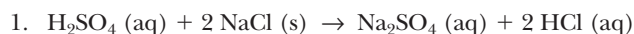


JARDUERA ETA PROBLEMA EBATZIAK



$$V = 25 \text{ mL} \quad 1 \text{ g}$$

$$0,1 \text{ M}$$

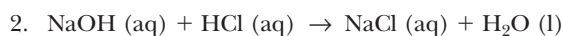
$$M (\text{NaCl}) = 58,5 \text{ g} \cdot \text{mol}^{-1}$$

$$25 \text{ mL disoluzio} \frac{1 \cancel{\text{L}}}{1000 \text{ mL}} \cdot \frac{0,1 \text{ mol H}_2\text{SO}_4}{1 \text{ L disoluzio}} = 0,0025 \text{ mol H}_2\text{SO}_4$$

$$1 \text{ g NaCl} \frac{1 \text{ mol NaCl}}{58,5 \text{ g NaCl}} = 0,017 \text{ mol NaCl}$$

0,0025 mol H_2SO_4 erabat kontsumi daitezten, NaCl-aren kantitate hau beharko genuke: $2 \cdot 0,0025 = 0,005$ NaCl, baina guk 0,017 ditugu; hortaz, ez da osorik kontsumituko.

Azido sulfurikoa kontsumituko da erabat.



$$V = 25 \text{ mL} \quad V = 40 \text{ mL}$$

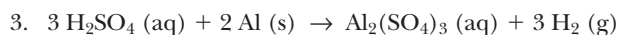
$$0,4 \text{ M} \quad 0,3 \text{ M}$$

$$25 \text{ mL disoluzio} \frac{1 \cancel{\text{L}}}{1000 \text{ mL}} \cdot \frac{0,4 \text{ mol NaOH}}{1 \text{ L disoluzio}} = 0,01 \text{ mol NaOH}$$

$$40 \text{ mL disoluzio} \frac{1 \cancel{\text{L}}}{1000 \text{ mL}} \cdot \frac{0,3 \text{ mol HCl}}{1 \text{ L disoluzio}} = 0,012 \text{ mol HCl}$$

Erreakzioan, errektibo bakoitzaren mol kopuru berberak kontsumitzen dira; beraz, mol kopuru txikiena duena agortuko da, NaOH-a, alegia.

Erreaktibo mugatzailea sodio hidroxidoa da.



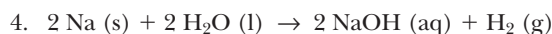
$$0,5 \text{ M}$$

$$V = 3,25 \text{ L}$$

BN

$$3,25 \text{ L H}_2 \frac{1 \text{ mol H}_2}{22,4 \text{ L H}_2} \cdot \frac{3 \text{ mol H}_2\text{SO}_4}{3 \text{ mol H}_2} \cdot \frac{1 \cancel{\text{L}} \text{ disoluzio}}{0,5 \text{ mol H}_2\text{SO}_4} \cdot \frac{1000 \text{ mL}}{1 \cancel{\text{L}}} = 290 \text{ mL disoluzio}$$

Azido sulfurikoaren 0,5 M motako disoluzioaren 290 L-k erreakzionatu beharko dute.



$$1 \text{ g} \quad V = 150 \text{ mL}$$

$$M (\text{Na}) = 23 \text{ g} \cdot \text{mol}^{-1}$$

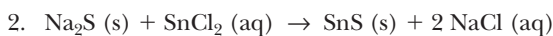
$$n (\text{NaOH}) = 1 \text{ g Na} \frac{1 \text{ mol Na}}{23 \text{ g Na}} \cdot \frac{2 \text{ mol NaOH}}{2 \text{ mol Na}} = 0,043 \text{ mol NaOH}$$

$$V (\text{H}_2\text{O}) = 1 \text{ g Na} \frac{1 \text{ mol Na}}{23 \text{ g Na}} \cdot \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol Na}} \cdot \frac{18 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} \cdot \frac{1 \text{ mL H}_2\text{O}}{1 \text{ g H}_2\text{O}} = 0,78 \text{ mL}$$

$$V(\text{H}_2\text{O})_{\text{amaiera}} = 150 \text{ mL} - 0,78 \text{ mL} = 149,22 \text{ mL}$$

$$M (\text{NaOH}) = \frac{0,043 \text{ mol NaOH}}{149,22 \text{ mL disoluzio}} \cdot \frac{1000 \text{ mL}}{1 \text{ L}} = 0,29 \text{ mol} \cdot \text{L}^{-1}$$

