# Learning Enhancement Team – Mathematics & Statistics

Pharmaceutical Calculations 2

## Conversions Between Strengths

1. Convert the following into the given unit
2. 1 in 200 → 1 g : 200 ml → 1000 mg : 200 ml → 10 mg : 2 ml → 5 mg : 1 ml → **5 mg/ml**
3. 1 in 400 → 1 g : 400 ml → 1000 mg : 400 ml → 10 mg : 4 ml → **2.5 mg/ml**
4. 1 in 25 → 1000 mg : 25 ml → 200 mg : 5 ml → 40 mg : 1 ml → **40 mg/ml**
5. 1 in 1000 → 1 g : 1000 ml → 0.1 g : 100 ml → **0.1 %w/v**
6. 1 in 500 → 1 g : 500 ml → 0.1 g : 50 ml → 0.2 g : 100 ml → **0.2 %w/v**
7. 1 in 5000 → 1 g : 5000 ml → 0.01 g : 50 ml → 0.02 g : 100 ml → **0.02 %w/v**
8. 1:10000 → 1 g : 10000 ml → 1000 mg : 10000 ml → 0.1 mg : 1 ml → **0.1 mg/ml**
9. 1:250 → 1 g : 250 ml → 4 g : 1000 ml → 0.4 g : 100 ml → **0.4 %w/v**
10. 500 mg/ml → 500 mg : 1 ml → 0.5 g : 1 ml → 1 g : 2 ml → **1 in 2 (1:2)**
11. 125 mg/ml → 125 mg : 1 ml → 250 mg : 2 ml → 1000 mg : 8 ml → 1 g : 8 ml → **1 in 8 (1:8)**
12. 5% w/v → 5 g : 100 ml → 1 g : 20 ml → **1 in 20 (1:20)**
13. 0.2% w/v → 0.2 g : 100 ml → 2 g : 1000 ml → 1 g : 500 ml → **1 in 500 (1:500)**

## Calculations with Strengths

1. If 25 g of a chemical is dissolved in 100 ml, what is this expressed in parts?

25 g : 100 ml → 1 g : 4 ml → **1 in 4 (1:4)**

1. If 80 g of a chemical is dissolved in 400 ml, what is this expressed in parts?

80 g : 400 ml → 8 g : 40 ml → 1 g : 5 ml → **1 in 5 (1:5)**

1. If 500 mg of a chemical is dissolved in 200 ml, what is this expressed in %w/v?

0.5 g : 200 ml → 0.25 g : 100 ml → **0.25 %w/v**

1. If 1200 mg of a chemical is dissolved in 1 l, what is this expressed in %w/v?

1.2 g : 1000 ml → 0.12 g : 100 ml → **0.12 %w/v**

1. If a formula is described as 1:500, how may ml are required to provide a dose of 25 mg?

1 g : 500 ml → 1000 mg : 500 ml → 100 mg : 50 ml → 25 mg : 12.5 ml → **12.5 ml**

1. If a formula is described as 1:2000, how many ml are required to provide a dose of 100 mg?

1 g : 2000 ml → 1000 mg : 2000 ml → 100 mg : 200 ml → **200 ml**

1. If a formula is 2% w/v, how many ml are required to provide a dose of 50 mg?

2 g : 100 ml → 2000 mg : 100 ml → 200 mg : 10 ml → 100 mg : 5 ml → 50 mg : 2.5 ml → **2.5 ml**

1. If a formula is 10% w/v, how many ml are required to provide a dose of 40 mg?

10 g : 100 ml → 10000 mg : 100 ml → 10 mg : 0.1 ml → 40 mg : 0.4 ml → **0.4 ml**

1. If 200 ml of water is added to 800 ml of a 1 in 200 solution, what is the final strength:

Original 1 g : 200 ml → 4 g : 800 ml

Add 200 ml of water so you now have 4 g : (800 + 200) ml → 4 g : 1000 ml

1. Expressed in parts?

4 g : 1000 ml → 1 g : 250 ml → **1 in 250**

1. Expressed in %v/v?

4 g : 1000 ml → 0.4 g : 100 ml → **0.4 %w/v**

1. If 50 ml of water is added to 200 ml of a 1:400 solution, what is the final strength:

Original 1 g : 400 ml → 0.5 g : 200 ml

Add 50 ml of water, so you now have 0.5 g : 250 ml

1. Expressed in parts?

0.5 g : 250 ml → 1 g : 500 ml → **1 in 500**

1. Expressed in %w/v?

0.5 g : 250 ml → 1 g : 500 ml → 0.2 g : 100 ml→ **0.2 %w/v**

1. If 500 ml of water is added to 2 l of a 20% w/v solution, what is the final strength expressed as %w/v?

Original 20 g : 100 ml → 400 g : 2000 ml (2000 ml is 2 l)

Add 500 ml of water : 400 g : 2500 ml

400 g : 2500 ml → 4 g : 25 ml → 16 g : 100 ml → **16 %w/v**

1. If 400 ml of water is added to 1 l of a 14% w/v solution, what is the final strength expressed as %w/v?

Original 14 g : 100 ml → 140 g : 1000 ml

Add 400 ml of water: 140 g : 1400 ml

140 g : 1400 ml → 10 g : 100 ml → **10% w/v**

## Dilutions

1. If you have stock of a medication that is given as 1 in 100, and you need to create 40 ml of a 1 in 200 solution, how many ml do you need to take from the concentrate?

1 in 200 is half the strength of 1 in 100, so take **20 ml**

Or

1. If you have a stock of medication that has strength 1 in 200, and you want to make 100 ml of a 1 in 1000 solution, how many ml do you need to take from the concentrate?

1 in 1000 is a 5 times dilution of 1 in 200, so need 100/5 = **20 ml**

1. If you want to make 200 ml of a medication that is 5% v/v, and you have stock medication that is 25% v/v, how much of the stock would you take?
2. How much of a 5 molar solution is required to produce 200 ml of a 1 molar solution?
3. How much of a 4 molar solution is required to produce 500 ml of a 500 millimolar solution?
4. If 100 ml of compound X in a 4 molar solution is required to react completely with 20 ml of compound Y, what is the strength of compound Y’s solution, assuming the reaction was 1X:1Y?
5. If 20 ml of compound X in a 2M solution is required to react completely with 4 ml of compound Y, what is the strength of compounds Y’s solution, if the reaction is 1X:1Y?
6. If 100 ml of compound X in a 5M solution is required to react completely with 20 ml of compound Y, what is the strength of compound Y’s solution if:
7. The reaction is 1X:1Y
8. The reaction is 1X:2Y
9. The reaction is 1X:5Y
10. The reaction is 2X:5Y
11. The reaction is 1X:0.5Y?