

## **AQA (GCSE Notes)**

### **Chapter 3: Particle Model of Matter**

- Q1.** Define the term density and write its formula.
- Q2.** How can you calculate the volume of a regular solid object?
- Q3.** Describe how to find the volume of an irregular solid object.
- Q4.** What apparatus would you use to measure the mass of a solid object?
- Q5.** How can a displacement method help in finding volume?
- Q6.** Explain why gases have lower densities than solids.
- Q7.** Describe how particles are arranged in a solid.
- Q8.** How does the particle arrangement in a liquid differ from that in a gas?
- Q9.** Why do solids have a higher density than gases?
- Q10.** What happens to the density of a substance if its volume increases but mass stays the same?
- Q11.** Describe how you would use a ruler to calculate the volume of a cube.
- Q12.** What is the importance of using the correct units in density calculations?
- Q13.** Explain how the particle model describes a change from liquid to gas.
- Q14.** What is meant by a physical change in terms of state changes?
- Q15.** Why is mass conserved when a substance changes state?
- Q16.** What happens to the mass of a substance when it melts?
- Q17.** Describe how to measure the density of a liquid using appropriate apparatus.
- Q18.** How do you ensure accuracy when measuring the volume of a liquid?
- Q19.** What is the relationship between particle spacing and density?
- Q20.** How would you use a micrometer to measure a small object's dimension?
- Q21.** Why is a Vernier calliper more accurate than a ruler?

- Q22.** What causes the volume of a substance to change when heated?
- Q23.** How does the particle model explain the process of freezing?
- Q24.** What physical property remains unchanged during a change of state?
- Q25.** Describe the motion of particles in a gas.
- Q26.** What is meant by the term 'sublimation'?
- Q27.** How can you show that evaporation is a physical change?
- Q28.** Explain the term 'conservation of mass' in simple words.
- Q29.** Why does ice float on water in terms of density?
- Q30.** How does boiling differ from evaporation?
- Q31.** How can a diagram show differences between solids, liquids, and gases?
- Q32.** Why do gases expand to fill their container?
- Q33.** What happens to particle energy during melting?
- Q34.** Why does the volume of a gas increase with temperature?
- Q35.** What safety precautions are needed when heating a liquid during an experiment?
- Q36.** Describe a method to compare densities of two different liquids.
- Q37.** Why must you use a balance with appropriate sensitivity for density experiments?
- Q38.** How does pressure relate to the particle movement in gases?
- Q39.** What are the limitations of using the particle model?
- Q40.** Describe how to draw a simple particle diagram of a solid.
- Q41.** How does the particle model explain condensation?
- Q42.** What changes when a solid becomes a liquid?
- Q43.** Why is it important to use the correct measuring instrument for each property?
- Q44.** How can you ensure your density measurement is reliable?
- Q45.** Describe how you would calculate the average density of several objects.

- Q46.** What does a high-density value tell you about a substance?
- Q47.** Why must the container's volume be subtracted when measuring the density of a liquid?
- Q48.** How does mass change when a liquid evaporates in a closed system?
- Q49.** Why are the properties of a material unchanged after a physical state change?
- Q50.** Explain how the density of an object can determine whether it sinks or floats in water.
- Q51.** What is internal energy in terms of particles in a system?
- Q52.** Name the two types of energy that make up internal energy.
- Q53.** How does heating affect the energy of particles in a system?
- Q54.** What happens to the temperature of a system when its internal energy increases?
- Q55.** What does specific heat capacity mean?
- Q56.** What is the unit of specific heat capacity?
- Q57.** How does the mass of a substance affect the temperature change when heated?
- Q58.** How can a change of state occur without a temperature rise?
- Q59.** What does the equation  $\Delta E = mc\Delta\theta$  represent?
- Q60.** Write the full names for the symbols in the equation  $\Delta E = mc\Delta\theta$ .
- Q61.** What is the unit for thermal energy change in the equation  $\Delta E = mc\Delta\theta$ ?
- Q62.** Describe what happens to particle movement when a substance is heated.
- Q63.** How does the type of material affect its temperature change when heated?
- Q64.** What happens to internal energy when a substance cools?
- Q65.** What role does potential energy play in internal energy?
- Q66.** What causes an increase in potential energy during heating?
- Q67.** How can you increase the internal energy of a system?
- Q68.** How can energy input raise the temperature without changing the state?
- Q69.** Why do some materials heat up faster than others?

