

# 💧 WATER = Chemical Miracle & Carrier of Life

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## 1. Chemical Unique: Why is water not a gas?

From a chemical point of view, water ( $\text{H}_2\text{O}$ ) is absolutely unique. If we were to follow only the periodic table of elements and standard physical laws, water should not exist in a liquid state on Earth at all – it should be a gas.

**Boiling Point Anomaly (Comparison with analogues)** The best way to demonstrate the "strangeness" of water is to compare it with oxygen's chemical "siblings". Oxygen (O) lies in group 16 of the periodic table. Below it are sulfur (S), selenium (Se), and tellurium (Te). All these elements form similar three-atom molecules with hydrogen ( $\text{H}_2\text{X}$ ).

**The physical rule is:** The heavier the molecule, the higher its boiling point should be.

**Comparative Boiling Point Table:**

Compound	Formula	Molar Mass	Boiling Point (°C)	State at 20°C
Water	$\text{H}_2\text{O}$	18 g/mol	+100 °C	Liquid
Hydrogen sulfide	$\text{H}_2\text{S}$	34 g/mol	-60 °C	Gas
Hydrogen selenide	$\text{H}_2\text{Se}$	81 g/mol	-41 °C	Gas
Hydrogen telluride	$\text{H}_2\text{Te}$	130 g/mol	-2 °C	Gas

**Scientific Conclusion:** Although water is the lightest (has the lowest mass), it has drastically the highest boiling point. According to the trend of other elements, water should boil at approx. -80 °C. The fact that it is liquid is an anomaly caused by strong **hydrogen bonds** (interaction between the hydrogen atom of one molecule and the lone electron pair of the oxygen of another molecule).

### Geometric Anomaly (Why is it not straight?)

- **$\text{CO}_2$  (O=C=O):** It is a linear molecule (180° angle). Because of this, the electric charges cancel out and the molecule is non-polar. Therefore,  $\text{CO}_2$  is a gas under normal conditions.
- **$\text{H}_2\text{O}$  (H-O-H):** It is not linear. The bond angle is 104.45°. The shape resembles the letter "V".

**Consequence:** Thanks to this curvature, a strong **dipole** is created (one side of the molecule is positive, the other negative). This makes water the "universal solvent". If water were linear like  $\text{CO}_2$ , life as we know it would not be possible because water would not be able to dissolve salts and minerals in blood or sap.

## 2. Catalogue of Anomalies: 23 Key Oddities of Water

Professor Martin Chaplin of London South Bank University identified **74 anomalies**. The source of all these anomalies is the hydrogen bond and the tetrahedral arrangement of molecules. While most liquids are just "balls sliding over each other", water is more of a "dynamic network" that does not break when the temperature changes, but reorganizes.

Here is a complete overview of key anomalies sorted into logical categories:

Category	No.	Anomaly (Phenomenon)	Scientific Explanation / Note
Phase Anomalies	1	Unusually high melting point	Given the small molecular mass, it should be approx. -90 °C (ice should not exist).

Category	No.	Anomaly (Phenomenon)	Scientific Explanation / Note
	2	<b>Unusually high boiling point</b>	It should be approx. -80 °C. Water is liquid only thanks to extremely strong hydrogen bonds.
	3	<b>High critical point</b>	Critical temperature (374 °C) is much higher than would correspond to molecule size.
	4	<b>Expansion on freezing</b>	Water increases volume by approx. 9% upon transition to ice (most substances shrink).
	5	<b>Melting under pressure</b>	Increasing pressure <b>lowers</b> the melting point of ice (for most substances it increases).
	6	<b>Supercooling</b>	Water can be cooled in a pure state down to -41 °C without freezing (if nucleation nuclei are missing).
	7	<b>Mpemba effect</b>	Under certain conditions, hot water freezes faster than cold water.
Density Anomalies	8	<b>Density of ice &lt; Density of water</b>	Solid phase floats on liquid. Unique property allowing life in oceans.
	9	<b>Maximum density at 3.984 °C</b>	Water shrinks on cooling only down to 4 °C, then starts to <b>expand</b> .
	10	<b>Minimum compressibility</b>	Water is least compressible at 46.5 °C (not at freezing point, as is common).
	11	<b>Density change with isotopes</b>	Heavy water (D <sub>2</sub> O) has maximum density at 11.2 °C (huge shift compared to H <sub>2</sub> O).
Thermodynamic	12	<b>Extreme heat capacity (C<sub>p</sub>)</b>	Water can absorb huge amounts of heat with minimal change in its own temperature.
	13	<b>Minimum heat capacity</b>	C <sub>p</sub> is not constant, it has its minimum at 36 °C (close to human body temperature).
	14	<b>High heat of vaporization</b>	Enormous energy is needed to evaporate water (that's why sweating is such effective cooling).
	15	<b>High heat of fusion</b>	A lot of energy is needed to melt ice, which stabilizes climate (glaciers melt slowly).
	16	<b>High thermal conductivity</b>	Among liquids (excluding liquid metals), water conducts heat best.
Physical / Mechanical	17	<b>High surface tension</b>	After mercury, water has the highest surface tension of all liquids (enables capillarity).
	18	<b>High viscosity</b>	Given molecule size, water is "stickier" than it should be.

