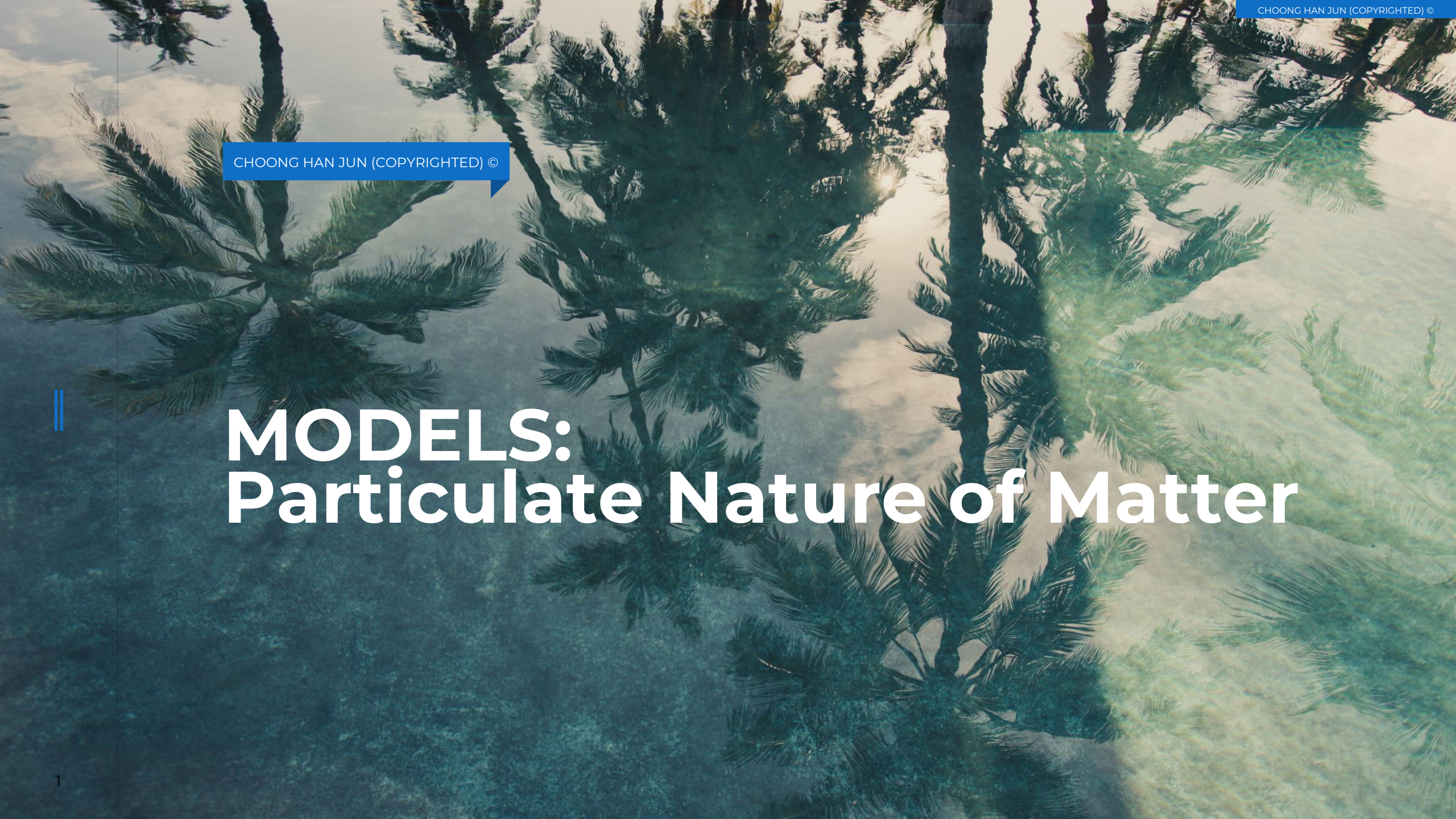

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MODELS: Particulate Nature of Matter

