

# Particles in Motion – Q1

## Points to ponder

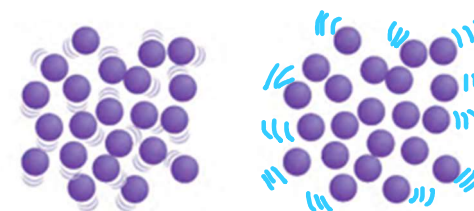
- ✓ Particles in liquid and gas are in random motion.
- ✓ **Random motion** – the movement in all directions at different speeds.
- ✓ **Diffusion** is the movement of particles from an area of higher concentration to an area of lower concentration.
- ✓ The speed of diffusion depends on the **temperature** of the liquid.
  - the **higher** the temperature, the **faster** the diffusion.
  - **faster** molecules have **high kinetic energy** (the energy of moving particles is called kinetic energy).



**Q1:**

- a) Which beaker has hot water? Beaker B  
b) Which beaker has cold water? Beaker A

**Q2: Add** motion lines to the liquid particles model on the right to show they are moving faster than the liquid particles on the left.



Model A

Model B

- (b) The energy of moving particles is called the Kinetic energy.  
(c) Which model has more kinetic energy? Model B

# Particles in Motion – Q1

6

Explain how the particle movement and collision allow the spread of matter in terms of diffusion

Textbook, figures, investigation

12, 13, 14

1) The energy of motion is called \_\_\_\_\_ energy.

## Correct Answer

kinetic

3) Temperature is a measure of \_\_\_\_ of the particles in an object.

- A) the difference between the potential energy and kinetic energy
- B) the sum of the potential energy and kinetic energy
- C) the average potential energy
- D) the average kinetic energy

## Correct Answer

D) the average kinetic energy

4) Kinetic energy is the energy of \_\_\_\_\_.

## Correct Answer

motion

16) At which temperature are the particles in a pencil moving the fastest?

- A) 50°C
- B) 40°C
- C) 30°C
- D) 20°C

## Correct Answer

A) 50°C

5) When temperature increases, average \_\_\_\_\_ increases.

- A) potential energy
- B) kinetic energy
- C) gravitational potential energy
- D) chemical energy

## Correct Answer

B) kinetic energy

# Particles in Motion – Q1

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Explain how the particle movement and collision allow the spread of matter in terms of diffusion

Textbook, figures, Investigation

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1) The measure of the average kinetic energy of the particles of a substance is its \_\_\_\_\_.

- A) temperature
- B) heat
- C) thermal energy
- D) kinetic energy

## Correct Answer

A) temperature

2) Which of the following statements about the particles in a material is true?

- A) The average kinetic energy of the particles increases as the temperature increases.
- B) The average kinetic energy of the particles decreases as the temperature increases.
- C) The average kinetic energy of the particles in a substance never changes.
- D) There is no relationship between kinetic energy and temperature.

## Correct Answer

A) The average kinetic energy of the particles increases as the temperature increases.

# Particles in Motion – Q2

7

Define thermal expansion and thermal contraction and compare between them according to: energy change, temperature, particle movement, volume, ... Etc.

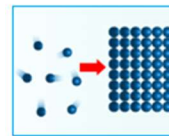
textbook, figures, 3D

17, 18, 19

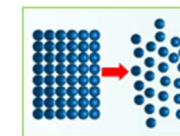
## Points to ponder

- ✓ As the **temperature** of a material **increases**, its particles **move faster**. This will cause the following:
  - i) the particles **move farther** apart.
  - ii) the particles **collide** with each other.
  - iii) the **volume** of the material **increases**.
  - iv) the **mass** of the material doesn't change.
  - v) the **number** of particles doesn't change.
  - vi) the **energy** of the particles would **increase**.
- ✓ **Thermal expansion** – the **increase** in volume of a material as temperature increases.
- ✓ **Thermal contraction** – the **decrease** in volume of a material as temperature decreases.

**Q1:** State whether the matter **Contract** or **Expand**?





Contract



Expand

**Q2:** Complete the table below using the words given in.

	Temperature of the Air (High/Low)	Speed of the particles (Fast/Slow)	Kinetic energy of particles (High/Low)	Space between the particles (Large/Small)	Volume of the Air (Increased/Decreased)
	Low	Slow	Low	Small	decreased
	High	Fast	High	Large	increased

# Particles in Motion – Q2

7

Define thermal expansion and thermal contraction and compare between them according to: energy change, temperature, particle movement, volume, ... Etc.

textbook, figures, 3D

17, 18, 19

4) When a substance is heated, the particles gain energy and move apart, increasing the volume. The mass of the substance being heated \_\_\_\_\_.

- A) increases
- B) decreases
- C) stays the same
- D) varies unpredictably

## Correct Answer

C) stays the same

6) Bars of different metals are all heated to 100°C to determine how their volume and length would be affected. Which statement describes the most likely outcome of this experiment?

- A) All of the volumes change and so do their lengths.
- B) All of the volumes change, but the lengths remain the same.
- C) The volumes and lengths do not change.
- D) All of the volumes change the same amount and the lengths remain constant.

## Correct Answer

A) All of the volumes change and so do their lengths.

7) A liquid thermometer works because liquid \_\_\_\_ when warmed.

- A) expands
- B) contracts
- C) solidifies
- D) condenses

## Correct Answer

A) expands

5) When a substance is cooled it usually expands.

- True
- False

## Correct Answer

False

# Particles in Motion – Q2

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Define thermal expansion and thermal contraction and compare between them according to: energy change, temperature, particle movement, volume, ... Etc.

textbook, figures, 3D

17, 18, 19

4) When a substance is heated, the particles gain energy and move apart, increasing the volume. The mass of the substance being heated \_\_\_\_\_.

- A) increases
- B) decreases
- C) stays the same
- D) varies unpredictably

## Correct Answer

C) stays the same

15) Most materials \_\_\_\_ when they are heated.

- A) condense
- B) freeze
- C) expand
- D) contract

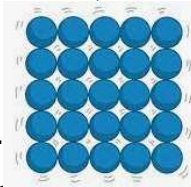
## Correct Answer

C) expand

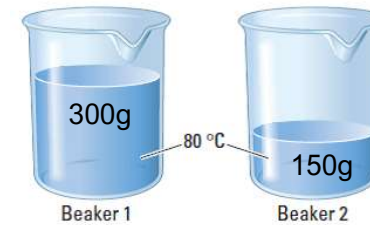
# Particles in Motion – Q3

## Points to ponder

- ✓ Particles in a solid are unable to move, they just vibrate.
  - they vibrate faster when heat (energy) is added.
  - they vibrate faster when temperature is increased.
  - they vibrate slower when cooled (heat removed).
  - they vibrate slower when temperature is decreased.
- ✓ **Temperature** is the average kinetic energy of the particles.
- ✓ Total energy is more when the material has more particles (more mass).
- ✓ If the temperature of the two water samples are the same, the sample with more mass will contain more energy.

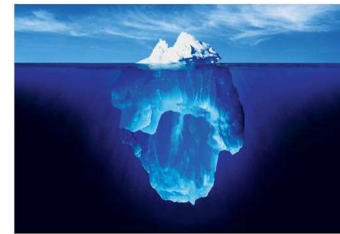


**Q1:** The picture below shows two beakers of water with the same temperature. Which beaker has more energy?



Beaker 1 has more energy as it has more mass and more particles.

**Q2:** Consider an iceberg and a hot cup of tea. Compare the two in terms of temperature and thermal energy.



The tea has a higher temperature, but the iceberg has more thermal energy, because it has so many more particles than the tea.