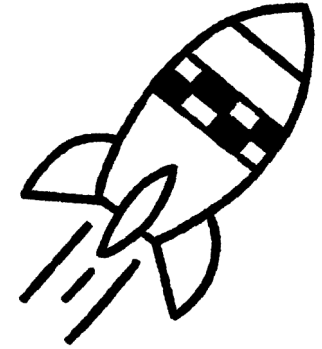


**Ilaalinta cufka (Conservation of mass) iyo isla'egyada
calaamadaha ee dheellitiran (balanced symbol
equations)**



Sayniska

Cutub: Fahanka falgalyada kiimikada (chemical reactions)

Natiijo

Waxaan sharxi karaa ilaalinta cufka (conservation of mass) iyo qori karaa isla'egyada kiimikada ee dheellitiran (balanced chemical equations) si aan u muujiyo sida atom-yada falgalyada (reactants) loo habeeyo si ay u sameeyaan waxsoosaarka (products).

qaacidada kiimikada (chemical formula)

isla'egta erayada (word equation)

isla'egta calaamadaha ee dheellitiran (balanced symbol equation)

tiro-koob (coefficient)

Erayada muhiimka ah

Qaacidada kiimikada (chemical formula) waxay ka dhigan tahay walax iyadoo la adeegsanayo calaamadaha curiyeyaasha (element symbols) iyo tirada / saamiga atom-yada ee curiye kasta (element) oo ku jira walaxda.

Isla'egta erayada (word equation) waa qaab lagu qeexo falgal (reaction) iyadoo la adeegsanayo magacyada kiimikada ee falgalyada (reactants) iyo waxsoosaarka (products).

Isla'egta calaamadaha ee dheellitiran (balanced symbol equation) waxay qeexaysaa falgal (reaction) iyadoo la adeegsanayo isla'eg calaamadeed oo leh tiro-koobyada (coefficients), kuwaas oo hubinaya in ay jiraan tirooyin siman oo atom-yada curiye kasta (element) ah oo labada dhinac ee isla'egta.

Tiro-koob (coefficient) waa tirada la dhigo horteeda qaacidada kiimikada (chemical formula) si loo dheellitiro isla'egta; waxay ku dhufataa dhammaan atom-yada qaacidada waxayna muujinaysaa saamiga walxaha ee falgal (reaction).

Qaabka casharka

Ilaalinta cufka (Conservation of mass) iyo isla'egyada calaamadaha ee dheellitiran
(balanced symbol equations)



Ilaalinta cufka (Conservation of mass)



Isla'egyada kiimikada (Chemical equations)

Ilaalinta cufka (Conservation of mass)

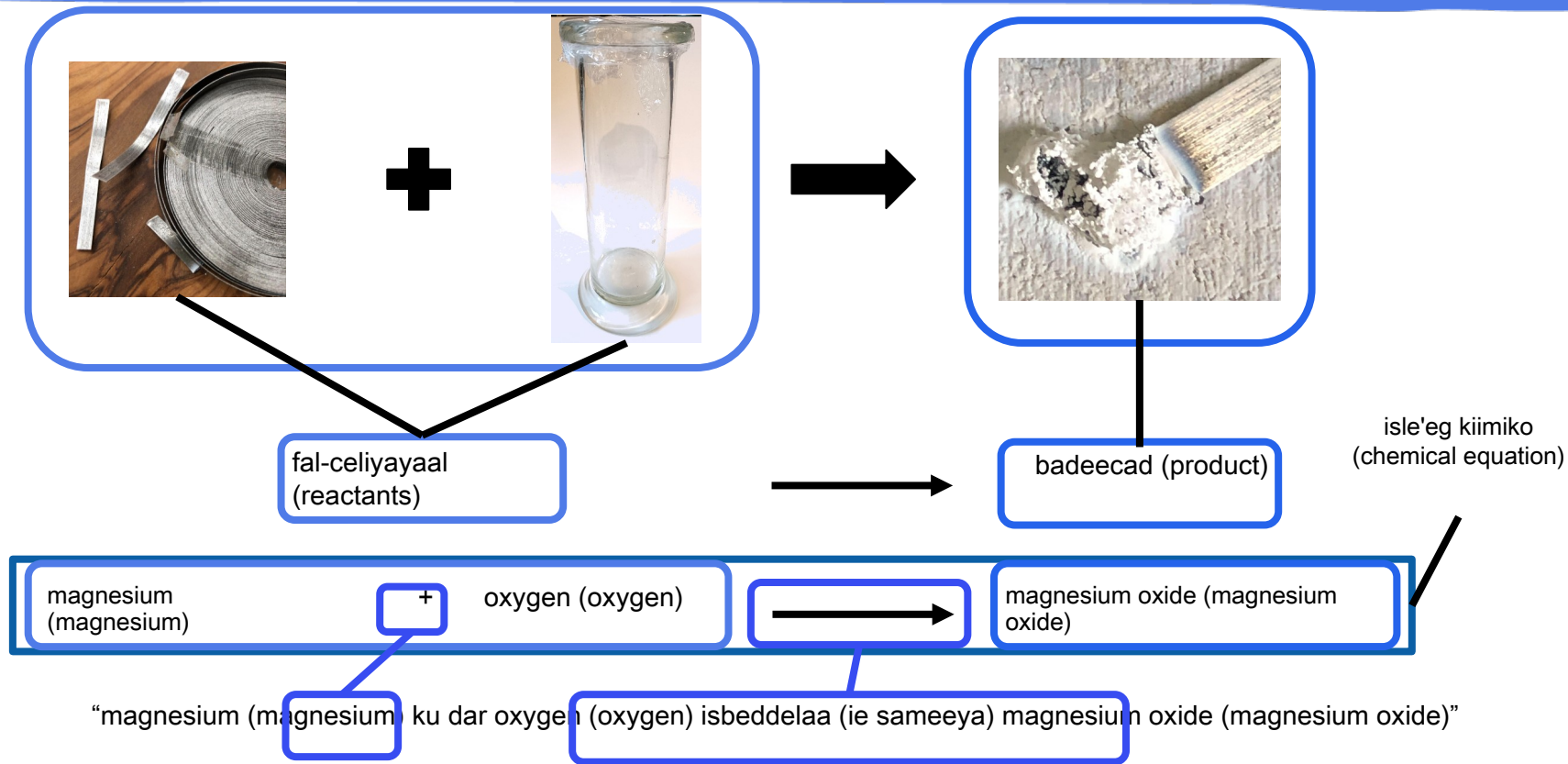
Inta lagu jiro falgal kiimikad (chemical reaction):

- atom-yo lama abuuru mana la baabbi'iyu
- atom-yada waa la habeeyaa si ay u sameeyaan walxo cusub
- cufka waxsoosaarka (products) wuxuu la siman yahay cufka falgalyada (reactants).

Tan waxaa loo yaqaan ilaalinta cufka (conservation of mass).



