

7. COMPARING THE ELEMENTS

BRAINSTORMING

1. In groups, find the similarities and differences between the words in pairs.



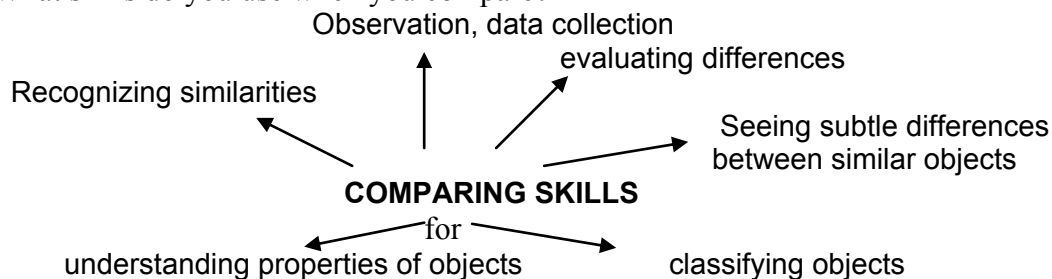
enthusiastic student - bored student

dolphin – submarine

Adam – Eve

2. What can you compare in chemistry?

3. What skills do you use when you compare?



LISTENING FOR NUMBERS- Abundance of the most common elements by mass.¹

1. Listen to the recording and note down the elements and the figures (percentages).

Reading numbers: 0.05 %: *nought point nought five percent*, 50-60 %: *fifty to sixty percent*

Earth's crust		Sea Water		Whole Earth	
Element	%	Element	%	Element	%

2. Look at the figures and write sentences comparing the occurrence of the elements. Use the following expressions:

slightly more than

far more than

a bit less than

much less than

not as much ...as...

Other examples:

*In the Earth's crust there is **much more** oxygen **than** aluminium (**not as much** Al **as** O).*

*In sea water we can find **slightly less** sulphur **than** magnesium.*

DESCRIBING SIMILARITIES AND DIFFERENCES

The Physical Properties of Six Metals

Metal	Specific Gravity	Melting Point (°C)	Boiling Point (°C)	Atomic Radius (Å)	Ionic Radius (Å)
Group I					
Copper	8.9	1083	2595	1.17	.96
Silver	10.5	960	2212	1.34	1.26
Gold	19.3	1063	2966	1.34	1.37
Group II					
Zinc	7.14	420	907	1.25	.74
Cadmium	8.65	321	765	1.41	.96
Mercury	13.60	-38.87	357	1.44	1.1

1. Circle the answer that best completes the statement according to the information in the chart.

- The atomic radius of cadmium is that of mercury.
 - as high as
 - not as high as
- mercury, cadmium has a high boiling point.
 - Like
 - Compared to
- The specific gravity of cadmium and copper are
 - similar
 - identical
- Compared to the other metals in this table, gold has specific gravity.
 - a relatively high
 - the highest
- The properties of cadmium and zinc are
 - comparable
 - identical
- Copper and gold have high boiling points.
 - comparatively
 - equally (=identically)
- The melting points of the Group II metals are those of Group I.
 - lower than
 - as low as
- The ionic radius of copper is to that of cadmium.
 - similar
 - equal

2. Speaking

Work in pairs and describe this table as a part of your presentation

Do not describe every number. You need to look at the important trends or characteristics and give a comparison or general overview.

Use the typical phrases, for example:

This is a table which shows ...

OK. Let's take a look at ...

As you can see on the left side of the table, ...

The first / second / next / column – row shows

The top row shows... / refers to .../specifies

WRITING

SHOWING SIMILARITIES

<i>A is</i>	<i>like as important as similar to comparable to</i>	<i>B..</i>
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<i>The properties of these metals are</i>	<i>equal / identical. similar / comparable.</i>
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<i>A</i>	<i>resembles parallels</i>	<i>B in many ways.</i>
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*Both carbon dioxide and hydrogen are gases.
Carbon dioxide and hydrogen are both gases.*

SHOWING DIFFERENCES

<i>X</i>	<i>is unlike is different from differs from</i>	<i>Y.</i>
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<i>X is</i>	<i>(far/much) heavier than less expensive than not as soft as</i>	<i>Y.</i>
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<i>Unlike X, In contrast to X, Compared to X, In comparison to X,</i>	<i>Y is light.</i>
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X is heavy, whereas / while/whilst Y is light.

