

# 1

## Molecular weights

### Basic calculations involving salts and hydrates

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- Q1** Calculate the molecular weights, the percentage of sodium and the grams of sodium in 25g of the following sodium salts:

<i>Salt</i>	<i>Formula</i>	<i>Molecular weight</i>	<i>% of Na</i>	<i>Gram of Na in 25g</i>
Sodium chloride	NaCl			
Sodium bicarbonate	NaHCO <sub>3</sub>			
Sodium fluoride	NaF			
Sodium potassium tartrate	C <sub>4</sub> H <sub>4</sub> KNaO <sub>6</sub>			
Tri sodium phosphate	Na <sub>3</sub> PO <sub>4</sub>			

- Q2** Calculate the percentage of iron and the number of milligrams of Fe in 200mg of the following anhydrous ferrous salts:

<i>Salt</i>	<i>Formula</i>	<i>Molecular weight</i>	<i>% of Fe</i>	<i>mg in 200mg</i>
Ferrous sulphate	FeSO <sub>4</sub>			
Ferrous succinate	C <sub>4</sub> H <sub>4</sub> FeO <sub>4</sub>			
Ferrous fumarate	C <sub>4</sub> H <sub>2</sub> FeO <sub>4</sub>			
Ferrous chloride	FeCl <sub>2</sub>			
Ferrous gluconate	C <sub>12</sub> H <sub>22</sub> FeO <sub>14</sub>			

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**Q3** For the above ferrous salts, calculate the number of milligrams of each salt that will contain the same amount of Fe ion as 200mg of ferrous sulphate.

**Q4** Calculate the molecular weight of the following hydrates, the percentage of water in each hydrate and the molecular weight of the equivalent anhydrous salts.

<i>Hydrate</i>	<i>Formula</i>	<i>Molecular weight of the hydrate</i>	<i>Percentage of water in the hydrate</i>	<i>Molecular weight of equivalent anhydrous salt</i>
Ferrous sulphate	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$			
Ferrous lactate	$\text{C}_6\text{H}_{10}\text{FeO}_6 \cdot 3\text{H}_2\text{O}$			
Ferrous tartrate	$\text{C}_4\text{H}_4\text{FeO}_6 \cdot \_ \text{H}_2\text{O}$			
Sodium sulphate	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$			
Sodium potassium tartrate	$\text{C}_4\text{H}_4\text{KNa}_2\text{O}_6 \cdot 4\text{H}_2\text{O}$			

**Q5** For the above hydrated ferrous salts, calculate the amount of hydrated salt, which will contain the same amount of Fe ion as 400mg of anhydrous ferrous sulphate.

**Q6** Calculate the mg of sodium and the number of mmol in 1g of the following sodium salts:

Sodium chloride	NaCl
Sodium lactate	$C_3H_5NaO_3$
Sodium bicarbonate	$NaHCO_3$

**Q7** Calculate the mg of magnesium and the number of mmol in 2g of the following magnesium salts:

Magnesium chloride	$MgCl_2 \cdot 6H_2O$
Magnesium acetate	$C_4H_6MgO_4 \cdot 4H_2O$
Magnesium phosphate	$Mg_3(PO_4)_2 \cdot 5H_2O$
Magnesium sulphate	$MgSO_4 \cdot 7H_2O$

**Q8** Calculate the number of mmol in 50mL of a 5% solution of the following salts:

- Sodium Chloride
- Potassium chloride
- Magnesium chloride
- Potassium bicarbonate
- Sodium bicarbonate

**Q9** Calculate the number of mmol of chloride ions in 20mL of a 5% solution of the following salts:

Potassium chloride

Sodium chloride

Magnesium chloride

### Calculations involving drugs and molecular weights

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**Q10** Calculate the weight of adrenaline acid tartrate (M.Wt = 333) and the weight of adrenaline hydrochloride (M.Wt = 219) which contain the equivalent of 0.3mg of adrenaline (M.Wt = 183).

**Q11** Calculate the weight of naproxen (M.Wt = 230) that will contain an equivalent amount of naproxen as 500mg of naproxen sodium (M.Wt = 252).

**Q12** Calculate the amount of amoxicillin sodium (M.Wt = 387) and the amount of amoxicillin trihydrate (M.Wt = 419), which will contain the equivalent of 250mg of amoxicillin (M.Wt = 365).

