

Everything flows!

This week's 'IST Austria – Pop Up Science' deals with fluid mechanics. This science examines liquids, gases and their properties.

Did you know that in 2018 wind flows were so strong that the current of the North Sea moved “wrongly” for a month and a half?

During this time, the wind mainly came from the east. Because of this, the direction of the ocean current changed from mid-February to late April 2018!



A. Read the following text and underline the most important information.

Fluid mechanics is a branch of physics and deals with moving fluids. Fluids are, for example, liquids such as water or blood, but also gases such as nitrogen or oxygen. Did you know that the chemical abbreviation for nitrogen is N_2 and for oxygen is O_2 ? In addition, did you know that the air we breathe consists of 78 percent (%) nitrogen and 21 percent (%) oxygen? The rest consists of argon, carbon dioxide (abbreviated as CO_2) and other gases.

If you want to know if something is a fluid or not, just imagine you put the substance in a glass. If the substance fills the entire glass, it is a fluid. It flows! Milk or oil are fluids because they fill the glass. A stone or a blade of grass does not do this and because of this, they are not fluids.

We learned that fluids flow. Fluids like water or blood flow quickly enough that we can see it. Other things like mountains or glaciers flow too! However, these flow over many years or even millennia. This means, that they flow so slowly that we cannot see it.

Possible research questions from researchers in fluid mechanics are, for example, "Why doesn't a water strider sink?" or "How do cyclones form?"

These questions have already been answered. However, research with liquids can also be very complicated! How certain things exactly work is often still a mystery where even the smartest researchers have no clue yet.

Did you know that fluid mechanics helps us to understand why an airplane can fly? With fluid mechanics, lots of energy can be saved when transporting oil or gas through pipes. In addition, without fluid mechanics, we would not be able to predict storms.

B. Try to answer the following questions and check the correct answers.

1. What is NOT a fluid?

- water a blade of grass nitrogen

2. What is the composition of air?

- 78 % oxygen, 21 % nitrogen, 1 % other gases
 78 % nitrogen, 21 % oxygen, 1 % other gases
 78 % oxygen, 21% other gases, 1 % nitrogen

3. What is the chemical abbreviation of carbon dioxide?

- OC₂ CO₂ KO₂

4. Which of the following things can flow?

- a blade of grass a pencil a glacier

5. Researchers have already answered all questions in fluid mechanics.

- true false

6. Give examples!

Fluid mechanics has helped us ...

... to save energy: _____

... to fly: _____

... to predict the weather: _____

C. Word search

This time our word search is a bit more difficult than last week. Different terms of physics are hidden in it. Can you find the following words?

- | | | |
|-------------------|-----------------|-------------|
| 1. THERMODYNAMICS | 5. MECHANICS | 9. LIGHT |
| 2. ELECTRICITY | 6. MACROPHYSICS | 10. CURRENT |
| 3. OXYGEN | 7. MICROPHYSICS | 11. FORCE |
| 4. FLUIDS | 8. ACOUSTICS | 12. OPTICS |

Circle each word. Good luck!