<i>X is a</i>	<i>relatively comparatively</i>	<i>soft metal.</i>
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Write a paragraph comparing these metals. Use some of the sentence structures mentioned above.

	atomic weight	occurrence on the Earth	density	corrosion resistant
aluminium	26.982	crust	2.70 g/cm ³	yes
iron	55.845	core, crust	7.87 g/cm ³	no
magnesium	24.305	crust, sea water	1.74 g/cm ³	no

Vocabulary:

make a discovery (v+n) – učinit objev
 all but 20 – všechny kromě 20
 rarely (adv) – málokdy, zřídka
 extract (v) – vytěžit, extrahovat
 major component (adj+n) – hlavní složka
 remain (v) – zůstat, zbývat

stainless steel (adj+n) – nerezová ocel
 cast iron (adj+n) – litina
 abundant(adj) /abundance(n) – hojný/hojnost
 emerge (v) – objevit se
 supply (n) – zásoba
 withstand heat (v+n) – odolat teplotu

1. Read the text and complete the gaps with these forms of adjectives:

*lighter, stronger,
 more chemically active, more durable, more resistant to corrosion, less abundant
 the most widely used*

The study of metals began in the Middle Ages when alchemists searched for a technique to convert “base metals”, like lead, to gold. They never succeeded in making gold but at least by experimenting with the metals (in contrast to the ancient Greeks, who only speculated about them) they made discoveries.

All but 20 of the over 100 elements identified to date are metals but only 7 of these are common in the earth’s crust. Iron, 1 _____ metal, is rarely found in the free state (not combined with other metals) and must be extracted from naturally occurring compounds (ores) such as hematite, magnetite, and pyrite. The beautiful colors of rocks are due to these iron compounds. In fact, iron pyrite is often called fool’s gold because of the similarity of its color to gold. Iron is very strongly magnetic, and the fact that the earth is a magnet itself tipped scientists off to the fact that iron is a major component of the earth’s core, or centre.

Pure iron is a relatively soft, silvery metal that is very active chemically (that is, it combines with oxygen to corrode or form rust). It is usually mixed with other elements or compounds to form alloys such as steel, stainless steel, or cast iron, which are 2 _____ and rust resistant than pure iron.

Aluminum is the most abundant metal, but it was not used until a century ago because it is so active chemically and difficult to extract. Like iron it is soft, but in contrast to iron and steel, aluminum is very light and 3 _____. These qualities make it useful for airplanes, trains, automobiles, and rockets.

In the 1940s, magnesium emerged as an important metal. Although it is 4 _____ in the earth, 5 _____, and harder to extract than aluminum, it is present in sea water and that means there is almost an endless supply of it.

In the space age, the extraordinary properties of titanium have made it the new wonder metal. 6 _____ and 7 _____ than steel, it is more resistant to corrosion and able to withstand heat.

The remaining major metals are sodium, potassium, and calcium, all too active chemically (they react violently with water) for use in construction.

2. Speaking. Discuss these questions in pairs:

1. Did alchemists contribute to the progress of chemistry? How?
2. How can iron be obtained? obtain = získat
3. How do we know that iron is in the Earth’s core?
4. How are the iron alloys different from iron in properties?
5. What are the advantages of Al over Fe?
6. Which metal is stronger than steel?