Disoluzioaren molartasuna: $0,29 \text{ mol} \cdot \text{L}^{-1}$

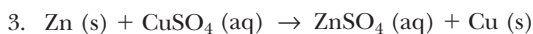


$$M (\text{SnCl}_2) = 189,7 \text{ g} \cdot \text{mol}^{-1}$$

$$M (\text{SnS}) = 150,7 \text{ g} \cdot \text{mol}^{-1}$$

$$20 \text{ g SnCl}_2 \cdot \frac{1 \text{ mol SnCl}_2}{189,7 \text{ g SnCl}_2} \cdot \frac{1 \text{ mol SnS}}{1 \text{ mol SnCl}_2} \cdot \frac{150,7 \text{ g SnS}}{1 \text{ mol SnS}} = 15,9 \text{ g SnS}$$

15,9 g eztañu (II) sulfuro lortuko dira.



a) $M (\text{CuSO}_4) = 159,5 \text{ g} \cdot \text{mol}^{-1}$

$$M (\text{Cu}) = 63,5 \text{ g} \cdot \text{mol}^{-1}$$

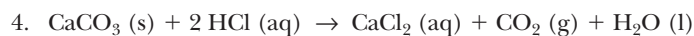
$$20 \text{ g CuSO}_4 \cdot \frac{1 \text{ mol CuSO}_4}{159,5 \text{ g CuSO}_4} \cdot \frac{1 \text{ mol Cu}}{1 \text{ mol CuSO}_4} \cdot \frac{63,5 \text{ g Cu}}{1 \text{ mol Cu}} = 7,96 \text{ g Cu}$$

Hauspeatutako kobre metalikoaren masa 7,96 g-koa da.

b) $M (\text{Zn}) = 65,4 \text{ g} \cdot \text{mol}^{-1}$

$$20 \text{ g CuSO}_4 \cdot \frac{1 \text{ mol CuSO}_4}{159,5 \text{ g CuSO}_4} \cdot \frac{1 \text{ mol Zn}}{1 \text{ mol CuSO}_4} \cdot \frac{65,4 \text{ g Zn}}{1 \text{ mol Zn}} = 8,2 \text{ g Zn}$$

8,2 g zink metaliko kontsumituko dira.



a) $M (\text{CaCO}_3) = 100 \text{ g} \cdot \text{mol}^{-1}$

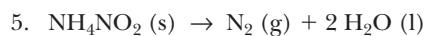
$$50 \text{ g CaCO}_3 \cdot \frac{1 \text{ mol CaCO}_3}{100 \text{ g CaCO}_3} \cdot \frac{1 \text{ mol CO}_2}{1 \text{ mol CaCO}_3} \cdot \frac{22,4 \text{ L CO}_2}{1 \text{ mol CO}_2} = 11,2 \text{ L de CO}_2$$

11,2 L CO₂ lortuko dira, ENean neurtuta.

b) $M (\text{CaCl}_2) = 111 \text{ g} \cdot \text{mol}^{-1}$

$$50 \text{ g CaCO}_3 \cdot \frac{1 \text{ mol CaCO}_3}{100 \text{ g CaCO}_3} \cdot \frac{1 \text{ mol CaCl}_2}{1 \text{ mol CaCO}_3} \cdot \frac{111 \text{ g CaCl}_2}{1 \text{ mol CaCl}_2} = 55,5 \text{ g CaCl}_2$$

55,5 g kaltzio kloruro lortuko dira.

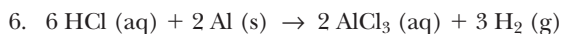


$$15 \text{ g}$$

$$M (\text{NH}_4\text{NO}_2) = 64 \text{ g} \cdot \text{mol}^{-1}$$

$$15 \text{ g NH}_4\text{NO}_2 \cdot \frac{1 \text{ mol NH}_4\text{NO}_2}{64 \text{ g NH}_4\text{NO}_2} \cdot \frac{1 \text{ mol N}_2}{1 \text{ mol NH}_4\text{NO}_2} \cdot \frac{22,4 \text{ L}}{1 \text{ mol N}_2} = 5,2 \text{ L N}_2$$

5,2 L nitrogeno (gasa) askatuko dira, ENean neurtuta.



