# GRADE 7 SCIENCE

## Unit 2: Heat

## Chapter 5: *Scientists use the Particle Theory of Matter to describe temperature.*

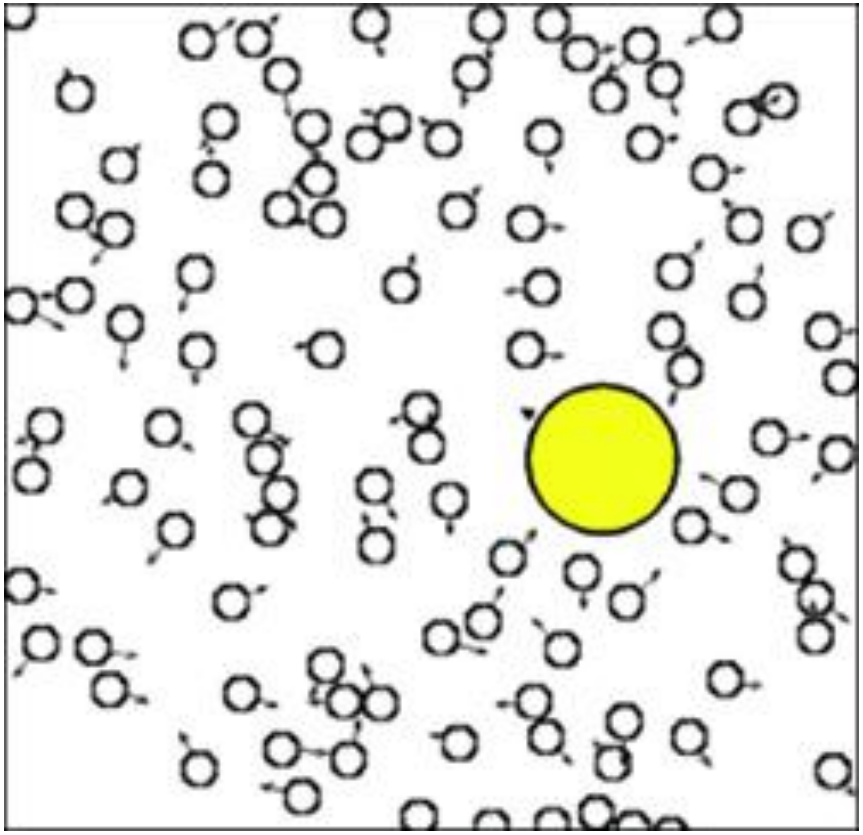
# MATTER

- Anything that takes up space and has mass.

# THE PARTICLE THEORY OF MATTER… (PTM)

- All matter is made up of tiny particles.
- These particles are always moving – they have energy. The more energy they have, the faster they move.

- There is space between all particles.
- There are attractive forces between the particles.
- The particles of one substance are the same but differ from another substance.



Temperature: The average energy of the particles of a substance.