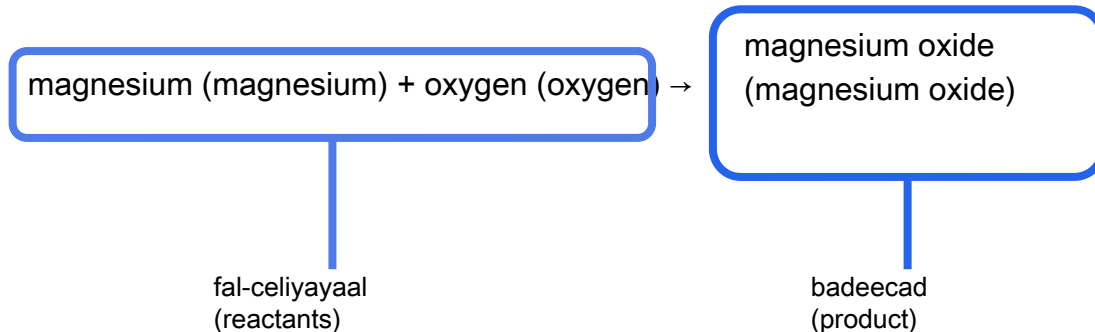
falgal (reaction) ee
magnesium iyo oxygen



Fallaarta ku jirta isle'eg kiimiko (chemical equation) waxay u taagan tahay ereyada 'isbeddelaa'.

fal-celiyayaal (reactants) → badeecado
(products)

Isle'egyada ereyada waa qaab fudud oo lagu qeexo falgal (reaction) kiimiko iyadoo la adeegsanayo ereyo keliya.

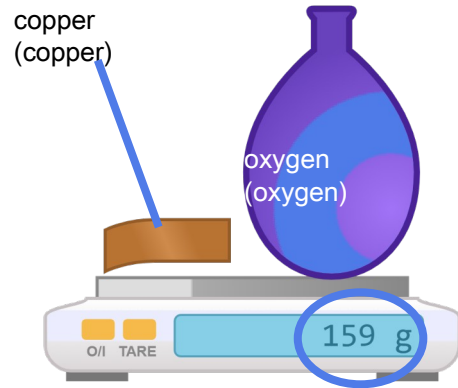


Ku darista oxygen (oxygen) (oxidation) waa tusaale falgal (reaction) kiimiko ah.

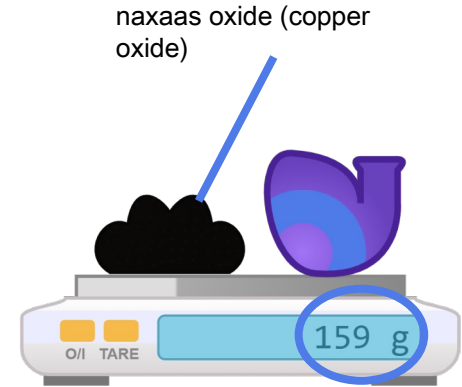
Σ cufka fal-celiyayaasha (reactants) = Σ cufka badeecadaha (products)

wadarta (sum
of)

127 g oo ah bir naxaas ah (copper metal) ayaa la fal-celsa 32 g oo oxygen (oxygen) ah; cufka fal-celiyayaasha (reactants) = 159 g.



naxaas (copper) + oxygen (oxygen) → naxaas oxide (copper oxide)



Wax soo saarka copper oxide wuxuu yeelan doonaa cuf 159 g. Tani waa isla cufka wadarta falgalka (reactants).

Ilaalinta cufka (Conservation of mass)

Kee ka mid ah weedhahan soo socda ayaa sax ah?

a

$\Sigma \text{mass reactants} > \Sigma \text{mass products}$

b

$\Sigma \text{mass reactants} = \Sigma \text{mass products}$



c

$\Sigma \text{mass reactants} < \Sigma \text{mass products}$

Ilaalinta cufka (Conservation of mass)

Bir ayaa la falgasha oxygen (oxygen) weel weyn oo xiran.

Waxa ku jira ayaa lahaa cuf 150 g oo ah falgalayaal (bir iyo oxygen). Waa maxay cufka wax soo saarka (bir oxide)?

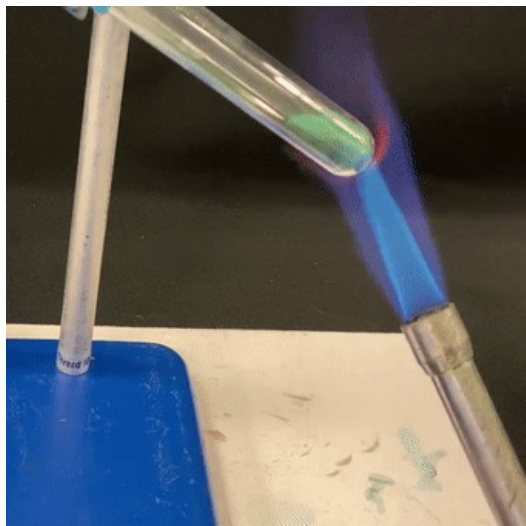
a 50 g

b 150 g



c 300 g

Mararka qaarkood, hal falgal (reactant) ayaa soo saara in ka badan hal wax soo saar.



kala-gurasho kulayl (thermal decomposition)
ee copper carbonate

Jebinta isku-dhafka (compound) ee walxo fudud (decomposition) waa tusaale falgal kiimiko (chemical reaction).



falgal (reactant)

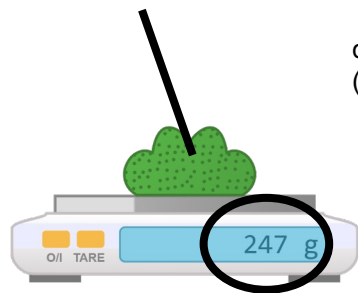
copper oxide carbon dioxide
(copper oxide) + (carbon
 dioxide)

wax soo saar
(products)

$\Sigma \text{cufka falgalyaha (reactants)} = \Sigma \text{cufka waxsoosaarka (products)}$

247 g oo copper carbonate ah ayaa la kululeeyaa oo kala-gurasho (decomposes) si ay u sameeyaan wax soo saar ah 159 g copper oxide iyo 88 g carbon dioxide.

copper carbonate
(copper carbonate)



copper carbonate
(copper carbonate)

247 g

→

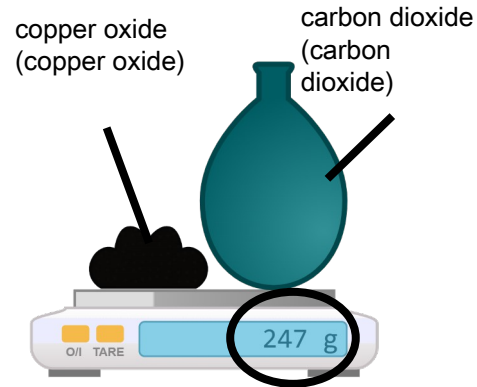
copper oxide
(copper oxide)

159 g

+

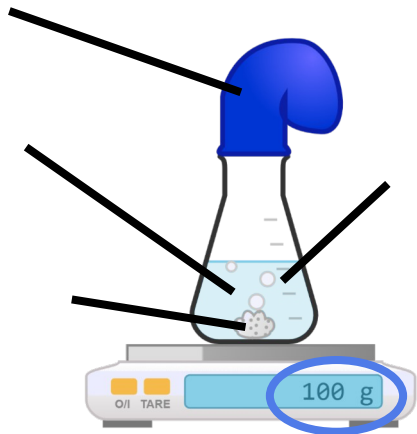
carbon dioxide
(carbon dioxide)

88 g

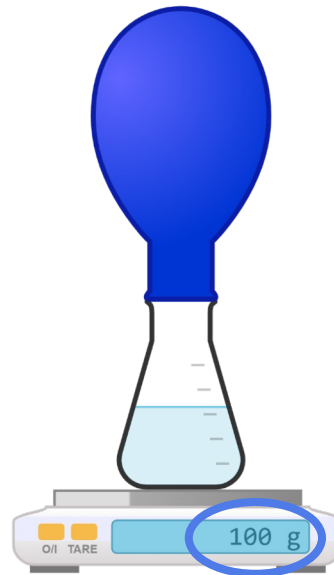
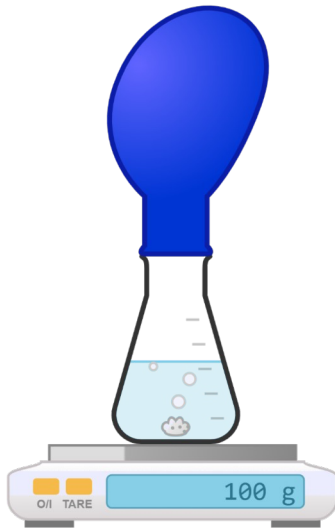


Waxsoosaarku (products) wuxuu yeelan doonaa cuf (mass) la mid ah wadarta cufka falgalyaha (reactants).

