



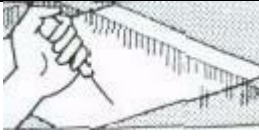
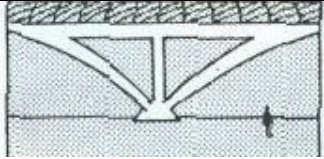

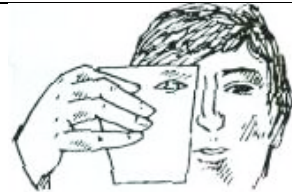
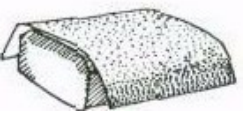
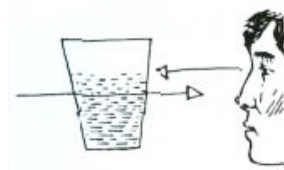
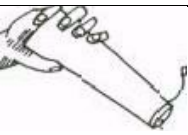


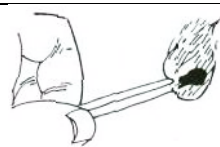


## 12 PROPERTIES OF MATERIALS

### 1. Adjectives describing properties - form nouns from the adjectives:

	A <b>brittle</b> material or thing breaks easily; e.g. glass, egg <b>noun:</b>		A <b>soft</b> material is easy to scratch e.g. chalk <b>noun:</b>
	A <b>tough</b> material / thing does not <i>break</i> easily; e.g. steel <b>noun:</b>		A <b>flexible</b> material <i>bends</i> easily: e.g. rubber <b>noun:</b>
	A <b>hard</b> material is difficult to <i>scratch</i> . e.g. glass <b>noun:</b>		A <b>rigid</b> material does not <i>bend</i> easily; e.g. concrete <b>noun:</b>
	Some materials have a <b>smooth</b> surface; they produce little <i>friction</i> when they are rubbed; e.g. ice <b>noun:</b>		You can see through <b>transparent</b> materials; e.g. water <b>noun:</b>
	Some materials have a <b>rough</b> surface and produce a lot of friction; e.g. sandpaper <b>noun:</b>		You cannot see through <b>translucent</b> materials but the light passes through them; e.g. dirty water <b>noun:</b>
	<b>Soluble</b> materials dissolve easily; e.g. salt <b>noun:</b>		You cannot see through <b>opaque</b> materials and the light cannot pass through them; e.g. metal <b>noun:</b>
	Materials which are <b>insoluble</b> do not <i>dissolve</i> ; e.g. glass <b>noun:</b>		<b>Combustible</b> materials <i>burn</i> easily e.g. wood <b>noun:</b>

Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science*.

### 2. Adjective + the infinitive. Choose the right word in the second sentence to say the same as the 1<sup>st</sup> one.

- |  |  |
|--|--|
| 1. You can scratch chalk easily.             | Chalk is <b>easy / hard</b> to scratch.                  |
| 2. Steel cannot be bent without force.       | Steel is <b>easy / difficult</b> to bend.                |
| 3. Diamond is so hard that it can cut glass. | Diamond is <b>hard / soft</b> enough to cut glass.       |
| 4. You can burn paper without much effort.   | Paper is <b>hard / easy</b> to burn.                     |
| 5. Rubber cannot be torn apart easily.       | Rubber is too <b>elastic / brittle</b> to be torn apart. |

**3. Look at the materials in task 1 and in pairs, say a few sentence about their properties. Make sentences with an adjective + the infinitive.**

**4. An experiment: Complete the text with the correct form of the word in brackets.**

<https://learnenglish.britishcouncil.org/skills/listening/upper-intermediate-b2/a-lecture-about-an-experiment>

Pitch is the name (1)..... (give) to a black substance that can be manufactured from petroleum, coal tar or plants. It was (2)..... (original) used in road (3)..... (construct), boat- (4)..... (build) and waterproofing roofs. It is known for its viscosity (being semi-fluid), its (5)..... (sticky) and its (6)..... (elastic). In fact, pitch is the world's (7)..... (thick) known fluid. An experiment to let drops of pitch form and then fall has been going for 92 years without (8)..... (interrupt).

**5. Circle the best answer.**

1. *The pitch drop experiment is ...*

- a. the oldest experiment in history.
- b. the oldest experiment that is still running today.
- c. the longest experiment in 1927.

2. *The creator of the experiment wanted to ...*

- a. have an experiment that lasted a long time.
- b. show the dangers of everyday materials.
- c. show that common substances have extraordinary properties.

3. *Pitch is a substance ...*

- a. that looks solid but is actually liquid.
- b. that looks liquid but is actually solid.
- c. that doesn't appear to be liquid or solid.

4. *The professor heated and poured the sample into a*

- a. porcelain vessel.
- b. plastic beaker.
- c. glass funnel.

