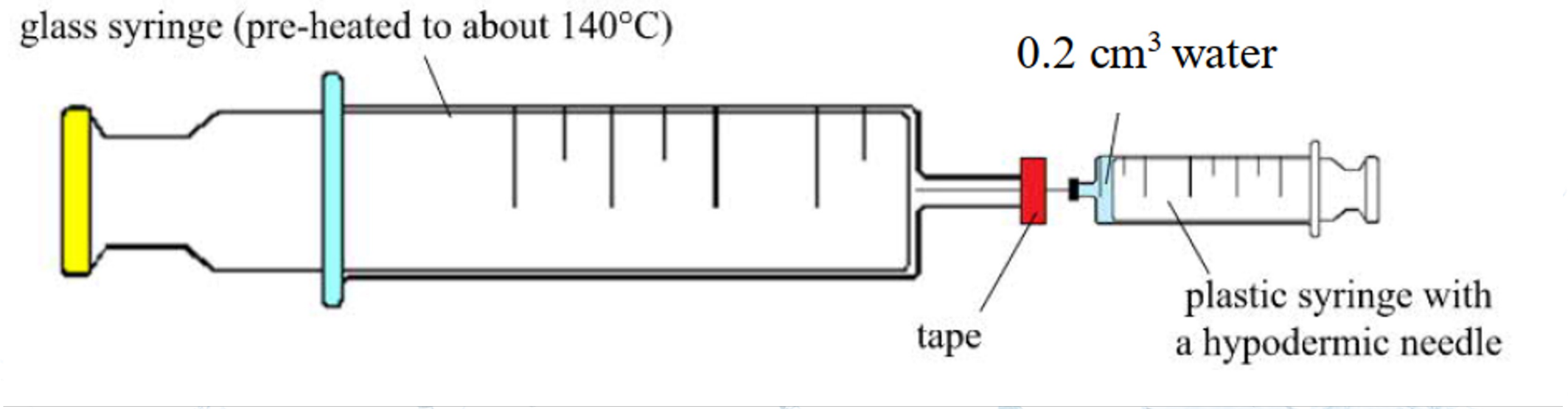
Promoting the Use of Educational Technology in Learning and Teaching in Science (S1-3) Learning and Teaching Resources

Thermal expansion and contraction

Thermal expansion & contraction

Integrated Science (Secondary 1)

Let’s predict what will happen inside the hot syringe:



Part 1:

"What would happen when the 0.2 cm^3 water is injected into the 140°C hot glass syringe?"

(1) predict what they can observe in the set-up;
(2) propose reasons for their predictions.

Part 2:

Share your ideas in groups. Come to a consensus on your group's predictions and explanations.

Make sure that your group's explanations include the following information:

(1)the substance(s) inside the syringe, and

(2)how particles are arranged in the substance(s).