Halkan, cufka falgalyaha (reactants) iyo qalabka waa 100 g, oo maadaama aan atom (atoms) laga lumin ama lagu helin, cufka qalabka iyo waxsoosaarka (products) sidoo kale waa 100 g.



cufka qalabka iyo falgalyaha (reactants)
= 100 g



cufka qalabka iyo waxsoosaarka
(products) = 100 g

Ilaalinta cufka (Conservation of mass)

Falgal (reaction) u dhexeeya laba kiimiko (chemicals) ayaa dhaca oo soo saara wadar ahaan 256 g oo waxsoosaar (products) ah. Waa maxay wadarta cufka (mass) falgalyaha (reactants)?



a



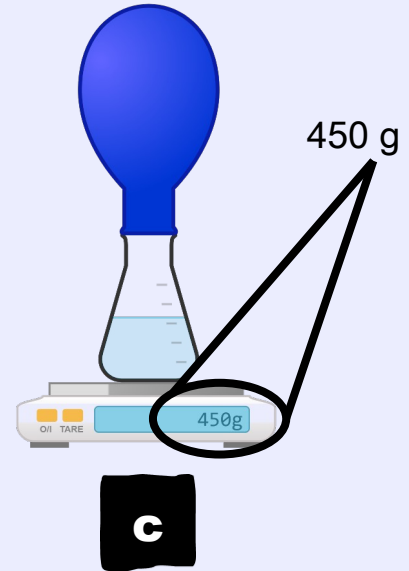
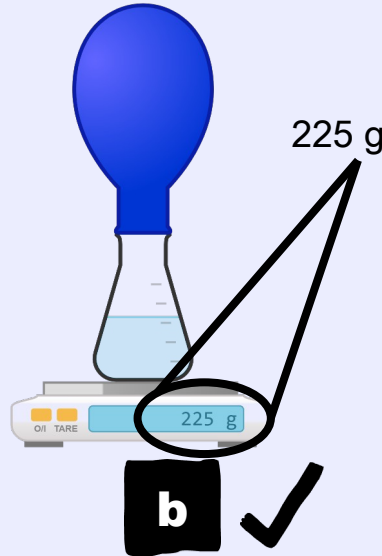
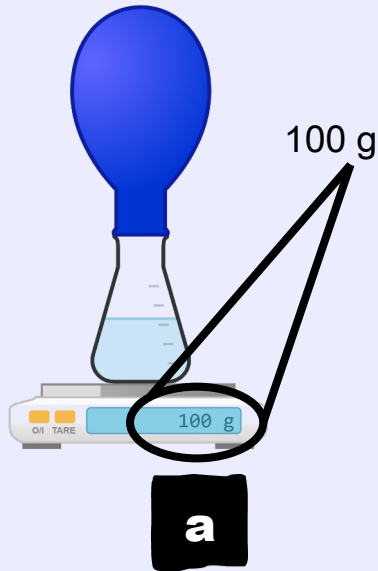
b



c

Ilaalinta cufka (Conservation of mass)

Cufka falgalyaha (reactants) iyo qalabka waa 225 g. Waa maxay akhrinta (reading) aad ka filan lahayd miisaanka (balance) dhamaadka falgalka (reaction)?



Ilaalinta cufka (Conservation of mass)

Cufka (mass) sheyga (product) dhamaadka falgal (reaction) waa 300 g. Waxaa jiray laba fal-celin (reactants); mid ka mid ah fal-celinta wuxuu lahaa cuf (mass) ah 120 g, marka waa maxay cufka (mass) fal-celinta kale?

a

120 g

b

180 g



c

300 g

d

420 g

1) Qaar ka mid ah ardayda ayaa ka hadlaya atamka (atoms) falgalyada (reactions). Sax bayaanadooda.

Atamku (atoms) waa soo baxaan oo waa baaba'aan marka falgal (reaction) dhaco.

Cufka (mass) sheyga (products) mararka qaar wuu ka badan yahay cufka (mass) fal-celiyeyaasha (reactants).



Yacquub



Saciid

Walxo cusub (new substances) ayaa laga sameeyaa sheyga (products) marka atamka (atoms) dib loo habeeyo inta lagu jiro falgal (reaction).



Isra

1) Qaar ka mid ah ardayda ayaa ka hadlaya atamka (atoms) falgalyada (reactions). Sax bayaanadooda.

Ma jiraan atam (atoms) la abuurro ama la baabbi'iyo marka falgal (reaction) dhaco.

Cufka (mass) sheyga (products) had iyo jeer wuxuu la mid yahay cufka (mass) fal-celiyeyaasha (reactants).



Yacquub



Saciid

Walxo cusub (new substances) ayaa laga sameeyaa fal-celiyeyaasha (reactants) marka atamka (atoms) dib loo habeeyo inta lagu jiro falgal (reaction).



Isra

- 2) Dhammeystir shaxda hoose (ha ku qorin sanduuqyada hadhka leh). Waxaad isticmaali kartaa xisaabiyaha (calculator).

cufka (mass) fal-celinta 1 (g)	cufka (mass) fal-celinta 2 (g)	Σ cufka falgalayaash a (g)	cufka badeecada 1 (g)	cufka badeecada 2 (g)	Σ cufka badeecadaha (g)
100	150	250			
135	85		65		
		950		525	
127	84			12	

2) Buuxi shaxda hoose (ha ku qorin sanduuqyada hadhka leh). Waxaad isticmaali kartaa xisaabiyaha

cufka falceliyaha 1 (g)	cufka falceliyaha 2 (g)	Σ cufka falgalayaasha (g)	cufka badeecada 1 (g)	cufka badeecada 2 (g)	Σ cufka badeecadaha (g)
100	150	250			
135	85	220	65		
950		950		525	
127	84	211		12	

Jawaabaha:

250

250

155

220

425

950

199

Qaabka casharka

Ilaalinta cufka iyo isleegyada calaamadaha dheellitiran (Conservation of mass and balanced symbol equations)



Ilaalinta cufka (Conservation of mass)



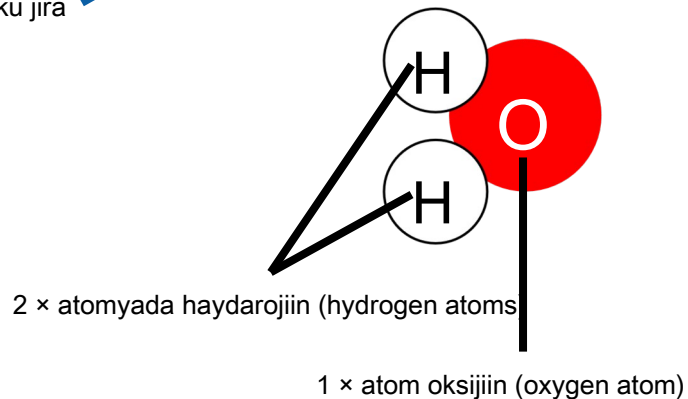
Isleegyada kiimikada (Chemical equations)

