Combined Science - Biology - KS4
Cell Biology

Useful Maths skills

(Downloadable student document)

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OAK NATIONAL ACADEMY

Finding the mean

Finding the mean

$$Mean = \frac{Sum\ of\ all\ data}{Number\ of\ data\ points}$$

Attempt	1	2	3	4	5
Change in cell mass in grams	0.16	0.11	0.10	0.14	0.19

Sum of all data = 0.16 + 0.11 +0.10 + 0.14 +0.19 = 0.7

Mean = 0.7 ÷ 5 = 0.14g

Pause the video to complete your task

Quick concept check: Find the mean number of hours required for a cell cycle.

Trial	1	2	3	4	5
Time required to complete a cell cycle(hours)	22	19	18.5	21	25

Resume once you're finished

Answer

$$Mean = \frac{Sum\ of\ all\ data}{Number\ of\ data\ points}$$

Sum of all data = 22+19+18.5 +21+25 = 105.5

Mean = 105.5 ÷ 5 = 21.1 hours

Converting units and standard form

Converting the units

1 mm = 1000 µm

0.2mm = **200** µm

3.4 mm =3400µm

Expressing numbers in standard form

We have learnt that 1 mm = 1000 µm.

So, 100mm = ____?_____ µm

100 x 1000 = 100,000µm

We can express 100,000µm in standard form.

$100{,}000\mu m = 1 \times 10^{5}\ \mu m$

Order of magnitude and standard form

Let's try these two questions together:

1. Express 35mm in μm. Make sure your answer is in standard form. **35mm = 35 x 1000μm = 35,000μm**

35,000μm = 3.5 x 10,000= 3.5 x 10 x10 x10 x10 = 3.5 x 10^4 μm

2. Express 90mm in μm. Make sure your answer is in standard form. **90mm = 90 x 1000μm = 90,000μm**

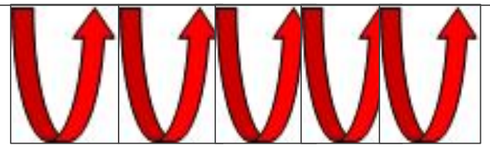
90,000μm = 9 x 10,000= 9 x 10 x10 x10 x10 = 9 x 10^4 μm

Using standard form to express small numbers

There is a cell of 0.00001 μm.

We can also express this in standard form.

$0.00001\ \mu m = 1 \times 10^{-5} \mu m$



Using standard form to express small numbers

There is a cell of 0.0005 mm.
Express the above in standard form.

$0.0005\ mm = 5 \times 10^{-4} mm$

There is a cell of 0.007 μm.
Express the above in standard form.

$0.007\ \mu m = 7 \times 10^{-3} mm$

Pause the video to complete your task

Express the following measurements in standard form.

1. 329,000μm = _____μm
2. 9.5 mm = _____μm
3. 256,000μm = _____mm
4. 183,000 μm = _____mm

Resume once you're finished

Pause the video to complete your task

Express the following measurements in standard form.

1. **329,000µm = _____µm**
2. **9.5 mm = _____µm**
3. **256,000µm = _____mm**
4. **183,000 µm = _____mm**

Answers:

1. 3.29×10^5 µm
2. 9.5×10^3 µm
3. 2.56×10^2 mm
4. 1.38×10^2mm

Resume once you're finished

Using the magnification equation

Finding the magnification using the magnification equation

$$\text{Magnification} = \frac{\textbf{Image size}}{\textbf{Actual size}}$$

E.g. Calculate the magnification of an object that is **0.001mm** long but has an image **100mm** long.

$$\frac{\textbf{100}}{\textbf{0.001}} = 100{,}000\text{x}$$

Finding the actual size of cells

What is the actual size of an object that looks **32 mm** under a **10x** magnification?

$$\text{Magnification} = \frac{\text{Image size}}{\text{Actual size}}$$

$$10 = \frac{32}{\text{Actual size}}$$

$$\textbf{Actual size} = \frac{32}{10} = \textbf{3.2mm}$$

Finding the image size

E.g. A cell that is **20µm** long is viewed under 2000x magnification. How long is the image?

$$\text{Magnification} = \frac{\textbf{Image size}}{\textbf{Actual size}}$$

$$2000 = \frac{\textbf{Image size}}{\textbf{20}}$$

Image size = 2000 x **20** = **40,000µm**

= **40mm**

Pause the video to complete your task

What is the magnification?

The width of the root is 45mm under the microscope while its actual size is 150µm. What is the magnification?

Resume once you're finished

Pause the video to complete your task

What is the magnification?

The width of the root is 45mm under the microscope while its actual size is 150µm. What is the magnification?

$$\frac{\textbf{45mm}}{\textbf{150µm}}$$

$$= \frac{\textbf{45,000µm}}{\textbf{150µm}}$$

$$= \textbf{3000x}$$

Resume once you're finished

Finding the percentage changes

Finding the percentage change

Steps 1: find the change

Step 2: apply

$$\text{Percentage change} = \frac{change}{starting\ value} \times 100$$

There is a piece of carrot. The carrot had a mass of 3g before being put complete into water. After one hour, the carrot was removed from the water, blotted dry and weighed. The mass of the carrot was 3.5g. Calculate the percentage change in mass.

The change = 3.5 - 3 = 0.5

Percentage change= 0.5 ÷ 3 x 100 = 16.7%.

Finding the percentage change

Steps 1: find the change

Step 2: apply

$$\text{Percentage change} = \frac{change}{starting\ value} \times 100$$

There is a piece of carrot. The carrot had a mass of 3g before being put complete into brine. After one hour, the carrot was removed from the water, blotted dry and weighed. The mass of the carrot was 2.5g. Calculate the percentage change in mass.

The change = 2.5 - 3 = -0.5

Percentage change = -0.5 ÷ 3 x 100 = -16.7%.

Pause the video to complete your task

Complete the table below.

Concentration of sugar solution (mol/dm^3)	Starting mass of potato cylinder (g)	Final mass of potato cylinder(g)	Change in mass of potato cylinder (g)	Percentage change in mass of potato cylinder (%)
0	2.60	3.07	0.47	
0.1	2.81	3.14		
0.2	2.69	2.72		
0.3	2.8	2.35		
0.4	2.65	2.05		

Resume once you're finished

Answers

Concentration of sugar solution (mol/dm^3)	Starting mass of potato cylinder (g)	Final mass of potato cylinder(g)	Change in mass of potato cylinder (g)	Percentage change in mass of potato cylinder (%)
0	2.6	3.1	0.47	18.1
0.1	2.8	3.1	0.33	11.7
0.2	2.7	2.7	0.03	1.1
0.3	2.8	2.4	-0.5	-16.1
0.4	2.7	2.1	-0.6	-22.6