Scaffolding to prevent cognitive overload

Education in Chemistry
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This series of questions starts with a fully scaffolded question; in the following questions scaffolding is removed.

Coping with tritration

1. 25.00 cm^3 of NaOH is just neutralised by 23.45 cm^3 of 0.100 mol/dm^3 HCl. Calculate the concentration of NaOH.

a. Symbol equation	HCl + NaOH → NaCl + H_2O
b. Stoichiometric ratio	HCl : NaOH = _____ : _____
c. Volume of substances in dm^3	V(NaOH) = _____ / 1000 = _____ dm^3 V(HCl) = _____ / 1000 = _____ dm^3
d. Amount of 'known' substance	n(HCl) = c(HCl) x V(HCl) = _____ x _____ = _____ mol
e. Amount of 'unknown' substance	n(NaOH) = n(HCl) x ratio = _____ x _____ = _____ mol
f. Concentration of 'unknown substance'	c(NaOH) = n(NaOH) / V(NaOH) = _____ / _____ = _____ mol/dm^3

2. 20.00 cm^3 of NaOH is just neutralised by 17.00 cm^3 of 0.100 mol/dm^3 H_2SO_4. Calculate the concentration of NaOH.

a. Symbol equation	$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$
b. Stoichiometric ratio	H_2SO_4 : NaOH = _____ : _____
c. Volume of substances in dm^3	V(NaOH) = _____ / 1000 = _____ dm^3 $V(H_2SO_4)$ = _____ / 1000 = _____ dm^3
d. Amount of 'known' substance	$n(H_2SO_4) = c(H_2SO_4) \times V(H_2SO_4)$ = _____ x _____ = _____ mol
e. Amount of 'unknown' substance	$n(NaOH) = n(H_2SO_4) \times$ ratio = _____ x _____ = _____ mol
f.	

3. 25.00 cm^3 of NaOH is just neutralised by 31.50 cm^3 of 0.100 mol/dm^3 HNO_3. Calculate the concentration of NaOH.

a. Symbol equation	$HNO_3 + NaOH \rightarrow NaNO_3 + H_2O$
b. Stoichiometric ratio	HNO_3 : NaOH = _____ : _____
c. Volume of substances in dm^3	V(NaOH) = _____ / 1000 = _____ dm^3 $V(HNO_3)$ = _____ / 1000 = _____ dm^3
d. Amount of 'known' substance	$n(HNO_3) = c(HNO_3) \times V(HNO_3)$ = _____ x _____ = _____ mol
e.	
f.	

4. 40.00 cm^3 of HCl is just neutralised by 36.70 cm^3 of 0.150 mol/dm^3 KOH. Calculate the concentration of HCl.

a. Symbol equation	$HCl + KOH \rightarrow KCl + H_2O$
b. Stoichiometric ratio	HCl : KOH = _____ : _____
c. Volume of substances in dm^3	V(KOH) = _____ / 1000 = _____ dm^3 V(HCl) = _____ / 1000 = _____ dm^3
d.	
e.	
f.	

5. 40.00 cm^3 of H_2SO_4 is just neutralised by 36.70 cm^3 of 0.150 mol/dm^3 KOH. Calculate the concentration of H_2SO_4.

a. Symbol equation	$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$
b. Stoichiometric ratio	H_2SO_4 : KOH = _____ : _____
c.	
d.	
e.	
f.	

6. 40.00 cm^3 of $Ba(OH)_2$ is just neutralised by 28.00 cm^3 of 0.100 mol/dm^3 HCl. Calculate the concentration of $Ba(OH)_2$.

a. Symbol equation	$2HCl + Ba(OH)_2 \rightarrow BaCl_2 + 2H_2O$
b.	
c.	
d.	
e.	
f.	

7. 35.00 cm^3 of $Ba(OH)_2$ is just neutralised by 21.35 cm^3 of 0.100 mol/dm^3 H_3PO_4. Calculate the concentration of $Ba(OH)_2$.

8. 41.40 cm^3 CH_3COOH is just neutralised by 32.05 cm^3 of 0.250 mol/dm^3 NaOH. Calculate the concentration of CH_3COOH.

9. 12.05 cm^3 of citric acid (tribasic) is just neutralised by 12.50 cm^3 of 0.050 mol/dm^3 potassium hydroxide. Calculate the concentration of citric acid.

10. 33.50 cm^3 of ammonia solution is just neutralised by 23.50cm^3 of 0.125 mol/dm^3 sulphuric acid. Calculate the concentration of ammonia solution.

Answers

1. 0.0938 mol/dm^3
2. 0.170 mol/dm^3
3. 0.126 mol/dm^3
4. 0.138 mol/dm^3
5. 0.0688 mol/dm^3
6. 0.0350 mol/dm^3
7. 0.0915 mol/dm^3
8. 0.194 mol/dm^3
9. 0.0173 mol/dm^3
10. 0.175 mol/dm^3