3. Test your vocabulary. Which words go to these phrases from the reading?

- | | | | |
|----------------------------------|---------------------------------|--------------------------|--------------------|
| 1. succeeded | making gold | 6. Al is difficult | extract |
| 2. they | discoveries | 7. in contrast | iron |
| 3. all | 20 | 8. Mg emerged | an important metal |
| 4. such | hematite, magnetite, and pyrite | 9. able to | heat |
| 5. similarity of its color | gold | 10. react | with water |

Names of chemical elements

Listening. Listen to the song of the elements by Tom Lehrer and fill in the gaps.

Available at <http://www.privatehand.com/flash/elements.html>, Transcript <http://www.edu-cyberpg.com/iec/elementsong.html>

<p>There's antimony, arsenic, aluminum, selenium, And hydrogen and _____ and nitrogen and rhenium. And nickel, neodymium, neptunium, germanium, And _____, americium, ruthenium, uranium, Europium, zirconium, lutetium, vanadium, And lanthanum and osmium and astatine and _____. And gold, protactinium and indium and gallium, And _____ and thorium and thulium and thallium.</p>	<p>There's holmium and helium and hafnium and erbium, And _____ and francium and fluorine and terbium. And manganese and mercury, molybdenum, _____ Dysprosium and scandium and cerium and cesium, And lead, praseodymium, and platinum, plutonium, Palladium, promethium, polonium, Tantalum, technetium, titanium, tellurium, And cadmium and _____ and chromium and curium.</p>
<p>There's yttrium, ytterbium, actinium, And boron, gadolinium, niobium, iridium. And strontium and _____ and silver and samarium, And bismuth, bromine, lithium, beryllium and barium.</p>	<p>There's sulfur, californium and fermium, berkelium, And also mendelevium, einsteinium and nobelium. And argon, _____, neon, radon, xenon, zinc and rhodium, And chlorine, carbon, cobalt, copper, Tungsten, tin and _____.</p>
	<p>These are the only ones of which the news has come to Harvard, And there may be many others but they haven't been discovered.</p>

HOMEWORK

Complete the gaps in the following list of common chemical elements.

	Al	gold	Au	oxygen	O
argon	Ar		He		P
barium	Ba	hydrogen	H	platinum	Pt
beryllium	Be		I		K
	B	iron	Fe		Si
bromine	Br		Pb	silver	Ag
	Cd	lithium	Li		Na
	Ca		Mg	strontium	Sr
carbon	C	manganese	Mn		S
	Cl		Hg	tin	Sn
chromium	Cr	neon	Ne		W
	Cu		Ni	xenon	Xe
fluorine	F		N		Zn

GRAMMAR

Použijte slova v závorkách a dokončete věty. Použijte **much** / **a bit** + *druhý stupeň*, popř. **than**:

1. Her illness was much more serious than we thought at first. (much / serious)
2. This bag is too small. I need something (much / big)
3. I'm afraid the problem is it seems. (much / complicated)
4. You looked depressed this morning but you look now. (a bit / happy)
5. I enjoyed our visit to the museum. It was I expected. (far / interesting)

d) Dokončete věty, použijte **as.....as**:

1. I'm quite tall but you are taller. I'm not as tall as you.
2. My salary is high but yours is higher. My salary isn't
3. You know a bit about cars but I know more. You don't
4. It's still cold but it was colder yesterday. It isn't

e) Vytvořte věty, kde použijete **the same as**:

1. Sally and Kate are both 22 years old. Sally is the same age as Kate.
2. You and I both have dark brown hair. Your hair
3. I arrived at 10:25 and so did you. I
4. My birthday is 5 April. Tom's birthday is 5 April, too. My

f) Dokončete věty. Použijte **than.... nebo as**:

1. I can't reach as high as you. You are taller than me.
2. He doesn't know much. I know more
3. I don't work particularly hard. Most people work as hard
4. We were very surprised. Nobody was more surprised

Sources: **Lesson based on** Zimmerman, F.: English for Science, Prentice Hall, Inc., London, 1989.

¹Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science*. Longman 1990. Unit 9, Listening Practice 1.

³Raymond Murphy: *English Grammar in Use* second edition, Cambridge University Press 1994.

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