- Q70.** How is specific heat capacity useful in everyday life?
- Q71.** What is the relationship between mass and thermal energy change?
- Q72.** Why does a higher mass require more energy to heat up?
- Q73.** Explain why metals have low specific heat capacity.
- Q74.** Describe a situation where heating changes the state but not the temperature.
- Q75.** What does  $\Delta\theta$  represent in the thermal energy equation?
- Q76.** How can you calculate specific heat capacity from a heating experiment?
- Q77.** What happens to the internal energy when water boils?
- Q78.** If two objects are made of different materials, why might one heat up faster?
- Q79.** What happens to the energy supplied during melting or boiling?
- Q80.** How do you measure the temperature change in a system during heating?
- Q81.** How would doubling the mass affect the temperature change, if energy input stays the same?
- Q82.** Why does water take longer to heat up than metal?
- Q83.** How can the internal energy of a gas be increased without heating it?
- Q84.** What factors determine how much thermal energy is needed to heat a substance?
- Q85.** How does increasing temperature affect the kinetic energy of particles?
- Q86.** Give an example of when thermal energy increases but the temperature stays constant.
- Q87.** Why is it important to know the specific heat capacity of a substance in heating systems?
- Q88.** What is meant by thermal equilibrium in a system?
- Q89.** What happens to the internal energy during condensation?
- Q90.** How can a thermometer be used to find  $\Delta\theta$  in a practical?
- Q91.** Why is more energy needed to heat a large pot of water than a small cup?
- Q92.** How can heat loss affect an experiment measuring specific heat capacity?
- Q93.** How does the specific heat capacity help in designing thermal storage systems?

- Q94.** What does a small specific heat capacity mean for temperature change?
- Q95.** Describe the effect of heating a substance with high specific heat capacity.
- Q96.** What is the difference between internal energy and thermal energy?
- Q97.** Why does temperature not change during a state change, even though energy is added?
- Q98.** How do kinetic and potential energy contribute to total internal energy?
- Q99.** Explain why ice requires energy to melt, even at  $0^{\circ}\text{C}$ .
- Q100.** Why does internal energy increase even if the temperature does not?
- Q101.** What is meant by latent heat in terms of particle energy?
- Q102.** Why does temperature stay constant during a change of state?
- Q103.** Define specific latent heat in simple terms.
- Q104.** What is the correct unit of specific latent heat?
- Q105.** State the equation used to calculate energy during a change of state.
- Q106.** What is meant by specific latent heat of fusion?
- Q107.** What is meant by specific latent heat of vaporisation?
- Q108.** What type of energy is involved when a substance melts?
- Q109.** What energy transfer occurs during boiling?
- Q110.** Why is energy still needed to melt ice even at  $0^{\circ}\text{C}$ ?
- Q111.** What happens to the internal energy of a substance during freezing?
- Q112.** In the equation  $E = mL$ , what does the letter L represent?
- Q113.** In the equation  $E = mL$ , what does the letter m represent?
- Q114.** In the equation  $E = mL$ , what does the letter E represent?
- Q115.** What happens to the arrangement of particles during condensation?
- Q116.** Give one difference between specific latent heat and specific heat capacity.
- Q117.** During vaporisation, why doesn't the temperature rise even when energy is added?