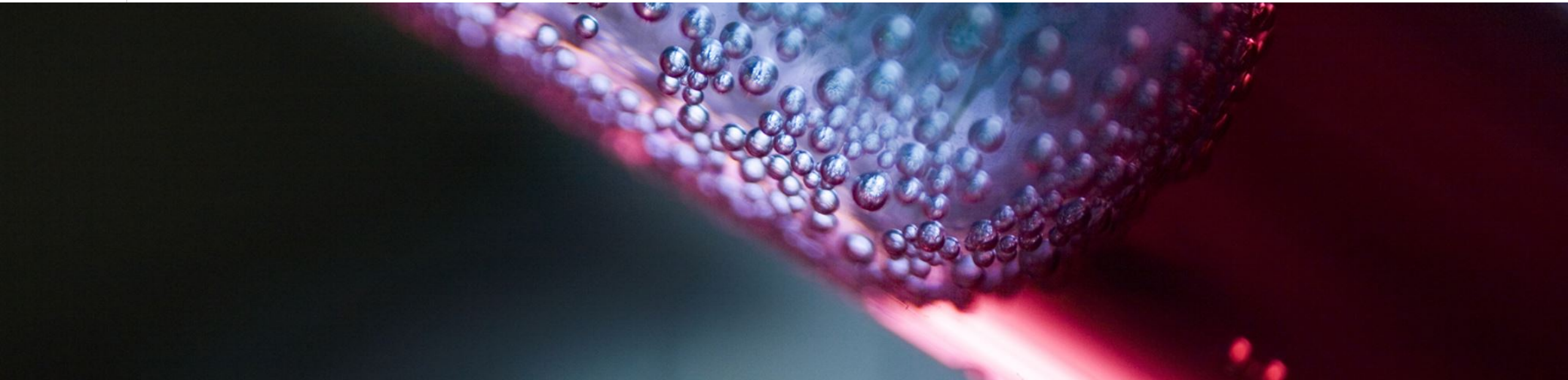
CHAPTER ANALYSIS

5 KEY CONCEPTS

- Show an awareness that according to the Particulate Nature of Matter, matter is made up of small discrete particles which are in constant and random motion
- Show an understanding of the simple model of solids, liquids, and gases, in terms of arrangement and movement of particles
- Use models to explain melting and boiling in terms of conversion of the three states of matter
- Duse models to explain expansion and contraction, and the conservation of mass during these processes
- Compare the properties of solids, liquids, and gases in terms of arrangement and movement of particles

KEY CONCEPT

MATTER



PARTICULATE THEORY OF MATTER

PARTICULATE THEORY OF MATTER

- The particles are very **small, invisible,** and cannot be seen without a microscope
- There are **spaces** between particles in matter
  (These spaces are different in solids, liquids, and gases)
- The particles of matter **move**.
  (Particles move at different speeds in solids, liquids, and gases)
- The particles are in **constant and random motion**.

Solid

- Particles are **close together**
- Particles are arranged in a **fixed, regular pattern**
- Particles cannot move freely but **constantly vibrate in their fixed position**

Liquid

- Particles are **close together but further apart compared to those in solids**
- Particles are **not arranged in a fixed, regular pattern**
- Particles **constantly move over short distances** and **slide across each other**

Gas

- Particles are **far apart**
- Particles occupy **all the space of the container**
- Particles constantly **move freely and randomly in all directions**

PROPERTIES OF MATTER

PROPERTIES

Solids	Liquids	Gases
• Have a definite shape • Have a definite volume • Cannot be compressed • Do not flow	• Have no definite shape • Have a definite volume • Cannot be compressed • Flow and take the shape of the container	• Have no definite shape • Have no definite volume • Can be compressed • Flow and spread in all directions to fill the container

SOLIDS

- **Definite shape, cannot flow**: particles cannot move freely and can only vibrate about fixed positions
- **Definite volume, cannot be compressed**: particles packed closely together and held in fixed positions

LIQUIDS

- **No definite shape, can flow**: particles are not in fixed positions and can slide over one another
- **Definite volume and cannot be compressed**: particles packed closely together (although not as close as those in solids)

GASES

- **No definite shape, can flow**: particles are far apart and move freely and randomly in all directions
- **No definite volume and can be compressed**: particles are far apart with lots of empty space in between

CHANGES OF STATE

When cooled, particles **lose energy and move slower and closer to one another**.

Hence, the volume **decreases**.

Cooled

Particles

Heated

When heated, particles **gain energy and move faster and further away from each other.**

Hence, the volume **increases**.

During expansion and contraction, only the distance between particles change. The **size and mass of particles do not change**.

CHANGES OF STATE

Solid (Ice)

- Particles close together and only vibrate in their fixed positions

Liquid (water)

- Particles are further apart and can move about over short distances

Gas (steam)

- Particles are far apart and move very fast and randomly

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