TEACHER KEY · LESSON WORKSHEET · GRADE 6 · Enrichment · not in IN 2023 Gr 6

Particle Model of Matter & States of Matter

Fill in each part when its number appears on the slide.

PART 1 · TARGET

I can use the particle model to explain the states of matter and changes of state.

PART 2 · WARM-UP

1. Name the three common states of matter and one example of each.
   Key: Solid (ice), liquid (water), gas (water vapor/air).
2. What happens to a puddle on a hot, sunny day? What is that process called?
   Key: The water evaporates: it changes from liquid to gas.
3. Why does a cold soda can get wet on the outside on a warm day?
   Key: Water vapor in the air cools on the can and condenses into liquid.

PART 3 · PREDICTION

Which particles are moving right now: the ones in your desk, your water bottle, or the air?

Circle one: [ ] Only the air [ ] The water and the air [ ] All three

PART 4 · VOCABULARY

Word	Meaning
Particle	A tiny piece of matter (atom or molecule) too small to see.
Thermal energy	The total energy of moving particles in a substance.
Temperature	A measure of the average motion (kinetic energy) of particles.
Melting / freezing	Solid to liquid / liquid to solid.

PART 5 · PARTICLES ARE ALWAYS MOVING

All matter is made of PARTICLES that are always MOVING. TEMPERATURE measures their average speed.

Check: What happens to particles when temperature rises?

Circle one: (A) They move faster (B) They get bigger (C) They stop (D) They disappear

Key: (A) They move faster. More thermal energy means faster particles.

PART 6 · SOLIDS, LIQUIDS, GASES

In a SOLID, particles vibrate in place. In a LIQUID, they slide past each other. In a GAS, they spread far apart.

Check: Which state has a definite volume but takes the shape of its container?

Circle one: (A) All three (B) Liquid (C) Solid (D) Gas

Key: (B) Liquid. Liquid particles are close together but can slide.

PART 7 · ADDING AND REMOVING ENERGY

Adding THERMAL ENERGY causes melting and evaporation. Removing it causes CONDENSATION and freezing.

Check: On the heating curve, why is the line flat at 0 °C?

Circle one: (A) The heater turned off (B) Particles stopped moving (C) The ice is cooling (D) Energy is breaking particles free to melt the ice

Key: (D) Energy is breaking particles free to melt the ice. During a change of state, added energy changes the state instead of the temperature.

PART 8 · EVAPORATION, CONDENSATION, SUBLIMATION

CONDENSATION is gas turning into liquid. SUBLIMATION is solid turning straight into gas.

Check: Water droplets form on a cold mirror after a shower. This is:

Circle one: (A) Sublimation (B) Condensation (C) Evaporation (D) Melting

Key: (B) Condensation. Water vapor lost energy and became liquid.

PART 9 · WORKED EXAMPLE

1. Problem: Explain what happens to ice particles as the ice is heated.
2. Step 1: At -10 °C, particles are packed tightly and vibrate in place: solid.
3. Step 2: Adding thermal energy makes them vibrate faster.
4. Step 3: At 0 °C they break out of fixed positions and slide past each other: liquid.
5. Step 4: At 100 °C they spread far apart and move fast: gas.

PART 10 · WE DO

Explain why a balloon shrinks when you put it in the freezer.

Answer: Slower particles take up less space

PART 11 · YOU DO

Water vapor touches a cold window and forms droplets. Which describes the particles?

Circle one: (A) They turn into new substances (B) They lose energy, slow down, and move closer together (C) They gain energy and spread out (D) They stop moving completely

Key: (B) They lose energy, slow down, and move closer together. Condensation: gas particles lose thermal energy and come together as a liquid.

PART 12 · WORK TIME: PARTICLE PANIC AT POLAR STATION

Write each code piece as you earn it: Lock 1: P Lock 2: H Lock 3: A Lock 4: S Lock 5: E

Final code: PHASE

PART 13 · WRAP-UP

Was your prediction in Part 3 right? One thing I learned today:

Key: Water vapor in the air cools on the can and condenses into liquid.