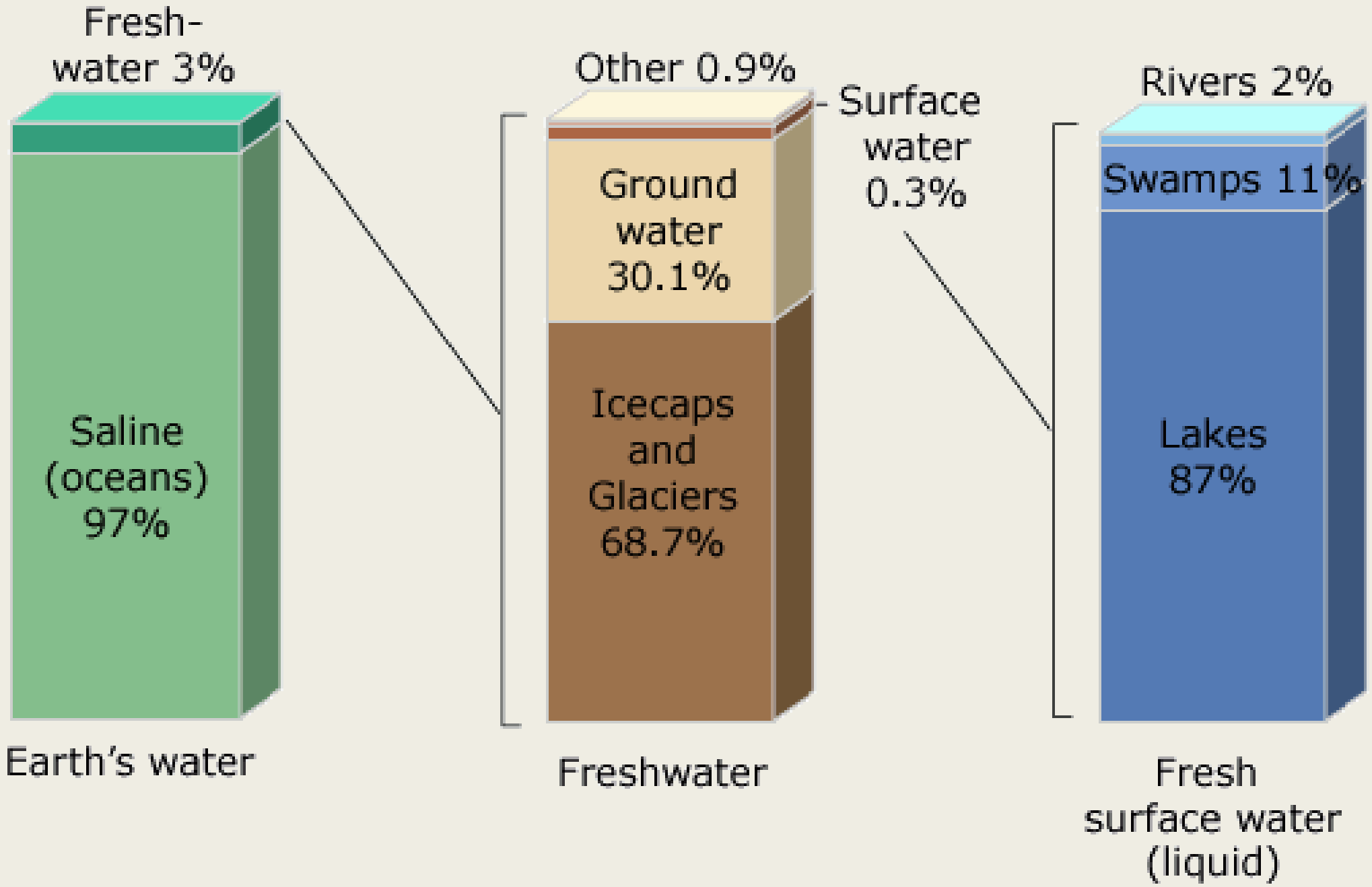
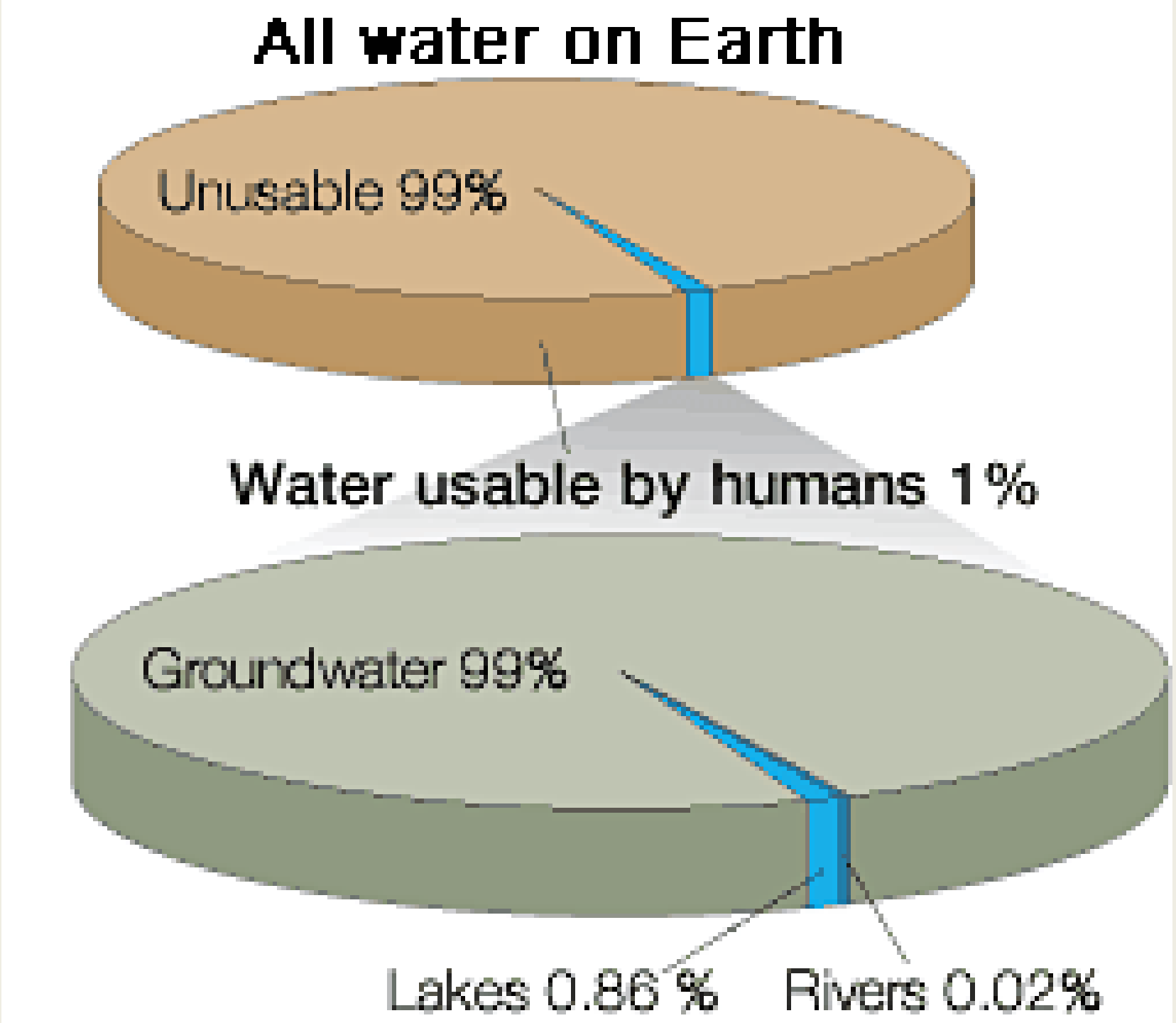
JEM 458
DENİZ JEOLOJİSİ

Arş. Gör. Dr. Kıymet DENİZ

7. Hafta

Distribution of Earth's Water




All water on Earth
Unusable 99%
Water usable by humans 1%
Groundwater 99%
Lakes 0.86 %
Rivers 0.02%

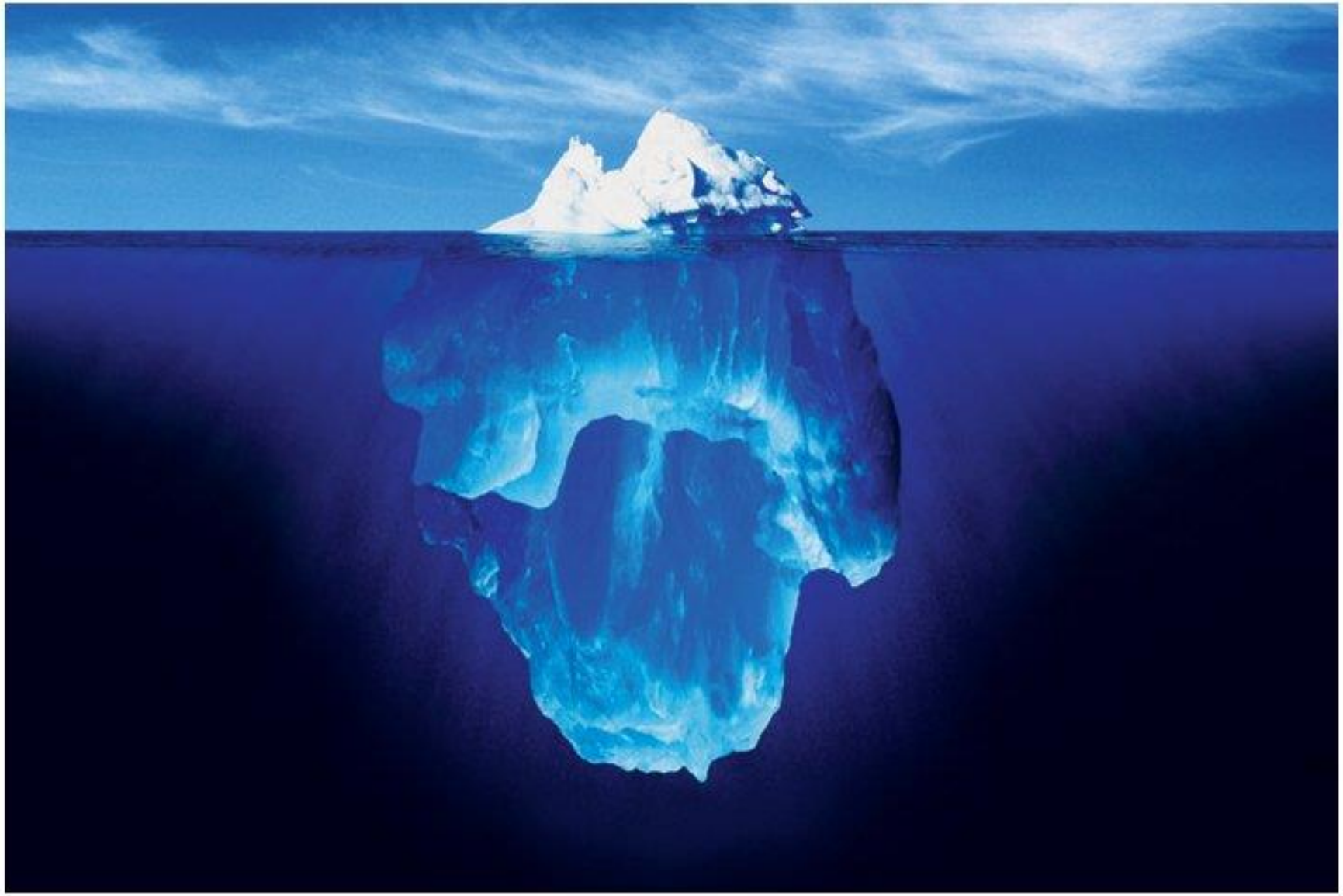
İnsan vücudu ne kadar oranda su içeriyor?

