

ScE7.3 : Mixtures and Solutions - ANSWERS

ScE7.3.1 : Substances and Mixtures

ScE7.3.2 : Solutions and Concentrations

ScE7.3.3 : Separating Mixtures

ScE7.3.1 : Substances and Mixtures

1. Pure substances and mixtures p.2 (p.229, 232, 242)
2. Homogeneous and heterogeneous mixtures p.3 (p.234, 242).
3. Solid, liquid and gaseous solutions p.4 (p.243)
4. Alloys p.5 (p.243)
5. Mixtures and light p.6 (p.244-245)
6. **Lab Activity** : *Classifying homogeneous and heterogeneous liquid mixtures.*
7. Particles in pure substances, homogeneous and heterogeneous mixtures p.7-10 (p.236-7, 242)



Terms

alloy
mixture
heterogeneous mixture

homogeneous mixture
mechanical mixture

solution
pure substance

1. **Pure substance** : contains a single substance, therefore only one kind of particles.
2. **Mixture** : contains two or more substances, therefore two or more types of particles.
3. **Heterogeneous mixture** , also called **mechanical mixture** a mixture where you can see the different substances (either just with your eyes, or with a microscope) because particles of different substances stay clumped together.
4. **Homogeneous mixture**, also called **solution** : a mixture where you only see one thing, because the particles of the different substances are so completely mixed together.
5. **Alloy** : a solid solution containing two or more metals.

Substances and Mixtures

With your group, do the activity **Classify This!** using the cards provided by your teacher. Then listen to your teacher's classification and complete the following table.

Pure Substances	Mixtures
Water Quartz Salt	Chocolate chip cookie Pizza Granite rock Freshly squeezed orange juice Vinegar Milk Clean air Muddy water Cloud

1. Explain the difference between the two categories.

A pure substance contains only one substance, a mixture contains two or more substances together.

2. Is the juice from a freshly squeezed orange a pure substance, or a mixture? Explain why.

It is a mixture, even nothing has been added to the juice, because oranges naturally contain many substances: water, sugar, vitamin C, pulp.....

3. Is vinegar a pure substance or a mixture? Explain why.

A mixture, because according to the label vinegar contains 5% acetic acid; the other 95% is water.

Homogeneous and Heterogeneous Mixtures

Now take the MIXTURES from the previous activity, and subdivide them again in two categories. Then again listen to your teacher's classification and complete the table below.

Heterogeneous Mixtures = Mechanical Mixtures	Homogeneous Mixtures = Solutions
Chocolate chip cookie Pizza Granite rock Milk Orange juice Muddy water Cloud	Vinegar Clean air

1. Explain the difference between a homogeneous and a heterogeneous mixture.
In a heterogeneous mixture you can see the different parts, either just with your eyes or with a microscope.
In a homogeneous mixture you can never see the different parts, even with a microscope.
2. What is the other word for “heterogeneous mixture”? **Mechanical mixture**
3. What is the other word for “homogeneous mixture”? **Solution**
4. Is a bowl of granola homogeneous or heterogeneous? Why?
Granola is heterogeneous, because you can see the different ingredients in your bowl : the oats, the nuts, the raisins, the milk.
5. Is clean seawater homogeneous or heterogeneous? Why?
Seawater is homogeneous, because the salt is dissolved so you can never see it, not even with a microscope.
6. Is milk homogeneous or heterogeneous? Why?
Milk is heterogeneous, even though you can't see the different substances with your eyes. But through a microscope you can see the droplets of fat and protein.

Solutions and States of Matter

Use your textbook to answer the following questions using the pages indicated.

- 1) Name the three states of matter (you know this from last unit!) **solid, liquid, gas**
- 2) Name 4 liquid solutions found on p.243.
Household vinegar, tap water, household hydrogen peroxide, window cleaner.
- 3) Name the substances found in seawater. (p.243)
Salts and water
- 4) Name a gas solution. p.243. **Air!!!**

Name the substances contained in air.
Nitrogen gas, oxygen gas, and tiny amounts of other gases including carbon dioxide and water vapor.
- 5) What is an **alloy**? (p.243)
A solid solution made from two or more metals.
- 6) How many karat is pure gold? (picture on p. 243) **Pure gold is 24-karat**

What percentage gold is 14-karat gold? **58%**
- 7) Go to p.234 and look at the picture 7.3. Name the alloy this frying pan is made of and the metals that it contains.
Stainless steel is made of iron and chromium, and sometimes carbon and silicon.
- 8) Read p.240. What is the name of the alloy scientists first thought was used to make the blade?
Bronze
What metals make this alloy? **Bronze contains tin and copper.**

When was this alloy invented? **4000 years ago**

What is the blade actually made of? **Copper**

Alloys

Compare the following metals : **gold, silver, bronze, iron, steel, copper, aluminium, brass**. Search for these metals in the periodic table (grade 9 textbook, p. 50).

