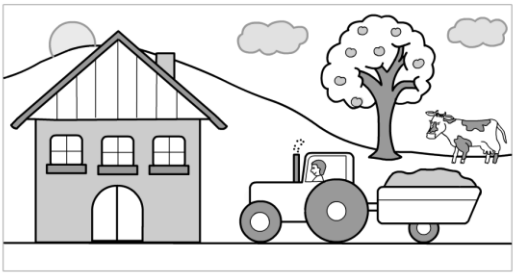
7. COMPARING THE ELEMENTS

1. There are 10 differences between these two pictures. Find them and describe them in pairs.
E.g. In the first picture ***THERE ARE*** *more windows than in the second picture.*

NAME: _____

THERE ARE 10 DIFFERENCES BETWEEN THOSE TWO PICTURES. FIND THEM AND MARK THEM WITH A CROSS.

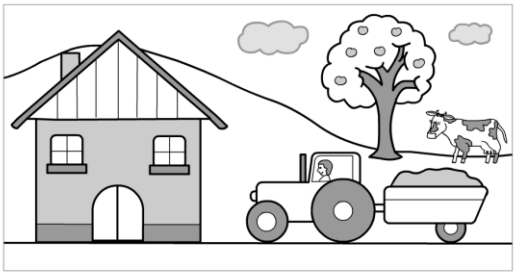
chimney →



← spot (on a cow)

← cart

house bedding →



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2. Discuss the following questions:

a) How often do we use comparing in everyday life? Think of shopping, going to school, transport, school lessons, looking for a job…

b) Try to remember what you have compared today or yesterday.

c) Try to compare: studying literature and science, Brno and your hometown, the foods in two countries that you know, boys and girls, a cat and a mouse, an American car with one from another country …

d) What can you compare in chemistry? Think about chemistry books, various diagrams, graphs, chemical tables, statistics.

3. Listening - Dictation: Abundance of the most common elements by mass.[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**	**%**

Speaking. Work in pairs. Forms 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*** *oxygen* ***than*** *aluminium (****not as much*** *O* ***as*** *Al).*
In sea water we can find ***slightly less*** *sulphur* ***than*** *magnesium.*

Article: THE WONDER METALS

4. Vocabulary:

You should know these words from our previous lessons:
major (adj), element (n), compound (n), convert (v), metal (n), experiment (v), common (adj), combine with … to form (v), occur (v), alloy (n), property (n), durable (adj)

New vocabulary:

search for a technique (v+n) – hledat techniku

make a discovery (v+n) – učinit objev
all but 20 – všechny kromě 20
rarely (adv) – málokdy, zřídka
extract (v) – vytěžit, extrahovat
due to – kvůli
major component (adj+n) – hlavní složka
relatively (adv) – relativně
chemically active(adv+adj) – chemicky aktivní

corrode/form rust (v) – korodovat/rezivět
rust resistant/resistant to corrosion (adj) – odolný proti korozi
stainless steel (adj+n) – nerezová ocel
cast iron (adj+n) – litina
abundant(adj) /abundance(n) – hojný/hojnost
emerge (v) – objevit se
present in (adj+prep) – přítomný v …
supply (n) – zásoba
withstand heat (v+n) – odolat teplu
remain (v) – zůstávat, zbývat

5. Read the text and find as many comparisons as you can *(e.g in contrast to, heavier than)* **Underline them.**

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 compound 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.

Now check the typical comparing vocabulary:

COMPARING SIMILARITIES

Magnesium is	***like*** ***as important as*** ***similar to*** ***comparable to***	*aluminum.*

The properties of these metals are	***equal / identical.*** ***similar / comparable.***

Magnesium	***resembles*** ***parallels***	*aluminum in many ways.*

Both *carbon dioxide* ***and*** *hydrogen are gases.*   *Carbon dioxide and hydrogen are* ***both*** *gases.*

CONTRASTING DIFFERENCES

Iron	*is* ***unlike*** *is* ***different from*** ***differs from***	*aluminum.*

Iron is	***(far/much) heavier than*** ***less expensive than*** ***not as soft as***	*aluminum.*

Unlike *iron,* ***In contrast to*** *iron,* ***Compared to*** *iron,* ***In comparison to*** *iron,*	*aluminum is light.*

Iron is heavy,	***whereas*** */* ***while/whilst*** *aluminum is light.*

Iron is a	***relatively*** ***comparatively***	*soft metal.*

7. Listen to these statements about three metals: iron, aluminium and lead. Complete the chart.[2]

	IRON	ALUMINIUM	LEAD
Density			
Does it corrode?			
Is it easy to extract?			

Check the answers in pairs.
Now write 1-3 sentences, comparing these metals.
E.g. In contrast to iron, aluminium doesn´t corrode.

