

1. Mixtures are composed of several pure substances. Mixtures are divided into homogeneous and heterogeneous.

Table 17.3 Solubilities of Ionic Compounds* aq = aqueous (dissolves in water); s = solid (does not dissolve in water)

Ions	Acetate	Bromide	Carbonate	Chlorate	Chloride	Fluoride	Hydrogen Carbonate	Hydroxide	Iodide	Nitrate	Nitrite	Phosphate	Sulfate	Sulfide	Sulfite
Aluminum	s	aq		aq	aq	s		s	—	aq		s	aq	—	
Ammonium	aq	aq	aq	aq	aq	aq	aq	—	aq	aq	aq	aq	aq	aq	aq
Barium	aq	aq	s	aq	aq	s		aq	aq	aq	aq	s	s	—	s
Calcium	aq	aq	s	aq	aq	s		s	aq	aq	aq	s	s	—	s
Cobalt(II)	aq	aq	s	aq	aq	—		s	aq	aq		s	aq	s	s
Copper(II)	aq	aq	s	aq	aq	aq		s	aq	aq		s	aq	s	
Iron(II)	aq	aq	s		aq	s		s	aq	aq		s	aq	s	s
Iron(III)	—	aq			aq	s		s	aq	aq		s	aq	—	
Lead(II)	aq	s	s	aq	s	s		s	s	aq	aq	s	s	s	s
Lithium	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	s	aq	aq	aq
Magnesium	aq	aq	s	aq	aq	s		s	aq	aq	aq	s	aq	—	aq
Nickel	aq	aq	s	aq	aq	aq		s	aq	aq		s	aq	s	s
Potassium	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq
Silver	s	s	s	aq	s	aq		—	s	aq	s	s	s	s	s
Sodium	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq	aq
Zinc	aq	aq	s	aq	aq	aq		s	aq	aq		s	aq	s	s

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We have a mixture of $\text{Cu}(\text{OH})_2$, NaOH and KOH . Which of these substances could be separated in the following way?



a.	$\text{Cu}(\text{OH})_2$
b.	NaOH
c.	KOH

2. Balance the reaction equation:



a.	1	3	1	2
b.	3	2	1	6
c.	2	2	3	2

3. Which metal combustion equation is correct?

- a. $S + O_2 \rightarrow SO_2$
- b. $Cu + O_2 \rightarrow CuO_2$
- c. $2 Mg + O_2 \rightarrow 2MgO$
- d. $3Al + O_2 \rightarrow Al_3O_2$

4. Which atom's electronic formula is correct?

- a. ${}_{13}^{27}Al$ 2,8,3
- b. ${}_{6}^{12}C$ 2,8,2
- c. ${}_{8}^{16}O$ 4,4
- d. ${}_{11}^{23}Na$ 1,8,2

Correct answers:

1a - From the solubility table we find that only $Cu(OH)_2$ is insoluble in water, which means that this mixture can be filtered to separate its precipitate.

2b - We compare the equation with the goal that before and after the reaction there are equal numbers of atoms of the same element

3c - The metal Mg reacts with oxygen O_2 in combustion to form magnesium oxide MgO

4a - We arrange the electrons of an atom into layers of electrons according to the rule: 2 electrons in the first layer, 8 electrons in the second layer and 18 electrons in the third layer. However, we need to arrange 13 electrons in total, which is shown by the atomic number written at the bottom of the symbol for the chemical element

Biology

TASK	ANSWER	CORRECT ANSWER
1. Which attribute is not appropriate to describe the meaning of blood?	A) brings oxygen and nutrients B) hemoglobin carries starch, glycogen, and protein around the body	1. B

	C) blood carries hormones throughout the body D) carries the products of vital activity to the organs of elimination	
2. The person from whom the organ is taken for transplantation is called:	A) the donor B) a doctor C) the patient D) recipient	2. D
3. What is the optimum temperature for human enzyme activity?	A) 20 laipsnių B) 37 C) 35 D) 40	3. B
4. The number of chromosomes a person has:	A) 48 B) 46 C) 44 D) 42	4. B
5. What do plants feed on?	A) minerals B) water C) carbon dioxide D) glucose	5. D

Commentato [111]: 2.A ??