The metals that are found in the periodic table are elements, therefore pure substances. The other metals are alloys. Classify the metals listed above in the following table.

Pure Metals	Alloys
Gold Silver Iron Copper Aluminium	Bronze Steel Brass

- a. Why is it impossible to tell if a metal is a pure substance or an alloy just by looking at it?

Because the mixture is homogeneous, you can't see if there is more than one metal in the mix. The particles of each metal are too small to be seen even with a microscope.

- b. How are alloys made?

The different metals are melted and mixed together, then they become solid when they cool.

Mixtures and Light

With your group, classify the cards showing liquid and gas mixtures according to the table below. Label each mixture as homogeneous (HO) or heterogeneous (HE).

	Clear	Cloudy/opaque
Liquids	Clear apple juice (HO) Tap water (HO) Vinegar (HO)	Paint (HE) Orange juice (HE) Milk (HE) Muddy water (HE)
gases	Clean air (HO)	Smoky air (HE) Fog (HE) Blowing snow (HE) Dusty air (HE)

Listen to your teacher and copy the notes for the following questions.:

1. Explain the difference between clear, cloudy, and opaque.

Clear: the light passes right through because there are no particles big enough to get in the way.

Cloudy : the light goes through but is scattered around because there are small pieces of different substances that get in the way.

Opaque: the light can't get through at all.

2. What is the Tyndall effect?

It is when you have light going through a cloudy substance and you can see from the side the shafts of light scattered by the small pieces.

3. If a gas or liquid mixture is clear, is it homogeneous or heterogeneous? Explain.

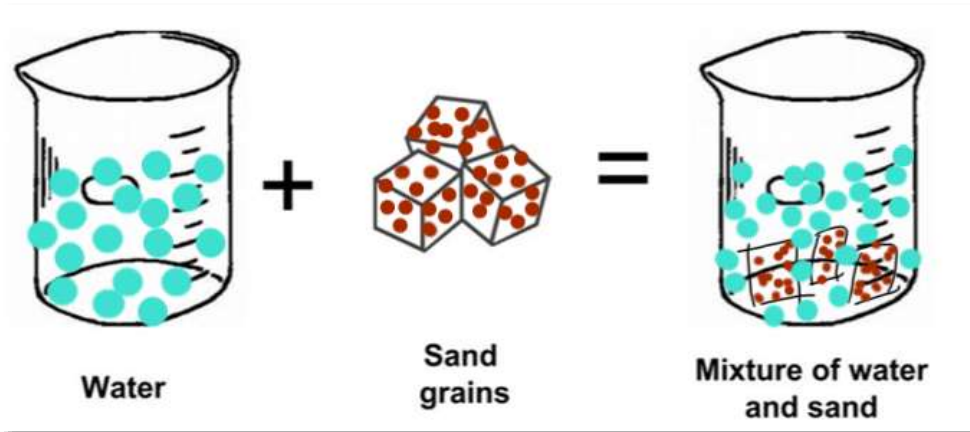
If a mixture is clear, it is homogeneous because it means there are no particles big enough to get in the way of the light.

4. If a gas or liquid mixture is cloudy or opaque, is it homogeneous or heterogeneous? Explain.

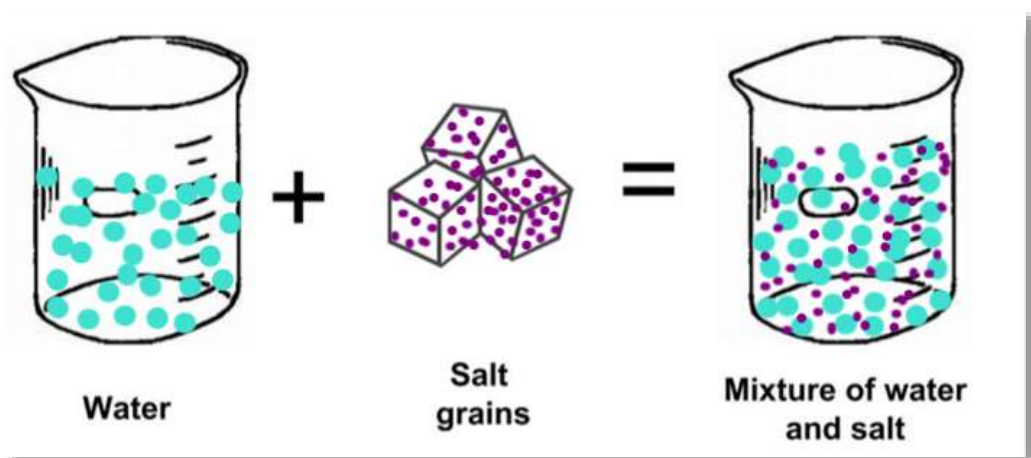
If it is cloudy or opaque it is heterogeneous, because the cloudiness is caused by the small pieces of substance that you could see with a microscope if you had one.