**Q118.** How does adding energy during a change of state affect the bonds between particles?

**Q119.** Define internal energy during a state change in terms of particles.

**Q120.** What is one method of measuring the latent heat of fusion of water?

**Q121.** Why is no temperature rise observed while a substance is melting?

**Q122.** A sample of ice is melting. How can you calculate the energy used?

**Q123.** Why does evaporation from the skin cause a cooling effect?

**Q124.** Describe the change in motion of particles during boiling.

**Q125.** What kind of energy do particles gain during melting?

**Q126.** What information can you obtain from a heating curve?

**Q127.** What does a flat section on a heating curve graph represent?

**Q128.** How does the energy required for vaporisation compare to fusion?

**Q129.** How does mass affect the energy required for a change of state?

**Q130.** List two safety precautions for a latent heat practical.

**Q131.** Which units would you use for energy in a latent heat calculation?

**Q132.** Why do different substances have different values of latent heat?

**Q133.** What happens to potential energy during the melting process?

**Q134.** Why is more energy needed to vaporise a liquid than to melt a solid?

**Q135.** Describe what happens to particles at the boiling point of a liquid.

**Q136.** Explain why your skin feels cold after alcohol evaporates from it.

**Q137.** How can you calculate specific latent heat from experiment data?

**Q138.** On a heating graph, what does the flat part during boiling represent?

**Q139.** Explain how latent heat is related to internal energy.

**Q140.** What happens to particle spacing during vaporisation?

**Q141.** Describe the motion of gas particles in a sealed container.

- Q142.** How is the temperature of a gas linked to its kinetic energy?
- Q143.** What happens to gas pressure when temperature increases at constant volume?
- Q144.** Why does faster movement of gas particles increase pressure?
- Q145.** How does temperature affect the average speed of gas molecules?
- Q146.** What is meant by random motion in gases?
- Q147.** Why does a rise in temperature increase pressure in a gas at constant volume?
- Q148.** Describe how gas particles exert pressure on the walls of a container.
- Q149.** What effect does cooling have on the pressure of a fixed volume of gas?
- Q150.** How would you describe the particle movement of a gas at a higher temperature?
- Q151.** What is the effect on gas pressure when the gas is compressed at constant temperature?
- Q152.** Explain why gas pressure decreases when volume increases at constant temperature.
- Q153.** State the equation that links gas pressure and volume for a fixed mass at constant temperature.
- Q154.** If pressure increases, what must happen to volume for temperature to remain constant?
- Q155.** Describe how gas particles create pressure on the walls of a container.
- Q156.** What unit is used to measure pressure in gas laws?
- Q157.** What unit is used to measure volume in gas laws?
- Q158.** Why does compressing a gas increase its pressure?
- Q159.** How does increasing the volume of a gas container affect particle collisions?
- Q160.** What does the equation  $pV = \text{constant}$  assume about the temperature of the gas?
- Q161.** Explain what is meant by a gas being "compressed."
- Q162.** What is meant by the term "constant temperature" in relation to the  $pV$  equation?
- Q163.** How does the particle model explain changes in pressure with volume?
- Q164.** Why do gases exert pressure on the walls of their containers?
- Q165.** What would happen to the pressure of a gas if its volume is halved at constant temperature?

- Q166.** What happens to the pressure of a gas if the volume doubles and temperature stays the same?
- Q167.** Describe how a gas can be compressed in a laboratory setting.
- Q168.** How does the frequency of particle collisions change when volume is decreased?
- Q169.** What effect does increasing pressure have on the shape of a flexible gas container?
- Q170.** What is meant by the term "net force at right angles to the wall" in gas pressure?
- Q171.** What assumption is made about the gas particles in the particle model?
- Q172.** If volume remains the same, what must happen to pressure for  $pV$  to remain constant?
- Q173.** How can the pressure of a gas be measured practically?
- Q174.** Why is it important to keep temperature constant when investigating pressure and volume?
- Q175.** State one example of a real-life device where gas pressure increases due to compression.
- Q176.** What is meant by "work is done on a gas"?
- Q177.** Give an example where doing work on a gas increases its temperature.
- Q178.** What is the energy transfer involved when a gas is compressed?
- Q179.** Why does compressing a gas increase its internal energy?
- Q180.** Describe how a bicycle pump demonstrates gas compression and temperature increase.
- Q181.** What happens to the temperature of a gas when it is compressed quickly?
- Q182.** Explain how doing work on a gas can increase its internal energy without heating.
- Q183.** How does the particle model explain an increase in temperature during compression?
- Q184.** What happens to the motion of gas particles when work is done on the gas?
- Q185.** State one safety consideration when compressing gases.
- Q186.** What is meant by the internal energy of a gas?
- Q187.** Explain how volume and pressure are related if temperature and mass stay constant.
- Q188.** What happens to gas particles during a rapid compression?
- Q189.** Why does a sealed syringe become harder to push as it is compressed?

- Q190.** What is the role of kinetic energy in determining gas pressure?
- Q191.** What happens to pressure if the volume of a gas is reduced to one-third at constant temperature?
- Q192.** How does temperature rise when a gas is compressed without losing energy?
- Q193.** What is the relationship between volume and pressure according to Boyle's Law?
- Q194.** Explain how gas pressure is affected in a scuba tank during compression.
- Q195.** What does it mean when we say gas pressure acts "at right angles" to the wall?
- Q196.** In terms of particles, explain why a gas exerts more pressure in a smaller container.
- Q197.** Describe how the internal energy of a gas changes when it is compressed in a pump.
- Q198.** If  $pV = \text{constant}$ , what happens to pressure if volume is decreased?
- Q199.** Why does compressing air in a container make it feel warmer?
- Q200.** What must remain constant for  $pV = \text{constant}$  to apply accurately?