Question	Answers	Correct answer
An Architect has sent you the plans for your new house. When you look at the plans, you notice that he has forgotten to specify the scale. You know that the longest wall is 25 m long: on the plan it is 12,5 cm long. What scale did the Architect use?	a) 1cm: 2m b) 2cm:1m c) 0.5cm: 1m d) 1cm: 0.5m	The correct answer is 1cm: 2m This is an easy problem. 12.5 cm in plan equals 25 m in reality, so 1 cm in plan equals $25/12.5 = 2$ m in reality. Check: $2 \times 12.5 = 25$. 
Nikola Tesla was a Croatian-American inventor and engineer. What year did he live in? What were his inventions?	a) 1808 - 1850, telephone, television, radio. b) 1856-1943, wireless transmission, Tesla transformer, high frequency transformer. c) 1902 - 1980, car, telephone, X-ray. d) 1880 - 1950, X-ray, high frequency transformer, telephone.	b) 1856-1943, wireless transmission, Tesla transformer, high frequency transformer. He was inventor, electrical engineer, mechanical engineer, and futurist best known for his contributions to the design of the modern alternating current (AC) electricity supply system.

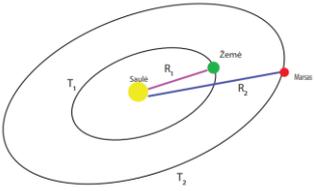
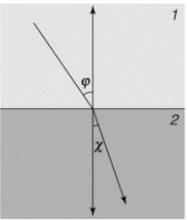
		
<p>Engineers have developed two water pumps for pumping out water in flooded areas. Pump A can pump out 1,000 L in 5 minutes and pump B can pump out 1,500L in 7,5 minutes. The residents of the flooded area prefer pump B because according to them: although it takes longer, pump B out more water than pump A. Did they make right decision?</p>	<p>a) Yes, because pump B pumps away the water faster</p> <p>b) There isn't enough information to answer the question.</p> <p>c) Yes, because it is the amount of water that is important.</p> <p>d) No.</p>	<p>Correct answer is NO. A useful question to ask would be "how many litres of water can each pump pump out in 1 minute? This then defines which variable we wish to find the unit value of.</p> <p>$1000L : 5 = 200L$</p> <p>$1500L : 7,5 = 200L$</p> <p>Both pumps work at the same rate, which means they will pump out the same amount of water in given time.</p>

Informatics

<p>What result will be shown on the screen when this code is executed?</p> <pre> for x in range (1,10): if x%2!=0: print (x) </pre>	<p>A. 2, 4, 6, 8, 10</p> <p>B. 1, 3, 5, 7, 9</p> <p>C. 1, 2, 3, 4, 5, 6, 7, 8, 9</p> <p>D. Error</p>	<p>Explanation:</p> <p>In computer programming, a loop is a sequence of instructions that is continually repeated until a certain condition is reached.</p> <p>The IF clause of the condition allows you to select only the values that satisfy the condition, in this case odd numbers, i.e. only those that do not divide by 2 without remainder.</p>
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<p>How many values can be stored in the registers of 16-bit architecture processors?</p> 	<p>A. 65536 B. 256 C. 4096 D. 262144</p>	<p>A binary numbering system is a numbering system that expresses numerical values using two symbols, 0 and 1. Each digit is called a bit. The binary numbering system is used in computers and other electronic devices. Since 2^{16} is 65536, the answer is A. Base 2 is because the binary numbering system is used.</p>
<p>What is the keyboard shortcut key to lock cell references (absolute cell) in a formula?</p>	<p>A. CTRL B. ALT C. F2 D. F4</p>	<p>In Excel, an absolute reference is a cell reference in which the column and row coordinates stay constant while copying a formula from one cell to the other. A dollar symbol (\$) is used before the coordinates to correct them. For instance, \$D\$2 is an absolute reference to cell D2.</p>
<p>We have two logical variables A and B, with possible values of "true" or "false". What will be the conditions (A AND B) OR (NOT A) when A = "true" and B = "false"?</p>	<p>A. False B. True C. Error D. 0</p>	<p>(A AND B) OR (NOT A) (true AND false) OR (NOT true) false OR false answer: false</p>