Mixtures and Particle Theory

1. Describe the difference between a pure substance and a mixture using particle theory.
A pure substance has only one type of particles, a mixture has two or more different types of particles.
2. Sketch the particles in each substance to show the arrangement of the particles in a mixture of **sand** and water, which is an example of **heterogeneous** mixture.



3. Sketch the particles in each substance to show the arrangement of the particles in a mixture of **salt** and water, which is an example of **homogeneous** mixture.



4. Describe in words the difference between a homogeneous and a heterogeneous mixture using particle theory.

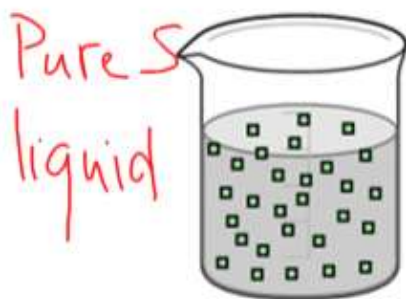
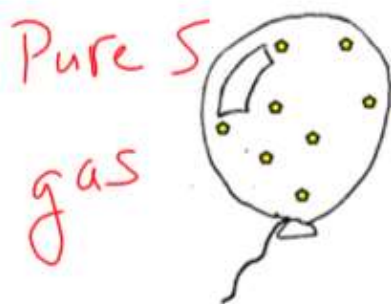
In homogeneous mixture the particles of the different substances are completely mixed, with no clumps remaining.

In a heterogeneous mixture the particles of different substances stay clumped together.

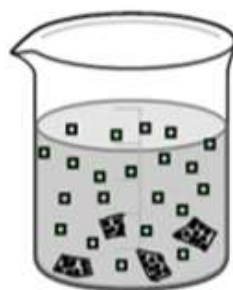
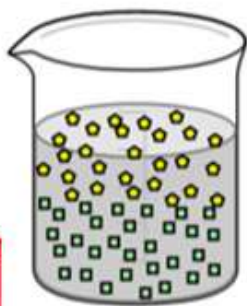
Interpreting Molecule Sketches

Interpret the following sketches of molecules by considering, as appropriate

- Is it a pure substance or a mixture?
- If it is a pure substance, is it a solid, liquid, or gas?
- If it is a mixture, is it homogeneous or heterogeneous?
- Are the different parts of the mixture solids, liquids, or gases?

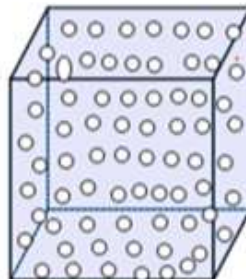
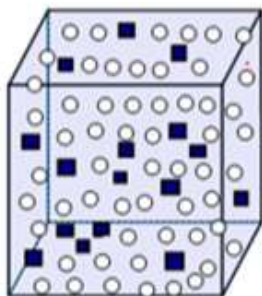


Mix
He
liq + liq

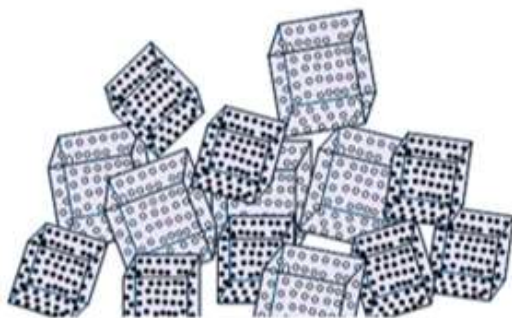


Mix
He
liq + solid

Mix
Ho
solid



Pure S
solid



Mix
He
solid + solid

Extension : A More Complicated Mixture, Fog

Air is a gaseous solution of several gases, including oxygen, nitrogen, and carbon dioxide. In fog, the air also contains a large number of tiny suspended droplets of water. Each droplet contains many molecules of water

- a. Is fog a pure substance or a mixture? Explain.

A mixture, since it is made of water and air.

- b. Is fog homogeneous or heterogeneous? Explain.

It is heterogeneous because it is cloudy, not clear, and also because the water molecules stay together in droplets.

- c. Sketch the arrangement of molecules in fog according to the description above. Use different symbols or colours for each kind of molecule, and include a legend. Your sketch should include 4 different types of molecules :

- Water molecules
- Oxygen molecules
- Nitrogen molecules
- Carbon dioxide molecules