5. *The first time a drop of pitch fell was ...*

- a. eight years after the experiment began.
- b. three years after the experiment began.
- c. forty years after the experiment began.

6. *Which of the following sentences is true about Professor John Mainstone?*

- a. He never saw the pitch drop.
- b. He was responsible for the experiment for over fifty years.
- c. He took over the experiment in 1927.

7. *In the year 2000, ...*

- a. an electricity failure meant the pitch drop was not filmed.
- b. scientists set up a live stream of the experiment.
- c. the ninth drop of pitch fell.

8. *In Dublin, ...*

- a. news about unusual events spread very quickly.
- b. scientists set up a similar experiment.
- c. people weren't interested in such a slow event.

**6. Do you know of any other famous experiments? What are they?**

**7. Here are other properties of materials. Form adjectives from these nouns.**

Czech translation	Noun	Adjective
1. pružnost	elasticity	elastic
2. křehkost	fragility	
3. tažnost	ductility	
4. kujnost	malleability	
5. vodivost	conductivity	
6. žáruvzdornost	heat-resistance	
7. zápalnost	flammability	
8. jedovatost, toxicita	toxicity	
9. reaktivita	reactivity	
10. netečnost	inertness	
11. lehkost	lightness	
12. savost, absorpčnost	absorbency	
13. viskozita, lepkavost	viscosity	
14. hustota	density	
15. trvanlivost, odolnost	durability	
16. odolnost proti korozi	corrosion resistance	
17. síla	strength	
18. rozpustnost	solubility	
19. hořlavost	combustibility	
20. propustnost	permeability	

**8. Grammar: the use of adjectives + infinitives – study the examples here:**

<http://www.grammaring.com/adjective-to-infinitive>

**9. Discoveries and inventions**

Add the words 1 -6 to the text.

Read the text to find out *what makes the properties of steel better*, and under what conditions. Underline your answers.

In 1913, English metallurgist Harry Brearly accidentally discovered that adding chromium to low carbon steel gives **1**\_\_ stain resistance. It is the addition of a minimum of 12% chromium to the steel **2**\_\_ 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 **3**\_\_ oxides are similar, so **4**\_\_ 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, **5**\_\_ oxide will quickly form and recover the exposed surface, protecting **6**\_\_ 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.

<http://worldsteel.org>

- |               |                |                 |                |                |                |
|---------------|----------------|-----------------|----------------|----------------|----------------|
| <b>1.</b> its | <b>2.</b> that | <b>3.</b> other | <b>4.</b> they | <b>5.</b> less | <b>6.</b> them |
| it            | which          | his             | that           | little         | it             |
| this          | what           | their           | what           | more           | us             |

## 10. Describing advantages and drawbacks

Talking about <b>ADVANTAGES</b>	<b>DISADVANTAGES</b>
<i>The greatest advantage of ...</i>	<i>One drawback of...</i>
<i>Another point in favour of ... is</i>	<i>Another point against ... is...</i>
<i>The major benefit of...</i>	<i>A major disadvantage of ...</i>
<b>PROS</b>	<b>CONS</b>
<i>good points, pluses, positive aspect, advantage, positive point, benefit</i>	<i>bad points, minuses, disadvantage, drawback, negative effect,</i>

You will get a picture showing a new invention. Describe the invention and persuade your classmates about its benefits.

### HOMEWORK: How to make graphene

<https://www.youtube.com/watch?v=ehvksWx3AJQ&list=PLA8E157D4D495E8D0> 0.30 – 3.30 , 5.35 – 6.56

The scientists from the University of Manchester show how to make graphene from graphite and explain why graphene is an extraordinary material. Complete the gaps with the given words. Then listen and check.

*impression squishy sticky naked excess absorbs rip edge sample cleave range conductor light*

1. We take some graphite and place it on some tape, ..... tape.
2. Then you just press the graphite, it's .....
3. Press the graphite on the tape and then you can take an .....
4. When you press the tape together, you're basically removing a few layers, (...) so we just remove the ..... graphite.
5. It's quite thick - it's still a graphite, you can see it with the ..... eye.  
(...)
6. Once you press the flakes onto the silicon surface, just grab the ..... of the tape and the trick is to remove the tape slowly.
7. If you do it too quickly, then the layers don't ..... that well.
8. What we would then do is transfer the ..... to a microscope.  
(...)
9. Nice thing about graphene is that it's got a whole ..... of properties which are all great.
10. Despite the fact that it is so thin, it's also the strongest material. If you try to ..... it apart, it takes more force than anything else.
11. Since it is so thin, it's also very .....
12. It's mostly transparent – it's about 97% transparent to light but another way of looking at it is despite being that thin it still ..... 3%.
13. Graphene is the best ..... of electricity and heat because electrons can zip through graphene as if they are particles of light.