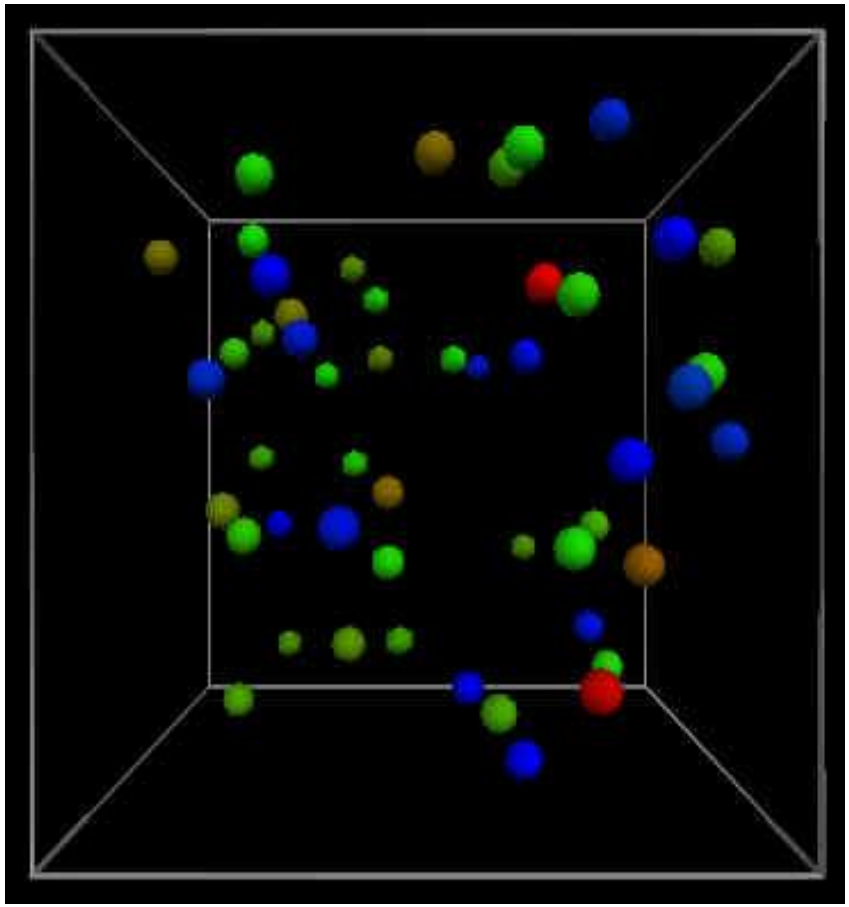
# QUESTION TO DISCUSS

"All particles in a glass of room temperature water are moving at the same speed."

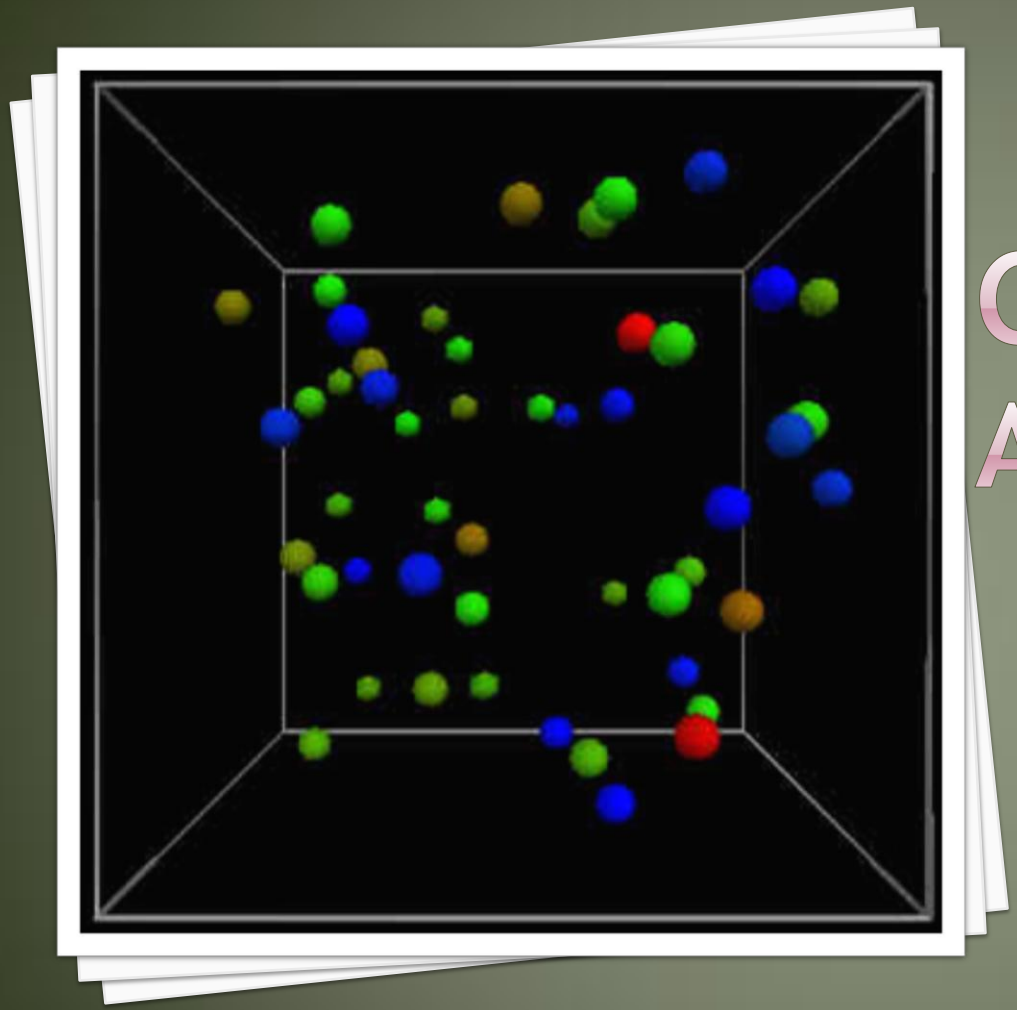
*Explain whether this statement is true or false.*