PHYSICS

<p>The distance between the Sun and the Earth is about $1.5 \cdot 10^{11}$ m. The distance between the Sun and Mars is $2.287 \cdot 10^{11}$ metres. What is the rotation period of Mars around the Sun in Earth days?</p> 	<p>A. 365 days B. 687 days C. 450 days D. 1348 days</p>	<p>Kepler's Third Law: the squares of the orbital periods of the planets are directly proportional to the cubes of the semi-major axes of their orbits.</p> $\frac{T_2^2}{T_1^2} = \frac{R_2^3}{R_1^3}$ $\frac{T_2^2}{365^2} = \frac{(2,287 \cdot 10^{11})^3}{(1,5 \cdot 10^{11})^3}$ $T_2^2 = \frac{365^2 \cdot (2,287 \cdot 10^{11})^3}{(1,5 \cdot 10^{11})^3}$ <p>From the obtained number, we draw the root: 687 days</p>
<p>An electrical circuit consists of a conductor with a resistance of 10 ohms. The electrical voltage in this circuit is 20 volts. What will be the amperage of the circuit?</p>	<p>A. 2 A (amperes) B. 10 A C. 200 A D. 0,5 A</p>	<p>A mathematical expression for Ohm's law for a part of a circuit: $U = I \cdot R$ Then $I = \frac{U}{R}$</p> 
<p>The speed of light in ice is $2.3 \cdot 10^8$ m/s. What is the absolute refractive index of ice?</p> 	<p>A. 2,45 B. 1 C. 1,3 D. 1,5</p>	<p>speed of light in air $c = 3 \cdot 10^8$ m/s In ice : $v = 2,3 \cdot 10^8$ m/s</p> <ul style="list-style-type: none"> $n = \frac{c}{v}$ $n = \frac{3 \cdot 10^8}{2,3 \cdot 10^8} = 1,3$
<p>A man driving a car at 90 km/h sees an obstacle and starts braking. The braking acceleration was 3 m/s^2. Determine how long it takes the car to stop</p>	<p>A. About 10 seconds B. About 8 seconds C. About 19 seconds D. About 50 seconds</p>	<p>Braking car speed formula: $\vec{v} = \vec{v}_0 + \vec{a} \cdot t$ Because car is braking, a is -a Stopped car speed $v=0$</p> $0 = \vec{v}_0 - \vec{a} \cdot t$ $t = \frac{v_0}{a} = \frac{25}{3} = 8,3$

