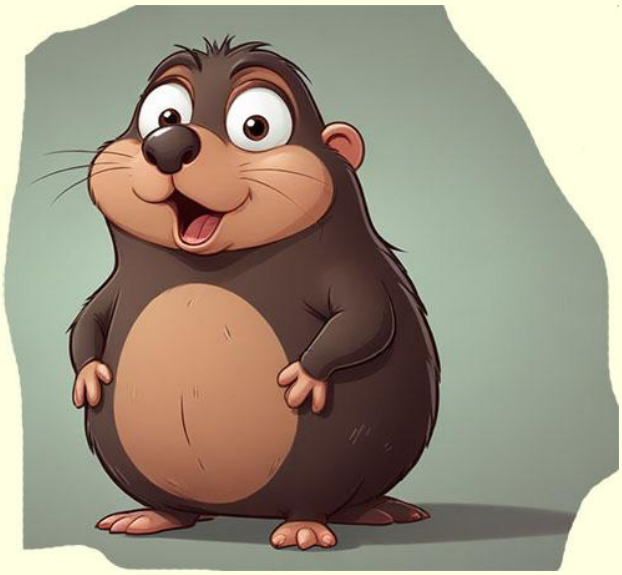
MOLE CALCULATIONS

Answer all the questions below. Check your answers when you are done.



1. Calculate the number of moles in 36g of water (H_2O).
2. What is the molar mass of carbon dioxide (CO_2)?
3. If you have 2 moles of NaCl, how many grams do you have?
4. Calculate the mass of 0.5 moles of sulfur dioxide (SO_2).
5. How many moles are there in 40 g of sodium hydroxide (NaOH)?
6. Calculate the mass of 3 moles of glucose ($C_6H_{12}O_6$).

b. Find the number of moles in 150 g of calcium carbonate ($CaCO_3$).

7. Calculate the mass of calcium chloride ($CaCl_2$) produced when 20 g of calcium reacts with chlorine gas. The equation for this reaction is shown below:

$$Ca + Cl_2 \rightarrow CaCl_2$$

8. Determine the mass of oxygen needed to react completely with 4.8 g of magnesium. The equation for this combustion reaction is shown below:

$$2Mg + O_2 \rightarrow 2MgO_2$$

9. Calculate the mass of aluminium oxide (Al_2O_3) produced when 27 g of aluminium reacts with oxygen. An equation for this reaction is shown below:

$$4Al + 3O2 \rightarrow 2Al_2O_3$$

10. Ammonia (NH_3) is produced by reacting nitrogen with hydrogen. Calculate the mass of ammonia produced when 28 g of nitrogen reacts with excess hydrogen. The equation for this reaction is shown below:

$$N_2 + 3H_2 \rightarrow 2NH3$$

Answers

1. Calculate the number of moles in 36g of water (H_2O).

Answer: 2 moles

2. What is the molar mass of carbon dioxide (CO_2)?

Answer: 44g

3. If you have 2 moles of NaCl, how many grams do you have?

Answer: 117g

4. Calculate the mass of 0.5 moles of sulfur dioxide (SO_2).

Answer: 0.5 moles × 64g = 32g

5. How many moles are there in 40 g of sodium hydroxide (NaOH)?

Answer: 40g ÷ 40g = 1 mole

6. Calculate the mass of 3 moles of glucose ($C_6H_{12}O_6$).

Answer: 3 moles × 180g = 540g

b. Find the number of moles in 150 g of calcium carbonate ($CaCO_3$).

Answer: 1 mole of $CaCO_3$ =100g, n= mass/Mr, so 150g ÷ 100g= 1.5 moles

7. Calculate the mass of calcium chloride ($CaCl_2$) produced when 20 g of calcium reacts with chlorine gas. The equation for this reaction is shown below:

$$Ca + Cl_2 \rightarrow CaCl_2$$

Answer:

- Calculate moles of Ca:
- N= mass/M_r
- 20g ÷ 40 = 0.5 moles

From equation above 1 mole of Ca produces 1 mole of $CaCl_2$

So 0.5 moles of calcium will produced: 0.5 moles of $CaCl_2$

1 mole of $CaCl_2$= 111g, so 0.5 mols is simply 111/2= 55.5g of $CaCl_2$

8. Determine the mass of oxygen needed to react completely with 4.8 g of magnesium. The equation for this combustion reaction is shown below:

$$2Mg + O_2 \rightarrow 2MgO_2$$

Answer:

Calculate moles of Mg: 4.8g÷24g =0.2 moles

From the equation above 2 moles of Mg react with 1 mole of oxygen. So 0.2 moles of Mg will react with 0.1 moles of oxygen gas. So just work out the mass of 0.1 moles of oxygen.

1 mole of oxygen = 32g, so 0.1 moles = 32 x 0.1 = 3.2g of oxygen are needed.

Mass of O_2: 0.10.10.1 moles × 32g/mol=3.2g32 g/mol = 3.2 g32g/mol=3.2g

9. Calculate the mass of aluminium oxide (Al_2O_3) produced when 27 g of aluminium reacts with oxygen. An equation for this reaction is shown below:

$$4Al + 3O2 \rightarrow 2Al_2O_3$$

Answer:

Calculate moles of Al used= 27g÷27=1 mole, so 1 mole of aluminium is reacting.

From the equation 4 mole of Al will produce 2 moles of aluminium oxide.

1 mole of aluminium oxide = 102g. This will produce 0.5 moles of Al_2O_3, that is 51g of Al_2O_3

10. Ammonia (NH_3) is produced by reacting nitrogen with hydrogen. Calculate the mass of ammonia produced when 28 g of nitrogen reacts with excess hydrogen. The equation for this reaction is shown below:

$$N_2 + 3H_2 \rightarrow 2NH3$$

Answer:

Calculate moles of N_2 reacting: 28g÷28g= 1 mole

1 mole of nitrogen will produce 2 moles of ammonia. 1 mole of ammonia is 17g, so 2 moles is 34g.