# KINETIC ENERGY

- The energy of movement.
- Temperature is then a measure of the average kinetic energy of the particles of a substance.



*Each color represents a particle of a varying speed. The average of these energies would be the temperature.*



# COMPLETE ACTIVITY 5-1 B

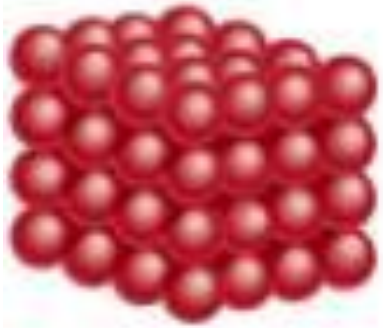
Average Kinetic Energy

*Page 137*

# STATES OF MATTER



Solid



Liquid

Gas

# THREE STATES OF MATTER... A COMPARSION

| | SOLID | LIQUID | GAS |
|---|---|---|---|
| VOLUME | Fixed | Fixed | Expands to fit the container |
| SHAPE | Fixed | Takes the shape of the container | Takes the shape of the container |
| PARTICLE ARRANGEMENT | Strong attractive forces – closer together | Moderate attractive forces – loosely held together | Weak attractive forces - very loosely held together |
| PARTICLE MOVEMENT | Vibrate | Slide past one another | Very quickly |

# EXPANSION VS. CONTRACTION

## Expansion

- Increasing the volume of a substance

## Contraction

- Decreasing the volume of a substance

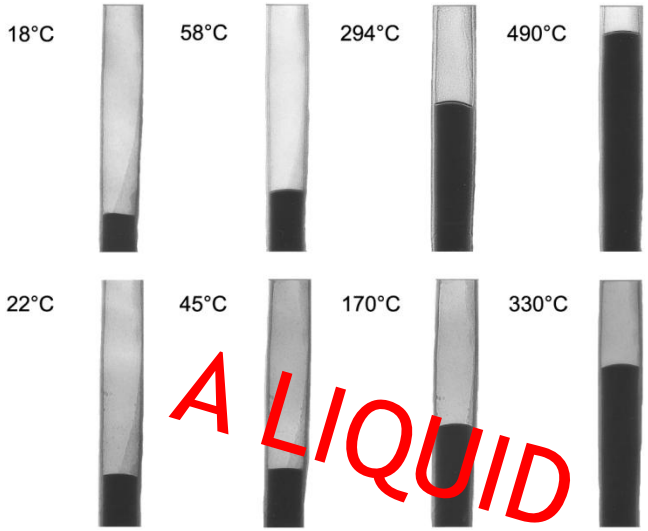
# EXPANSION

- When the particles are heated, they gain energy, move faster, spread out and take up more space thereby increasing their volume.

# CONTRACTION

- When the particles are cooled, they lose energy, move slower, move closer together and take up less space thereby decreasing their volume.






