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| **Science (S1-3)** **Updated Curriculum (2017)** |

**Unit 6 Matter as Particles**

**Rainbow Column**

**(Teacher’s Version)**

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| **Unit 6 Matter as Particles**Topic: DensityEstimated lesson time: 80 mins |

**Rainbow Column**

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| **[ Learning Objectives ]**After this learning activity, students should be able to 1. find out the densities of water and sugar syrup;
2. prepare solutions with different densities using different amount of sugar syrup and water;
3. make a rainbow column; and
4. design a new dessert with rainbow column.
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**A. Concept Review**

1. Write down the formula of density.

**Density =** $\frac{mass}{volume}$

 2. Write down the unit of density.

**The unit of density** **is** g / cm3.

3. Fill in the blanks.

 When an object sink, its \_\_\_\_density \_\_\_\_\_\_ is \_\_higher\_\_\_\_ than that of its surrounding.

 When an object float, its \_\_\_density\_\_\_\_\_\_\_ is \_\_lower\_\_\_\_ than that of its surrounding.

1. **Density of solutions**

Find the densities of water and sugar syrup.

**A. Materials**

● 30 mL water ● 30 mL sugar syrup

● 100 mL beaker × 2 ● 10 mL measuring cylinder × 2

● dropper × 2 ● electronic balance × 1

● labels × few

**B. Procedure**

1. Take a 100 mL beaker with 30 mL sugar syrup from the teacher’s desk. Label it as ‘syrup’.
2. Add about 30 mL tap water into another 100 mL beaker. Label it as ‘water’.
3. Label a measuring cylinder as ‘syrup’.
4. Place the measuring cylinder on an electronic balance. Record the mass of the empty measuring cylinder.
5. Add 10 mL sugar syrup into the measuring cylinder. Record the mass of the measuring cylinder with sugar syrup.
6. Label another measuring cylinder as ‘water’.
7. Repeat steps 4 - 5 using the measuring cylinder labelled with ‘water’ with tap water.
8. After recording the mass, find the density of the two solutions.

**C. Result**

 Complete the following table.

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| **Solution** | **Volume of solution****(cm3)** | **Mass of**  | **Density****(unit: g/cm3 )** |
| **empty measuring cylinder (g)** | **measuring cylinder with solution (g)** | **solution****(g)** |
| Sugar syrup | 10 | 36.7 | 49.7 | 13.0 | 1.3 |
| Water | 10 | 37.4 | 47.4 | 10 | 1.0 |

1. **Rainbow column**

**Task: Make a rainbow column with five layers of different colours in a test tube with water and sugar solution**.

**A. Planning**

*Guiding questions:*

1. How are you going to prepare the five layers of solutions?

To prepare five solutions with different densities.

1. How are you going to make different colours to the layers of the solutions?

To add different dyes to the solutions.

*Tips:*

In order to prepare five solutions of different densities with water and sugar syrup, suggest the total volume to be made up for each solution, and the amount of water and sugar solution to be used for each solution. Then calculate the density of each solution.

Total volume of each solution to be prepared : 4 cm3 .

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| --- | --- | --- | --- | --- |
|  | **Volume of water****(cm3)** | **Volume of sugar syrup****(cm3)** | **Density of solution****(unit:** g/cm3 **)** | **Order of solutions to be added into the test tube** **(Rainbow column)** |
| Solution A | 4 | 0 | =$ $1.0 | 5th |
| Solution B | 3 | 1 | = $\frac{1×3+1.3×1}{4}$ = 1.075 | 4th |
| Solution C | 2 | 2 | = $\frac{1.3×2+1×2}{4}$ = 1.15 | 3rd |
| Solution D | 1 | 3 | = $\frac{1×1+1.3×3}{4}$ = 1.225 | 2nd |
| Solution E | 0 | 4 | =$ $1.3 | 1st |

* The above solutions will be added one by one into a test tube to make up a rainbow column. Which one should be added first into the test tube?

Solution \_\_\_\_E\_\_\_\_\_\_ because it has the \_\_\_\_highest\_\_\_\_\_\_\_\_\_ density.

* Fill in the order of solutions to be added into the test tube in the above table.

**B. Apparatus and materials**

● 30 mL water ● 30 mL sugar syrup

● 100 mL beaker × 2 ● 10 mL measuring cylinder × 2

● dropper × 6 ● glass rod × 1

● dye × 5 ● test tube × 6

● test tube rack × 1 ● labels × few

**C. Procedure**

1. Prepare 5 solutions of different densities in 5 different test tubes according to the suggested amount of water and sugar syrup in the table in Part A. Label the test tubes properly.
2. Add a drop of dye of different colour into different test tubes and mix well by a glass rod.
3. Transfer the solutions one by one into a test tube according to the order listed in the table in Part A. You may decide by your own the amount of each solution to be added.

(Reminder: Transfer the solution gentlly to prevent it from mixing with other solutions.)

**D. Result**

 Paste a photo of your rainbow column or draw the rainbow column in the box below.

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**E. My design of dessert**

Hong Kong people love to enjoy dessert, which always instantly boost people mood and make them feel better. Apply the concepts involved in making a rainbow column to design a new dessert. You may try the idea of food fusion with other dessert. Please show your design by drawing and words.

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End