MATHEMATICS

TASK	ANSWERS	CORRECT ANSWERS																																																												
<p>In a simplified weather forecasting model, there are only two types of weather: cloudy (D) or sunny (S). The probabilities were calculated by examining past results:</p> <ul style="list-style-type: none"> - If it is cloudy today, the probability that the sun will shine tomorrow is 0.3 - If it is cloudy today, the probability of cloudy tomorrow is 0.7 - If the sun is shining today, the probability that the sun will shine tomorrow is 0.6 - If the sun is shining today, the probability of cloudy weather tomorrow is 0.4 <p>1. Make a transition probability matrix:</p> <table border="1" data-bbox="240 913 408 1043"> <tr> <td></td> <td>S</td> <td>D</td> </tr> <tr> <td>S</td> <td></td> <td></td> </tr> <tr> <td>D</td> <td></td> <td></td> </tr> </table>		S	D	S			D			<p>a)</p> <table border="1" data-bbox="703 577 868 703"> <tr> <td></td> <td>S</td> <td>D</td> </tr> <tr> <td>S</td> <td>0,6</td> <td>0,3</td> </tr> <tr> <td>D</td> <td>0,4</td> <td>0,7</td> </tr> </table> <p>b)</p> <table border="1" data-bbox="711 779 868 904"> <tr> <td></td> <td>S</td> <td>D</td> </tr> <tr> <td>S</td> <td>0,4</td> <td>0,6</td> </tr> <tr> <td>D</td> <td>0,7</td> <td>0,3</td> </tr> </table> <p>c)</p> <table border="1" data-bbox="703 958 868 1084"> <tr> <td></td> <td>S</td> <td>D</td> </tr> <tr> <td>S</td> <td>0,6</td> <td>0,3</td> </tr> <tr> <td>D</td> <td>0,4</td> <td>0,7</td> </tr> </table> <p>d)</p> <table border="1" data-bbox="703 1137 868 1263"> <tr> <td></td> <td>S</td> <td>D</td> </tr> <tr> <td>S</td> <td>0,6</td> <td>0,7</td> </tr> <tr> <td>D</td> <td>0,3</td> <td>0,4</td> </tr> </table>		S	D	S	0,6	0,3	D	0,4	0,7		S	D	S	0,4	0,6	D	0,7	0,3		S	D	S	0,6	0,3	D	0,4	0,7		S	D	S	0,6	0,7	D	0,3	0,4	<p>b)</p> <table border="1" data-bbox="959 577 1114 725"> <tr> <td></td> <td>S</td> <td>D</td> </tr> <tr> <td>S</td> <td>SS</td> <td>SD</td> </tr> <tr> <td></td> <td>0,4</td> <td>0,6</td> </tr> <tr> <td>D</td> <td>DS</td> <td>DD</td> </tr> <tr> <td></td> <td>0,7</td> <td>0,3</td> </tr> </table> <p>SS - sun today and tomorrow DS - cloudy today, sun tomorrow The sum of the probabilities in the row must equal 1.</p>		S	D	S	SS	SD		0,4	0,6	D	DS	DD		0,7	0,3
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<p>2. Calculate the probability that if the sun is shining today, it will be cloudy in 2 days?</p> $\begin{pmatrix} & & \end{pmatrix} \cdot \begin{pmatrix} & & \end{pmatrix} = \begin{pmatrix} & & \end{pmatrix}$	<p>a) $\begin{pmatrix} 0,6 & 0,3 \\ 0,4 & 0,7 \end{pmatrix} \cdot \begin{pmatrix} 0,6 & 0,3 \\ 0,4 & 0,7 \end{pmatrix} = \begin{pmatrix} 0,36 & 0,16 \\ 0,09 & 0,49 \end{pmatrix}$</p> <p>b) $\begin{pmatrix} 0,6 & 0,4 \\ 0,3 & 0,7 \end{pmatrix} \cdot \begin{pmatrix} 0,6 & 0,4 \\ 0,3 & 0,7 \end{pmatrix} = \begin{pmatrix} 0,48 & 0,52 \\ 0,39 & 0,61 \end{pmatrix}$</p> <p>c) $\begin{pmatrix} 0,6 & 0,3 \\ 0,4 & 0,7 \end{pmatrix} \cdot \begin{pmatrix} 0,6 & 0,3 \\ 0,4 & 0,7 \end{pmatrix} = \begin{pmatrix} 0,48 & 0,61 \\ 0,48 & 0,61 \end{pmatrix}$</p>	<p>b) $\begin{pmatrix} 0,6 & 0,4 \\ 0,3 & 0,7 \end{pmatrix} \cdot \begin{pmatrix} 0,6 & 0,4 \\ 0,3 & 0,7 \end{pmatrix} = \begin{pmatrix} 0,48 & 0,52 \\ 0,39 & 0,61 \end{pmatrix}$</p> <p>The sum of the row is always 1. Asked by S and 2 days later by D. So the probability is 0.52.</p>																																																												

	$d) \begin{pmatrix} 0,6 & 0,7 \\ 0,3 & 0,4 \end{pmatrix} \cdot \begin{pmatrix} 0,6 & 0,7 \\ 0,3 & 0,4 \end{pmatrix} = \begin{pmatrix} 0,24 & 0,24 \\ 0,21 & 0,21 \end{pmatrix}$	
3. If $a+b=c+d$ and $b=c$, what can be logically said about a and d ?	a) $a=d$ b) $a>d$ c) $a<d$	a) $a=d$ if $b=c$, subtract b from both sides of the equals sign to get $+b-b=c-b+d \therefore a=d$.