- Bebekler: 78%
- 1 Yaşındaki Çocuk: 65%
- Yetişkin Erkek: 60%
- Bayan: 55%
- Neden bayanların vücudundaki su oranı daha az?

Deniz organizmaları ne kadar su içeriyor?

- Büyük bir çoğunluğu % 80 civarında
- Deniz anası ise %95'ten fazla su içermektedir

Neden su eşsizdir?

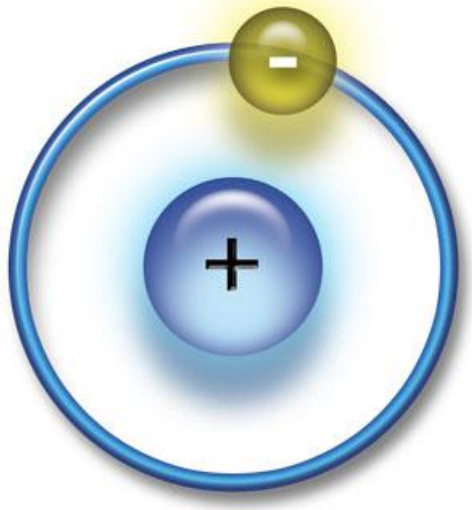


Element ve Molekül

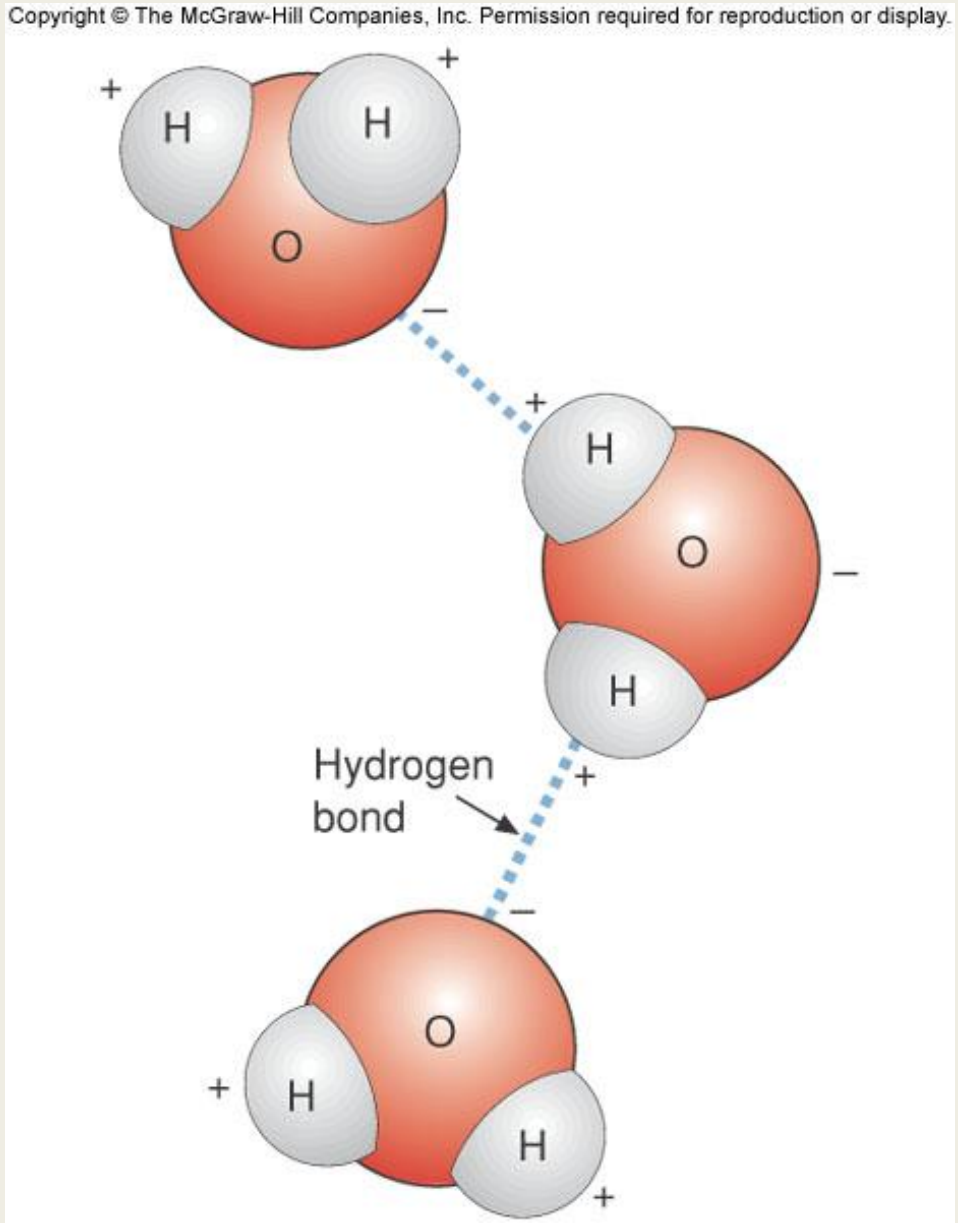
Periodic Table of the Elements

	IA												IIIA	IVA	VA	VIA	VIIA	0
1	1 H	IIA																2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg	IIIB	IVB	VB	VIB	VIIB	——	VII	——	IB	IB	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	57 *La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	89 +Ac	104 Rf	105 Ha	106 Sg	107 Ns	108 Hs	109 Mt	110 110	111 111	112 112	113 113					

* Lanthanide Series	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
+ Actinide Series	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr



