

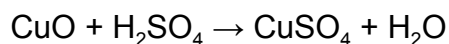
## Calculations for KS4 Chemistry - Worksheet

You will need a copy of the Periodic Table to complete these questions.

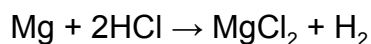
- Find the  $A_r$  (relative atomic mass for the following elements)
  - K
  - F
  - Mg
  - O
  - H
  - N
  - Cl
  - Cu
  - S
- Calculate the  $M_r$  for the following
  - KF
  - MgO
  - $\text{HNO}_3$
  - HCl
  - $\text{CuSO}_4$
- Write an equation for moles that includes mass and  $M_r$  (include all relevant units).

moles =
- Calculate how many moles are in the following:
  - 10g of Na
  - 5g of Mg
  - 15g of C
  - 20g of Cu
- What is the mass of:
  - 0.1 moles of Na
  - 0.5 moles of C
  - 2 moles of B
  - 5 moles of Cu

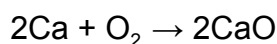
6. How many grams of  $\text{CuSO}_4$  could be made from 10g of  $\text{CuO}$  and an excess of  $\text{H}_2\text{SO}_4$ ?



7. What mass of  $\text{Mg}$  would be needed to make 15g of  $\text{MgCl}_2$ , when reacted with an excess of  $\text{HCl}$ ?



8. How many grams of  $\text{CaO}$  would be needed to completely react with 12g of  $\text{O}_2$ ?



9. Write an equation for moles that includes volume and concentration (include all relevant units).

moles =

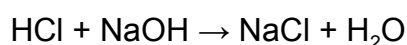
10. How many moles are there in  $20\text{cm}^3$  of a  $0.5\text{mol/dm}^3$  solution of  $\text{HNO}_3$ ?

11. How many moles are there in  $10\text{cm}^3$  of a  $0.1\text{mol/dm}^3$  solution of  $\text{CuSO}_4$ ?

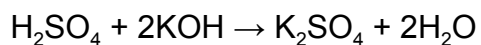
12. What is the volume of 0.02 moles of a solution of  $\text{HCl}$ , concentration  $2\text{mol/dm}^3$ ?

13. What is the concentration of 0.015 moles of a solution of  $\text{NaCl}$ , concentration  $1.5\text{mol/dm}^3$ ?

14. What volume of  $0.5\text{mol/dm}^3$   $\text{NaOH}$  is required to neutralise  $25\text{cm}^3$  of a  $0.1\text{mol/dm}^3$  solution of  $\text{HCl}$ ?



15. Find the unknown concentration of  $\text{KOH}$ .  $35\text{cm}^3$  of  $1\text{mol/dm}^3$  of  $\text{H}_2\text{SO}_4$  was required to neutralise  $26.5\text{cm}^3$  of the unknown  $\text{KOH}$ .



## Calculations for KS4 Chemistry - Worksheet (Answers)

1. Find the Ar (relative atomic mass for the following elements)

- a) K 39
- b) F 19
- c) Mg 24
- d) O 16
- e) H 1
- f) N 14
- g) Cl 35.5
- h) Cu 63.5
- i) S 32

2. Calculate the Mr for the following

- f) KF  $Mr = 39 + 19 = 58$
- g) MgO  $Mr = 24 + 16 = 40$
- h) HNO<sub>3</sub>  $Mr = 1 + 14 + (3 \times 16) = 63$
- i) HCl  $Mr = 1 + 35.5 = 36.5$
- j) CuSO<sub>4</sub>  $Mr = 63.5 + 32 + (4 \times 16) = 159.5$

3. Write an equation for moles that includes mass and Mr (include all relevant units).

$$\text{moles} = \text{mass} / \text{Mr (or Ar)}$$

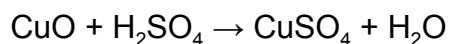
4. Calculate how many moles are in the following:

- e) 10g of Na  $\text{moles} = 10 / 23 = 0.43$
- f) 5g of Mg  $\text{moles} = 5 / 24 = 0.21$
- g) 15g of C  $\text{moles} = 15 / 12 = 1.25$
- h) 20g of Cu  $20 / 63.5 = 0.31$

5. What is the mass of:

- e) 0.1 moles of Na  $\text{mass} = \text{moles} \times \text{Mr (or Ar)} = 0.1 \times 23 = 2.3\text{g}$
- f) 0.5 moles of C  $\text{mass} = 0.5 \times 12 = 6\text{g}$
- g) 2 moles of B  $\text{mass} = 2 \times 11 = 22$
- h) 5 moles of Cu  $\text{mass} = 5 \times 63.5 = 317.5\text{g}$

6. How many grams of  $\text{CuSO}_4$  could be made from 10g of  $\text{CuO}$  and an excess of  $\text{H}_2\text{SO}_4$ ?