Qaaciddada kiimikada (chemical formula) ee walaxdu waxay muujinaysaa tirada nooc kasta oo atom ah oo jooga.

e.g. H_2O

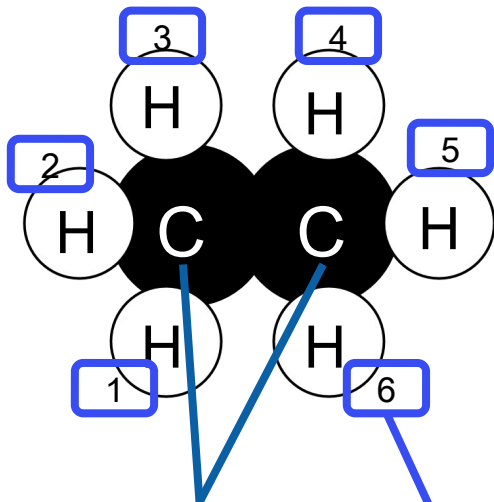
nambarka hoose (subscript number) waa tirada atomyada curiyaha (element) ee ku jira xarunta (compound)

lama baahna nambarka hoose (subscript number) haddii uu jiro kaliya 1 atom oo noocaas ah



Tusaale kale oo qaacidada kiimikada ah.

tusaale ahaan ethane C_2H_6



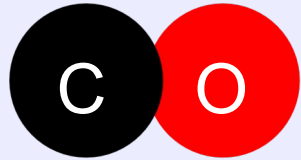
2 × atamka carbon

6 × atamka hydrogen

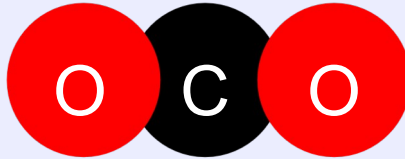
nambarka subscript wuxuu kaliya ku dhufanayaa curiye (element) uu si toos ah u raaco

Isla'egyada kiimikada (Chemical equations)

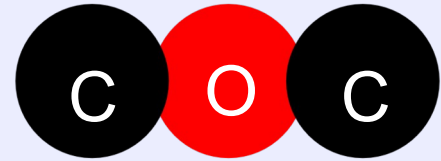
Kee ka mid ah jaantusyada walxaha hoose ku habboon qaacidada kiimikada ee carbon dioxide (CO₂)?



a



b ✓



c

Imisa iyo noocce atam ayaa ku jira copper sulfate (CuSO_4)?

a 1 × atamka copper (Cu), 1 × atamka sulfur (S), 4 × atamka oxygen (O) ✓

b 1 × atamka copper (Cu), 4 × atamka sulfur (S), 4 × atamka oxygen (O)

c 4 × atamka copper (Cu), 4 × atamka sulfur (S), 4 × atamka oxygen (O)

Phosphoric acid wuxuu ka kooban yahay saddex atam oo hydrogen ah, hal atam oo phosphorus ah iyo afar atam oo oxygen ah.

Buuxi meelaha bannaan si aad u qorto qaacidada phosphoric acid.

H__P__O__

H_3PO_4

Citric acid wuxuu ka kooban yahay lix atam oo carbon ah, sideed atam oo hydrogen ah iyo toddoba atam oo oxygen ah.

Buuxi meelaha bannaan si aad u qorto qaacidada citric acid.

C__H__O__

$\text{C}_6\text{H}_8\text{O}_7$

Copper carbonate wuxuu ka samaysan yahay hal atom oo copper (Cu) ah, hal atom oo carbon (C) ah iyo saddex atom oo oxygen (O) ah. Qor qaacidada copper carbonate.



Zinc sulfate wuxuu ka samaysan yahay hal atom oo zinc (Zn) ah, hal atom oo sulfur (S) ah iyo afar atom oo oxygen (O) ah. Qor qaacidada zinc sulfate.



How many and what type of atoms are in the compound glucose, $\text{C}_6\text{H}_{12}\text{O}_6$?

a

6 × carbon (C) atoms, 12 × hydrogen (H) atoms and 12 × oxygen (O) atoms

b

6 × carbon (C) atoms, 6 × hydrogen (H) atoms and 12 × oxygen (O) atoms

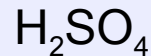
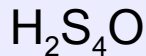
c

6 × carbon (C) atoms, 12 × hydrogen (H) atoms and 6 × oxygen (O) atoms



Sulfuric acid contains two hydrogen atoms, one sulfur atom and four oxygen atoms.

Midkee ka mid ah qaaciidooyinka soo socda ayaa matalaya aashitada sulfuric (sulfuric acid)?



a

b

c

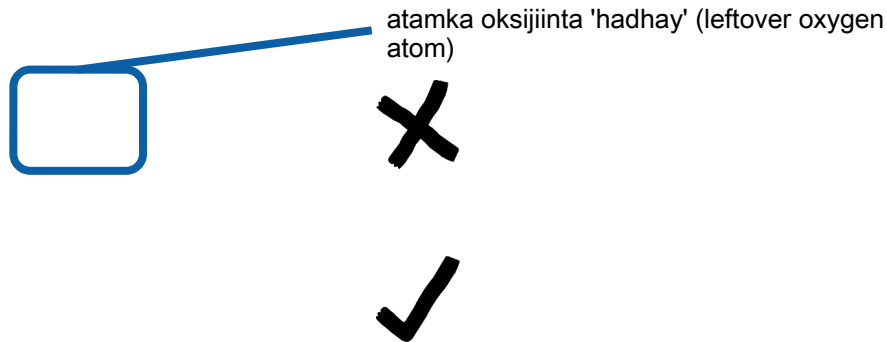
Symbol equations:

- waa isla'egyo kiimiko oo isticmaala qaaciidooyin (formulae)
- represent how atoms in the reactants rearrange to form products
- muuji saamiga (ratio) falgalka (reactants) loo baahan yahay iyo alaabta (products) la sameeyo.



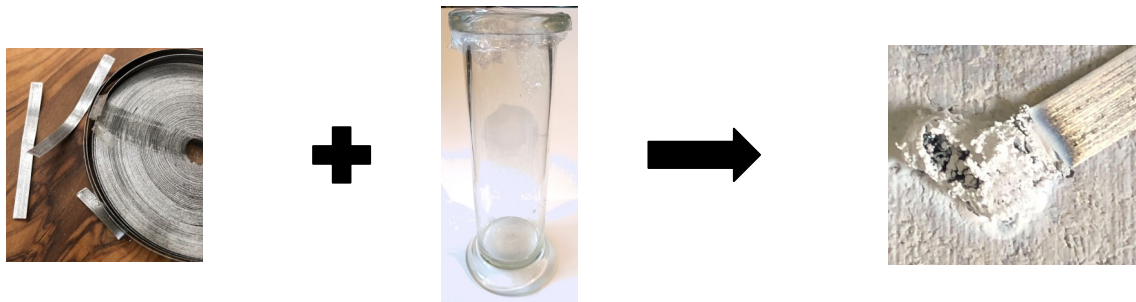
Marka la dheellitiro isla'egyada (balancing equations), waxaa muhiim ah in la xusuusto:

- dhammaan atamka falgalka (reactant atoms) waa dib loo habeeyaa si ay u sameeyaan alaabta (products)
- tirada atamka falgalka (reactant atoms) = tirada atamka alaabta (product atoms)

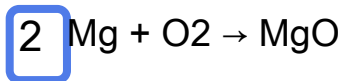


Isla'egyada kiimikada (Chemical equations)

