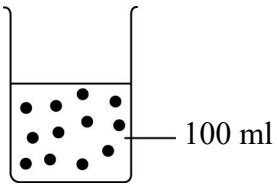
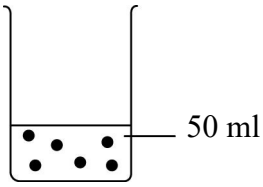
Chemistry: Chapter 15 Concentration of solutions
Combined Science (Chemistry Part): Chapter 15 Concentration of solutions

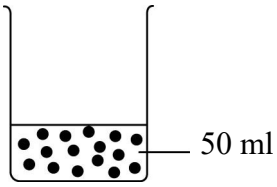
Section 15.1

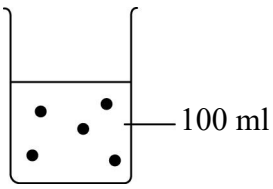
|!|EMA041515001O|!|

Which of the following substances is the most concentrated?

A. 

B. 

C. 

D. 

□

##C Concentration refers to the amount of solute per unit volume. C has the greatest number of particles per unit volume.##

Section 15.2

|!|EMA041515002O|!|

Which of the following solutions contains the largest amount of chloride ions?

A. 100 cm^3 of 1 M KCl(aq)
B. 70 cm^3 of 2 M NaCl(aq)
C. 80 cm^3 of 1 M $CaCl_2$(aq)
D. 50 cm^3 of 1 M $AlCl_3$(aq)

□

##C##

|!|EMA041515003O|!|

How many moles of ions are present in 200 cm^3 of 1.5 M $(NH_4)_2CO_3$?

A. 0.3 mole
B. 0.9 mole
C. 1.2 mole
D. 1.5 mole

##B##

|!|EMA041515004O|!|
What volume of 0.8 M NaOH solution can be prepared from 12 g NaOH?

A. 0.375 cm^3
B. 15 cm^3
C. 375 cm^3
D. 1500 cm^3

##C##

|!|EMA041515005O|!|
What volume of water has to be added to 200 cm^3 of 0.7 M $CaCl_2$ solution so as to dilute it to 0.5 M?

A. 80 cm^3
B. 100 cm^3
C. 140 cm^3
D. 280 cm^3

##A##

|!|EMB041515006O|!|
What is the molarity of the resultant $MgCl_2$ solution formed by mixing 100 cm^3 of 0.5 M $MgCl_2$ solution and 150 cm^3 of 0.9 M $MgCl_2$ solution?

A. 0.70 M
B. 0.74 M
C. 1.23 M
D. 1.85 M

##B##

|!|EMA041515007O|!|
What is the concentration of aqueous sodium ions in a 500 cm^3 solution containing 0.585 g of pure sodium chloride?

A. 0.01 mol dm^{-3}
B. 0.02 mol dm^{-3}
C. 0.03 mol dm^{-3}

D. 0.04 mol dm^{-3}

□

##B Sodium chloride completely dissociates in water to give sodium and chloride ions.
Mole ratio of NaCl(aq) to Na^+(aq) is 1:1
Molar mass of NaCl = 23 + 35.5 = 58.5 g

No. of moles of NaCl = $\frac{0.585}{58.5}$ mol = 0.01 mol

So the concentration of sodium ions = 0.01 × $\frac{1000}{500}$ mol dm^{-3} = 0.02 mol dm^{-3}##

|!|EMA041515008O|!|
What is the concentration of bromine in a 200 cm^3 solution containing 1.598 g of bromine?

A. 0.02 mol dm^{-3}
B. 0.04 mol dm^{-3}
C. 0.05 mol dm^{-3}
D. 0.06 mol dm^{-3}

□

##C 1.598 g of bromine is equivalent to 0.01 mole. Therefore, the concentration of bromine in 200 cm^3 is 0.01 × $\frac{1000}{200}$ mol dm^{-3} = 0.05 mol dm^{-3}##

|!|EMB041515009O|!|
A sample of a certain concentrated acid has a density of 1.96 g cm^{-3} and contains 95.0% of the acid by mass. What is the concentration (correct to one decimal place) of the acid in the sample?
(Relative molecular mass of the acid is 100)

A. 17.4 M
B. 18.2 M
C. 18.6 M
D. 19.3 M

□

##C Mass of 1 dm^3 of the concentrated acid = 1960 g
Mass of the acid in 1 dm^3 of the concentrated acid = 1960 × 0.95 = 1862 g

No. of moles of the acid in 1 dm^3 of the concentrated acid = $\frac{1862}{100}$ mol= 18.62 mol

So the concentration of the concentrated acid = 18.62 M##

|!|EMA041515010O|!|

A 2.0 M potassium chloride solution is prepared by dissolving 37.3 g of potassium chloride in distilled water. What is the volume of the solution formed?

A. 75.0 cm^3
B. 100.0 cm^3
C. 250.0 cm^3
D. 400.0 cm^3

□

##C No. of moles of KCl = $\frac{37.3}{39.1+35.5}$ mol = 0.5 mol

Let x be the volume of the solution in dm^3.

The molarity of KCl = 2.0 = $\frac{0.5}{x}$

So, x = 0.25

i.e. the volume of solution is 250.0 cm^3.##

|!|EMB041515011O|!|

Which of the following concentrations is INCORRECT if 10 g of sodium carbonate solid is dissolved in water to give a 500 cm^3 solution?