$$V = 140 \text{ L}$$

$$a) \quad T(\text{H}_2) = 20 \text{ }^\circ\text{C} = 293 \text{ K}$$

$$P(\text{H}_2) = 740 \text{ mm Hg} \frac{1 \text{ atm}}{760 \text{ mm Hg}} = 0,9737 \text{ atm}$$

$$n(\text{H}_2) = \frac{P V}{R T} = \frac{0,9737 \text{ atm} \cdot 140 \text{ L}}{0,082 \text{ atm} \cdot \text{L} \cdot \text{K}^{-1} \cdot \text{mol}^{-1} \cdot 293 \text{ K}} = 5,67 \text{ mol H}_2$$

$$M(\text{Al}) = 27 \text{ g} \cdot \text{mol}^{-1}$$

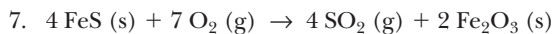
$$5,67 \text{ mol H}_2 \frac{2 \text{ mol Al}}{3 \text{ mol H}_2} \cdot \frac{27 \text{ g Al}}{1 \text{ mol Al}} = 102 \text{ g Al}$$

102 g aluminio beharko dira.

$$b) \quad M(\text{AlCl}_3) = 133,5 \text{ g} \cdot \text{mol}^{-1}$$

$$5,67 \text{ mol H}_2 \frac{2 \text{ mol AlCl}_3}{3 \text{ mol H}_2} \cdot \frac{133,5 \text{ g AlCl}_3}{1 \text{ mol AlCl}_3} = 505 \text{ g AlCl}_3$$

505 g AlCl₃ lortuko dira.



$$V = 40 \text{ L}$$

$$T(\text{SO}_2) = 400 \text{ }^\circ\text{C} = 673 \text{ K}$$

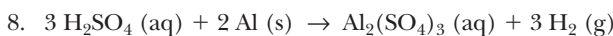
$$P(\text{SO}_2) = 740 \text{ mm Hg} \frac{1 \text{ atm}}{760 \text{ mm Hg}} = 0,974 \text{ atm}$$

$$n(\text{SO}_2) = \frac{P V}{R T} = \frac{0,974 \text{ atm} \cdot 40 \text{ L}}{0,082 \text{ atm} \cdot \text{L} \cdot \text{K}^{-1} \cdot \text{mol}^{-1} \cdot 673 \text{ K}} = 0,706 \text{ mol SO}_2$$

$$M(\text{FeS}) = 87,8 \text{ g}$$

$$0,706 \text{ mol SO}_2 \frac{4 \text{ mol FeS}}{4 \text{ mol SO}_2} \cdot \frac{87,8 \text{ g FeS}}{1 \text{ mol FeS}} = 62 \text{ g FeS}$$

62 g burdina sulfuro behar dira.



$$M(\text{Al}) = 27 \text{ g} \cdot \text{mol}^{-1} \quad m(\text{Al}) = 10 \text{ g}$$

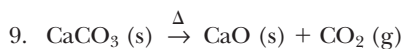
$$n(\text{H}_2) = 10 \text{ g Al} \frac{1 \text{ mol Al}}{27 \text{ g Al}} \cdot \frac{3 \text{ mol H}_2}{2 \text{ mol Al}} = 0,556 \text{ mol H}_2$$

$$T(\text{H}_2) = 25 \text{ }^\circ\text{C} = 298 \text{ K}$$

$$P(\text{H}_2) = 750 \text{ mm Hg} \frac{1 \text{ atm}}{760 \text{ mm Hg}} = 0,987 \text{ atm}$$

$$V(\text{H}_2) = \frac{n(\text{H}_2) R T}{P} = \frac{0,556 \text{ mol} \cdot 0,082 \text{ atm} \cdot \text{L} \cdot \text{K}^{-1} \cdot \text{mol}^{-1} \cdot 298 \text{ K}}{0,987 \text{ atm}} = 13,8 \text{ L H}_2$$

13,8 L hidrogeno (gasa) lortuko ditugu.



