**Percentages**

1. What does the word ‘**percent**’ mean?
2. State the equation for calculating percentage change.
3. For each of the following calculate the percentage increase.

***Show all of your workings to an appropriate number of decimal places.***

* 1. Start mass = 2.6g; Final mass = 2.7g 6. Start mass = 1.7g; Final mass = 2.3g
  2. Start mass = 1.7g; Final mass = 1.9g 7. Start mass = 2.3g; Final mass = 2.6g
  3. Start mass = 3.2g; Final mass = 3.7g 8. Start mass = 2.5g; Final mass = 2.6g
  4. Start mass = 2.6g; Final mass = 2.9g 9. Start mass = 2.3g; Final mass = 2.7g
  5. Start mass = 1.2g; Final mass = 1.5g 10. Start mass = 1.8g; Final mass = 2.1g

1. For each of the following calculate the percentage decrease.

***Show all of your workings to an appropriate number of decimal places.***

* 1. Start mass = 2.6g; Final mass = 2.3g 6. Start mass = 1.7g; Final mass = 1.5g
  2. Start mass = 2.9g; Final mass = 2.7g 7. Start mass = 2.3g; Final mass = 2.1g
  3. Start mass = 2.6g; Final mass = 2.1g 8. Start mass = 2.1g; Final mass = 1.8g
  4. Start mass = 1.6g; Final mass = 1.3g 9. Start mass = 1.8g; Final mass = 1.6g
  5. Start mass = 1.2g; Final mass = 1.0g 10. Start mass = 3.1g; Final mass = 2.7g

1. For each of the following calculate the percentage change.

***Show all of your workings to an appropriate number of decimal places.***

* 1. Start mass = 2.6g; Final mass = 2.9g 6. Start mass = 1.1g; Final mass = 1.5g
  2. Start mass = 2.7g; Final mass = 2.7g 7. Start mass = 2.1g; Final mass = 2.7g
  3. Start mass = 2.3g; Final mass = 2.1g 8. Start mass = 2.1g; Final mass = 2.8g
  4. Start mass = 1.6g; Final mass = 1.8g 9. Start mass = 1.8g; Final mass =1.3g
  5. Start mass = 1.2g; Final mass = 1.8g 10. Start mass = 3.2g; Final mass =2.7g

1. Find the number from the following percentages.

***Show all of your workings to 2 s.f.***

* 1. What is 10% of 90?
  2. What is 5% of 105?
  3. What is 50% of 62?
  4. What is 17% of 54?
  5. What is 15% of 72?
  6. What is 67% of 109.3?

**Examination style questions**

**1** A student cut some cores from a turnip. They placed the cores into difference sugar concentrations to estimate the concentration of the solution inside the turnip cells.

Here are their results:

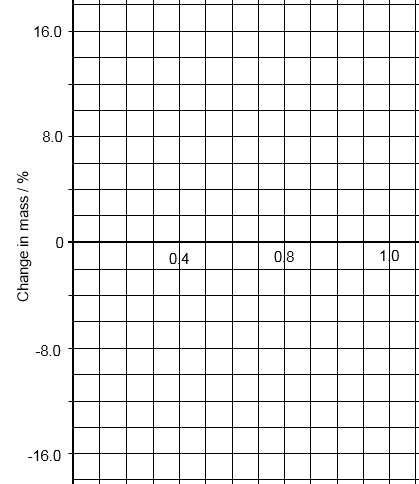
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Concentration of sucrose solution/ M** | **Start mass/ g** | **Final mass/ g** | **Change in mass/ g** | **Percentage change in mass/ %** |
| 0.0 | 1.30 | 1.51 |  |  |
| 0.2 | 1.32 | 1.47 |  |  |
| 0.4 | 1.34 | 1.39 |  |  |
| 0.6 | 1.22 | 1.21 |  |  |
| 0.8 | 1.30 | 1.19 |  |  |
| 1.0 | 1.33 | 1.15 |  |  |

**(a)** Calculate the change in mass and percentage change in mass for each turnip core.

**(b)** Plot a graph of the percentage change in mass against the concentration of sucrose solution.

Your graph should include:

* A label for the x-axis
* Line of best fit



**(c)** Why calculate the **percentage change in mass** in addition to the **change in mass**?

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**(d)** Identify the **anomalous result**.

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**(e)** Use the graph to estimate the concentration of the solution inside the turnip cells.

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**(e)** Identify two possible sources of error in the investigation.

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**Answers**

**Percentages**

**a** Out of 100

**b** % change = (Change ÷ Original) x 100

**c** **(1)** +3.8% **(6)** +35.3%

**(2)** +11.8% **(7)** +13.0%

**(3)** +15.6%  **(8)** +4.0%

**(4)** +11.5% **(9)** +17.4%

**(5)** +25.0% **(10)** +16.7%

**d** **(1)** -11.5% **(6)** -11.8%

**(2)** -6.9% **(7)** -8.7%

**(3)** -19.2%  **(8)** -14.3%

**(4)** -18.8% **(9)** -11.1%

**(5)** -16.7% **(10)** -12.9%

**e** **(1)** +11.5% **(6)** +36.4%

**(2)** 0% **(7)** +28.6%

**(3)** -8.7% **(8)** +33.3%

**(4)** +12.5% **(9)** -27.8%

**(5)** +50.0% **(10)** -15.6%

**f** **(1)** 9.0 **(4)** 9.2

**(2)** 5.3 **(5)** 11

**(3)** 31 **(6)** 73

**Examination style questions**

**1** **(a)**

|  |  |  |
| --- | --- | --- |
| **Concentration of sucrose solution/ M** | **Change in mass/ g** | **Percentage change in mass/ %** |
| 0.0 | **0.21** | **+16.2** |
| 0.2 | **0.15** | **+11.1** |
| 0.4 | **0.05** | **+3.8** |
| 0.6 | **-0.01** | **-0.8** |
| 0.8 | **-0.11** | **-9.0** |
| 1.0 | **-0.18** | **-13.5** |

**(b)** Correct plot; labelled axes; line of best fit

**(c)** Allows comparison; different starting masses/ sizes

**(d)** 0.6M sucrose solution

**(e)** Concentration of solution; drying chops; accuracy of balance; water evaporation from solution.