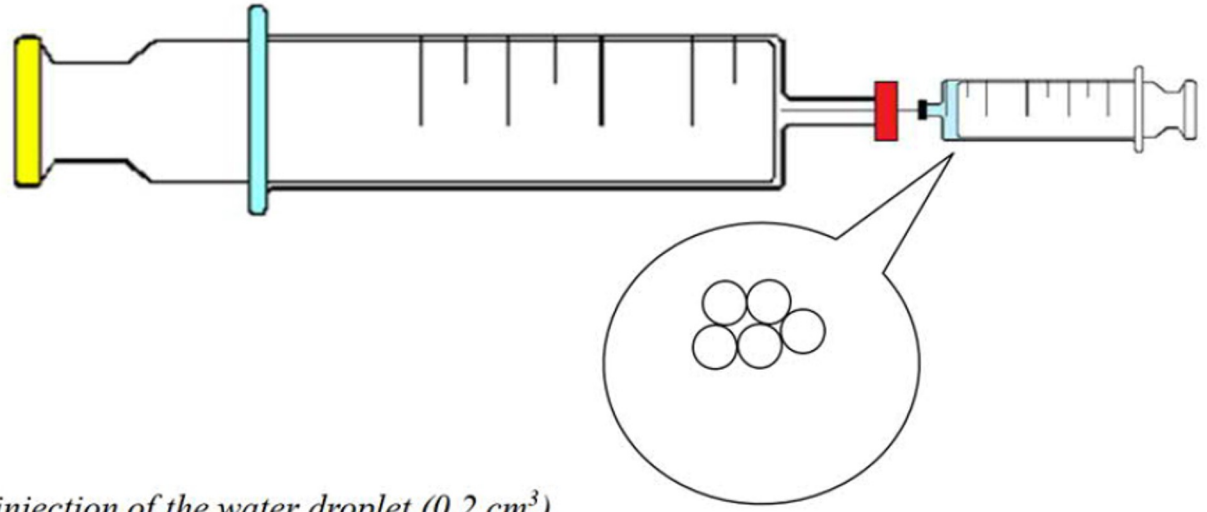
Demonstration ❶

1. Watch the demonstration carefully.
2. Record your observations and inference in the demonstration
   - Volume inside the hot syringe
   - Movement of the plunger
   - Substance in the syringe

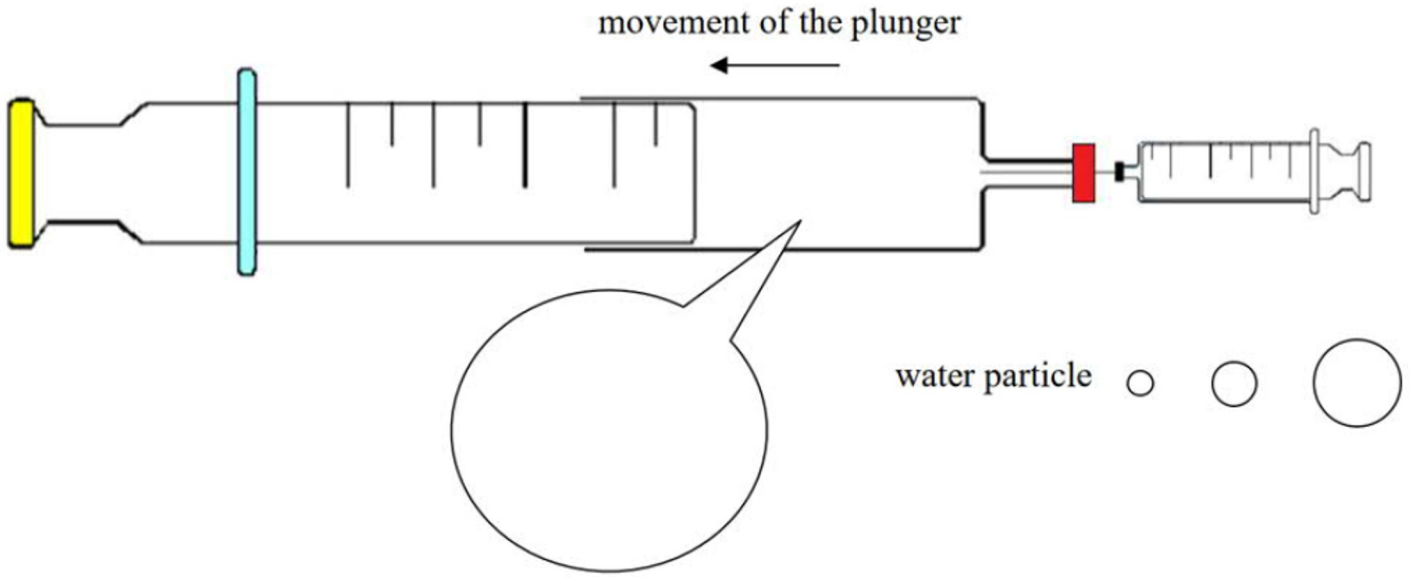
Demo V1

- Construct a diagram to show the particle arrangement of the substance inside the syringe after injection of the water droplet on the *Drag Game* platform.