H_2O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+
+
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Hydrogen
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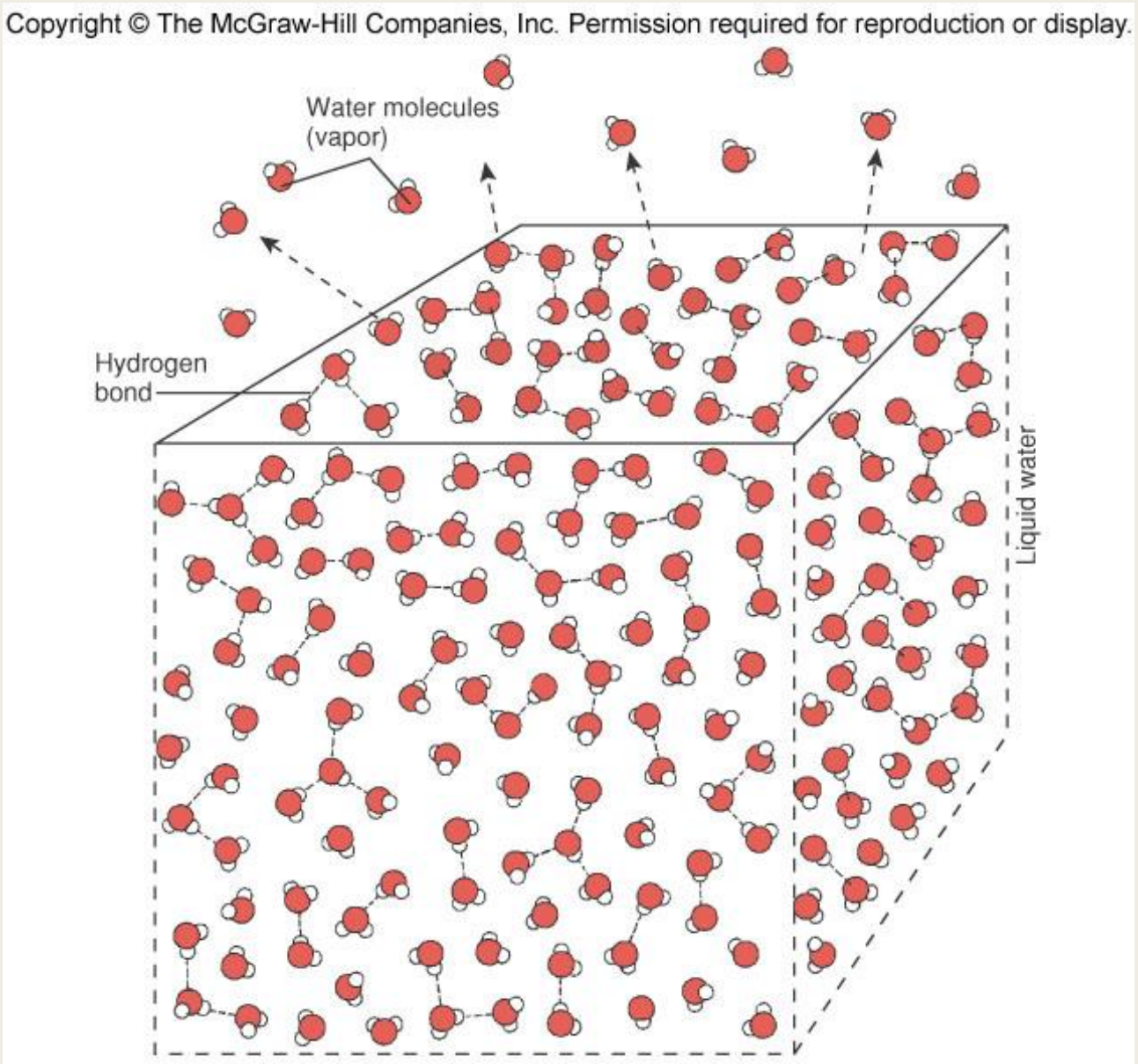
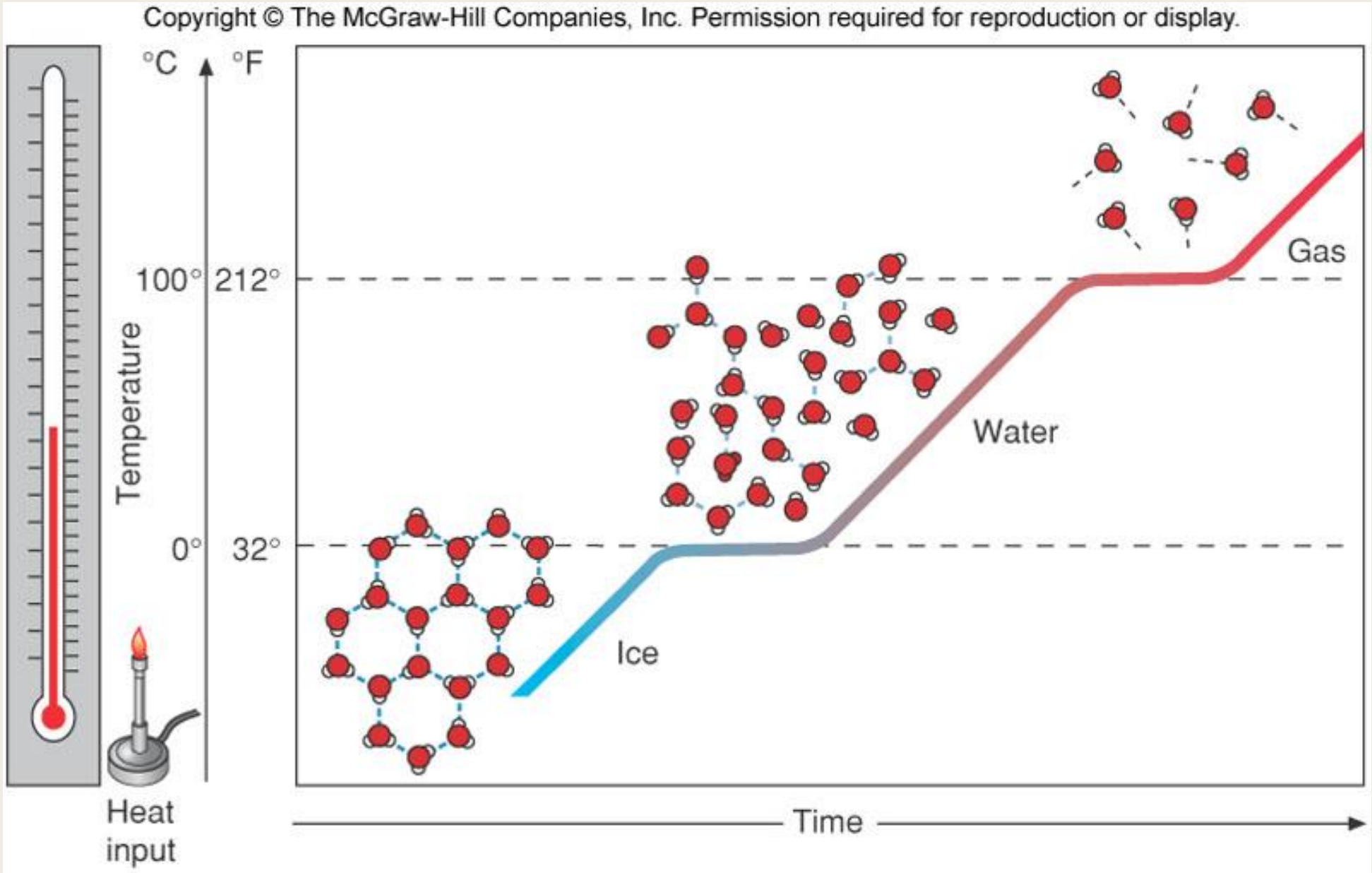
Hidrojen Bağları

