PROPERTIES OF MATERIALS

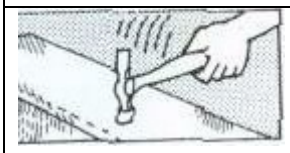
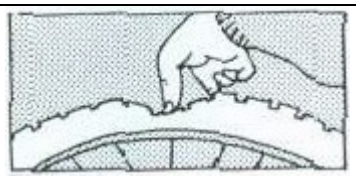
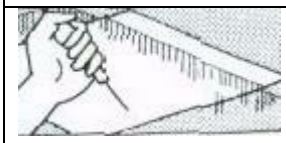
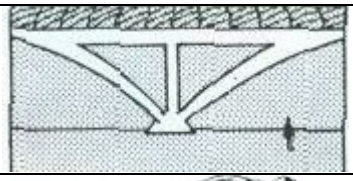
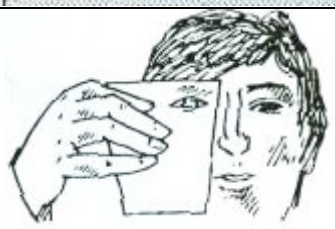
1. Think about the things listed below. Can you describe them to the person sitting next to you? Talk about the material they are made of, the size, shape, colour, country of origin, etc. You partner may ask questions. Then swap roles.

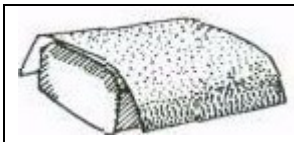
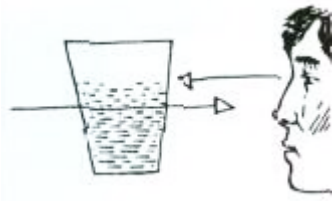
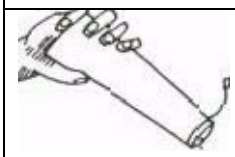
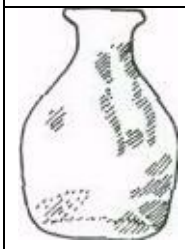
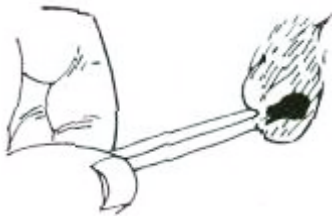
- your memorable present
- your favourite piece of clothing or jewellery
- something that you could never be without
- something that you would like to have

2. Discuss these questions:

a) What materials can you see in this classroom? What objects are made of them?
b) Think of plastic, glass, wood objects. Can you compare these materials?
c) What is your favourite material for clothes? Do you prefer natural or synthetic materials? Why?
d) What material are you wearing right now? Look at the label - what is the composition of this material?
e) Give examples of things which were originally made of natural materials and now are made of plastics. Why are plastics now used? Are there any disadvantages?
f) What are some traditional and modern building materials? Give examples.

3. Adjectives describing properties: give more examples of things with this property. Form nouns from the adjectives:[1]

	A *brittle* material or thing breaks easily; e.g. (for example, for instance, such as, like) glass, egg,. . **noun:**		A soft material is easy to scratch e.g. chalk **noun:**
	A *tough* material / thing does not *break* easily; e.g. steel,. . . **noun:**		A *flexible* material *bends* easily: e.g. rubber, .. **noun:**
	A *hard* material is difficult to *scratch.* e.g. glass, .. . **noun:**		A *rigid* material does not *bend* easily; e.g. concrete,... **noun:**
	Some materials have a *smooth* surface; they produce little *friction* when they are rubbed; e.g. ice,... noun:		You can see through *transparent* materials; e.g. water,. … noun:

	Some materials have a *rough* surface and produce a lot of friction; e.g. sandpaper, . .. noun:		You cannot see through *translucent* materials but the light passes through them; e.g. dirty water, . . . noun:
	*Soluble* materials dissolve easily; e.g. salt,… noun:		You cannot see through *opaque* materials and the light cannot pass through them; e.g. metal,. . . noun:
	Materials which are *insoluble* do not *dissolve*; e.g. glass,... noun:		*Combustible* materials *burn* easily e.g. wood,... noun:

4. Writing questions: make any meaningful questions for these answers.

a) Example*:* ……*Why do branches of a tree bend in the wind……?* Because they are flexible.

b) ……? Because it is tough.

c) ……? Because they are rigid.

d) ……? Because it is soft.

e) ……? Because diamond is harder.

f) ……? Because it is opaque.

g) ……? Because it is insoluble.

5. Complete the sentences below with appropriate words from exercise 3.

a. The carbonates and phosphates of all metals are _____ in water but _____ in dilute acids.

b. The pale pink colour of quartz, which can range from _____ to translucent, is known as rose quartz.

c. Some colloids are _____ because of the Tyndal effect, which is the scattering of light by particles in the colloids.

d. System Soft Shot is a booster for dry and _____ hair.

e. _____ materials are liable to catch fire very easily and burn.

f. _____ is an important property of steel.

g. This PVC tubing offers excellent wear resistance and rubber-like _____.

h. A _____ substance or object is stiff & does not bend, stretch or twist easily.

6. Listening[2]:

Listen to some properties of materials. Make notes in the form of a table.