Before the injection of the water droplet (0.2 cm^3)



After the injection of the water droplet (0.2 cm^3)



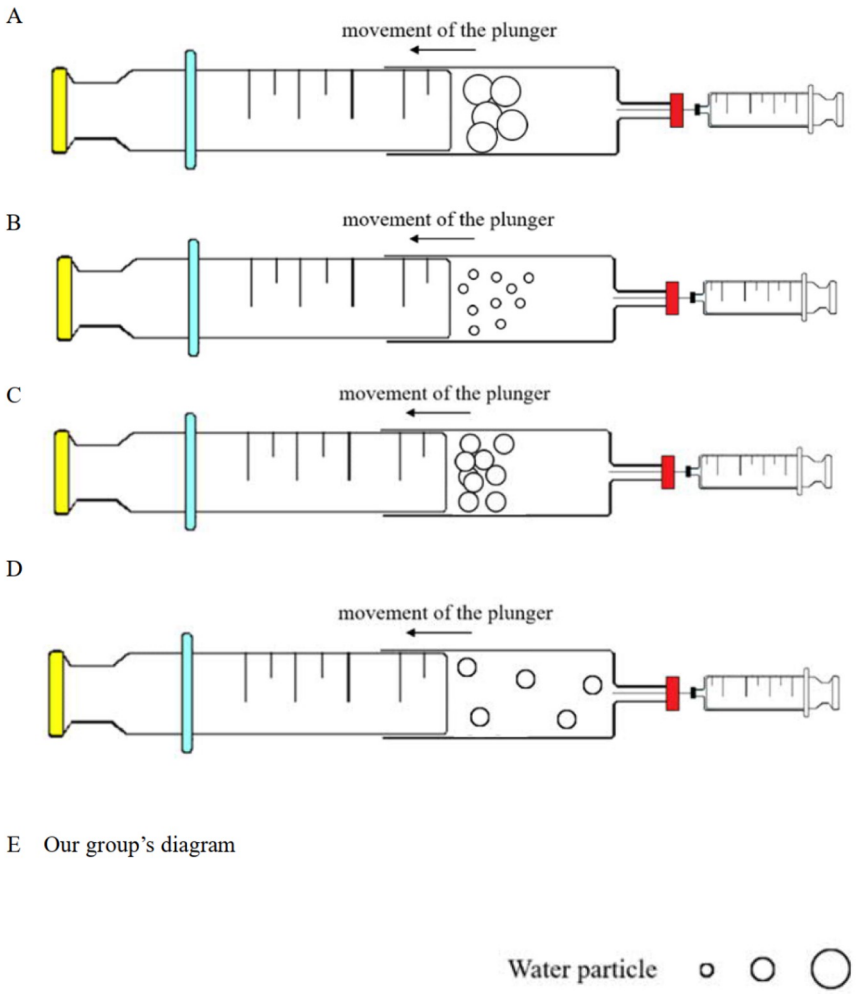
https://draggame.e-learning.hk/en/templates/291/view/

Share your ideas
with your classmates.

In a group, read the 4 diagrams and your groupmates' diagrams:

(1) evaluate which diagram best represents what happens at the particle level for explaining the macroscopic observations in the demonstration.

(2) give reasons for their choice.



Consider the following questions:

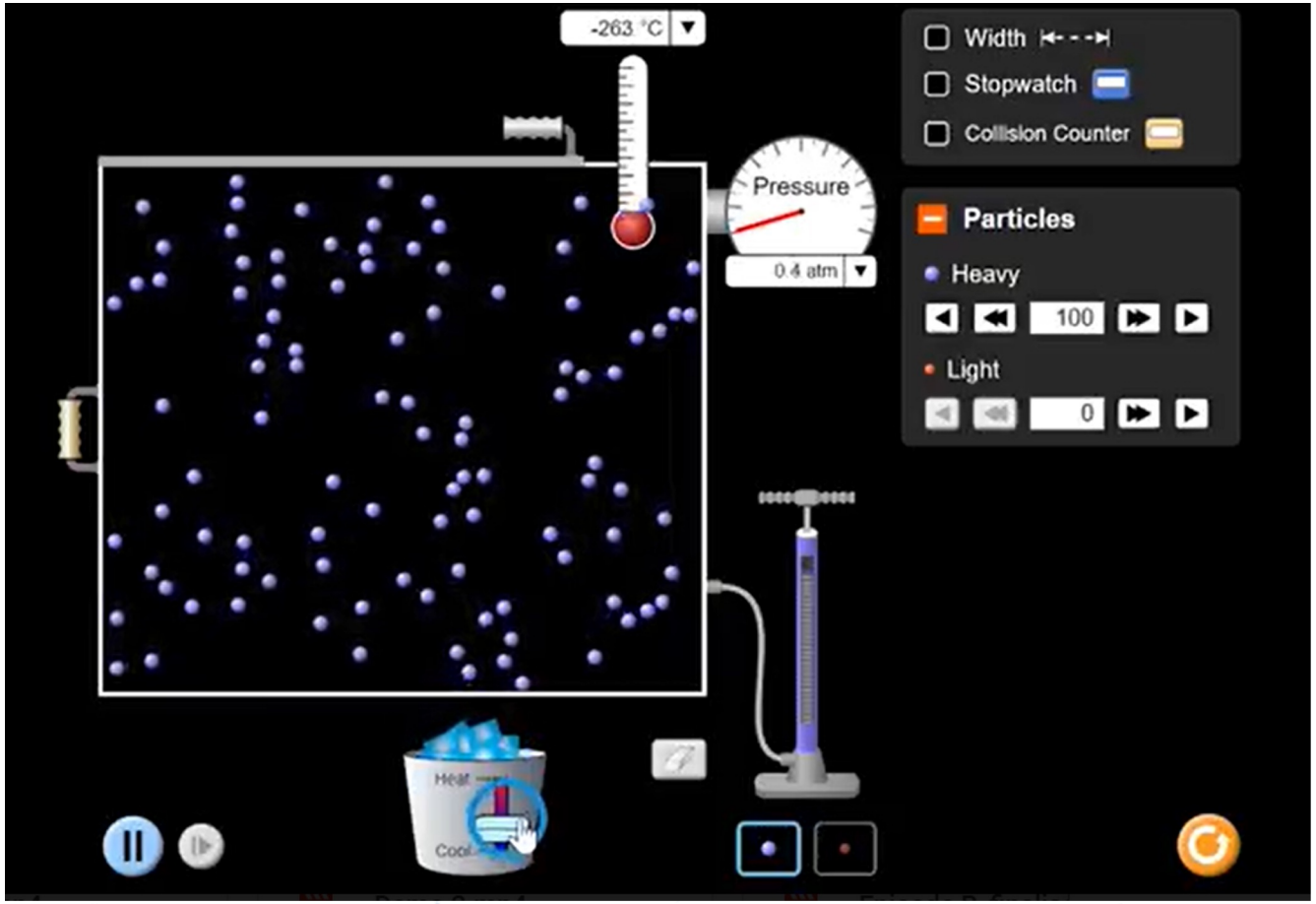
- Should the number of water particles change? Why?
- Should the size of the water particles change? Why?
- What should the distribution of the water particles be? Why?

Our class’s idea

	Group
A	
B	
C	
D	

Share your ideas with your classmates.

- We think that diagram _____ best represents what happens at the particle level ….. *because*
- *Why* did the volume inside the syringe change?



- Observe carefully
- Describe what happens to the particles when temperature increases