Falalkan (reaction), laba jeer waxaa loo baahan yahay magnesium (magnesium) sida oxygen (oxygen) si loo falgaliyo dhammaan oxygen-ka.



magnesium (magnesium) + oxygen (oxygen) → magnesium oxide (magnesium oxide)



Marka la qorayo isla'eg astaan (symbol equation):

- saamiyada (ratios) falgalka (reactants) iyo alaabta (products) waxaa lagu muujiyaa isku-dhufashada (coefficients) ('tirooyin waaweyn') oo la hor dhigo walxaha
- habka xisaabinta isku-dhufashada (coefficients) ee isla'eg astaan (symbol equation) waxaa loo yaqaan dheellitirid (balancing).



isku-dhufashada
(coefficients)

halka aan la muujin isku-dhufashada
(coefficient) waxaa loo qaadanaayaa in
ay jirto hal 'qayb' oo walaxda ah

isla'eg astaan ah oo dheellitiran
(balanced symbol equation)

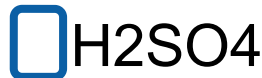
Isle'egyada kiimikada (Chemical equations)

Xeerarka qaaciidooyinka iyo isle'egyada:

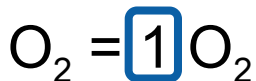
- qaaciidada kiimikada ee walaxdu ma beddelanto
- subscripts ('tirooyin yaryar') ee qaaciidooyinka lama beddeli karo lamana kordhin karo



- coefficients ('tirooyin waaweyn') had iyo jeer waxay ku hor yaalliin qaaciidooyinka waana beddeli karaan



- haddii qaaciidada kiimikada aysan nambar ku hor qabin, coefficient-keedu waa 1.



Isle'egyada kiimikada (Chemical equations)

Waa maxay coefficient-ka Na (sodium) ee isle'egta soo socota? $4\text{Na} + \text{O}_2 \rightarrow 2\text{Na}_2\text{O}$?

a 1

b 2

c 4 ✓

d 6

Isle'egyada kiimikada (Chemical equations)

Waa maxay coefficient-ka O₂ (oxygen) ee isle'egta soo socota? $C + O_2 \rightarrow CO_2$

a 0

b 1 ✓

c 2

d 4

Isle'egyada kiimikada (Chemical equations)

Run mise been?

Kaliya subscripts ('tirooyin yaryar') ayaa la beddelaa si loo dheellitiro isle'eg, tusaale: $2P + 3Cl_2 \rightarrow P_2Cl_6$.



Run



Been



Sabab u sheeg jawaabtaada

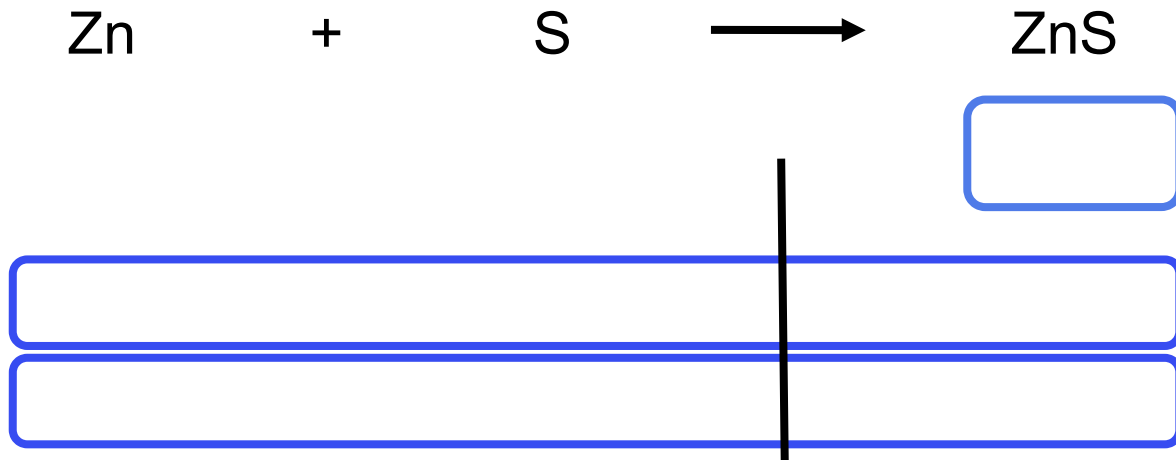
a Kaliya coefficients ('tirooyin waaweyn') ayaa la beddeli karaa marka la dheellitiraayo isle'egyada.



b Labadaba coefficients ('tirooyin waaweyn') iyo subscripts ('tirooyin yaryar') waa la beddeli karaa marka la dheellitiraayo isle'egyada.

Isle'egyada kiimikada (Chemical equations)

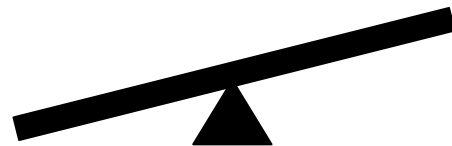
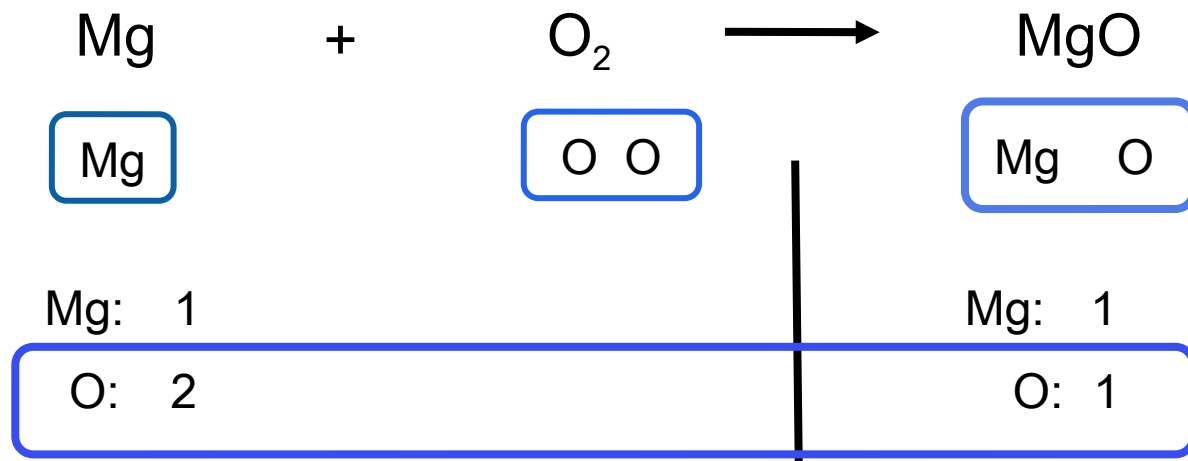
Marka la dheellitiraayo isle'eg calaamadeed, ujeedku waa in la hubiyo in tirada atom-yada curiye (element) kasta ay isku mid tahay labada dhinac ee fallaarta falgal (reaction).



Falgal (reaction) waa dheellitiran sida loo qoray.

Isla'egta kiimikada (Chemical equations)

Qaabaynta isla'egta sida hoos ku cad waxay kaa caawinaysaa inaad la socoto atamka ku lug leh.