*Why do we need to be concerned with expansion and contraction in the above pictures?*

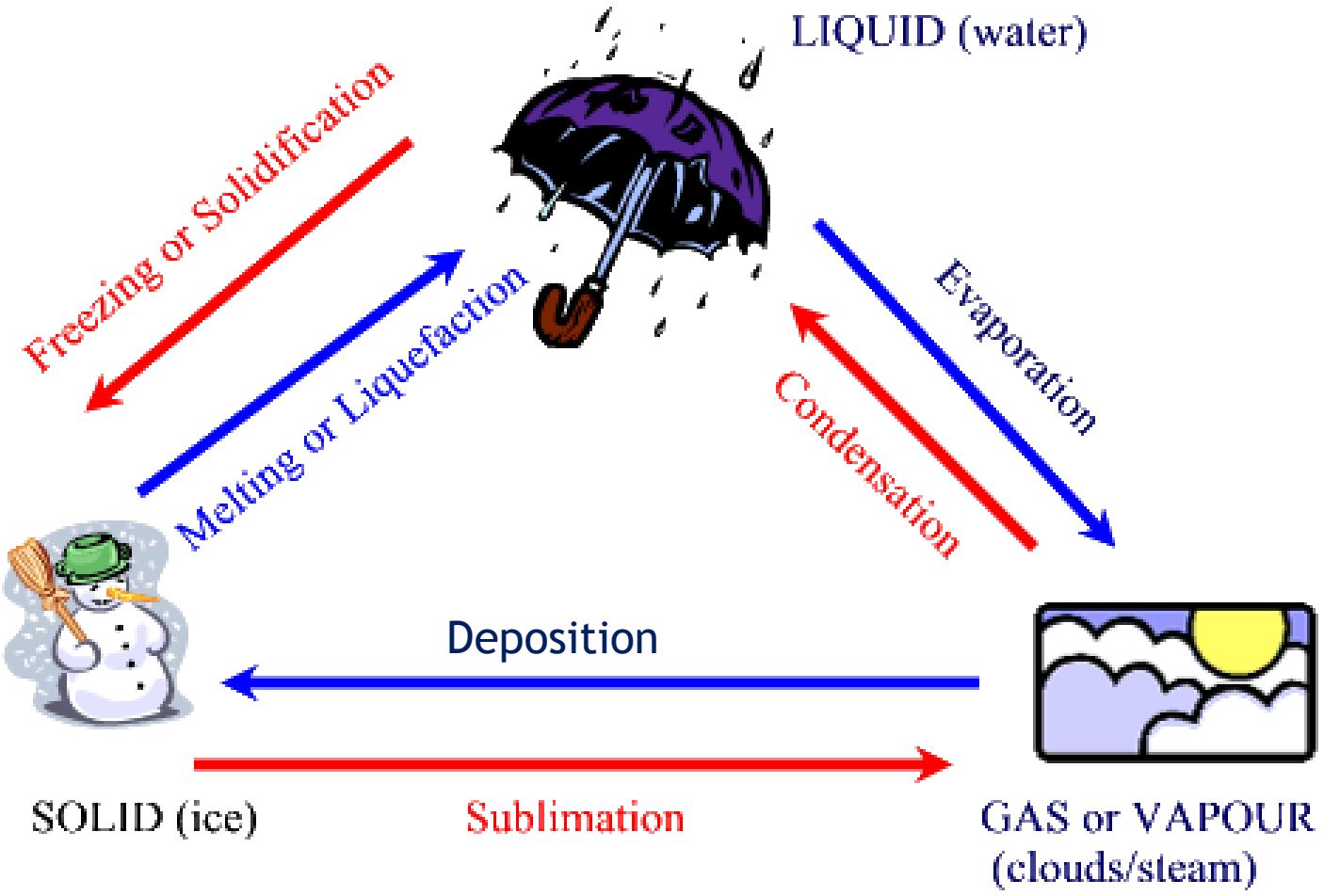
# DEMOS…

1. Activity 5-2 B