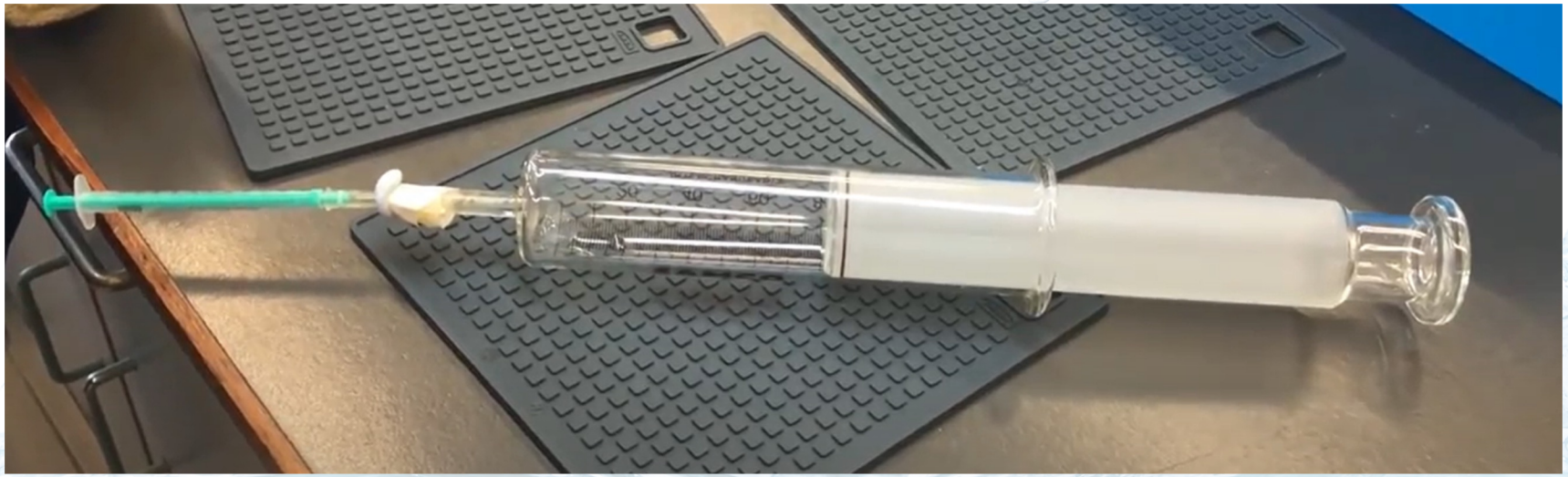
Animation V1

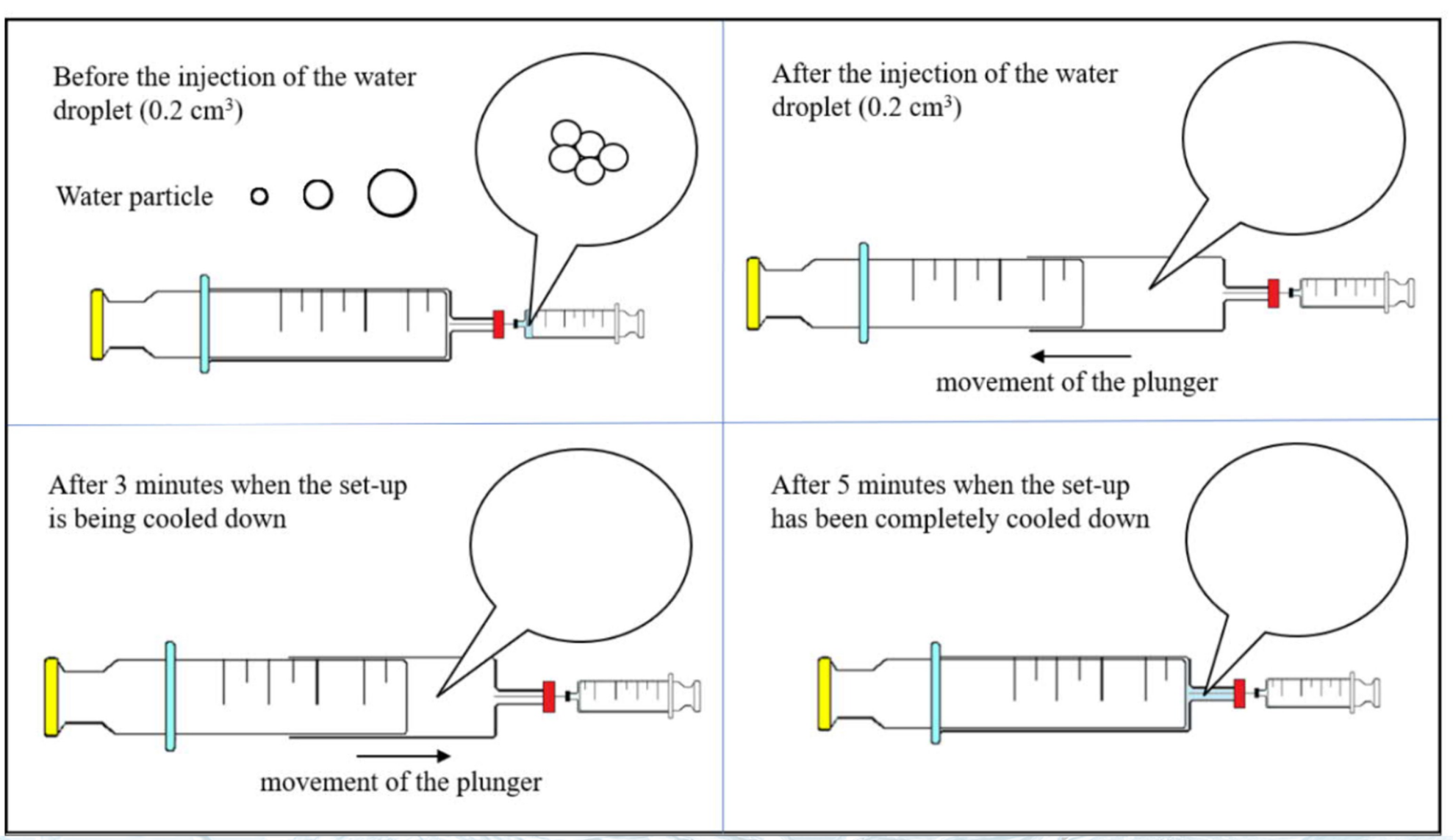
https://phet.colorado.edu/sims/html/gases-intro/latest/gases-intro_en.html

