

Physical Chemistry Fundamentals

- 1 Complete the table about these atoms and ions. (2)

atom / ion	atomic number	mass number	protons	neutrons	electrons
${}_{15}^{31}\text{P}^{3-}$					
			35	46	36

- 2 Convert these quantities into the units shown.

- 3
- a) 25 cm^3 to dm^3 (1)
- b) 500 cm^3 to m^3 (1)
- c) 100 kPa to Pa (1)
- d) 89 mg to g (1)
- e) -196°C to K (1)
- f) 0.102 nm to m (1)

- 2 a) Explain what the Avogadro constant is. (1)
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- 4 b) Calculate the number of molecules of water in 90.0 g of water. (Avogadro constant, $L = 6.022 \times 10^{23} \text{ mol}^{-1}$)
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- (2)

- 3 Calculate the relative formula mass (M_r) of the following substances.

- a) O_2 (1)
- b) K_2SO_4 (1)
- c) $\text{Mg}(\text{NO}_3)_2$ (1)
- d) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (1)

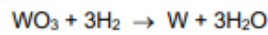
5 Calculate the mass of each of the following.

- a) 5.00 moles of Fe₂O₃ (1)
- b) 0.250 moles of hydrogen (1)
- c) 1.50 x 10⁻⁴ moles of aluminium iodide (1)

Calculate the number of moles of each of the following.

- a) 23.6 g of Cu..... (1)
- b) 43.8 mg of fluorine (1)
- c) 1.25 tonnes of vanadium(V) oxide (1)

7 In a reaction, 115 g of tungsten was formed from 200 g of tungsten oxide. Calculate the percentage yield.

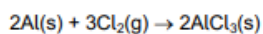


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8 What mass of oxygen reacts with 2.30 g of sodium? $4\text{Na(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{Na}_2\text{O(s)}$

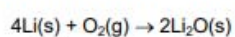
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- 8 Which is the limiting reagent and what mass of aluminium chloride is formed when 1.35 g of aluminium is heated with 4.26 g of chlorine?



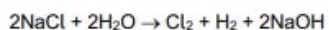
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- 9 Which is the limiting reagent and what mass of lithium oxide is formed when 1.0 g of lithium is heated with 1.3 g of oxygen?



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- 10 Calculate the percentage atom economy to form chlorine in this reaction.



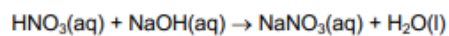
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- 11 250 cm³ of aqueous solution contains 2.0 g of dissolved sodium hydroxide. Calculate the concentration of the solution in mol dm⁻³

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Titration Calculations

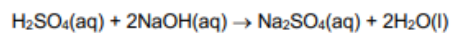
In a titration, it was found that 25.00 cm³ of 0.100 mol dm⁻³ sodium hydroxide reacts with 26.38 cm³ of nitric acid. Calculate the concentration of the nitric acid solution in mol dm⁻³.



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- 10 In a titration, it was found that 25.0 cm³ of 0.150 mol dm⁻³ sulfuric acid reacts with 23.58 cm³ of sodium hydroxide solution. Calculate the concentration of the sodium hydroxide solution in mol dm⁻³.



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(3)