

## Unit 2 Classifying in Physics

### 1. Discussion points – classification.

- a) How could you classify students in this class or school? According to ...
- b) What are some ways you could classify foods? clothes? cars? schools? films? cities? academic subjects? animals? jobs? people in your town or country? music?
- c) A nutritionist might be interested in classifying food according to calories, cholesterol content, sugar content etc. What type of classification might interest a biologist? A meteorologist? A psychologist? A police detective? A football player?
- d) What about a physicist? What can you classify in physics?

### 2. CLASSIFYING MATTER. Read the following passage. Then classify the matter, using the information in the text.

#### State of matter

(From: Wikipedia, the free encyclopedia)

**States of matter** are the distinct forms that different phases of matter take on. Solid, liquid and gas are the most common states of matter on Earth. However, much of the baryonic matter of the universe is in the form of hot plasma, both as rarefied interstellar medium and as dense stars.

Historically, the distinction is made based on qualitative differences in bulk properties. Solid is the state in which matter maintains a fixed volume and shape; liquid is the state in which matter maintains a fixed volume but adapts to the shape of its container; and gas is the state in which matter expands to occupy whatever volume is available.

The state or *phase* of a given set of matter can change depending on pressure and temperature conditions, transitioning to other phases as these conditions change to favor their existence; for example, solid transitions to liquid with an increase in temperature. A phase transition indicates a change in structure and can be recognized by an abrupt change in properties.

More recently, distinctions between states have been based on differences in molecular interrelationships. Solid is the state in which intermolecular attractions keep the molecules in fixed spatial relationships. Liquid is the state in which intermolecular attractions keep molecules in proximity, but do not keep the molecules in fixed relationships. Gas is the state in which molecules are comparatively separated and intermolecular attractions have relatively little effect on their respective motions. Plasma is a highly ionized gas that occurs at high temperatures. The intermolecular forces created by ionic attractions and repulsions give these compositions distinct properties, for which reason plasma is described as a fourth state of matter.

Forms of matter that are not composed of molecules and are organized by different forces can also be considered different states of matter. Superfluids (like Fermionic condensate) and the quark–gluon plasma are examples.

**MATTER**

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3. **Speaking. Work in pairs.**  
**Describe the diagram that you have drawn, using the typical classifying vocabulary:**

Matter	is/are may be can be could be	classified grouped divided arranged categorized	into	divisions groups types classes categories classifications
		classified categorized classed grouped	as	solid, liquid, or gas

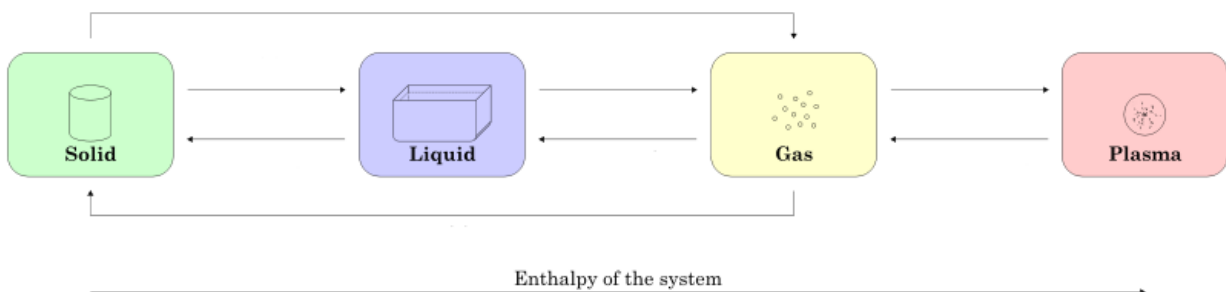
There are (three/ four/ many)	types kinds classes categories	of matter
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Oxygen is	a type a kind a form an example	of gas
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Everything	is made up of is composed of consists of	matter/ molecules
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Different states of matter	include comprise	Superfluids and the quark-gluon plasma
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4. **Look at the picture and label all the phase transitions (according to arrows)**(from: [www.wikipedia.org](http://www.wikipedia.org))



**5. Video** (<http://www.youtube.com/watch?v=qJRxYBIfZIE&feature=related> – states of matter, changes in state)

**Before you watch: check the vocabulary below:**

*occur to turn into vapour to make up evaporation melt bound rigid hollow mist sublimation*

**Watch and answer the questions below:**

- a) What are bubbles of water made up of?
- b) At what temperature do liquids change into gas?
- c) What is the melting point of a substance?
- d) What is the average temperature at which rock melts?
- e) Why is water different from most liquids?
- f) How can it be explained?
- g) Describe dry ice and its possible states.

**6. GRAMMAR REVISION - passive voice**

**I. Look at the sentences from the lesson:**

1. Matter can be classified as solid, liquid & gas.
2. A considerable force would be needed to change the shape of an iron bar.
3. Crystalline solids are arranged in a definite pattern.
4. When they are heated, they melt.
5. If water is poured on the table...