Demonstration ❷

Demo V2

“What would happen to the substance inside the syringe at the particle level when the hot glass syringe is being/has been cooled down? Why?”





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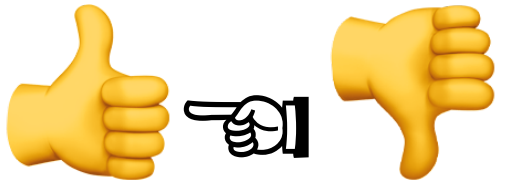
Share your ideas with your neighbour.

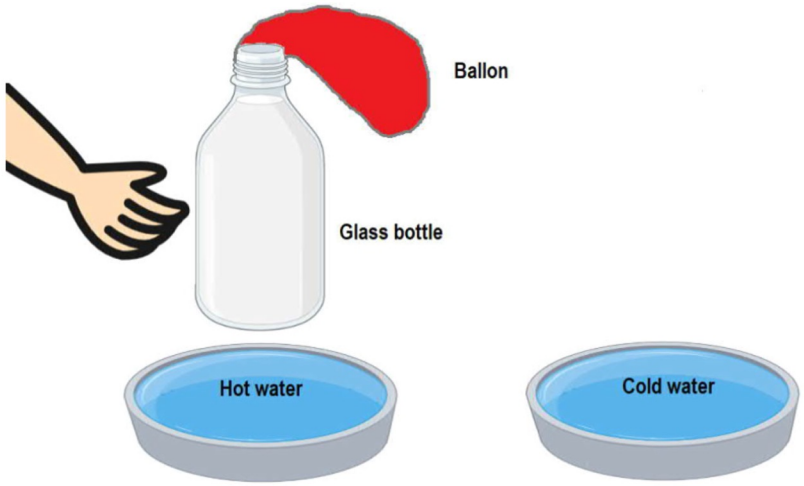
Let’s self assess if we can: 

- describe and explain volume expansion as a result of vaporisation of water using particle level diagrams
- describe and explain volume contraction as a result of condensation of water using particle level diagrams

- make accurate scientific observations and measurements
- create and evaluate particle level diagrams for explaining macroscopic observations related to thermal expansion and contraction

Assignment

1. An empty glass bottle is fitted with a deflated balloon on its mouth. Using particle level diagrams, describe and explain what would happen to the balloon and why things would happen when it is placed in hot water and then in cold water.



"What would happen when the bottle is put into hot water and into cold water?"

What would happen at the particle level (Note: Draw the balloon only):

Developed by Faculty of Education, The University of Hong Kong