From *Nucleus of General Science.* Unit 1, Listening Practice 2.

	material	**property**	**verbal structure**
Example:	*salt*	*soluble*	*dissolves easily*

7. Some other properties of materials. Form adjectives from these nouns.

Czech translation	**Noun**	**Adjective**
a) pružnost	***elasticity***	***elastic***
b) křehkost	fragility	
c) tažnost	malleability	
d) kujnost	ductility	
e) vodivost	conductivity	
f) žáruvzdornost	heat-resistance	
g) zápalnost	flammability	
h) jedovatost, toxicita	toxicity	
i) reaktivita	reactivity	
j) netečnost	inertness	
k) lehkost	lightness	
l) těžkost	heaviness	
m) savost, absorpčnost	absorbency	
n) viskozita, lepkavost	viscosity	
o) hustota	density	
p) trvanlivost, odolnost	durability	
q) odolnost proti korozi	corrosion resistance	
r) síla	strength	
s)		
t)		
u)		
v)		
w)		

8. Speaking:

Work in pairs. One student describes something, using as many adjectives as he or she can. The second one should guess what it is (can ask yes/no questions). You can describe the colour, size, shape, origin, appearance, use etc. Then swap roles.

Useful phrases:

The object	*is*	***slightly / relatively / quite / extremely***			*small / soluble in water / hot / silvery*
The	***colour / shape / durability***	*of*	*the object*	*is*	*blue / circular / high*

9. Read the article and complete the empty lines in exercise 7 with more properties.

Why Is Stainless Steel Stainless?[3]

In 1913, English metallurgist Harry Brearly accidentally discovered that adding chromium to low carbon steel gives it stain resistance. It is the addition of a minimum of 12% chromium to the steel that makes it resist rust, or stain 'less' than other types of steel. The chromium in the steel combines with oxygen in the atmosphere to form a thin, invisible layer of chrome-containing oxide, called the passive film. The sizes of chromium atoms and their oxides are similar, so they pack neatly together on the surface of the metal, forming a stable layer only a few atoms thick. If the metal is cut or scratched and the passive film is disrupted, more oxide will quickly form and recover the exposed surface, protecting it from oxidative corrosion. The passive film requires oxygen to self-repair, so stainless steels have poor corrosion resistance in low-oxygen and poor circulation environments.

According to the World Steel Association, there are over 3,500 different grades of steel, with unique physical, chemical and environmental properties. They can be broadly categorized into four groups.

1) Carbon Steels:
Carbon steels contain trace amounts of alloying elements and account for 90% of total steel production. The most widely used grades of steel contain only 0.1-0.25% carbon.

2) Alloy Steels:
Alloy steels contain alloying elements (e.g. manganese, silicon, nickel, titanium, copper, chromium and aluminium) in varying proportions in order to manipulate the steel's properties, such as its hardenability, corrosion resistance, strength, formability, weldability or ductility. Applications for alloys steel include pipelines, auto parts, transformers, and electric motors.

3) Stainless Steels:
Stainless steels generally contain between 10-20% chromium and are valued for high corrosion resistance. These steels can be divided into three groups based on their crystalline structure:

- *Austenitic:* Austenitic steels are non-magnetic and non heat-treatable, and generally contain 18% chromium, 8% nickel and less than 0.8% carbon. Austenitic steels are often used in food processing equipment, kitchen utensils and piping.
- *Ferritic:* Ferritic steels contain trace amounts of nickel, 12-17% chromium, less than 0.1% carbon, along with molybdenum, aluminium or titanium. These magnetic steels cannot be hardened with heat treatment, but can be strengthened by cold works.
- *Martensitic:* Martensitic steels contain 11-17% chromium, less than 0.4% nickel and up to 1.2% carbon. These magnetic and heat-treatable steels are used in knives, cutting tools, as well as dental and surgical equipment.

4) Tool Steels:
Tool steels contain tungsten, molybdenum, cobalt and vanadium in varying quantities to increase heat resistance and durability, making them ideal for cutting and drilling equipment.

Rewrite English names of chemical elements from the text:
C O Cr Mn Si Ni Ti Cu Al Mo W Co V

HOMEWORK[4]

Science and Technology: Fill in the gap with the correct word.

a. …….. are being carried out to find a cure for cancer.
Experiences Experiments Trials Research

b. Microscopes ……..very small objects many times to make them visible.
magnify enlarge expand increase

c. Radio signals are now often ……..by satellite.
received delivered transmitting dispersed

d. Computers are able to …… vast amounts of data very quickly.
digest convert adapt process

e. Solar power stations are able to …….. the energy of the sun.
maximise drive convert harness

f. Other …… energy sources include wind and wave power.
recyclable returnable reusable renewable

g. In some types of power station steam is used to ……turbines.
force turn drive rotate

h. Mercury is …….at room temperature
fluid liquid solid gas

i. Hydrogen and oxygen are the two …….. that make up water.
compounds atoms molecules elements

j. All ……..is composed of atoms.
stuff material substance matter

k. The …… of lead is greater than that of aluminium.
viscosity absorbency density volume

l. When water is heated it ……..more quickly.
evaporates condenses melts solidifies

m. The …….. of iron and oxygen produces rust.
reaction separation decomposition composition

n. Chemists study the composition of natural ……..
substances machines mixtures alloys

o. The …….. of water is 100°C.
melting point boiling point point of condensation freezing point

9. Choose the right word in a sentence:

a) A conductive / conductivity material can be used to conduct electricity.
b) If a material is easy to stretch under stress, we call it elastic / elasticity.
c) If you want to improve durable / durability of a machine, clean it regularly.
d) Hard / hardness is an important property of steel.
e) Concrete is used for building because it is strong / strength.

Adapted from: [1]Jirků, Dana et al. *English for Future Engineers.* Praha: ČVUT, 2007.
[2] Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science.* Longman 1990.
[3] World Steel Association website: http://worldsteel.org
[4] J.Harbord: *Topic-based Vocabulary*.