A. 20 g dm^{-3}
B. 0.02 g cm^{-3}
C. 0.19 mol dm^{-3}
D. 0.24 mol dm^{-3}

□

##D Concentration = $\frac{\text{mass}}{\text{volume}} = \frac{10\text{ g}}{\left(\frac{500}{1000}\right)\text{dm}^3} = 20\text{ g dm}^{-3}$

$= \frac{10\text{ g}}{500\text{ cm}^3} = 0.02\text{ g cm}^{-3}$

No. of moles of Na_2CO_3 = $\frac{\text{mass}}{\text{molar mass}} = \frac{10\text{ g}}{106\text{ g mol}^{-1}} = 0.094$ mol

Concentration = $\frac{\text{no. of moles}}{\text{volume}} = \frac{0.094\text{ mol}}{\left(\frac{500}{1000}\right)\text{dm}^3} = 0.19\text{ mol dm}^{-3}$##

|!|EMA041515012O|!|

What volume of 0.05 M Na_2CO_3 solution can be prepared from 2.65 g of Na_2CO_3?

A. 0.05 dm^3
B. 500 dm^3
C. 0.5 dm^3
D. 50 cm^3

□

##C No. of moles of Na_2CO_3 used = $\frac{2.65}{106}$ mol = 0.025 mol

Volume of solution = $\frac{0.025\ mol}{0.05\ mol\ dm^{-3}}$ = 0.5 dm^3##

|!|EMA041515013O|!|
What is the mass of solute in 250.0 cm^3 of 0.50 M HCl(aq)?

A. 2.63 g
B. 4.75 g
C. 5.2 g
D. 6.5 g

□

##B No. of moles of HCl in 0.50 M HCl(aq) = 0.50 × $\frac{250}{1000}$ mol = 0.13 mol

Mass of HCl = 0.13 × 36.5 g = 4.75 g.##

|!|EMB041515014O|!|
Which of the following cases has different masses of solutes in the two solutions?

	Solution 1	Solution 2
A.	500 cm^3 of 0.50 M Na_2SO_4	100 cm^3 of 2.50 M Na_2SO_4
B.	0.25 dm^3 of 0.15 M Na_2CO_3	0.05 dm^3 of 0.75 M Na_2CO_3
C.	25 cm^3 of 0.10 M NaOH	0.05 dm^3 of 0.05 M NaOH
D.	100 cm^3 of 0.05 M NaCl	0.025 dm^3 of 0.02 M NaCl

□

##D No. of moles = molarity × volume of solution##

|!|EMA041515015O|!|
Which of the following statements about a 0.50 M $MgCl_2$ solution is correct?

A. There are 0.50 M Mg^{2+} ions and 0.50 M Cl^- ions.
B. There are 0.50 M Mg^{2+} ions and 1.0 M Cl^- ions.
C. There are 1.0 M Mg^{2+} ions and 0.50 M Cl^- ions.
D. There are 1.0 M Mg^{2+} ions and 1.0 M Cl^- ions.

☐

##B##

|!|EMA041515016O|!|

Which of the following information about a 0.025 M sodium carbonate solution is correct?

	Concentration of Na^+ ions / M	Concentration of CO_3^{2-} ions / M
A.	0.025	0.025
B.	0.025	0.05
C.	0.05	0.025
D.	0.05	0.05

☐

##C Formula of sodium carbonate is Na_2CO_3.##

|!|EMA041515017O|!|

Which of the following information about the number of moles of ions present in 25 cm^3 of 0.20 M ammonium sulphate solution is correct?

	Ammonium ion	Sulphate ion
A.	5×10^{-3} mol	5×10^{-3} mol
B.	5×10^{-3} mol	1×10^{-2} mol
C.	1×10^{-2} mol	1×10^{-2} mol
D.	1×10^{-2} mol	5×10^{-3} mol

☐

##D No. of moles of $(NH_4)_2SO_4 = 0.20 \times \frac{25}{1000} = 5 \times 10^{-3}$ mol

1 mole of $(NH_4)_2SO_4$ gives 2 moles of NH_4^+ ions and 1 mole of SO_4^{2-} ions
So, 5×10^{-3} mole of $(NH_4)_2SO_4$ will have 1×10^{-2} mole of NH_4^+ ions and 5×10^{-3} mole of SO_4^{2-} ions.##

|!|EMA041515018O|!|

What volume of water has to be added to 250 cm^3 of 0.20 M K_2CO_3 solution to dilute it to 0.05 M?

A. 250 cm^3
B. 500 cm^3
C. 750 cm^3
D. 1000 cm^3

☐

##C When a solution is diluted, the number of moles of the solute is unchanged.

So, no. of moles of solute = $(MV)_{\text{before dilution}} = (MV)_{\text{after dilution}}$

$$0.20 \times \frac{250}{1000} = 0.05 \times \frac{V}{1000}$$

$V = 1000\ cm^3$

Volume of water added = $(1000 - 250)\ cm^3 = 750\ cm^3$##

Each question below consists of two separate statements. Decide whether each of the two statements is true or false; if both are true, then decide whether or not the second statement is a *correct* explanation of the first statement. Then select one option from A to D according to the following table:

A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
B. Both statements are true and the 2nd statement is NOT a correct explanation of the 1st statement.
C. The 1st statement is false but the 2nd statement is true.
D. Both statements are false.

Section 15.1

|!|EMA041515019O|!|

1 M solution means there is 1 mole of a solute being dissolved in 100 cm^3 of water.	A 1 M solution is more concentrated than a 0.5 M of the same kind of solution.

☐

##C 1 M means 1 mole per dm^3 or per 1000 cm^3.##

Section 15.2

|!|EMA041515020O|!|

0.15 mole Na_2CO_3 contains 0.45 mole ions.	1 formula unit of Na_2CO_3 gives 2 formula units of Na^+ ions and 1 formula unit of CO_3^{2-} ions.

☐

##A##