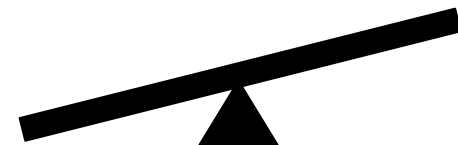
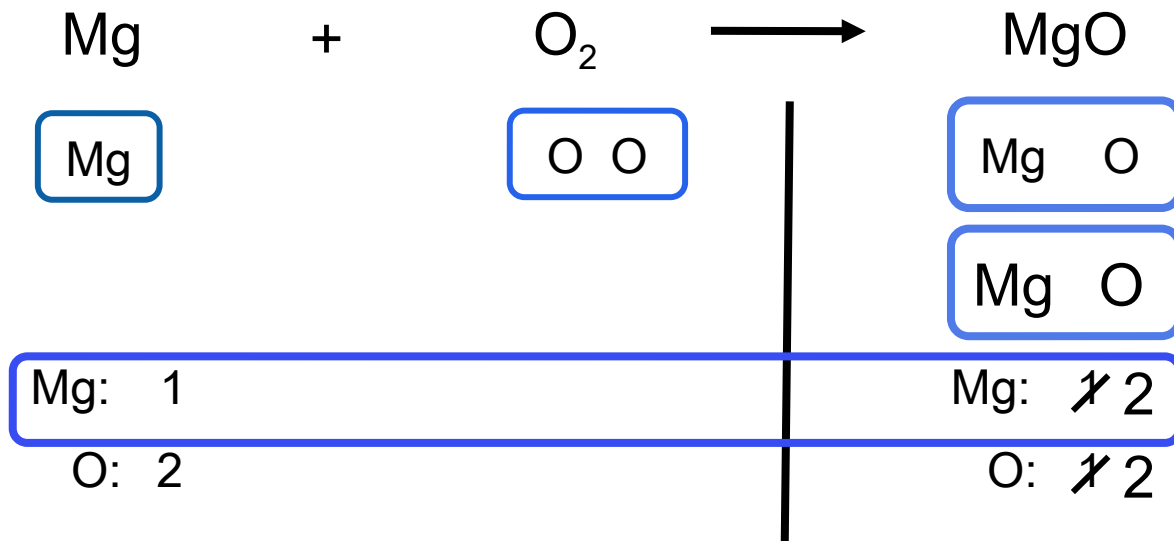


Falgal (reaction) ma aha dheellitiran sida loo qoray.

Isla'egta kiimikada (Chemical equations)

Haddii curiye (element) uu aan dheellitirnayn, ku dar walax dhammaystiran oo jaantus ah dhinaca ku habboon ee isla'egta.

Dib u xisaabi tirada atamka ee curiyeyaasha (elements).

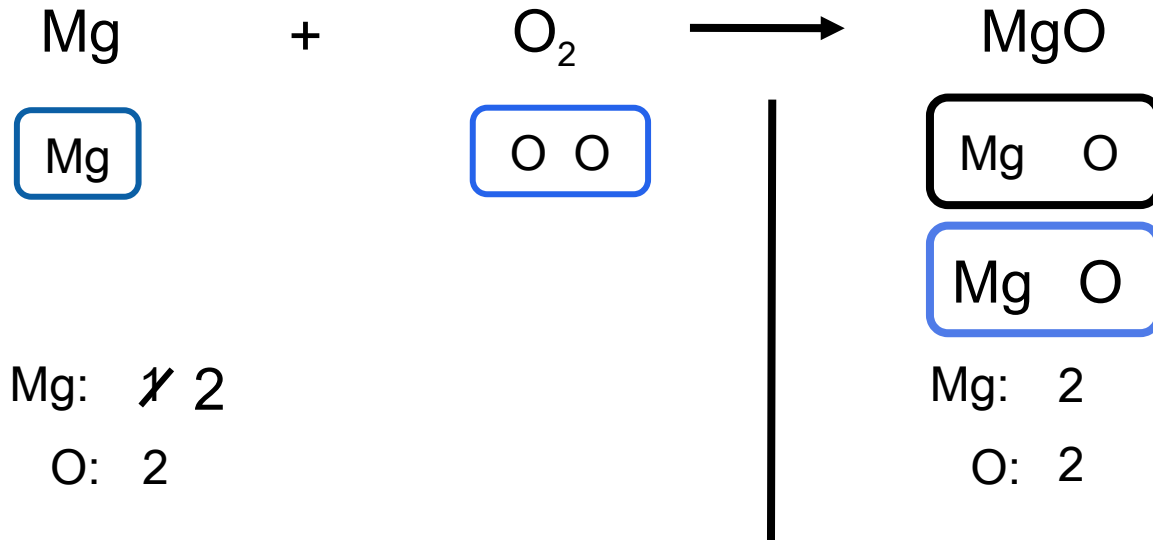


Falgal (reaction)-ku waa mid aan dheellitirnayn sida loo qoray.

Isleegyada kiimikada (Chemical equations)

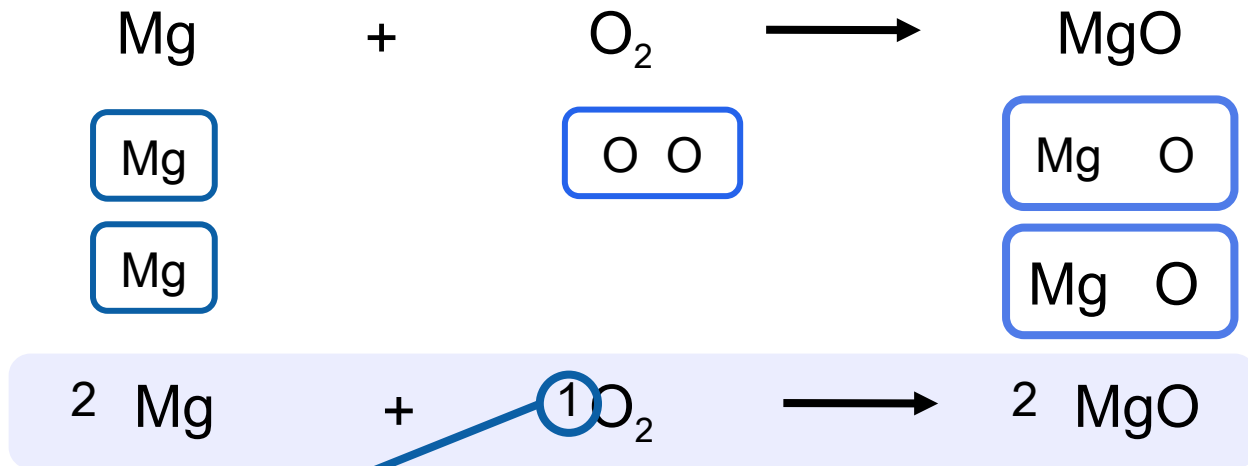
Ku sii dar sawirada walxaha ku habboon ilaa curiye (element) kasta uu leeyahay tiro atam oo isku mid ah dhinac kasta oo fallaarta ah.

Xusuusnow inaad dib u xisaabiso tirada atamka ee curiyeyaasha (elements).



Falgal (reaction)-ku waa mid dheellitiran sida loo qoray.