Category	No.	Anomaly (Phenomenon)	Scientific Explanation / Note
	19	<b>Viscosity and pressure</b>	For water, viscosity <b>decreases</b> with increasing pressure (up to approx. 33 °C), for most liquids it increases.
	20	<b>Speed of sound</b>	Speed of sound in water grows with temperature up to 74 °C, then starts to drop (anomalous behavior).
<b>Chemical</b>	21	<b>High dielectric constant</b>	Allows water to effectively cancel attractive forces between ions (thus great at dissolving salts).
	22	<b>Ion mobility (H+ and OH-)</b>	Hydrogen and hydroxide ions move much faster in water than other ions (so-called Grotthuss mechanism).
	23	<b>Dissociation</b>	Degree of dissociation (breakdown into ions) grows with temperature much faster than for other liquids.

### 3. Water in Us and on Earth: Macrocosm and Microcosm Analogy

The analogy between "water in us" and "water on Earth" is one of the most popular topics. It is often said that a human is a walking aquarium or a "contained drop of the ocean".

**Water Proportion: Are we a fractal of Earth?** The magic number 70% is often cited. However, it depends on whether we measure area or mass.

Subject	Water Proportion (Measurement)	Note / Analogy
Planet Earth	~71 % (Surface)	Covers most of the surface, but makes up only <b>0.02 % of total mass</b> of Earth (water is just a thin shell).
Human Body (Adult)	~60–65 % (Mass)	In newborns it is up to <b>78 %</b> (similar to ocean surface), with age we drop to 50 % ("drying out").
Human Brain	~73–75 %	Surprising match with ocean surface. The brain floats in liquor (saline solution) like land in the sea.
Blood (Plasma)	~90–92 %	Chemical composition of blood plasma is strikingly similar to prehistoric seawater (so-called René Quinton theory).
Jellyfish	95–98 %	Almost "living water". Has no brain, heart or bones, just structured water in gel form.
Cucumber	96 %	In terms of water content, cucumber is more liquid than jellyfish, but holds shape thanks to cellulose.

**Summary of Analogy (Table):**

Aspect	Earth (Macrocosm)	Human (Microcosm)	Meaning
Surface/Volume	71 % ocean	60–70 % water	Water is the medium in which life exists.

Aspect	Earth (Macrocosm)	Human (Microcosm)	Meaning
Salinity	~3.5 % salt (ocean)	~0.9 % salt (blood/tears)	Our internal environment is a "diluted ocean".
Flow	Gulf Stream (thermohaline)	Blood circulation	Necessity of constant movement for distribution of heat and nutrients.
Ideal Temperature	15 °C (surface average)	37 °C (core)	Temperatures where water is liquid and chemically most active.

**Visual Paradox of Earth:** If you gathered all water from Earth (oceans, glaciers, rivers) into one sphere, it would be surprisingly small compared to the size of the planet.

#### 4. The Mystery of 37 °C: Temperature and Human Metabolism

Why does the human body have a temperature of ~36.5 to 37.5 °C? Physical chemistry of water offers a fascinating explanation.

