Pearson Edexcel

STUDY PACK 1.4

CONCENTRATIONS & TITRATIONS

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Calculations based on concentrations in solution

Calculate the number of moles of the underlined species in the volume of solution stated.

1	25 cm^3 of 1.0 mol dm^{-3} $\underline{HCl}$
2	50 cm^3 of 0.5 mol dm^{-3} $\underline{HCl}$
3	250 cm^3 of 0.25 mol dm^{-3} $\underline{HCl}$
4	500 cm^3 of 0.01 mol dm^{-3} $\underline{HCl}$
5	25 cm^3 of 1.0 mol dm^{-3} $\underline{NaOH}$
6	50 cm^3 of 0.5 mol dm^{-3} $\underline{KOH}$
7	50 cm^3 of 0.25 mol dm^{-3} $\underline{HNO_3}$
8	100 cm^3 of 0.1 mol dm^{-3} $\underline{H_2SO_4}$
9	25 cm^3 of 0.05 mol dm^{-3} $\underline{KMnO_4}$
10	25 cm^3 of 0.2 mol dm^{-3} $\underline{FeSO_4}$

Calculate the mass of material in the given volume of solution

11	25 cm^3 of 1 mol dm^{-3} HCl
12	50 cm^3 of 0.5 mol dm^{-3} NaCl
13	100 cm^3 of 0.25 mol dm^{-3} NH_4NO_3
14	100 cm^3 of 0.1 mol dm^{-3} $AgNO_3$
15	25 cm^3 of 1 mol dm^{-3} $BaCl_2$
16	50 cm^3 of 0.2 mol dm^{-3} H_2SO_4
17	20 cm^3 of 0.1 mol dm^{-3} NaOH
18	50 cm^3 of 0.1 mol dm^{-3} K_2CrO_4
19	25 cm^3 of 0.02 mol dm^{-3} $KMnO_4$
20	25 cm^3 of 0.1 mol dm^{-3} $Pb(NO_3)_2$

What is the concentration in moles dm^{-3} of the following?

21	3.65 g of HCl in 1000 cm^3 of solution
22	3.65 g of HCl in 100 cm^3 of solution
23	6.62 g of $Pb(NO_3)_2$ in 250 cm^3 of solution
24	1.00 g of NaOH in 250 cm^3 of solution
25	1.96 g of H_2SO_4 in 250 cm^3 of solution
26	1.58 g of $KMnO_4$ in 250 cm^3 of solution
27	25.0 g of $Na_2S_2O_3.5H_2O$ in 250 cm^3 of solution
28	25.0 g of $CuSO_4.5H_2O$ in 250 cm^3 of solution
29	4.80 g of $(COOH)_2.2H_2O$ in 250 cm^3 of solution
30	10.0 g of $FeSO_4.(NH_4)_2SO_4.6H_2O$ in 250 cm^3 of solution
31	240 cm^3 of $NH_3(g)$ dissolved in 1000 cm^3 of solution
32	480 cm^3 of HCl(g) dissolved in 100 cm^3 of solution
33	120 cm^3 of $SO_2(g)$ dissolved in 250 cm^3 of solution
34	24 cm^3 of HCl(g) dissolved in 200 cm^3 of solution
35	100 cm^3 of $NH_3(g)$ dissolved in 10 cm^3 of solution

Answers

Simple volumetric calculations

In this series of calculations you should start by writing the equation for the reaction taking place then generate the molarity/volume ratio. In some cases you will need to calculate the molarity of the solutions before you start the main part of the question.

For questions 1–10 calculate the molarity of the first named solution from the data below.

1	25 cm^3 of sodium hydroxide	reacts with	21.0 cm^3 of 0.2 mol dm^{-3} HCl
2	25 cm^3 of sodium hydroxide	reacts with	17.0 cm^3 of 0.1 mol dm^{-3} H_2SO_4
3	20 cm^3 of hydrochloric acid	reacts with	23.6 cm^3 of 0.1 mol dm^{-3} NaOH
4	20 cm^3 of hydrochloric acid	reacts with	20.0 cm^3 of a solution of NaOH containing 40 g dm^{-3} of NaOH
5	25 cm^3 of nitric acid	reacts with	15 cm^3 of a solution of 0.2 mol dm^{-3} NH_4OH
6	25 cm^3 of a solution of barium chloride	reacts with	20 cm^3 of a solution of 0.05 mol dm^{-3} sulphuric acid
7	25 cm^3 of a solution of NaCl	reacts with	10 cm^3 of a 0.02 mol dm^{-3} silver nitrate
8	10 cm^3 of a solution of $AlCl_3$	reacts with	30 cm^3 of 0.01 mol dm^{-3} silver nitrate
9	25 cm^3 of H_xA	reacts with	25 cm^3 of 0.2 mol dm^{-3} NaOH to give Na_2A
10	25 cm^3 of H_3PO_4	reacts with	100 cm^3 of 0.1 mol dm^{-3} NaOH to give NaH_2PO_4

11 25 cm^3 of a solution of 0.1 mol dm^{-3} NaOH reacts with 50 cm^3 of a solution of hydrochloric acid. What is the molarity of the acid?

12 25 cm^3 of a solution of 0.2 mol dm^{-3} KOH reacts with 30 cm^3 of a solution of nitric acid. What is the concentration of the acid in moles dm^{-3}?

13 In a titration 25 cm^3 of ammonia solution react with 33.30 cm^3 of 0.1 mol dm^{-3} HCl. What is the concentration of the ammonia solution in g dm^{-3}?

14 In the reaction between iron(II) ammonium sulphate and potassium manganate(VII) solution. 25 cm^3 of the Fe^{2+} solution reacted with 24.8 cm^3 of 0.020 mol dm^{-3} $KMnO_4$ solution. What is the molarity of the iron(II) ammonium sulphate solution?

15 10 cm^3 of a solution of NaCl react with 15 cm^3 of 0.02 mol dm^{-3} silver nitrate solution. What is the concentration of the NaCl solution in g dm^{-3}?

16 25 cm^3 of a solution of an acid H_xA containing 0.1 mol dm^{-3} of the acid in each 1000 cm^3 of solution reacts with 75 cm^3 of a solution of 0.1 mol dm^{-3} NaOH. What is the value of x?

17 25 cm^3 of a solution of sodium carbonate react with 10 cm^3 of a 0.1 mol dm^{-3} HCl. What is the concentration of the sodium carbonate?

18 What volume of 0.1 mol dm^{-3} HCl will be needed to react with 25 cm^3 of 0.2 mol dm^{-3} NaOH?

19 What volume of 0.05 mol dm^{-3} H_2SO_4 will be needed to react with 25 cm^3 of 0.2 mol dm^{-3} NaOH?

20 What volume of 0.02 mol dm^{-3} $KMnO_4$ will be needed to react with 25 cm^3 of 0.1 mol dm^{-3} $FeSO_4$ solution?

Answers

Answers