

# Math in biotechnology field

[Science](#), [Mathematics](#)



23 February Mathematics Assignment You are setting up a PCR reaction and the protocol asks you to add 0.5 ng of DNA to the reaction. You have a sample of DNA which is 5 mg/ml. Describe your approach to adding the same volume in parts per million to the reaction? Be specific, describe your dilutions, how much you will pipette, etc?

From the 5 mg/mL take 1  $\mu$ l and add 999  $\mu$ l or top it up to 1000  $\mu$ l, conc. = 5  $\mu$ g/mL

From the 5  $\mu$ g/ $\mu$ l, take 1  $\mu$ l and add 999  $\mu$ l or top it up to 1000  $\mu$ l, conc. = 5 ng/mL

5 ng/ml = 5 ng/1000  $\mu$ L

0.5 ng = 100  $\mu$ L

But 1 ppm = 1 ng/ $\mu$ L, (IUPAC, 1: Myron, 217)

Yet our target 0.5 ng is in 100  $\mu$ L (0.005 ng in 1  $\mu$ L)

Therefore, based on 1 ppm = 1 ng/ $\mu$ L, target volume 0.5 ng = 0.005 ppm

2- You are setting up a PCR reaction and the protocol asks you to add 0.2 ng of DNA to the reaction. You have a sample of DNA which is 3 mg/ml. Describe your approach to adding the same volume in parts per million to the reaction? Be specific, describe your dilutions, how much you will pipette, etc?

From the 3 mg/mL take 1  $\mu$ l and add 999  $\mu$ l or top it up to 1000  $\mu$ l, conc. = 3  $\mu$ g/mL

From the 3  $\mu$ g/ $\mu$ l, take 1  $\mu$ l and add 999  $\mu$ l or top it up to 1000  $\mu$ l, conc. = 3 ng/mL

3 ng/ml = 3 ng/1000  $\mu$ L

0.3 ng = 100  $\mu$ L

0. 2ng = 67uL

But 1ppm = 1ng/uL, (IUPAC, 1: Myron, 217)

Yet our target 0. 2ng is in 67uL (0. 00298ng in 1uL )

Therefore, based on 1ppm = 1ng/uL, target volume 0. 2ng/ul = 0. 00298ppm

3- You are setting up a PCR reaction and the protocol asks you to add 0. 9ng of DNA to the reaction. You have a sample of DNA which is 3mg/ml. Describe your approach to adding the same volume in parts per million to the reaction? Be specific, describe your dilutions, how much you will pipette, etc?

From the 3mg/mL take 1ul and add 999ul or top it up to 1000ul, conc.=  
3ug/mL

From the 3ug/ul, take 1ul and add 999ul or top it up to 1000ul, conc.=  
3ng/mL

3ng/ml = 3ng/1000uL

0. 3ng = 100ul

Therefore 0. 9ng = 300ul

But 1ppm = 1ng/uL, (IUPAC, 1: Myron, 217)

Yet our target 0. 9ng is in 300uL (0. 003ng in 1uL )

Therefore, based on 1ppm = 1ng/uL, target volume 0. 9ng/ul = 0. 003ppm

4- You are setting up a PCR reaction and the protocol asks you to add 3. 0ng of DNA to the reaction. You have a sample of DNA which is 8mg/ml. Describe your approach to adding the same volume in parts per million to the reaction? Be specific, describe your dilutions, how much you will pipette, etc?

From the 8mg/mL take 1ul and add 999ul or top it up to 1000ul, conc.=  
8ug/mL

From the 8ug/ul, take 1ul and add 999ul or top it up to 1000ul, conc.=  
8ng/mL

$8\text{ng/ml} = 8\text{ng}/1000\text{uL}$

8ng is in 1000ul

Therefore 3ng is in = 375ul

But 1ppm = 1ng/uL, (IUPAC, 1: Myron, 217)

Yet our target 3ng is in 375uL (0. 008ng in 1uL )

Therefore, based on 1ppm = 1ng/uL, target volume 3ng/ul = 0. 008ppm

5- You are setting up a PCR reaction and the protocol asks you to add 0. 6ng of DNA to the reaction. You have a sample of DNA which is 6mg/ml. Describe your approach to adding the same volume in parts per million to the reaction? Be specific, describe your dilutions, how much you will pipette, etc?

From the 6mg/mL take 1ul and add 999ul or top it up to 1000ul, conc.=  
6ug/mL

From the 6ug/mL, take 1ul and add 999ul or top it up to 1000ul, conc.=  
6ng/mL

$6\text{ng/ml} = 6\text{ng}/1000\text{uL}$

Therefore the 0. 6ng represents = 100ul

0. 6ng = 100ul

But 1ppm = 1ng/uL, (IUPAC, 1: Myron, 217)

Yet our target 0. 6ng is in 100uL (equivalent to 0. 006ng in 1uL )

Therefore, based on 1ppm = 1ng/uL, target volume 0. 6ng/ul = 0. 006ppm

Works cited

IUPAC, Compendium of Chemical Terminology, 997. Web. 22 Feb. 2015

Kaufman, Myron. Principles of thermodynamics. New York: CRC Press, 2002.

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