**Minimum Heat Capacity** The heat capacity of water is not constant. It drops and reaches its **minimum precisely around 36–37 °C**.

- **What this means:** Precisely at human body temperature, water is thermodynamically "most obedient".
- The body consumes **the least energy** to keep its temperature stable or change it slightly (e.g., during fever).
- **Conclusion:** Our biology seemingly evolved to utilize this "energy saving" in the physics of water.

**Blood Viscosity and Thirst** Viscosity (thickness) of water decreases with increasing temperature. At 37 °C, blood is thin enough for the heart to pump it easily. If we had a body temperature of 20 °C, blood would be thicker and the heart would have to work much harder. *Have you ever thought that when you are "thirsty", it is actually your cells calling for a change in viscosity and electrical conductivity so they can function properly?*

**Metabolic River and Curiosities** Water in the body is not a static tank, it is a river.

- **Half-life of water in the body:** The average residence time of water in the body is **9 to 14 days**.
- In approx. 2 weeks you exchange half of all water molecules in your body.
- **Animals that do not drink (Jerboa):** Creates water chemically, as a byproduct of digesting dry seeds.
- **Formula:** Energy + Water.
- **Camel's Hump:** Not for water, but for fat. Burning 1 kg of fat creates **1.1 liters of metabolic water**.
- **Extremophiles:** Bacteria live in water at **110–120 °C** thanks to immense pressure at the ocean bottom preventing boiling.

#### 5. Physical Paradox - Mpemba Effect and 4th Phase

**Mpemba Effect (Hot freezes faster)** The phenomenon where hot water freezes faster than cold was discovered in 1963 by Tanzanian student Erasto Mpemba. There is no single explanation, it is a combination of mechanisms:

1. **Evaporation:** Hot water evaporates intensely, so less water remains in the container, freezing sooner.
2. **Convection currents:** Turbulent flow arises in hot water, accelerating heat removal at container walls.
3. **Supercooling (Key factor):** Cold water tends to supercool (e.g. to -5 °C) and remain liquid. Hot water, due to its dynamics, immediately "falls" into the solid state at 0 °C.
4. **Relaxation of hydrogen bonds:** In hot water, bonds are stretched and upon cooling release energy (shrink) much faster (exponentially).

#### 6. Physical Paradox – 4th Phase of Water "Exclusion Zone" (EZ water)

This concept, standing at the intersection of biology, chemistry, and physics, was popularized by bioengineer Dr. Gerald Pollack of the University of Washington. It is not ice, liquid, or vapor, but a specific arrangement of water occurring at the interface with hydrophilic (water-loving) surfaces.

##### A. Chemical Structure: H<sub>3</sub>O<sub>2</sub> (Not H<sub>2</sub>O)

While common water is chemically \$H\\_2O\$, water in the fourth phase has the formula **H<sub>3</sub>O<sub>2</sub>** according to Pollack.

- **Structure:** Molecules are not chaotic like in common liquid, but align into an ordered lattice resembling honeycombs (hexagonal layers).
- It behaves more like a **liquid crystal**.

- **Density and stability:** This structure is more stable and ordered than common water.

B. Key Properties The name "Exclusion Zone" (EZ) comes from its main ability:

- **Exclusion of impurities:** This water layer uncompromisingly expels everything that doesn't belong – dissolved substances, minerals, and even bacteria.
- It creates a zone of perfectly pure water at the material surface.
- **Electric Charge:** EZ water carries a **negative charge**.
- Water pushed beyond this zone (so-called "bulk water") becomes positively charged (full of  $\text{H}_3\text{O}^+$  protons).
- This creates charge separation similar to a battery.
- **Optical Properties:** This water specifically absorbs UV light at **270 nm**, which is one of its identification signs in the lab.

C. Energy Source: Battery Charged by Light What supplies energy for the creation of this highly ordered structure?

- **Infrared Radiation:** Pollack's experiments proved that the EZ zone enlarges and grows under the influence of light, specifically **infrared radiation** (which is basically radiant heat).
- Light thus functions as an energy source that "charges" this water battery.