Marka atamka curiye (element) kasta ay isu dheellitiraan, tiriyo tirada sawirada walax kasta. Tani waa isku-dhufashada (coefficient) ee walaxdaas.



uma baahnid
inaad qorto 1

iska'eg isla'eg calaamadeysan (balanced symbol equation)

Isla'egyada kiimikada (Chemical equations)



Sidee u qori lahayd CaCO_3 markaad tirinayso atomo si aad u dheellitirto isla'eg?

a

Ca C O

Ca: 1

C: 1

O: 1

b

Ca C O O O

Ca: 1

C: 1

O: 3



c

Ca Ca Ca C C C O O O O

Ca: 3

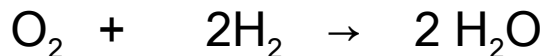
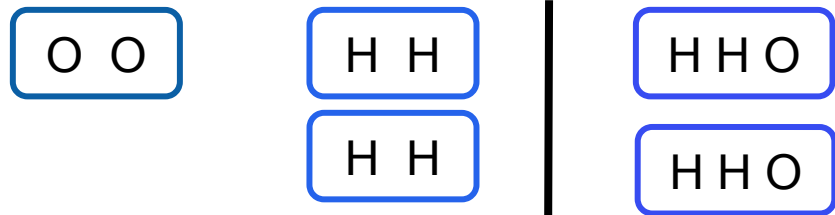
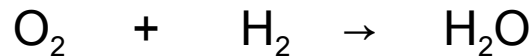
C: 3

O: 3

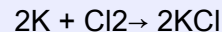
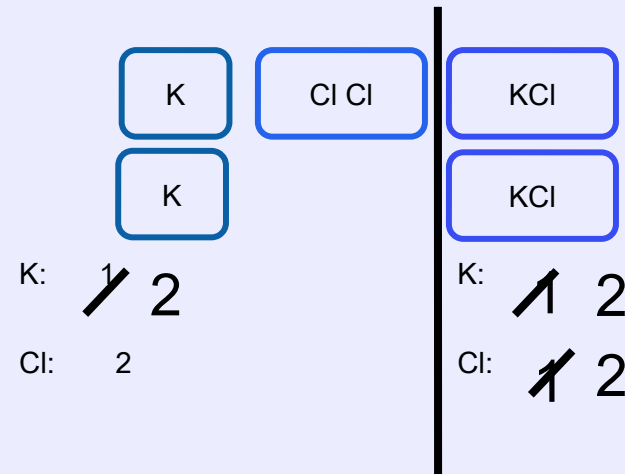
Isla'egyada kiimikada (Chemical equations)

Dheellitir isla'egta calaamadeysan.

Anigu waxaan ... (I do ...)



Adigu waxaad ... (You do ...)



- 1) Isku dhig qaaciddooyinka (formulae) iyo sharraxaadaha walxaha hoose (isticmaal shaxda xilliyeed (periodic table) si aad u eegto calaamadaha curiyeyaasha (elements)).

sharraxaad (description)

nitrogen dioxide wuxuu ka kooban yahay hal atom oo nitrogen ah iyo laba atom oo oxygen ah

qaaciddo
(formula)

HNO_3

ammonia wuxuu ka kooban yahay hal atom oo nitrogen ah iyo saddex atom oo hydrogen ah

N_2O

nitrous oxide wuxuu ka kooban yahay laba atom oo nitrogen ah iyo hal atom oo oxygen ah

NO_2

nitric acid wuxuu ka kooban yahay hal atom oo hydrogen ah, hal atom oo nitrogen ah iyo saddex atom oo oxygen ah

NH_3

- 1) Isku dhig qaaciddooyinka (formulae) iyo sharraxaadaha walxaha hoose (isticmaal shaxda xilliyeed (periodic table) si aad u eegto calaamadaha curiyeyaasha (elements)).

Sharaxaad

nitrogen dioxide wuxuu ka kooban yahay hal atom oo nitrogen ah iyo laba atom oo oxygen ah

ammonia wuxuu ka kooban yahay hal atom oo nitrogen ah iyo saddex atom oo hydrogen ah

Nitrous oxide wuxuu ka kooban yahay laba atom oo nitrogen ah iyo hal atom oo oxygen ah

Nitric acid wuxuu ka kooban yahay hal atom oo hydrogen ah, hal atom oo nitrogen ah iyo saddex atom oo oxygen ah

Formula

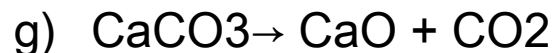
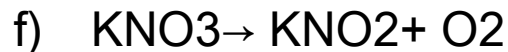
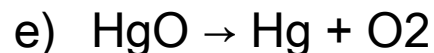
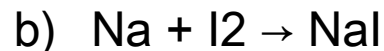
HNO₃

N₂O

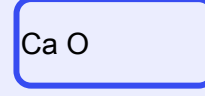
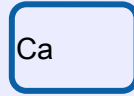
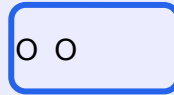
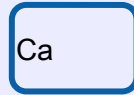
NO₂

NH₃

2) Dheellitir isla'egyada soo socda, muuji shaqadaada:



a) Dheellitir isla'egta calaamadda.



Ca: $\frac{1}{2}$

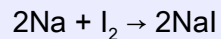
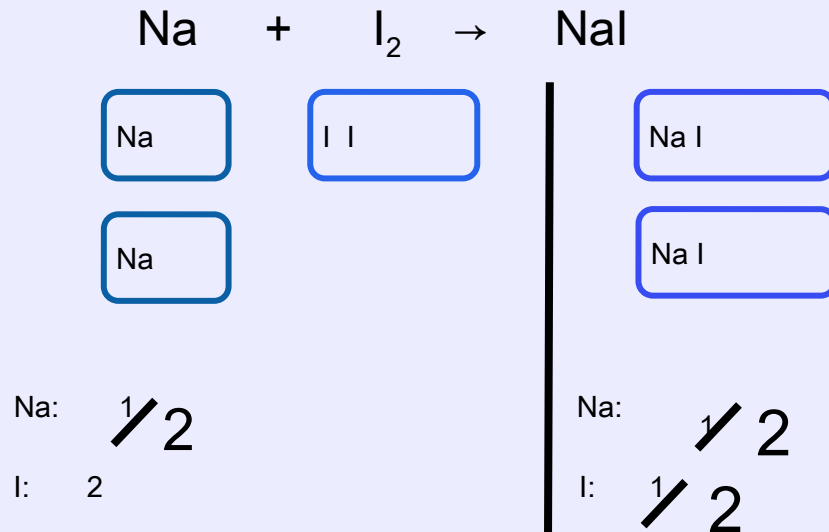
O: 2

Ca: $\frac{1}{2}$

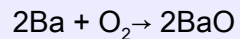
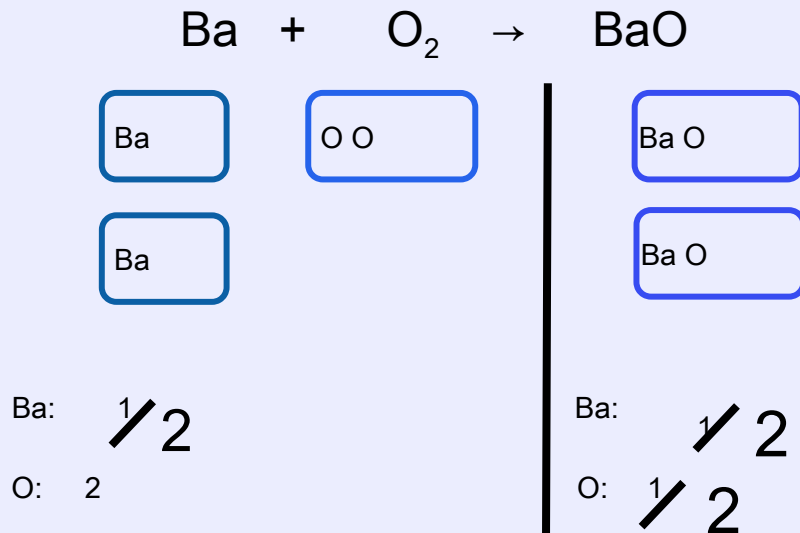
O: $\frac{1}{2}$