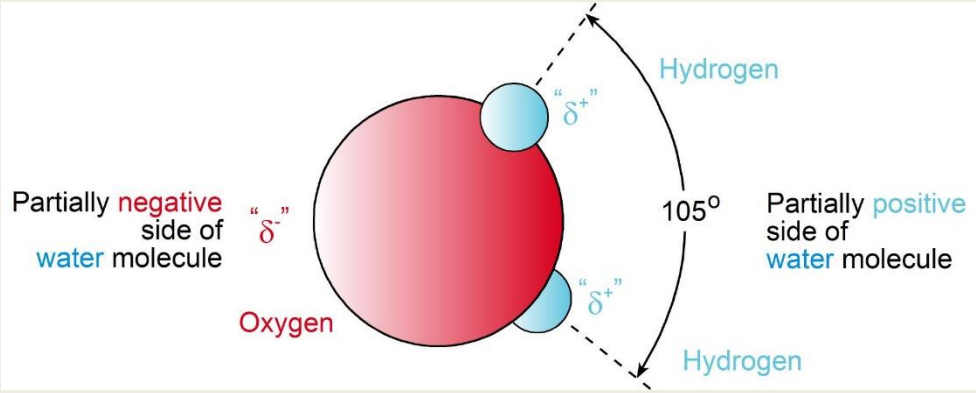


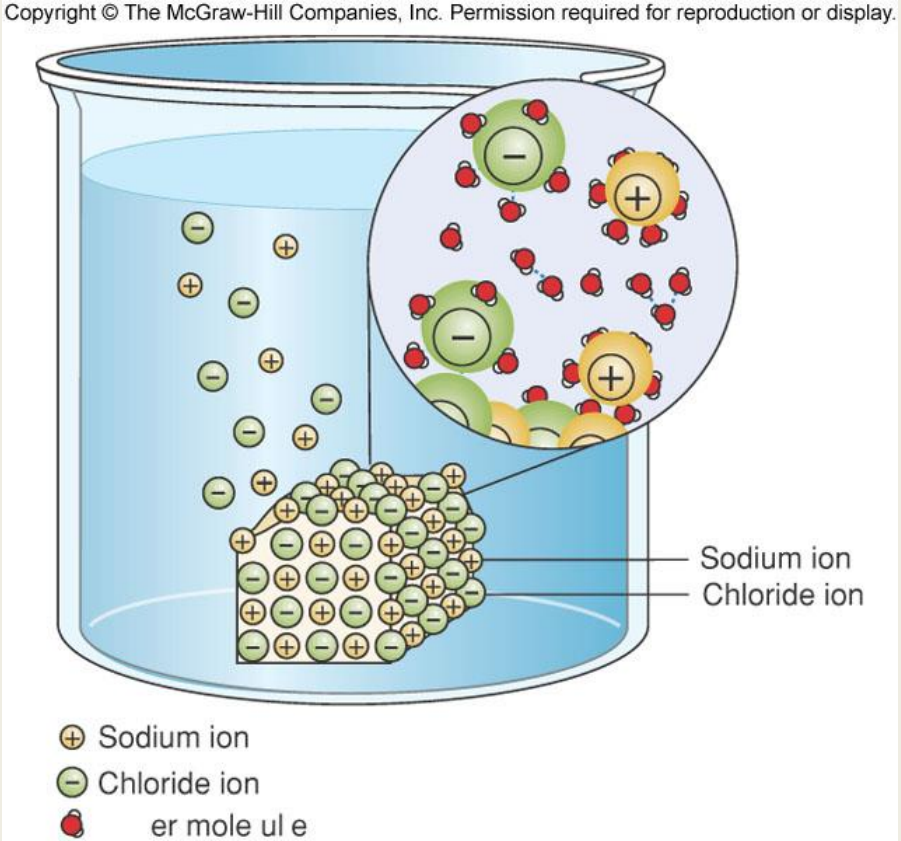
Hızlı ve Yavaş Moleküller

Suyun Moleküler Yapısındaki Değişiklikler

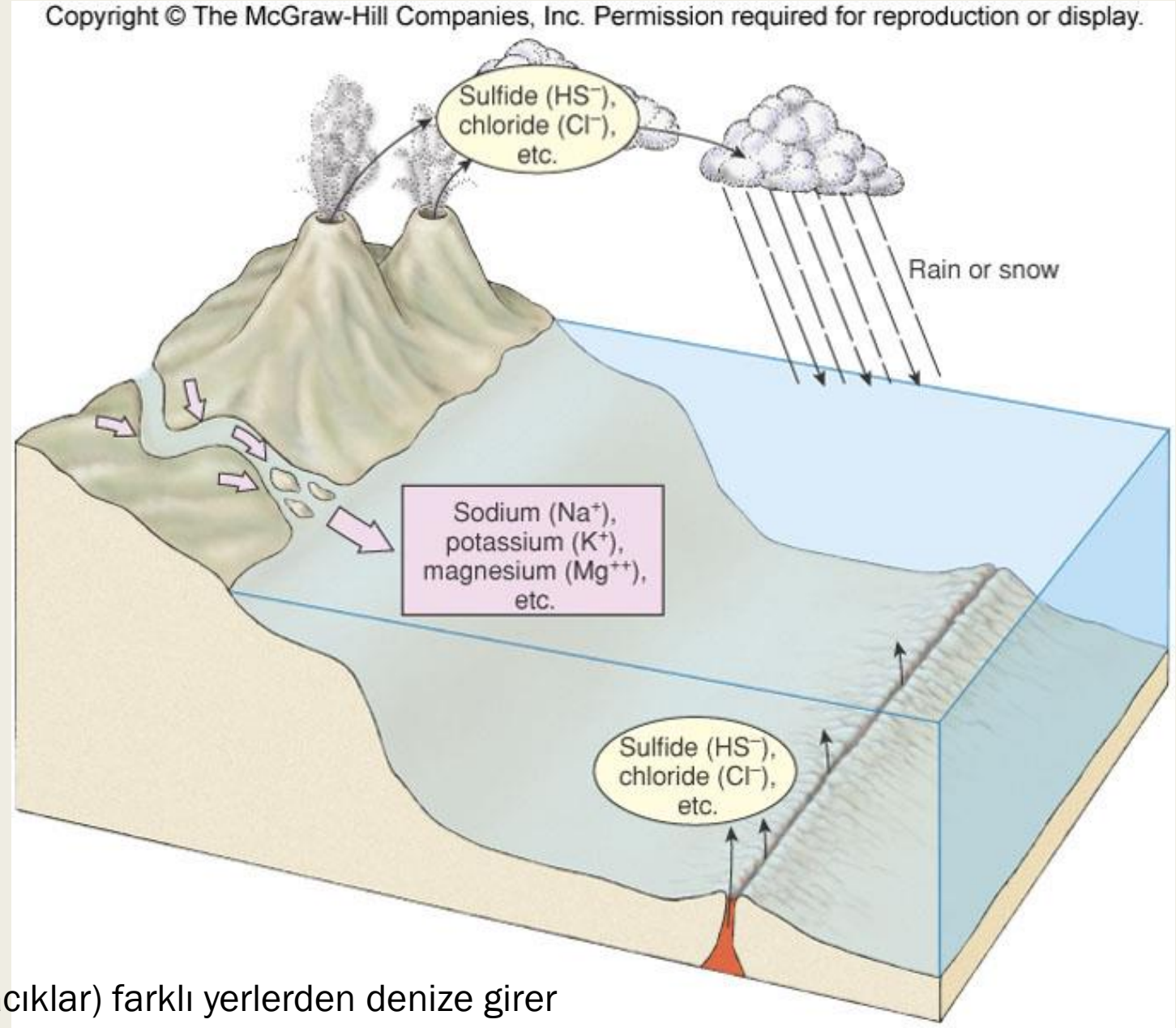


Su neden Evrensel Çözücü

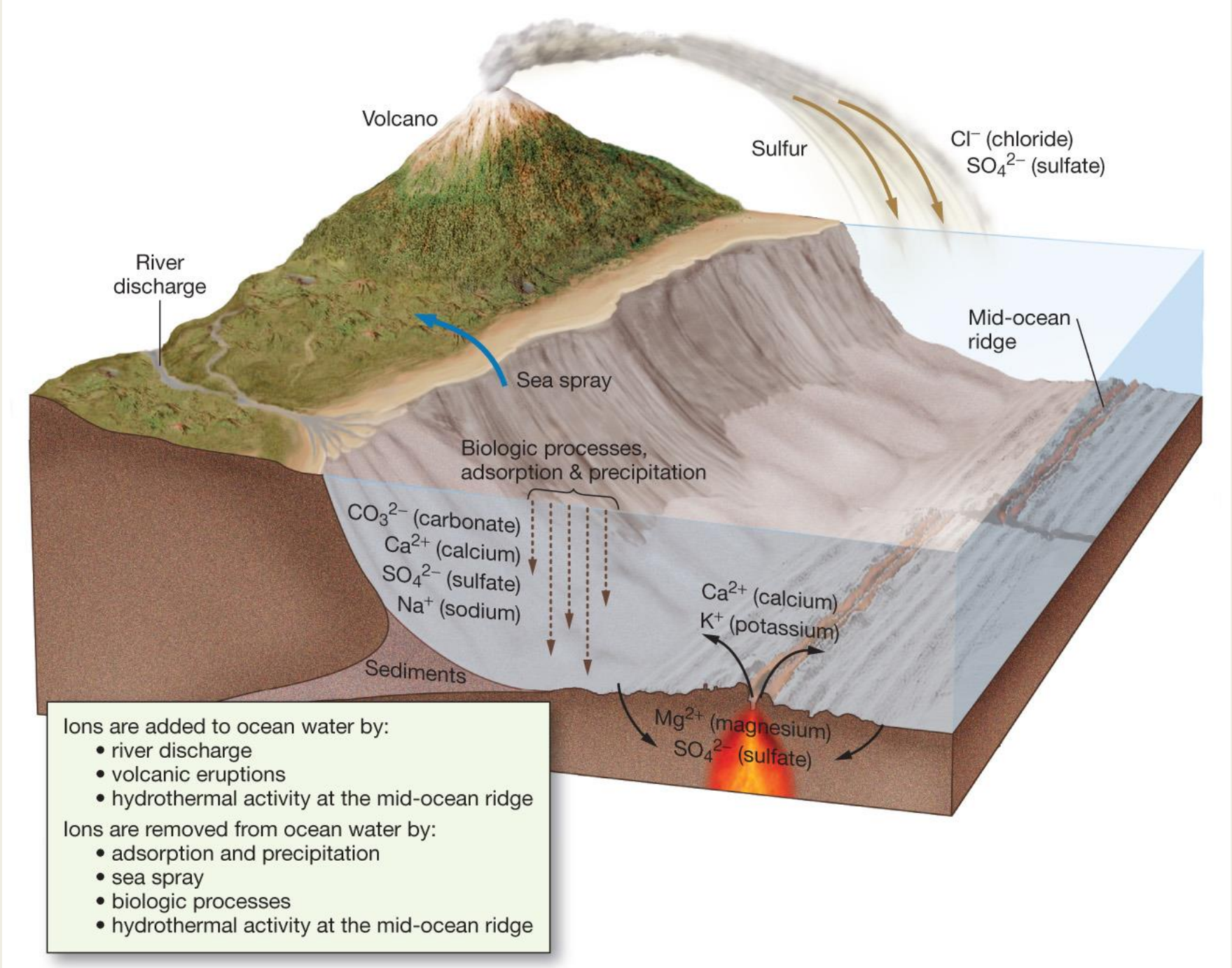




Deniz Suyu Nasıl Oluşur?



İyonlar (yüklü parçacıklar) farklı yerlerden denize girer



Deniz Suyunun Bileşimi

Table 3.1
The Composition of Seawater of 35‰ Salinity

Although the concentration varies slightly from place to place in the ocean, the percentage of total salinity of each ion remains constant.

Ion	Concentration ‰	Percentage of Total Salinity
Chloride (Cl^-)	19.345	55.03
Sodium (Na^+)	10.752	30.59
Sulfate (SO_4^{-2})	2.701	7.68
Magnesium (Mg^{+2})	1.295	3.68
Calcium (Ca^{+2})	0.416	1.18
Potassium (K^+)	0.390	1.11
Bicarbonate (HCO_3^-)	0.145	0.41
Bromide (Br^-)	0.066	0.19
Borate ($H_2BO_3^-$)	0.027	0.08
Strontium (Sr^{+2})	0.013	0.04
Fluoride (F^-)	0.001	0.003
Other dissolved material	<0.001	<0.001

TABLE 5.1 SELECTED DISSOLVED MATERIALS IN 35‰ SEAWATER

1. Major Constituents (in parts per thousand, ‰)

Constituent	Concentration (‰)	Ratio of constituent/total salts (%)
Chloride (Cl^-)	19.2	55.04
Sodium (Na^+)	10.6	30.61
Sulfate (SO_4^{2-})	2.7	7.68
Magnesium (Mg^{2+})	1.3	3.69
Calcium (Ca^{2+})	0.40	1.16
Potassium (K^+)	0.38	1.10
Total	**34.58‰**	**99.28%**

2. Minor Constituents (in parts per million, ppm[a])

Gases		Nutrients		Others	
Constituent	Concentration (ppm)	Constituent	Concentration (ppm)	Constituent	Concentration (ppm)
Carbon dioxide (CO_2)	90	Silicon (Si)	3.0	Bromide (Br^-)	65.0
Nitrogen (N_2)	14	Nitrogen (N)	0.5	Carbon (C)	28.0
Oxygen (O_2)	6	Phosphorus (P)	0.07	Strontium (Sr)	8.0
		Iron (Fe)	0.002	Boron (B)	4.6

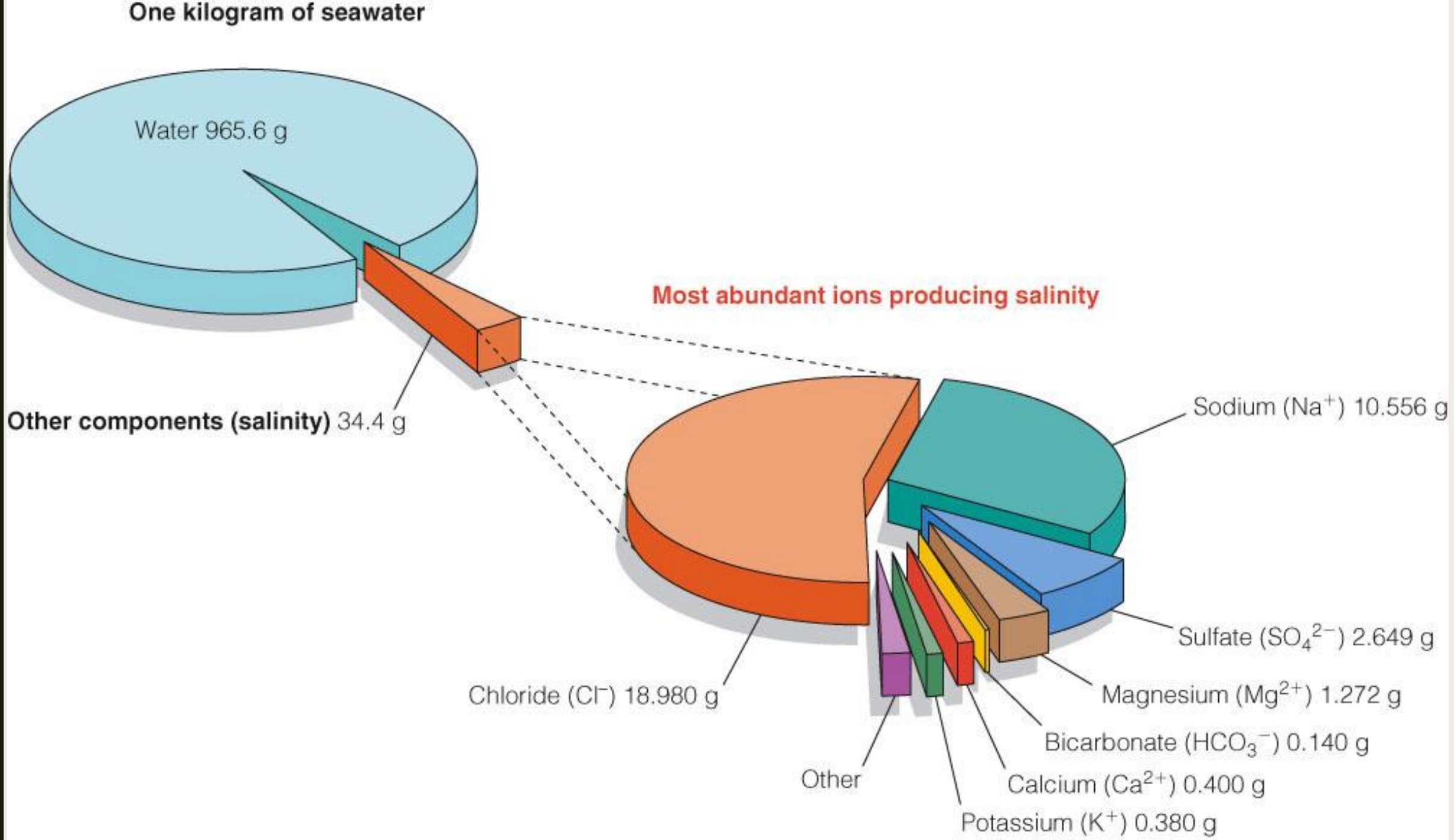
3. Trace Constituents (in parts per billion, ppb[b])