D. Biological Significance: Energy for Life This is likely the most fundamental consequence of the theory.

- **Cell as a Battery:** Our cells are full of hydrophilic surfaces (proteins, membranes).
- According to Pollack, most water in our body is in the form of EZ water.
- **Function:** Water in cells works as a **battery powered by light/heat**, supplying energy for cellular processes.
- This would explain some mechanisms that cannot be fully explained by chemical energy (ATP) alone.

E. Scientific Status (Facts vs. Hypothesis) It is important to distinguish what is a measured fact and what is theoretical interpretation:

- **Fact:** The phenomenon of "exclusion zone" (layer of pure water at surface) is experimentally verified and recognized by mainstream science.
- **Debate:** The interpretation that it is a completely new state with chemical formula  $\text{H}_3\text{O}_2$  is a subject of scientific discussion.
- Critics (mainstream chemistry) often argue that the phenomenon can be explained by classical electrostatics and colloidal chemistry without needing to rewrite the water formula.

## 7. Memory and Vibrations: Influence of Frequencies and Freezing

The relationship between water and vibrations intertwines physics with metaphysics.

**Table: Influence of Frequencies on Water**

Frequency Type	Range	Phenomenon Type (Effect)	Scientific / Physical Description
Low Audio	20–200 Hz	Cymatics (Faraday waves)	Formation of standing waves on the surface. Water forms geometric shapes (mandalas, stars). The higher the frequency, the more complex the pattern.
Resonant (Microwaves)	2.45 GHz	Thermal Excitation	Oscillation of water molecules. Friction and heat are created. Destructive to biological structures (cooking).
Ultrasound	20k–1 MHz	Acoustic Cavitation	Formation and violent collapse of microbubbles (temperature up to 5000 K). Tears cell walls, cleans surfaces.
Music / Words (Emoto)	Various	Crystallization (Hypothesis)	Masaru Emoto claimed "positive" vibrations form beautiful crystals, "negative" deformed ones. <b>Scientifically unconfirmed.</b>
"Healing" (Solfeggio)	432/528 Hz	Harmonization (Esoterics)	Considered frequencies repairing DNA. Physically these are common sound waves.

**Water Memory and Repeated Freezing** What happens during repeated freezing of water? It depends on the point of view.

Perspective	What happens during repeated freezing?	Result (Property)	Analogy
Chemical (Mainstream)	Expulsion of salts and gases.	<b>Extremely pure water</b> , but "hungry" and tasteless. pH change.	Distillation / Purifier
Physical (Quantum)	Change of Ortho/Para isomer ratio.	<b>Hysteresis:</b> Water "remembers" for a while that it was ice (spin memory).	Magnetic tape (short-term)
Schauberger (Vitality)	Static freezing takes movement from water.	<b>"Dead" water</b> (unless vortexed). Loss of natural charge.	Battery not in use
Informational (Diamond)	Reset of crystal lattice.	<b>Tabula rasa.</b> Each freezing erases the previous imprint and creates a new one.	Reformatting HDD

## 8. Invisible Threat: Nanoplastics and Change of Water Physics

Sources provide an alarming view of how micro- and nanoplastics (MNP) fundamentally change the **molecular structure of water**. It is not just pollution, but a change in physical properties.

### Physical Change and "Hydration Shell"

- **Disruption of bonds:** Plastic nanoparticles contain oxygen and nitrogen, form hydrogen bonds with water and "embed" themselves into its structure.
- **Trap for water (Hydration shell):** Nanoplastics acquire an electric charge.
- A layer of water molecules forms around the charged particle, strongly attracted to it.
- **A single nanoparticle can immobilize up to a million surrounding water molecules.**
- **Loss of thermal conductivity:** Trapped water molecules lose mobility. Water thus loses the ability to effectively transfer heat.

### Impacts on Planet and Human

- **Ocean as Insulator:** The ocean stops removing heat from Earth's interior. It functions as a "thermal plug".
- Heat accumulates in the depths, leading to overheating of the planet from within.
- **End of Oxygen:** Overheated and plastic-saturated ocean stops producing oxygen and starts emitting \$CO\_2\$.
- Disruption of gas cycle and hypoxia (lack of oxygen) threatens.
- **Biological Sabotage:** In the body, nanoplastics penetrate cells, disrupt bioelectric signals and function as carriers of viruses and toxins (viruses survive longer on plastics).