$$

a) how many molecules of carbon dioxide react with two formula units of KO_2?

1 36% 32% 2 5% 6.02×10^{23} 12.5% 4

molecule 4% 3 4% 8

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	2	?		0	0

Change	-2	-1		+1	1.5
Ending	0	0		1	1.5

The question is asking about the Change row, if 2Fu's of KO_2 react how many molecules of CO_2 react. In the Change row the ratio of the reactants and products must be the same as the ratio (coefficients) in the balanced chemical equation. So we assume there are 2 fu's of KO_2 initially and we do not know how many CO_2 molecules we have initially. We know all of the KO_2 must react, so the Change for KO_2 is -2 fu's. Since the ratios of the reactants (and products) must be the same as the ratio of the coefficients in the balanced chemical equation than 1 molecule of CO_2 must react: ratio of coefficients is 4 : 2, which is the same as -2 : -1.

(2 fu of KO_2 * (2 molecules CO_2/4 fu KO_2) = 1 molecule CO_2)

b) how many molecules of dioxygen are produced when eight formula units of KO_2 react with excess carbon dioxide?

6 molecules 39% 18% 3 7% 4 4% 2 9% 12 5% 7

The ICE table for this question would look like below:

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	8	excess		0	0
Change					
Ending					?

To complete the Change row we know that 8 fu's of KO_2 react. Since the reactants (KO_2 and CO_2) must react according to the ratio of the coefficients (4 : 2) and the products (K_2CO_3 and O_2) also must be formed in the same ratio as their coefficients (2 : 3). The ICE table will look like

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	8	excess		0	0
Change	-8	-4		+4	+6

Ending					?

So the Ending row is obtained by adding the INitial and the Change row. The ICE table will now be,

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	8	excess		0	0
Change	-8	-4		+4	+6
Ending	0	excess		+4	+6

(8 fu of KO_2 * (3 molecules O_2/4 fu KO_2) = 6 molecule O_2)

c) how many formula units of potassium carbonate are produced when six molecules of CO_2 react with excess potassium superoxide?

6 formula units 52% 12.5% #2 5% 4 7% 3 9% 12

The ICE table for this question would look like below:

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	excess	6		0	0
Change					
Ending				?	

To complete the Change row we know that 6 molecules of CO_2 react. Since the reactants (KO_2 and CO_2) must react according to the ratio of the coefficients (4 : 2) and the products (K_2CO_3 and O_2) also must be formed in the same ratio as their coefficients (2 : 3). The ICE table will look like

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	excess	6		0	0

Change	-12	-6		+6	+9
Ending				?	

So the Ending row is obtained by adding the Initial and the Change row. The ICE table will now be,

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	excess	6		0	0
Change	-12	-6		+6	+9
Ending	excess	0		+6	+9

(6 molecules of CO_2 * (2 fu K_2CO_3/2 molecules CO_2) = 6 fu K_2CO_3)

d) how many formula units of potassium superoxide must react to form 27 molecules of O_2 assuming excess carbon dioxide?

36formula units 39%% 7% 54 5% 7

The ICE table for this question would look like below:

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	?	excess		0	0
Change					
Ending					27

To complete the Change row we know that 27 molecules of O_2 are formed in the reaction. Assuming there is no O_2 initially, and 27 molecules were formed, we can assume the Change for O_2 must be +27. Since the reactants (KO_2 and CO_2) must react according to the ratio of the coefficients (4 : 2) and the products (K_2CO_3 and O_2) also must be formed in the same ratio as their coefficients (2 : 3). The ICE table will look like

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	?	excess		0	0
Change	-36	-18		+18	+27
Ending					?

So the Ending row is obtained by adding the Initial and the Change row. The ICE table will now be,

	$4KO_2(s)$	$+ 2CO_2(g)$	--->	$2K_2CO_3(s)$	$+ 3O_2(g)$
Initial	?	excess		0	0
Change	-36	-18		+18	+27
Ending	0	excess		+18	+27

(27 molecules of O_2 * (4 fu KO_2/3 molecules O_2) = 36 fu KO_2)

5. Is there anything about the questions that you feel you do not understand? List your concerns/questions.

nothing

6. If there is one question you would like to have answered in lecture, what would that question be?

nothing