8. 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

a) The atomic radius of cadmium is …… that of mercury.
1. as high as 2. not as high as
b) …….. mercury, cadmium has a high boiling point.
1. Like 2. Compared to
c) The specific gravity of cadmium and copper are ……. .
1. similar 2. identical
d) Compared to the other metals in this table, gold has …… specific gravity.
1. a relatively high 2. the highest
e) The properties of cadmium and zinc are …… .
1. comparable 2. identical
f) Copper and gold have ……. high boiling points.
1. comparatively 2. equally (=identically)
g) The melting points of the Group II metals are ……. those of Group I.
1. lower than 2. as low as
h) The ionic radius of copper is …….. to that of cadmium.
1. similar 2. equal

9. Speaking. Work in pairs. Describe the table in Exercise 8. Use the typical comparing vocabulary.Use these phrases to describe the table:

This is a table which shows …
As you can see on the right side of the table, …
This shows / illustrates / demonstrates / refers to …
Here we can see … As you can see, …
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.

11. Work in small groups. Write a short text, comparing two items of your choice. Use the standard structures, phrases and vocabulary. Then read it aloud to everybody.

12. HOMEWORK:

Circle the synonym (=word that means the same):

1. Chemists study the composition of natural *substances*.
a. materials b. machines

2. Plastic products are hard to dispose of because they are almost *indestructible*.
a. unable to be destroyed b. unable to be constructed

3. Silicon is a nonmetallic element that is inexpensive because it is so *abundant* in minerals and rocks.
a. rare b. plentiful

4. When exposed to air and moisture, iron will *corrode*.
a. rust b. shine

5. After the fire, the police investigated the cause of the *combustion*.
a. burning b. excitement

6. Gasoline should be stored carefully because it is *flammable*.
a. fireproof b. able to catch fire easily

7. Heat can *convert* a solid to a liquid.
a. condense b. change

8. The ammonia was *diluted* in water to make it weaker.
a. thinned b. thickened

9. A *catalyst* speeds up a chemical reaction.
a. chemical agent b. forest animal

10. To obtain aluminum, metallurgists must *extract* it from bauxite.
a. remove b. destroy

11. The temperature on a Fahrenheit fever thermometer *ranges* from 94° to 108°.
a. extends b. contracts

12. The *volume* of air in a room can be measured in cubic feet.
a. quality b. quantity

13. Ten *minus* four equals six.
a. less b. plus

14. Newton *computed* the weights of the planets.
a. measured b. calculated

15. Water contains hydrogen and oxygen in a *ratio* of two to one.
a. proportion b. size

16. The price of gasoline was *quadrupled*, and there were fears it would go even higher.
a. multiplied by four b. divided by four

Sources: **Lesson based on** Zimmerman, F.: English for Science, Prentice Hall, Inc., London, 1989.
[1]Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science.* Longman 1990. Unit 9, Listening Practice 1.
[2] Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science.* Longman 1990. Unit 5, Listening Practice 2.

Week 6 – Comparing the Elements - Vocabulary	
search for a technique (v+n)	hledat techniku
make a discovery (v+n)	učinit objev
all but 20	všechny kromě 20
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supply (n)	zásoba
withstand heat (v+n)	odolat teplu
remain (v)	zůstávat, zbývat
similar to …	podobný jako …
comparable to …	srovnatelný s …
Magnesium resembles / paralells aluminium.	Hořčík připomíná hliník.
Iron is unlike / different than /differs from aluminium.	Železo se liší od hliníku.
Both carbon dioxide and hydrogen are gases.	Jak oxid uhličitý, tak vodík jsou plyny.
Iron is not as soft as aluminium.	Železo není tak měkké jako hliník.
Unlike / In contrast to …	Na rozdíl od …
Compared to / in comparison with …	Ve srovnání s …
Iron is heavy, whereas / while / whilst aluminum is light.	Železo je těžké, zatímco hliník je lehký.
identical (adj) / identically (adv)	identický, totožný / identicky
equal (adj) / equally (adv)	stejný, rovnocenný / stejně, rovnocenně
Iron is heavier than aluminium	Železo je těžší než hliník.
Aluminium is less heavy than iron.	Hliník je méně těžký než železo.
Mercury has the lowest melting point of all metals.	Rtuť má nejnižší bod tání ze všech kovů.
This is a table which shows …	Tato tabulka ukazuje …
As you can see on the right side of the table,	Jak vidíte na pravé straně tabulky …
This shows / illustrates / demonstrates / refers to …	Toto ukazuje / ilustruje / demonstruje / odkazuje k …
Here we can see … As you can see, …	Tady vidíme … Jak vidíme …
OK. Let's take a look at …	Dobrá. Podívejme se na …
The first / second / next / column – row shows that …	První / druhý / další sloupec – řada ukazuje, že …