

## COMPARING THE ELEMENTS

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

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

2. Discuss the following questions:

- How often do we use comparing and contrasting in everyday life?
- Try to remember what you have compared today or yesterday.
- What can you compare in chemistry?

3. Listening: Abundance of the most common elements by mass.<sup>1</sup>

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	%

Speaking. Work in pairs. Form sentences comparing the elements, using these expressions:  
*slightly / a bit / much / far / a lot more – less ... than ... ; not as much ... as ...*

*Example: In the Earth's crust there is much more aluminium than oxygen (not as much Al as O).  
 In sea water we can find slightly less sulphur than magnesium.*

## THE WONDER METALS

### 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

### 4. Read the text and find out what wonder metals are used in the construction industry.

- 1 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.
- 2 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, the most widely used 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.
- 3 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 more durable and rust resistant than pure iron.
- 4 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 more resistant to corrosion. These qualities make it useful for airplanes, trains, automobiles, and rockets.
- 5 In the 1940s, magnesium emerged as an important metal. Although it is less abundant in the earth, more chemically active, and harder to extract than aluminum, it is present in sea water and that means there is almost an endless supply of it.
- 6 In the space age, the extraordinary properties of titanium have made it the new wonder metal. Lighter and stronger than steel, it is more resistant to corrosion and able to withstand heat.
- 7 The remaining major metals are sodium, potassium, and calcium, all too active chemically (they react violently with water) for use in construction.

### 5. Read the text once again and find the answers to these questions:

1. What is the chemical substance called fool’s gold?
2. What are the most common alloys formed with iron?
3. What is the advantage of aluminium over iron?
4. Where does magnesium occur?
5. Which elements react violently with water?

## SHOWING SIMILARITIES

<i>Magnesium is</i>	<u>like</u> <u>as important as</u> <u>similar to</u> <u>comparable to</u>	<i>aluminum.</i>
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<i>The properties of these metals are</i>	<i>equal / identical.</i> <i>similar / comparable.</i>
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<i>Magnesium</i>	<i>resembles</i> <i>parallels</i>	<i>aluminum 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>Iron</i>	<i>is unlike</i> <i>is different from</i> <i>differs from</i>	<i>aluminum.</i>
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<i>Iron is</i>	<i>(far/much) heavier than</i> <u>less expensive than</u> <u>not as soft as</u>	<i>aluminum.</i>
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<i>Unlike iron,</i> <i>In contrast to iron,</i> <i>Compared to iron,</i> <i>In comparison to iron,</i>	<i>aluminum is light.</i>
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<i>Iron is heavy,</i>	<i>whereas / while/whilst aluminum is light.</i>
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<i>Iron is</i> <i>a</i>	<i>relatively</i> <i>comparatively</i>	<i>soft metal.</i>
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**6.Listen to these statements about three metals: iron, aluminum and lead. Complete the chart.<sup>2</sup>**

	IRON	ALUMINIUM	LEAD
<b>Density</b>			
<b>Does it corrode?</b>			
<b>Is it easy to extract?</b>			

**Check the answers in pairs.**

**Now write a few sentences comparing these metals.**

*E.g. In contrast to iron, aluminium doesn't corrode.*

**7. Tables, charts, and graphs are useful for organizing information. Circle the answer that best completes the statement according to the information in the chart.**

*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

- 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

**Speaking. Work in pairs. Describe the table in Exercise 7. Use the typical comparing vocabulary and some phrases, for example:**

*This is a table which shows ...*  
*As you can see on the right side of the table, ...*  
*This shows / illustrates / demonstrates / refers to ...*  
*OK. Let's take a look at ...*  
*The first / second / next / column – row shows that ...*

**10. Read the text and then order the seven metals according to their melting points. List the metal with the highest melting point first.**

The melting point of *platinum* is high compared to most metals but not as high as that of *chromium*. The melting point of *zinc* is less than half the melting point of *gold* and approximately three times the melting point of *sodium*. *Mercury* has the lowest melting point of all the metals. *Copper* and gold have similar melting points, but the melting point of copper is slightly higher than gold and lower than platinum.

**Sources:** Lesson based on Zimmerman, F.: English for Science, Prentice Hall, Inc., London, 1989.  
<sup>1</sup>Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science*. Longman 1990. Unit 9, Listening Practice 1.  
<sup>2</sup>Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science*. Longman 1990. Unit 5, Listening Practice 2  
<sup>3</sup>Raymond Murphy: *English Grammar in Use* second edition, Cambridge University Press 1994.

**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/iecc/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**

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

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

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

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

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

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

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

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