What is the general pattern of a passive sentence?

subject + \_\_\_\_\_ + \_\_\_\_\_

Do they say what happens to the subject? (*matter, force, solids, etc.*)

Do the underlined phrases say who/what performs action?

Are the sentences formal or informal?

**II. Rewrite the sentences using passive voice.**

1. We can classify matter according to different criteria.
2. The government will build a road right outside her front door.
3. His professors were discussing his oral exam right in front of him.
4. My colleagues are attending a seminar at the moment.
5. Corrosion has damaged the hull of the ship.
6. John Logie Baird transmitted the first television picture in 1925.

**Rewrite the sentences using active voice.**

1. The lecture will be delivered by Professor Pierce.
2. These books had been left in the classroom by a careless student.
3. Coffee is grown in many parts of Hawaii by plantation workers.
4. The "Theory of Relativity" was developed by Albert Einstein
5. The streets around the fire had been blocked off by the police.
6. A great deal of our oil will have been exported to other countries by our government.

**III. Think about rules or regulations in our class/ university/ students residence halls/ public transport/etc. and write 5 sentences in the passive voice, e.g.: *Mobile phones have to be switched off***

## 7. Reading comprehension

Complete the text with the clauses below:

- that can be recognised by their different properties
- that result in a change of identity
- without changing its chemical identity
- because there is some observable change
- hydrogen and oxygen are *chemically* combined
- is classified as a chemical property
- that do not change chemical identities

### Changes in matter: Is it physical or chemical?

Sulphur is yellow; iron is magnetic; water boils at 100°C. These are different properties of matter, but with something in common. We can observe the colour of a substance, pick it up with a magnet, measure its boiling point or determine its mass (1) \_\_\_\_\_. Such properties are classified as **physical properties**. In chemistry, the word *physical* is used to refer to processes (2) \_\_\_\_\_. Separating sulphur and iron with a magnet is a physical separation. Boiling water is a *physical* change – the steam that forms is still water (H<sub>2</sub>O).

By contrast to physical changes such as boiling, there are processes that do result in changes of identity. When gasoline burns, it is converted to a mixture of carbon dioxide, carbon monoxide, and water. Burning in air, a property that gasoline, kerosene, and similar substances have in common, (3) \_\_\_\_\_.

The word *chemical* is used to describe processes (4) \_\_\_\_\_. The combination of hydrogen and oxygen to form water is a *chemical change* or **chemical reaction** – a process in which one or more substances (the **reactants**, which can be elements or compounds, or both) are converted to one or more different substances (the **products**, which can also be elements or compounds, or both).

A chemical reaction produces a new arrangement of atoms. The number and kinds of atoms in the reactants and products remain the same, but the reactants and products are different substances (5) \_\_\_\_\_. To distinguish between a hydrogen-oxygen mixture and a compound composed of hydrogen and oxygen, we might say that in water, (6) \_\_\_\_\_. The meaning is that the hydrogen and oxygen atoms are held together strongly enough to form the individual units we call water molecules.

Some easily observed results of chemical reactions are the rusting of iron, the change of leaf colour in the fall, and the formation of carbon dioxide bubbles by an antacid tablet. Often, though not always, the occurrence of a chemical reaction can be detected (7) \_\_\_\_\_.  
(adapted from Joesten Castellion, Hogg *The World of Chemistry*. Thomson Brooks/Cole: 2007.)

### Vocabulary:

matter (n) – hmota  
 solid (n/adj) - pevná látka,  
 pevný  
 liquid (n/adj) - kapalina,  
 kapalný  
 gas (n), gaseous /adj.) – plyn,  
 plynný  
 property (n) - vlastnost  
 rarefied – řídký  
 dense – hustý  
 based on – vycházející z, založený na  
 to maintain – udržovat, zachovávat  
 to adapt – přizpůsobit se  
 to expand – rozšířit (se), roztáhnout, rozrůst  
 to occupy – zabírat, zaplnit  
 transition – přechod  
 to indicate – naznačovat  
 abrupt – náhlý, prudký  
 interrelationship – vzájemný vztah

in proximity – v blízkosti  
 repulsion – odpor, odpuzování  
 be composed of – skládat se z...  
 to consider – považovat, pokládat  
 gluon – *hypotetická neutrální částice pojící vzájemně kvarky*  
 to occur – nastat, vyskytovat se  
 evaporation – vy-/odpařování  
 to pull apart – roztrhnout, odtrhnout od sebe  
 boiling point – bod varu  
 melting point – bod tání  
 freezing point – bod tuhnutí  
 on average – průměrně  
 tied up – svázaný  
 exception – výjimka  
 volume – objem  
 rigid – tuhý, pevný  
 hollow – dutý, prázdný