Constituent	Concentration (ppb)	Constituent	Concentration (ppb)	Constituent	Concentration (ppb)
Lithium (Li)	185	Zinc (Zn)	10	Lead (Pb)	0.03
Rubidium (Rb)	120	Aluminum (Al)	2	Mercury (Hg)	0.03
Iodine (I)	60	Manganese (Mn)	2	Gold (Au)	0.005

[a]Note that 1000 ppm = 1‰.

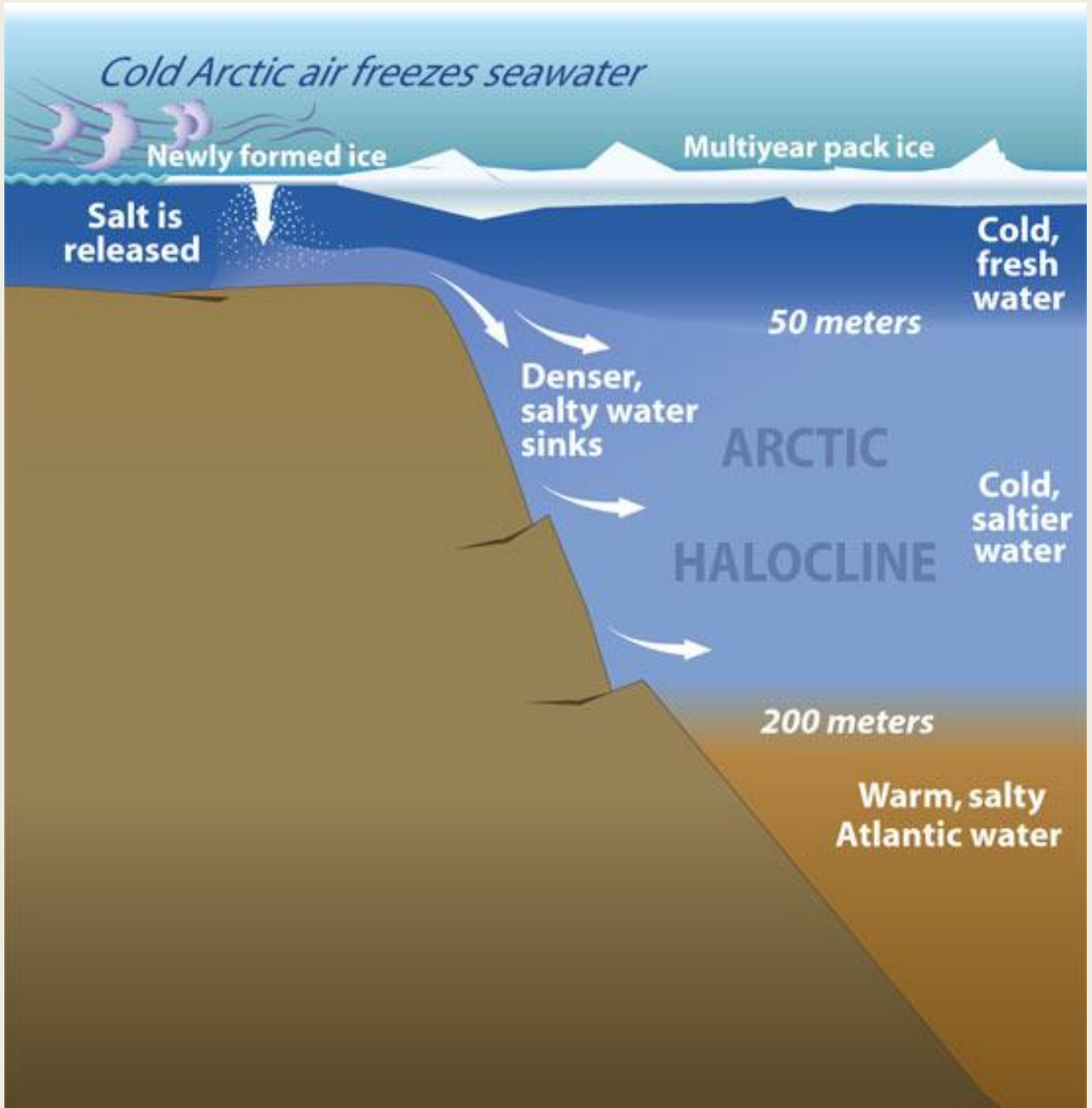
[b]Note that 1000 ppb = 1 ppm.

Deniz Suyu Ne Kadar Tuzlu?

