

Grade 7 Science **Unit Review for Pure Substances and Mixtures**

Review your notes and use the internet to find the answers to the unit review questions.

What is Matter?

Anything that has mass and takes up space.

What is the basic structure of all atoms?

There are three particles to all atoms. There is a dense, relatively tiny center nucleus with protons and neutrons and an outer cloud of tiny electrons. The protons have a positive charge and the neutrons have no charge and the electrons have a negative charge. The number of protons in the nucleus is what makes the atom a specific substance. I.e., there are 6 protons in a carbon atom, 1 in Hydrogen and 79 in Gold.

List the 5 main ideas of the particle theory.

1. All matter is made up of tiny particles called atoms
2. Each pure substance has a unique type of particle – different from other pure substances (different atoms).
3. There are relatively large spaces between particles and within particles
4. All matter is constantly moving or vibrating
5. There are attractive forces between particles

What are the 3 states of matter? Compare and contrast them.

Solid – coldest state; fixed shape; lowest volume

Liquid – ‘middle’ state; takes the shape of the bottom of a container; constant volume

Gas – highest energy state; takes shape of entire container; lots of space between particles

What are the main differences between particles of a solid and the particles of a gas?

Solids are low energy state with relatively high bond strength between particles and gives them a rigid structure and constant volume. Gases have a high energy state, very little bond strength due to high energy state of particles and therefore have low density and high heat.

What is a pure substance?

A pure substance has only one kind of particle. That can be a single type of atom (oxygen, iron, helium) or a precise combination of atoms called a molecule (H₂O, CH₄, CO₂ etc.). They have specific, predictable and constant properties unique to that substance.

Indicate whether each statement is true or false.

F 1. A solution is made up of one or more solvents dissolved in a solute.

It is one solvent and one or more solutes...

T 2. The terms “concentrated” and “dilute” can be used to describe the amount of solute in a solution.

While both are unsaturated, dilute solutions have relatively little solute and concentrated have a lot of solute.

F 3. Cooling a solvent is a good way to increase the solubility of a solute.

The opposite. Heating a solution increases solubility since the particles have more energy and weaker bonds.

Complete each sentence given below.

4. In tea and coffee, the solvent is the hot water.

5. agitation (stirring) and heating are two ways to make a solid dissolve in a liquid more quickly.

Match each term in the left column with its definition from the right column.

b 6. soluble

(a) substance that dissolves

c 7. saturated

(b) able to dissolve in a solvent

a 8. solute

(c) unable to dissolve any more

Circle the letter beside the answer that best answers the question.

9. A student dissolves 10 g of sugar in enough water to make 25 mL of solution. What is the solute?

(a) **The sugar**

(c) The salt

(b) The water

(d) 10 g

10. A scientist wants to decrease the rate at which a solid dissolves in a liquid. What should the scientist do?

(a) **Cool the liquid.**

(c) Increase the volume of the liquid.

(b) Stir the mixture.

(d) Break the solid into smaller pieces.

11. Holly dissolves 50mL of drink power in 150mL of water. She is surprised that the final volume is only 170mL. Why do think Holly is surprised at the final volume and use the particle theory to explain Holly's observation.

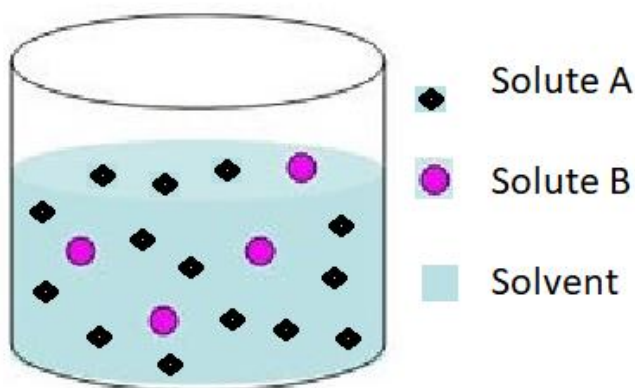
The crystal powder has a lot of space between the crystals and so the 50 mL of powder is not fully 50 mL since the solid does not fully occupy the space it is in. The water completely fills the space since it is a liquid. The water also

dissolves the crystals as it forms a solution which is completely liquid and fully occupies the shape of the container it is in.

12. A scientist dissolves 4.2 g of a substance in 50 mL of water to make a saturated solution. Can she dissolve any more solute in the solution? Explain.

Unless she changes the temperature, she cannot. IF she raises the temperature of the water, she can dissolve more solute in the solution.

13. A scientist dissolves two solutes in a single solvent. The concentration of solute A is higher than the concentration of solute B. Draw a picture showing the particles of solute A, solute B, and the solvent in the solution. Make sure to include a key for your picture.



14. What is a mechanical Mixture? How is it different than a solution?

A mechanical mixture is a heterogeneous mixture in which it is easy to see the different parts of the combined parts. The parts are not chemically changed and therefore can be separated through different processes. A solution is also a combination of different particles, but the particles combine and change their properties (dissolve) creating a homogeneous mixture in which all parts look the same. The more solute added, the greater the change in properties of the solvent.

15. When an ice cube melts, do the particles change to a different kind of particle? Explain why or why not.

No, the particles are the same, but they change state (from liquid to the gas state). This can seem to be a change in particle since the visible liquid 'disappears' but the water vapour can easily be changed back to liquid by cooling the vapour to under 100°C. There is no chemical change – just a state change.

16. How is the purity of gold measured? Why is gold jewelry not pure gold?

Purity of gold is measured in Karats. It is a measure of the proportion of gold in a gold alloy. Pure gold has 24 parts gold to 24 parts and is pure gold. 18K or 18 Karat gold is 18 of 24 parts gold and so on for 20 K and 10 K gold. Pure Jewelry is not pure gold since pure gold is very soft and is very expensive. The jewelry would break and be lost if pure gold was used.

17. Sewage is a stinky, messy mixture of many things but, it is turned into water that we can drink. How?

Sewage is drained through a sewer system to a sewage treatment plant in a town or large city and it is treated through a variety of separation techniques. Sewage is sent through bar screens to separate large items and debris. It is then sent through a grit tank to allow heavier items like stones and sand to settle to the bottom of the tank. the organic matter is treated with bacteria in an aeration tank (bioremediation – bacteria eat up the organics and digest it so that it is no longer toxic). Then the fluid is clarified through settling or floatation where further sludge is removed. The water is then treated with Chlorine, Ozone or UV light to kill or sterilize any remaining bacteria or viruses and released into the environment where it can be taken in as drinking water (another process to make it even more safe to drink).

18. Is fresh spring water a pure substance?

Fresh spring water is a solution since it has dissolved particles in it as the water flows underground, it dissolves particles since water is such a good solvent (Universal Solvent). There is water but also Calcium, Sodium, Sulphur and in some cases, toxins and suspended sediment.