$$\text{Mr of CuO} = 63.5 + 16 = 79.5$$

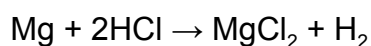
$$\text{Mr of CuSO}_4 = 63.5 + 32 + (4 \times 16) = 159.5$$

$$\text{moles of CuO} = \text{mass/Mr} = 10/79.5 = 0.13$$

$$\text{moles of CuSO}_4 = \text{moles of CuO} = 0.13$$

$$\text{mass of CuSO}_4 = \text{moles} \times \text{Mr} = 0.13 \times 159.5 = 20.7\text{g}$$

7. What mass of  $\text{Mg}$  would be needed to make 15g of  $\text{MgCl}_2$ , when reacted with an excess of  $\text{HCl}$ ?



$$\text{Ar of Mg} = 24$$

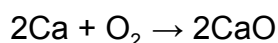
$$\text{Mr of MgCl}_2 = 24 + (2 \times 35.5) = 95$$

$$\text{moles of MgCl}_2 = \text{mass/Mr} = 15/95 = 0.16$$

$$\text{moles of Mg} = \text{moles of MgCl}_2 = 0.16$$

$$\text{mass of Mg} = \text{moles} \times \text{Mr (or Ar)} = 0.16 \times 24 = 3.8\text{g}$$

8. How many grams of  $\text{CaO}$  would be needed to completely react with 12g of  $\text{O}_2$ ?



$$\text{Mr of O}_2 = 2 \times 16 = 32$$

$$\text{Mr of CaO} = 40 + 16 = 56$$

$$\text{moles of O}_2 = \text{mass/Mr} = 12/32 = 0.38$$

$$\text{moles of CaO} = \text{moles of O}_2 \times 2 = 0.38 \times 2 = 0.76$$

$$\text{mass of CaO} = \text{moles} \times \text{Mr} = 0.76 \times 56 = 42.6\text{g}$$

9. Write an equation for moles that includes volume and concentration (include all relevant units).

$$\text{moles} = \text{vol (dm}^3\text{)} \times \text{conc (mol/dm}^3\text{)}$$

$$\text{or moles} = \frac{\text{vol (cm}^3\text{)} \times \text{conc (mol/dm}^3\text{)}}{1000}$$



10. How many moles are there in 20cm<sup>3</sup> of a 0.5mol/dm<sup>3</sup> solution of HNO<sub>3</sub>?

$$\text{moles} = \frac{20 \times 0.5}{1000} = 0.01$$

11. How many moles are there in 10cm<sup>3</sup> of a 0.1mol/dm<sup>3</sup> solution of CuSO<sub>4</sub>?

$$\text{moles} = \frac{10 \times 0.1}{1000} = 0.001 \text{ or } 1 \times 10^{-3}$$

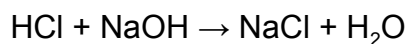
12. What is the volume of 0.02 moles of a solution of HCl, concentration 2mol/dm<sup>3</sup>?

$$\text{vol} = \frac{\text{moles} \times 1000}{\text{conc}} = \frac{0.02 \times 1000}{2} = 10 \text{cm}^3$$

13. What is the concentration of 0.015 moles of a solution of NaCl, concentration 1.5mol/dm<sup>3</sup>?

$$\text{Conc} = \frac{\text{moles} \times 1000}{\text{vol}} = \frac{0.015 \times 1000}{1.5} = 10 \text{mol/dm}^3$$

14. What volume of 0.5mol/dm<sup>3</sup> NaOH is required to neutralise 25cm<sup>3</sup> of a 0.1mol/dm<sup>3</sup> solution of HCl?

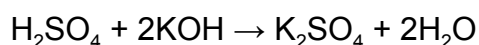


$$\text{moles of HCl} = \frac{\text{vol} \times \text{conc}}{1000} = \frac{25 \times 0.1}{1000} = 0.0025$$

$$\text{moles of NaOH} = \text{moles of HCl} = 0.0025$$

$$\text{volume of NaOH} = \frac{\text{moles} \times 1000}{\text{conc}} = \frac{0.0025 \times 1000}{0.5} = 5 \text{cm}^3$$

15. Find the unknown concentration of KOH. 35cm<sup>3</sup> of 1mol/dm<sup>3</sup> of H<sub>2</sub>SO<sub>4</sub> was required to neutralise 26.5cm<sup>3</sup> of the unknown KOH.



$$\text{moles of H}_2\text{SO}_4 = \frac{\text{vol} \times \text{conc}}{1000} = \frac{35 \times 1}{1000} = 0.035$$

$$\text{moles of KOH} = 2 \times \text{moles of H}_2\text{SO}_4 = 0.07$$

$$\text{conc of KOH} = \frac{\text{moles} \times 1000}{\text{vol}} = \frac{0.07 \times 1000}{26.5} = 2.6 \text{mol/dm}^3$$