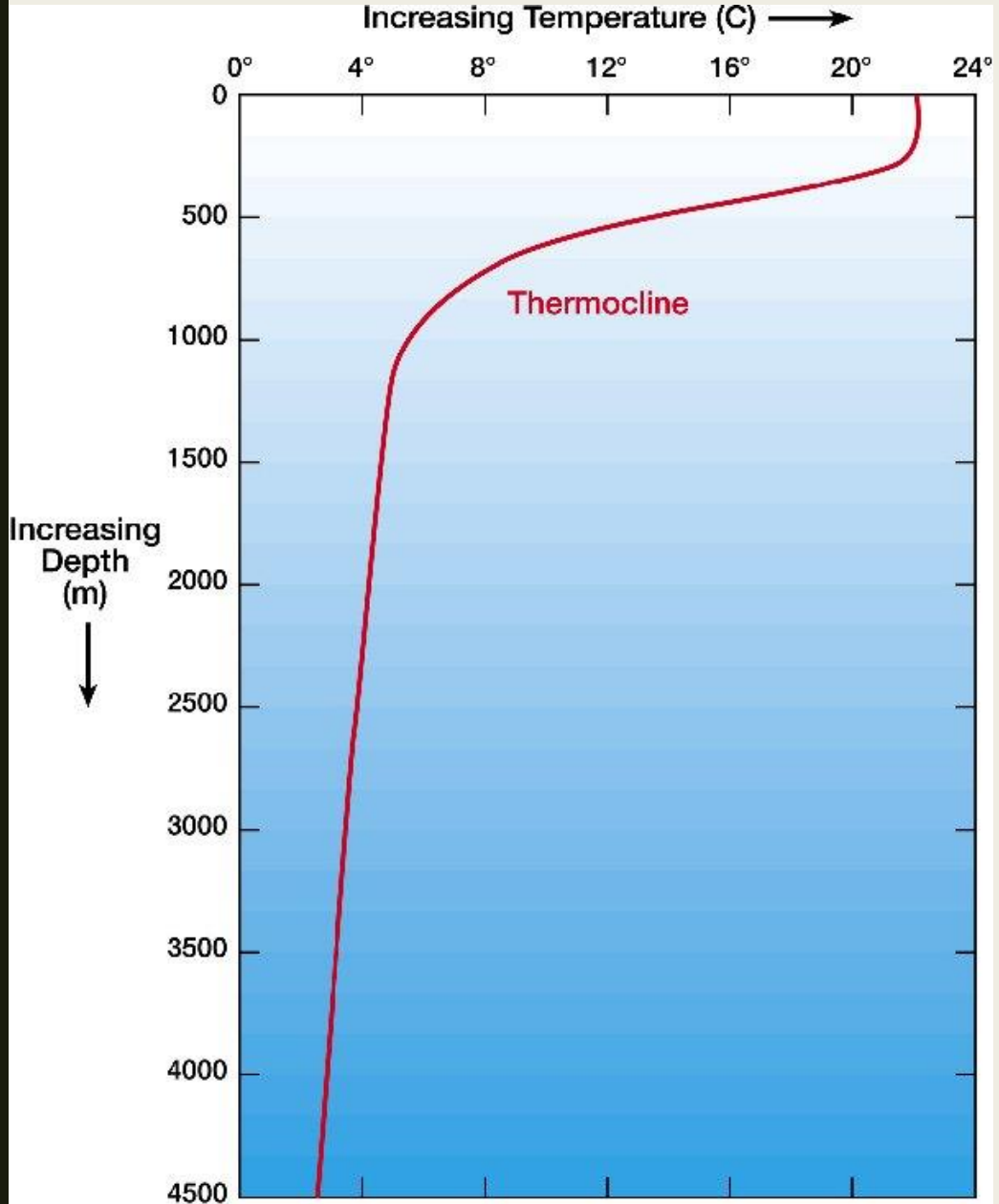


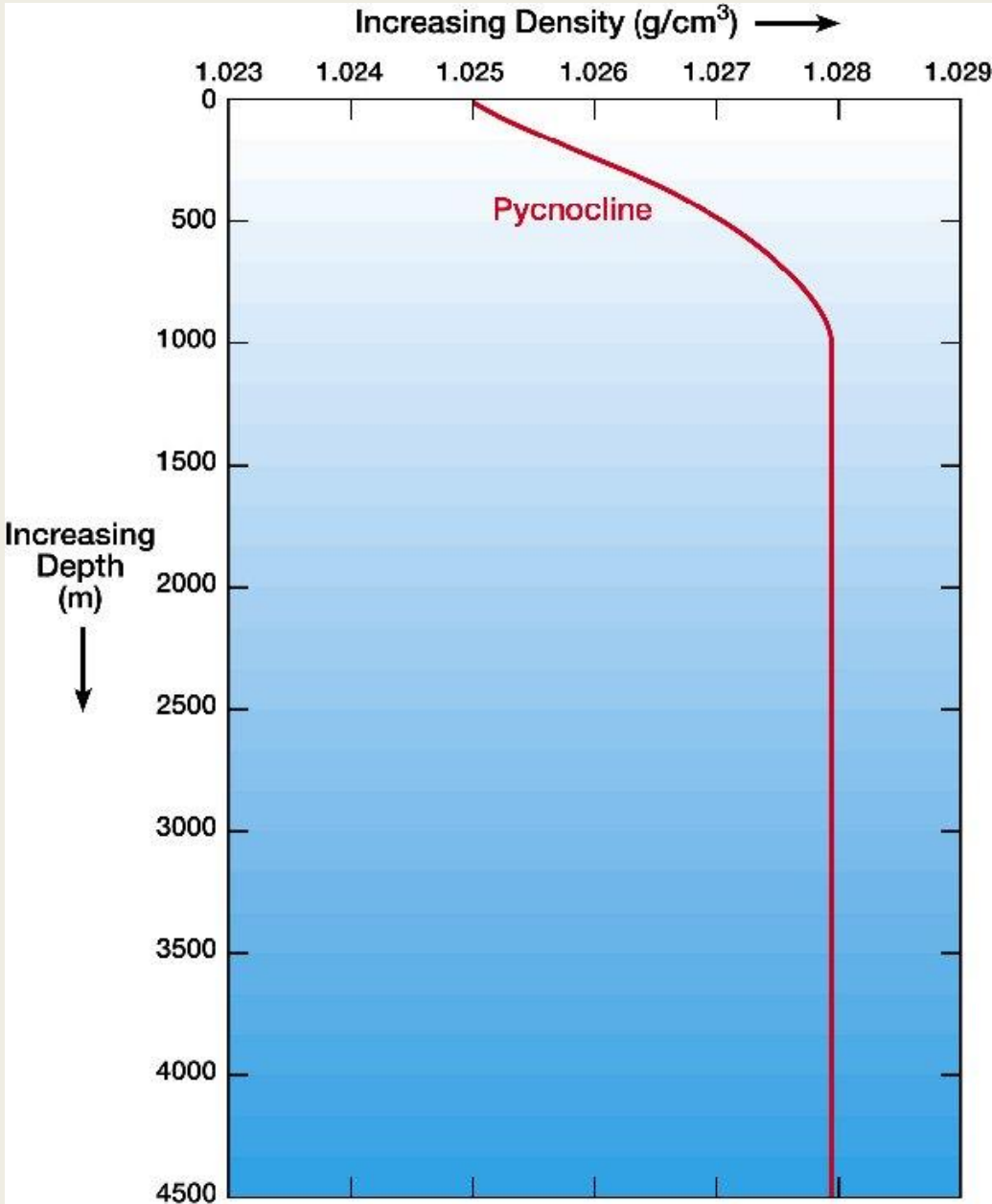
Tuzluluk, Sıcaklık, Yoğunluk

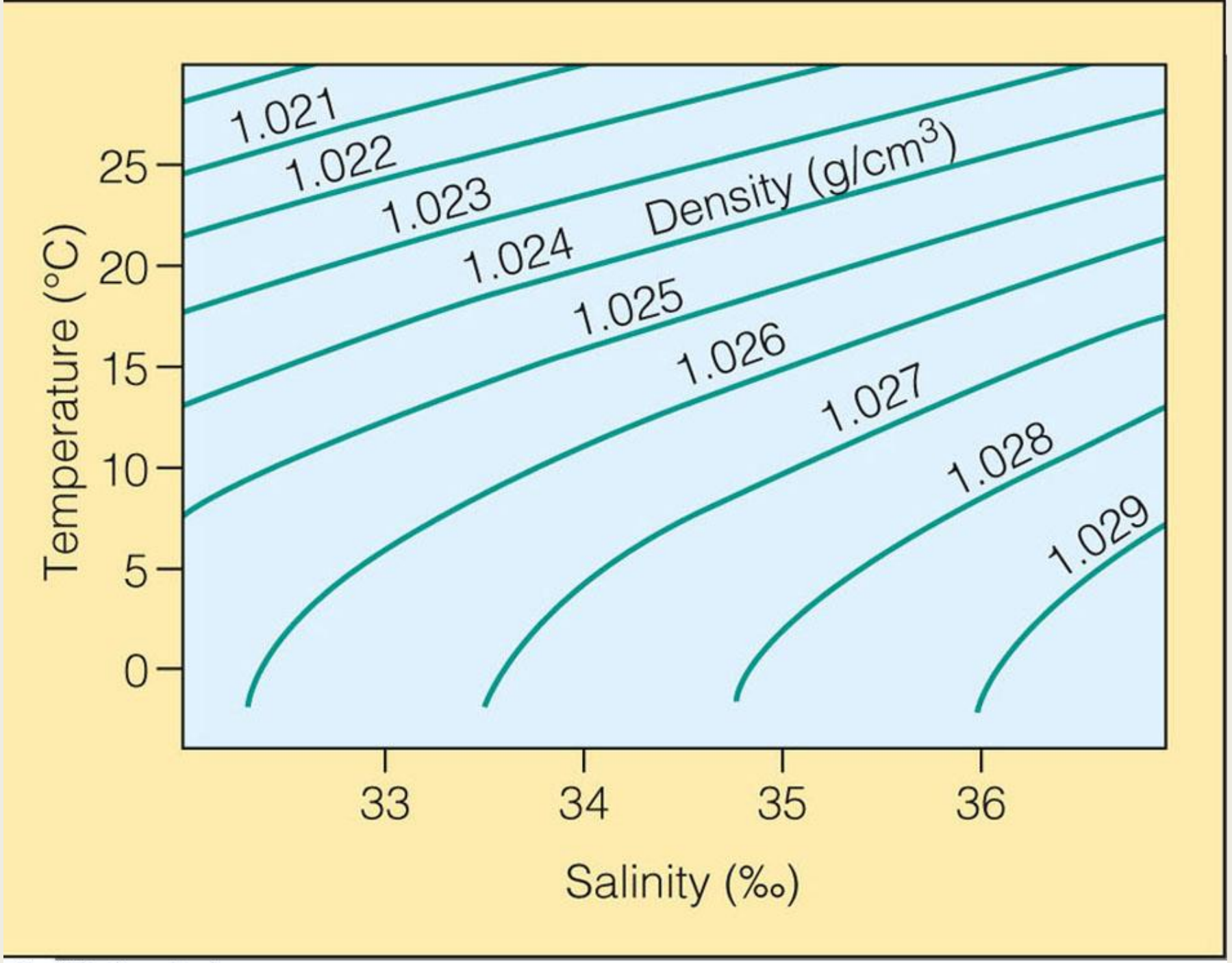
Tuzluluk, Sıcaklık, Yoğunluk

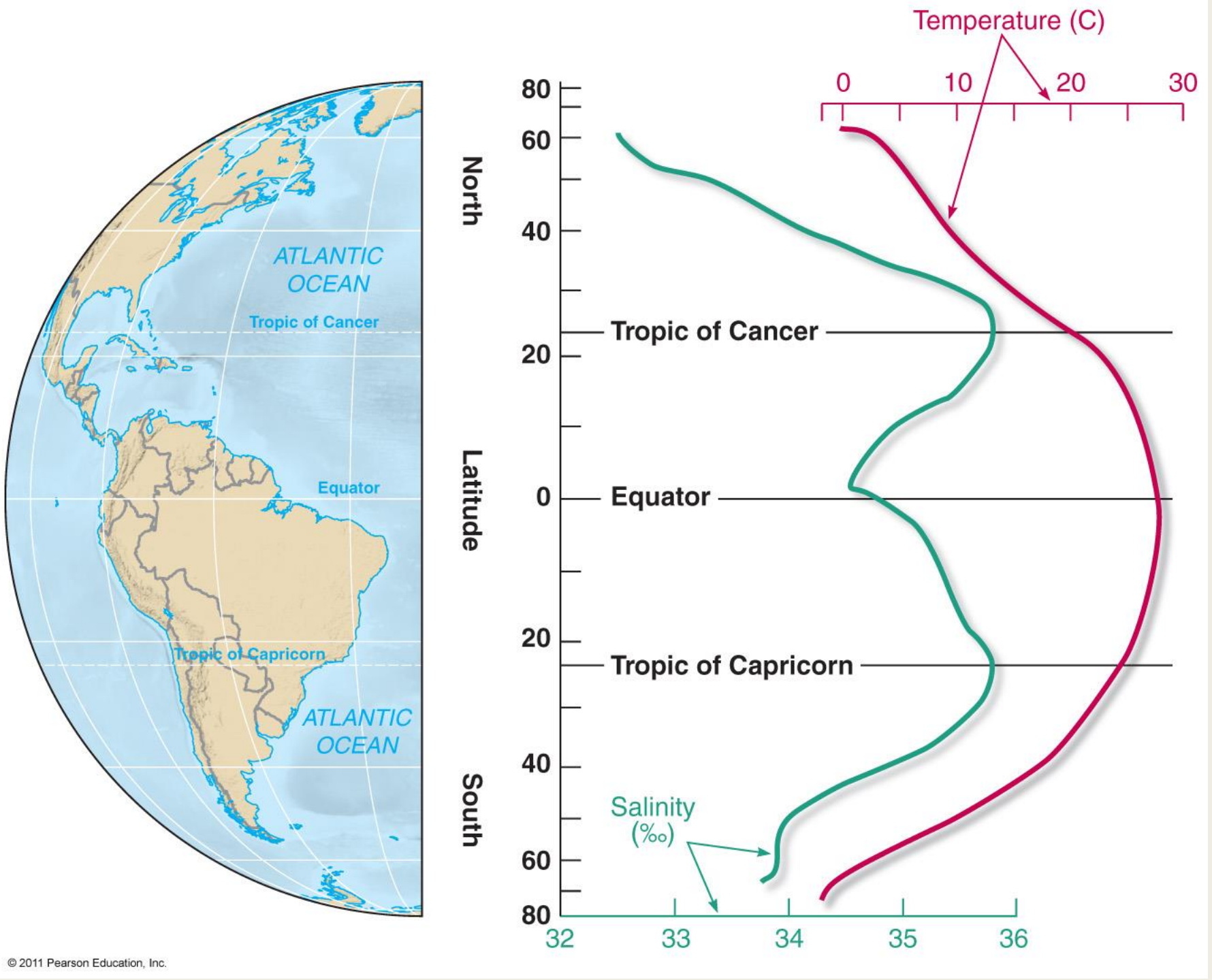


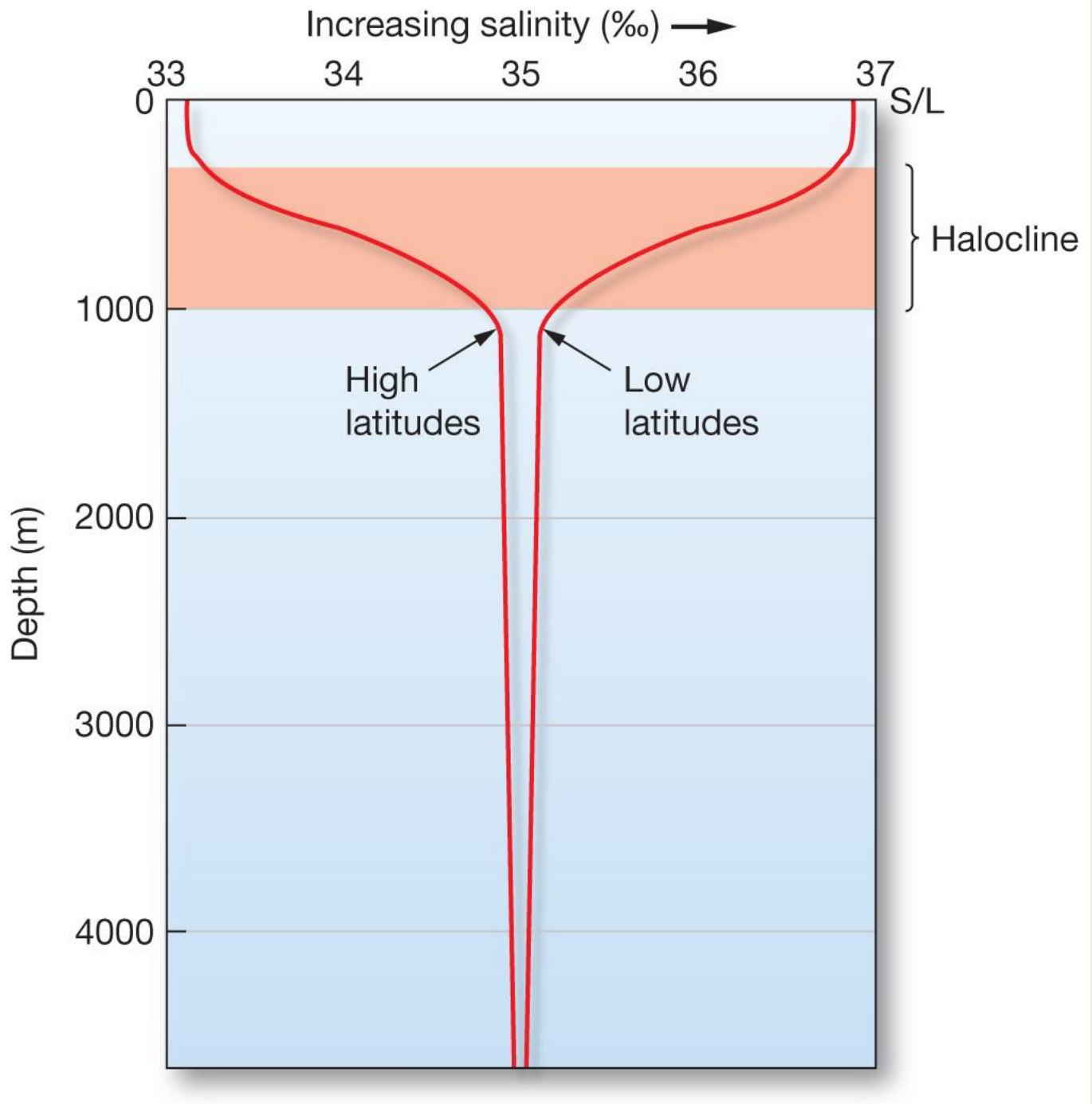
Tuzluluk, Sıcaklık, Yoğunluk

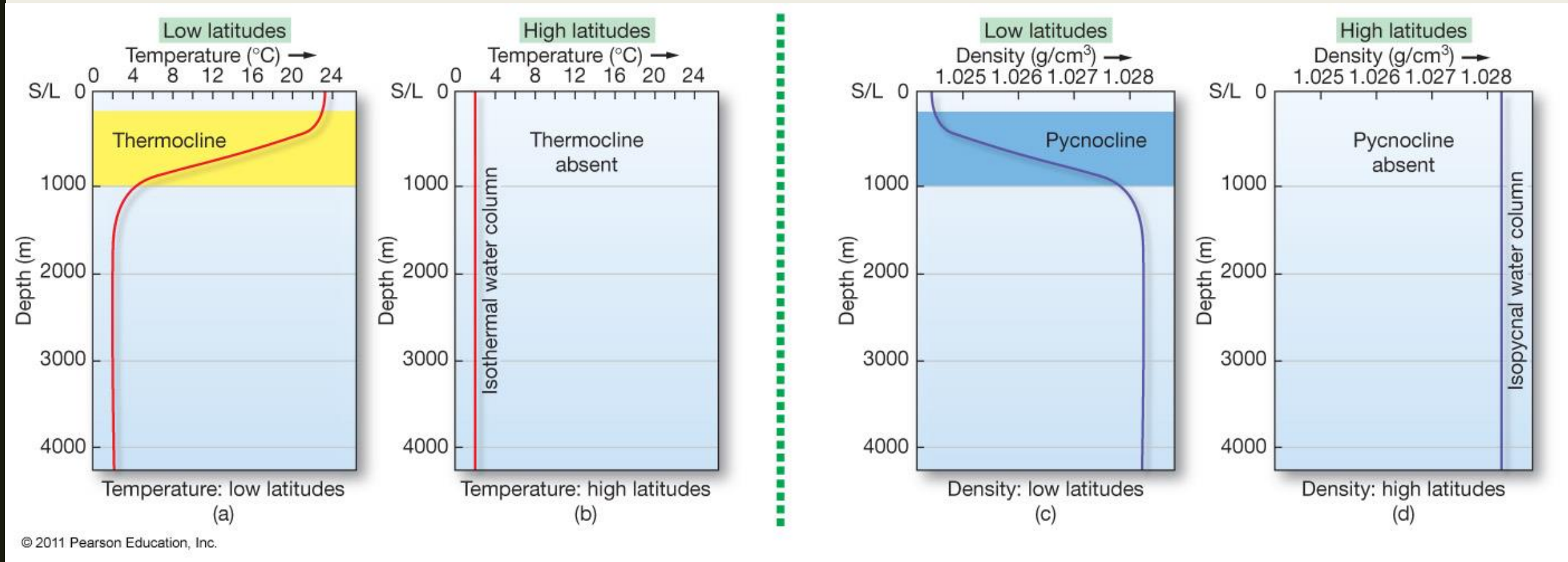


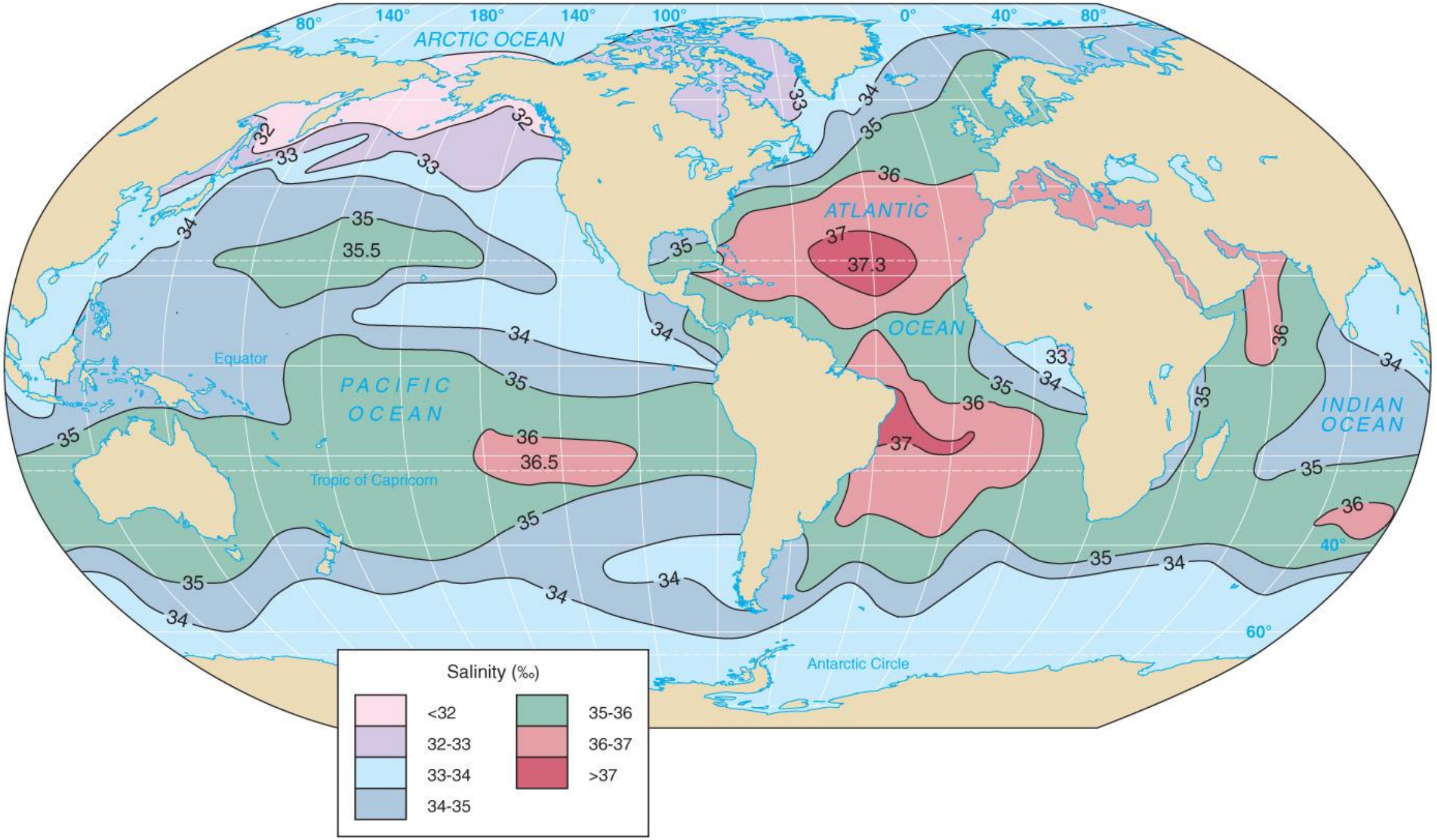






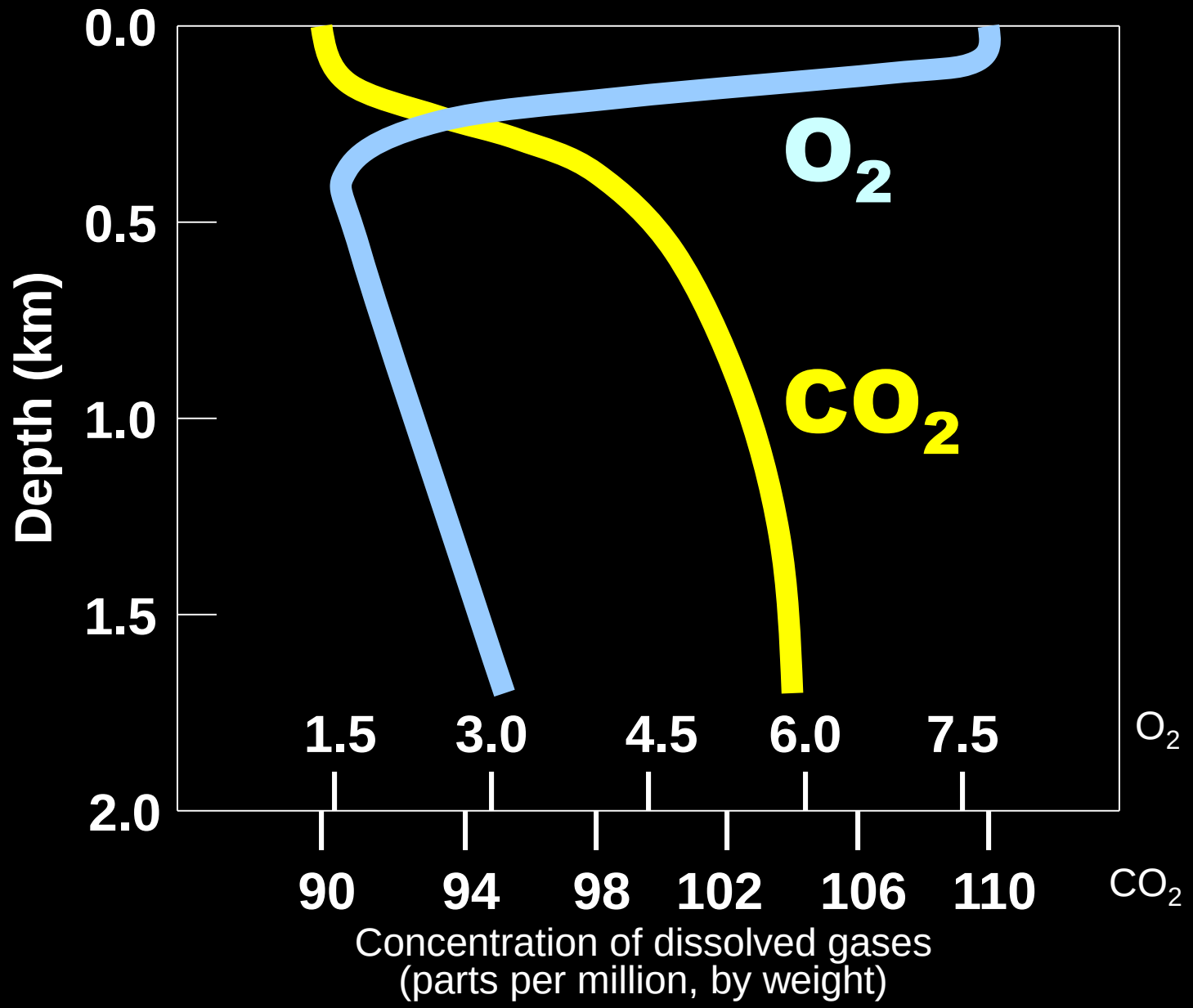






Location/type	Salinity
Normal open ocean	33-38‰
Baltic Sea	10‰ (brackish)
Red Sea	42‰ (hypersaline)