**Q13** Calculate the amount of isoprenaline base (M.Wt = 211), which is contained in 100g isoprenaline hydrochloride (M.Wt = 248) and 200g isoprenaline sulphate (M.Wt = 566).

Isoprenaline	$C_{11}H_{17}NO_3$
Isoprenaline hydrochloride	$C_{11}H_{17}NO_3.HCl$
Isoprenaline sulphate	$(C_{11}H_{17}NO_3)_2.H_2SO_4.2H_2O$

**Q14** A pharmacist has to extemporaneously prepare 28 capsules each containing 50mg of clindamycin. Clindamycin hydrochloride powder is available. Calculate the amount of clindamycin hydrochloride required for 28 capsules.

Clindamycin M.Wt	= 425
Clindamycin hydrochloride M.Wt	= 461

**Q15** Topal tablets each contain 40mg of sodium bicarbonate. Calculate the number of mmol of Na in each tablet. Molecular weights: Na = 23 HCO<sub>3</sub> = 61

**Q16** Algicon suspension contain 50mg/5mL of potassium bicarbonate. If a patient takes 10mL qds for 10 days, how many mmol of K will be contained in this quantity?

Mol wts: K= 39, HCO<sub>3</sub> = 61

**Q17** A sample of dried magnesium sulphate contains 60% of  $\text{MgSO}_4$ . How many grams of  $\text{Mg}^{++}$  are contained in a 5g sample?

Mol wts: Mg = 24, S = 32, O = 16

**Q18** You are required to make a batch of 25 powders each containing 4mg of flupentixol. You only have available flupentixol dihydrochloride powder. Calculate how much flupentixol dihydrochloride you would require to make 25 powders (assume you are not making an excess).

Mol wt: Flupentixol 435, flupentixol dihydrochloride 507

**Q19** How many mmols of lithium are provided by 1g of Lithium carbonate and how many are provided by 2g of lithium citrate?

Mol wt of lithium carbonate  $\text{Li}_2\text{CO}_3$  = 74

Mol wt of lithium citrate  $\text{C}_6\text{H}_5\text{Li}_3\text{O}_7 \cdot 4\text{H}_2\text{O}$  = 282

**Q20** A pharmacist has to provide a litre of approximately 50mmol/litre of  $\text{Na}^+$  for use as an emergency oral rehydration therapy. The only available source of  $\text{Na}^+$  is a litre infusion bottle of 0.9% sodium chloride. What volume of the infusion fluid should be made up to 1 litre with purified water to provide the correct concentration of  $\text{Na}^+$ ?

Mol wts Na = 23, Cl = 35.5

**Q21** A pharmacist has to prepare a solution containing 10mmol Na<sup>+</sup> in 200mL. What quantity of sodium chloride should be used to prepare the solution?

Mol Wts Na = 23, Cl = 35.5

**Q22** Flupentixol injection contains 100mg of flupentixol decanoate per mL. How much flupentixol is contained in 2mL of the injection?

Molecular weight of flupentixol = 435

Molecular weight of flupentixol decanoate = 588

**Q23** Calculate the amount of haloperidol in 50mg of haloperidol decanoate?

Molecular wt of haloperidol = 375

Molecular wt of haloperidol decanoate = 530

**Q24** You are required to produce a 4 molar solution of a drug with a molecular weight of 60. You have available 12g of the drug. What would be the final volume of the solution?

**Q25** Phenytoin sodium has a molecular weight of 274. How much phenytoin sodium will be required to prepare 40mL of a 0.2 molar solution?

**Q26** A 'specials dispensing service' has an order to prepare 500 one mL ampoules of clindamycin injection (120mg/mL). Clindamycin phosphate is available. Calculate the weight of clindamycin phosphate required to prepare the batch of ampoules assuming no excess is made.

Clindamycin M.Wt = 425

Clindamycin phosphate M.Wt = 505

### Calculations involving the use of the BNF

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The information from the BNF required to answer these questions can be found at the end of the section, if a copy of the BNF is unavailable to the reader.

Hints on how to calculate the answer are shown below each question.

**Q27** A child of 4 years is given the recommended dose of fluoride ion daily. The child lives in an area in which the water contains 250 micrograms of fluoride ion per litre and the child consumes 3 litres of this water per day.