K	P	V	E	N	V	E	L	E	C	T	R	I	C	I	T	Y	P	A	I
W	N	G	I	T	H	E	R	M	O	D	Y	N	A	M	I	C	S	R	U
B	E	U	X	D	Z	A	K	G	R	X	O	A	L	W	Q	W	G	L	J
Q	L	G	X	J	R	B	J	N	S	U	A	E	F	W	P	K	A	M	R
C	M	E	C	H	A	N	I	C	S	J	Z	Y	O	O	X	G	Z	I	F
U	J	R	P	T	M	N	V	D	O	X	Y	G	E	N	R	K	K	C	V
R	I	M	D	G	Z	S	U	K	Q	W	I	O	F	V	H	C	C	R	N
R	X	B	A	Q	V	F	L	U	I	D	S	X	Q	J	X	R	E	O	N
E	L	D	Z	C	A	L	I	D	C	E	I	Q	X	H	A	Y	K	P	S
N	Z	Q	A	Z	R	T	H	B	C	X	L	P	A	U	C	Q	F	H	G
T	C	H	O	J	R	O	Z	S	D	Y	H	O	X	D	O	X	A	Y	O
C	M	L	D	U	A	C	P	N	X	U	X	P	Y	J	U	Z	N	S	I
T	Z	R	Y	F	C	I	K	H	D	G	Z	T	A	C	S	L	R	I	V
V	V	M	E	C	M	X	M	V	Y	S	H	I	F	I	T	G	A	C	D
A	T	G	U	D	E	D	F	U	P	S	S	C	J	K	I	D	E	S	O
W	Q	L	X	E	C	T	R	Z	S	J	I	S	L	Y	C	A	C	K	P
H	I	D	F	P	Y	E	O	D	K	F	T	C	Z	I	S	H	M	X	Y
C	V	S	R	N	J	N	T	O	F	B	N	I	S	J	G	S	E	M	T
P	U	G	W	E	M	P	I	W	M	T	S	F	W	Z	A	H	S	K	C
M	H	U	P	D	S	L	L	H	K	Y	P	O	A	O	K	I	T	Y	G

D. Color the pictures. Have fun!



Solutions

A. The correct answers are:

1. **A blade of grass** is NOT a fluid.
2. The air consists of **78 % nitrogen, 21 % oxygen and of 1 % other gases**.
3. The chemical abbreviation of carbon dioxide is **CO₂**.
4. A glacier cannot flow.
5. That researchers have already answered all questions in fluid mechanics is **false**.
6. Fluid mechanics has helped us to **understand why an airplane can fly, to save energy when transporting oil or gas through pipes and to predict storms**.

B. Here you can see where to find the following words:

K	P	V	E	N	V	E	L	E	C	T	R	I	C	I	T	Y	P	A	I
W	N	G	I	T	H	E	R	M	O	D	Y	N	A	M	I	C	S	R	U
B	E	U	X	D	Z	A	K	G	R	X	O	A	L	W	Q	W	G	L	J
Q	L	G	X	J	R	B	J	N	S	U	A	E	F	W	P	K	A	M	R
C	M	E	C	H	A	N	I	C	S	J	Z	Y	O	O	X	G	Z	I	F
U	J	R	P	T	M	N	V	D	O	X	Y	G	E	N	R	K	K	C	V
R	I	M	D	G	Z	S	U	K	Q	W	I	O	F	V	H	C	C	R	N
R	X	B	A	Q	V	F	L	U	I	D	S	X	Q	J	X	R	E	O	N
E	L	D	Z	C	A	L	I	D	C	E	I	Q	X	H	A	Y	K	P	S
N	Z	Q	A	Z	R	T	H	B	C	X	L	P	A	U	C	Q	F	H	G
T	C	H	O	J	R	O	Z	S	D	Y	H	O	X	D	O	X	A	Y	O
C	M	L	D	U	A	C	P	N	X	U	X	P	Y	J	U	Z	N	S	I
T	Z	R	Y	F	C	I	K	H	D	G	Z	T	A	C	S	L	R	I	V
V	V	M	E	C	M	X	M	V	Y	S	H	I	F	I	T	G	A	C	D
A	T	G	U	D	E	D	F	U	P	S	S	C	J	K	I	D	E	S	O
W	Q	L	X	E	C	T	R	Z	S	J	I	S	L	Y	C	A	C	K	P
H	I	D	F	P	Y	E	O	D	K	F	T	C	Z	I	S	H	M	X	Y
C	V	S	R	N	J	N	T	O	F	B	N	I	S	J	G	S	E	M	T
P	U	G	W	E	M	P	I	W	M	T	S	F	W	Z	A	H	S	K	C
M	H	U	P	D	S	L	L	H	K	Y	P	O	A	O	K	I	T	Y	G

Sources: <https://klexikon.zum.de/>; <https://www.suchsel.net/>; *Extreme westward surface drift in the North Sea: Public reports of stranded drifters and Lagrangian tracking*, Stanev E.V. et al., Continental Shelf Research, 2019