Great Salt Lake	280‰
Dead Sea	330‰
Tap water	0.8‰ or less
Premium bottled water	0.3‰

Çözünmüş Gazlar



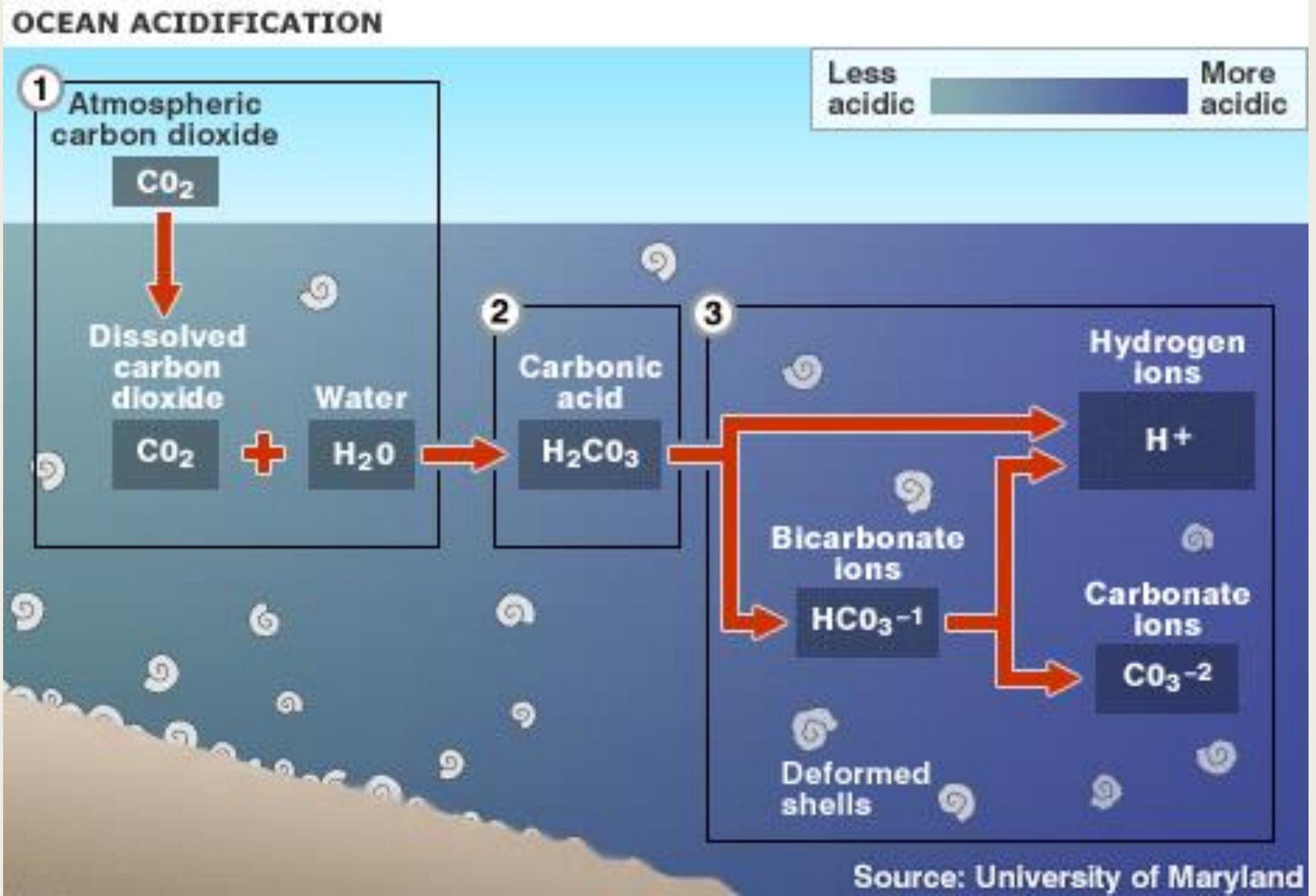

OCEAN ACIDIFICATION
Less acidic
More acidic
1
Atmospheric carbon dioxide
CO_2
Dissolved carbon dioxide
CO_2
Water
H_2O
2
Carbonic acid
H_2CO_3
3
Hydrogen ions
H^+
Bicarbonate ions
HCO_3^{-1}
Carbonate ions
CO_3^{-2}
Deformed shells
Source: University of Maryland

TABLE 5.2 COMPARISON OF SELECTED PROPERTIES OF PURE WATER AND SEAWATER

Property	Pure water	35‰ Seawater
Color (light transmission)		
• Small quantities of water	Clear (high transparency)	Same as for pure water
• Large quantities of water	Blue-green because water molecules scatter blue and green wavelengths best	Same as for pure water
Odor	Odorless	Distinctly marine
Taste	Tasteless	Distinctly salty
pH	7.0 (neutral)	Surface waters range = 8.0–8.3; average = 8.1 (slightly alkaline)
Density at 4°C (39°F)	1.000 g/cm^3	1.028 g/cm^3
Freezing point	0°C (32°F)	−1.9°C (28.6°F)
Boiling point	100°C (212°F)	100.6°C (213.1°F)

VARIATION IN PH LEVELS IN THE WORLD'S OCEANS