   "Bulging Balloons"

2. Activity 5-2 C "Race to  for the Top"

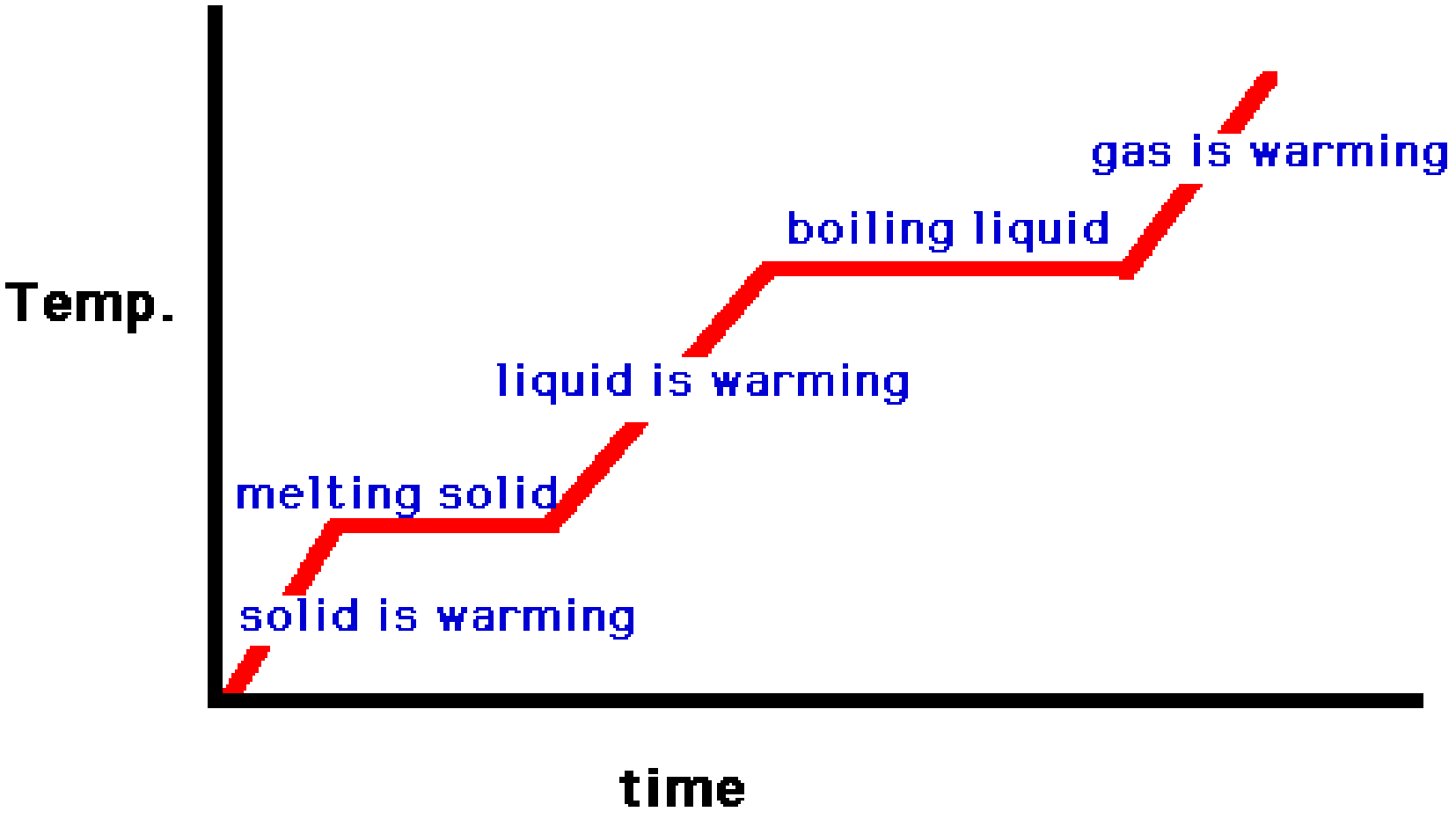
3. Activity 5-2 D
" Expanding Solids"
   *Pages 151 - 155*