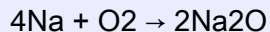
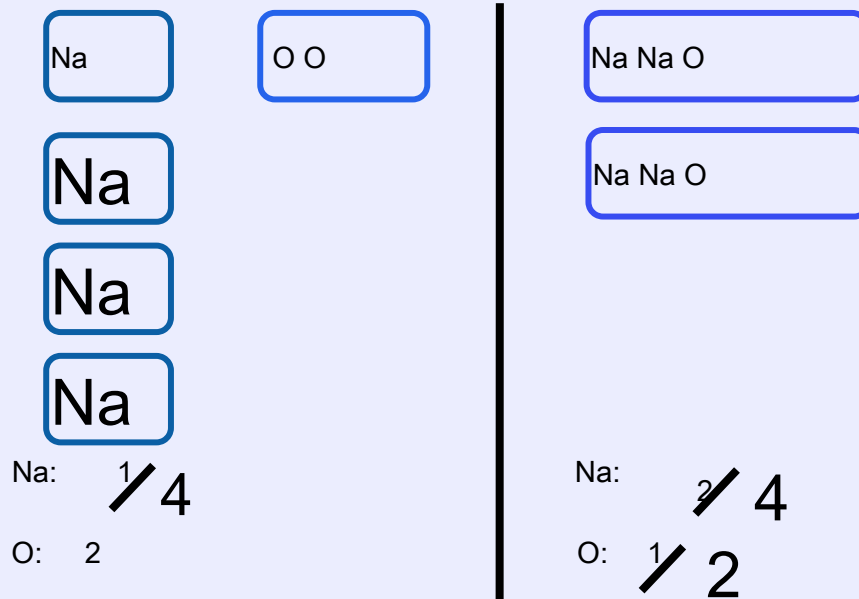
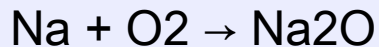
b) Balance the symbol equation.



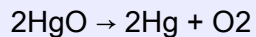
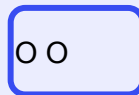
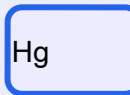
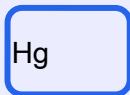
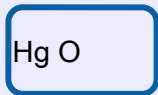
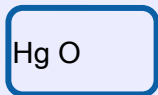
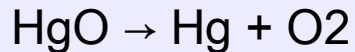
c) Balance the symbol equation.



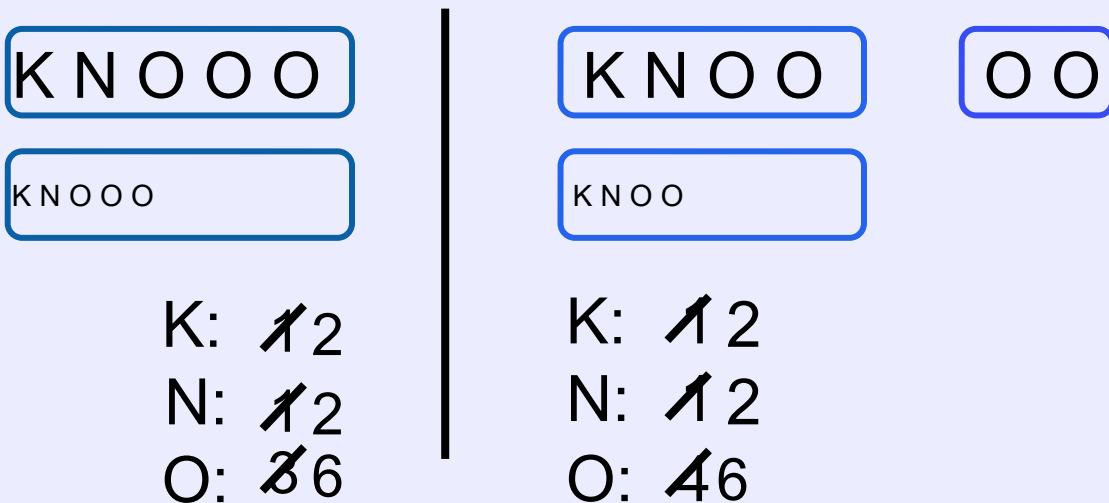
d) Dheellitir isla'egta calaamadda (symbol equation).



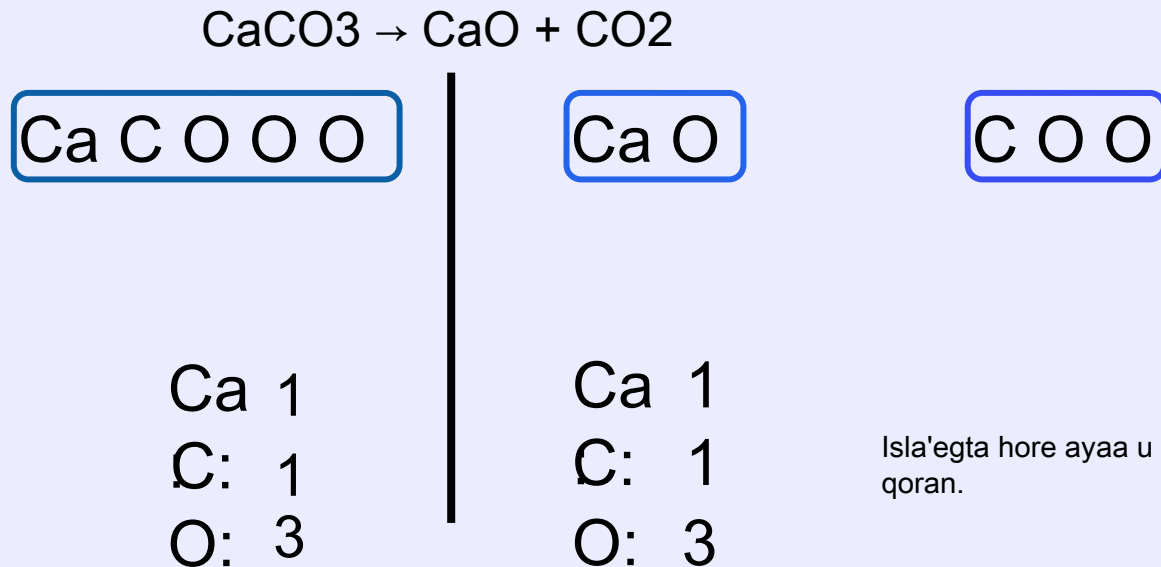
e) Dheellitir isla'egta calaamadda (symbol equation).



f) Dheellitir isla'egta calaamadda (symbol equation).



g) Dheellitir isla'egta calaamadda (symbol equation).



Isla'egta hore ayaa u dheellitiran sida qoran.

Soo koobid

Ilaalinta cufka (Conservation of mass) iyo isla'egyada calaamadda ee dheellitiran (balanced symbol equations)

Cufka (mass) alaabta soo baxda (products) ee falgalka (reaction) kiimikada wuxuu la mid yahay cufka fal-celiyeyaasha (reactants).

Isla'egyada ereyada (Word equations) waa qaab fudud oo lagu qeexo falgalada (reactions) kiimikada.

Qaacidoooyinka kiimikada (Chemical formulae) waxay matalaan tirada nooc kasta oo atam ah oo ku jira fal-celiye (reactant) ama alaab soo bax (product).

Isla'egyada kiimikada (Chemical equations) waxay matalaan sida atamka ku jira fal-celiyeyaasha (reactants) u dib-u-habeynayaan si ay u sameeyaan alaabta soo baxda (products).

Fallaarta (arrow) ee isla'egta kiimikada waxay mataleysaa ereyada 'isku beddelaa' (changes into).