1 kg, % 90

$$M (\text{CaCO}_3) = 100 \text{ g} \cdot \text{mol}^{-1}$$

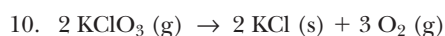
$$1 \text{ kg CaCO}_3 \frac{1000 \text{ g}}{1 \text{ kg}} \cdot \frac{90 \text{ g erreal}}{100 \text{ g teoriko}} \cdot \frac{1 \text{ mol CaCO}_3}{100 \text{ g CaCO}_3} \cdot \frac{1 \text{ mol CO}_2}{1 \text{ mol CaCO}_3} = 9 \text{ mol CO}_2$$

$$T (\text{CO}_2) = 300 \text{ }^\circ\text{C} = 573 \text{ K}$$

$$P (\text{CO}_2) = 740 \text{ mm Hg} \frac{1 \text{ atm}}{760 \text{ mm Hg}} = 0,974 \text{ atm}$$

$$V (\text{CO}_2) = \frac{n R T}{P} = \frac{9 \text{ mol CO}_2 \cdot 0,082 \text{ atm} \cdot \text{L} \cdot \text{K}^{-1} \cdot \text{mol}^{-1} \cdot 573 \text{ K}}{0,974 \text{ atm}} = 434,16 \text{ L CO}_2$$

434 L karbono dioxido lortuko ditugu.



40 g, % 95

$$M (\text{KClO}_3) = 122,6 \text{ g} \cdot \text{mol}^{-1}$$

$$40 \text{ g KClO}_3 \frac{95 \text{ g erreal}}{100 \text{ g teoriko}} \cdot \frac{1 \text{ mol KClO}_3}{122,6 \text{ g KClO}_3} \cdot \frac{3 \text{ mol O}_2}{2 \text{ mol KClO}_3} = 0,46 \text{ mol O}_2$$

$$T (\text{O}_2) = 25 \text{ }^\circ\text{C} = 298 \text{ K}$$

$$P (\text{O}_2) = 740 \text{ mm Hg} \frac{1 \text{ atm}}{760 \text{ mm Hg}} = 0,974 \text{ atm}$$

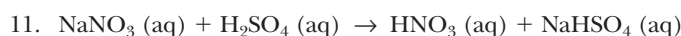
$$V (\text{O}_2) = \frac{n R T}{P} = \frac{0,46 \text{ mol} \cdot 0,082 \text{ atm} \cdot \text{L} \cdot \text{K}^{-1} \cdot \text{mol}^{-1} \cdot 298 \text{ K}}{0,974 \text{ atm}} = 11,5 \text{ L O}_2$$

11,5 L oxigeno lortuko dira.

$$M (\text{KCl}) = 74,6 \text{ g} \cdot \text{mol}^{-1}$$

$$40 \text{ g KClO}_3 \frac{95 \text{ g erreal}}{100 \text{ g teoriko}} \cdot \frac{1 \text{ mol KClO}_3}{122,6 \text{ g KClO}_3} \cdot \frac{2 \text{ mol KCl}}{2 \text{ mol KClO}_3} \cdot \frac{74,6 \text{ g KCl}}{1 \text{ mol KCl}} = 23,1 \text{ g KCl}$$

23,1 g potasio kloruro lortuko dira.



m (NaNO_3) = 10 g

m (H_2SO_4) = 9,8 g

Lehenik, errektibo mugatzailea bietako zein den kalkulatuko dugu:

$$M (\text{NaNO}_3) = 85 \text{ g} \cdot \text{mol}^{-1}$$

$$M (\text{H}_2\text{SO}_4) = 98 \text{ g} \cdot \text{mol}^{-1}$$

$$10 \text{ g } \cancel{\text{NaNO}_3} = \frac{1 \text{ mol NaNO}_3}{85 \text{ g } \cancel{\text{NaNO}_3}} = 0,118 \text{ mol NaNO}_3$$

$$9,8 \text{ g } \cancel{\text{H}_2\text{SO}_4} = \frac{1 \text{ mol H}_2\text{SO}_4}{98 \text{ g } \cancel{\text{H}_2\text{SO}_4}} = 0,1 \text{ mol H}_2\text{SO}_4 \text{ (mugatzailea)}$$

Errektibo bakoitzetik mol batek errektionatu duenez, azido sulfurikoa kontsumituko da arinago, horretatik da-goelako gutxien.

Ondoren, errektibo mugatzailean oinarrituriko kalkuluak egingo ditugu:

$$M (\text{HNO}_3) = 63 \text{ g} \cdot \text{mol}^{-1}$$

$$9,8 \text{ g } \cancel{\text{H}_2\text{SO}_4} \frac{1 \text{ mol H}_2\text{SO}_4}{98 \text{ g } \cancel{\text{H}_2\text{SO}_4}} \cdot \frac{1 \text{ mol HNO}_3}{1 \text{ mol H}_2\text{SO}_4} \cdot \frac{63 \text{ g HNO}_3}{1 \text{ mol HNO}_3} = 6,3 \text{ g HNO}_3$$

6,3 g azido nitriko lor ditzakegu.