# CHANGES OF STATE



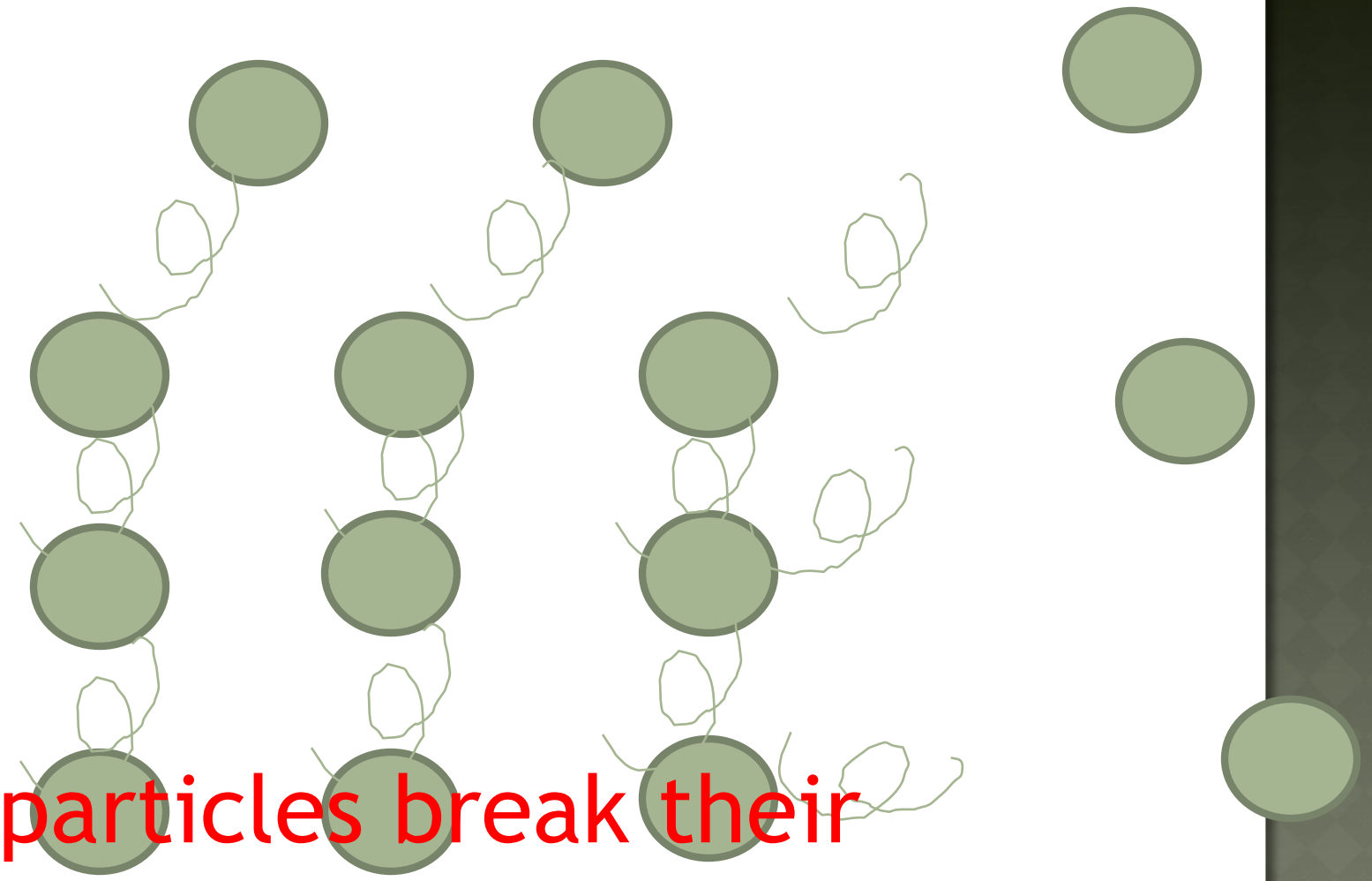

Blue = add heat  Red = lose heat

# GRAPHING CHANGES OF STATE *(A HEATING CURVE)*



# CHANGES OF STATE AND THE PTM

- Adding heat energy, increases the kinetic energy and therefore the temperature.



The particles break their attractive forces with their neighbouring particles when kinetic energy is increased.

- Eventually, the kinetic energy will be great enough to break the attractive forces holding the particles together thereby changing state.

*The opposite is true if heat energy is decreased.*

CORE LAB ACTIVITY

# Activity 5-3C
# "The Plateau Problem"
# Page 166 (7)