- Calculate the weekly consumption of fluoride ion (in mg) by the child.
- Calculate the daily and weekly fluoride consumption from drinking water.
- Using the BNF, find the recommended dose of fluoride for a child of 4 years taking into account the fluoride in the drinking water.

- Q28** Medicoal granules are given to a patient for the emergency treatment poisoning. The treatment regimen is 2 sachets immediately followed by 1 sachet every 20 minutes for the next hour. Calculate the mmol of Na and the charcoal that the patient will receive as a result of the ingestion of medicoal granules.
- Use the BNF to find the mmol of sodium and the mg of charcoal per sachet.
  - Calculate the number of sachets required.
- Q29** A cardiac patient is changed from gastrocote liquid to gaviscon liquid, both at a dose of 10mL qds. Calculate the increased intake of sodium (in mmols) by the patient, if the patient takes the gaviscon for 7 days at the correct dose.
- Use the BNF to find the number of mmol of sodium in 10mL of both mixtures.
  - Calculate the number of mmol of sodium for the dosage regimen for both mixtures for one week.
- Q30** A child of 6 Kg is prescribed Gaviscon Infant oral powder at the BNF recommended dosage. Calculate the sodium intake (in mmol) if the child is given three meals a day followed by the gaviscon infant oral powder for 14 days. Use the BNF to find the number of sachet per dose and the number of mmol of sodium per dose.
- Q31** A patient is changed from calcium and ergocalciferol tablets (1 tds) to Calcichew D3 tablets (1 od). What is the increase in Ca intake (in mmol) due to the change to Calcichew, if the patient takes the tablets for 4 weeks at the recommended dose?
- Use the BNF to find the number of mmol of calcium in each tablets.
  - Calculate the calcium intake for each tablet for the dosage regimen.

- Q32** A child requires 75 mg of chloroquine once a week. Chloroquine sulphate syrup is available. The child is going to a malarial area for 4 weeks. What is the dose for the syrup and how much should be prescribed for the child?
- (a) What is the equivalence between chloroquine and chloroquine phosphate?
  - (b) What is the required dose?
  - (c) For how long should the child be prescribed chloroquine?
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- Q33** How many micrograms of betamethasone dipropionate is contained in 30 G of Lotri-derm? What is the equivalent weight of betamethasone?
- (a) Convert the % strength of betamethasone dipropionate to micrograms.
  - (b) Use the equivalence of betamethasone to the dipropionate found in the BNF.
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- Q34** A patient takes one Calcium and Vitamin D tablet twice a day for 28 days. How many mmols of calcium ion will they consume?
- (a) Calculate the number of tablets required
  - (b) Use the BNF to find the number of mmol of calcium per tablet
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- Q35** A patient requires 80.5 mmol of phosphate per day for 7 days. Only Phosphate-Sandoz tablets are available. How many tablets should the patient take per day and how many mmols of potassium will they consume during the 7 days course of tablets?
- (a) Use the BNF to find out the number of mmol of phosphate and potassium contained in one tablet
  - (b) How many tablets will the patient require to provide 80.5mmol of phosphate

**BNF information for questions 27–35**

- Q27** *Recommended dose of fluoride is 500 micrograms daily*
- Q28** *Each medical sachet contains 17.9mmol of sodium*
- Q29** *Gastrocote contains 1.8mmol Na per 5mL  
Gaviscon contains 3mmol Na per 5mL*
- Q30** *Each sachet contains 0.92mmol of sodium ion and the dose is 2 sachets tds*
- Q31** *Calcium and ergocalciferol tablets contain 2.4mmol of calcium ion  
Calcichew D3 contains 12.6mmol of calcium ion*
- Q32** *Chloroquine sulphate syrup contains the equivalent of chloroquine base 50mg/5mL  
Require chloroquine for 1 week before and 4 weeks after travel ie 1 + 4 + 4 = 9 weeks*
- Q33** *Lotriderm contains 0.064% of Betameth. Diprop  
betameth diprop 0.64% is eqiv to 0.5% betamethasone*
- Q34** *2.4mmols of calcium ion per tablet*
- Q35** *Phosphate–Sandoz tablets each contain 16.1mmol of phosphate and 3.1mmol of potassium per tablet*