

Appendix

Fourteen pairs of questions asked in the test; one pair of questions is related to one topic, where the correct answer to the basic questions (B) explains physiological or biochemical background of the clinical question (C)

Pair of questions*		Correct answer
1 B	Nernst potential of which ion is closest to the membrane potential of the cell?	potassium
1 C	Serum concentration variances of which ion are most life threatening?	potassium
Lethality in hypo- or hyperkalemia is due to major contribution of Nernst potential of potassium in the cell membrane potential.		
2 B	Arterial pressure is proportional to the product of _____ and peripheral resistance.	heart minute volume
2 C	Oliguria causes _____ in the level of arterial blood pressure.	increase
Hypertension in oliguria is caused by the increase in heart minute volume, referring to the basic equation of hemodynamics asked in the basic question.		
3 B	Which molecule is the terminal acceptor of electrons and hydrogen in the process of complete oxygenation of food?	oxygen
3 C	Which basic disorder of the acid-base balance of the blood is caused by chronic hypoxia?	metabolic acidosis
Chronic lack of oxygen in the tissues causes metabolic acidosis due to accumulation of the products of incomplete oxygenation of food. Oxygen is the terminal acceptor of electrons in the process of food oxygenation.		
4 B	Osmotic pressure on the capillary membrane results from _____ dissolved in the plasma.	proteins
4 C	Peripheral edema in the liver cirrhosis arises from the decrease in the _____ pressure of the plasma.	colloid-osmotic
Hypoproteinemia causes edema because proteins constitute the osmotic pressure on the capillary vessels' membrane.		
5 B	Nutritive deficit of which mineral can cause goiter?	iodine
5 C	Endemic goiter results from the accumulation of molecules of _____ in the follicles of the thyroid gland.	thyreo-globulin
The reason for the expansion of thyroid gland in hypothyroidism caused by the iodine deficit is accumulation of the protein thyroglobulin.		
6 B	Peptide _____ contracts efferent arteriole of glomeruli increasing the resorption of sodium and water into the peritubular capillaries.	angio-tensin II
6 C	Renal artery stenosis causes an increase in releasing hormone _____ from the juxtaglomerular cells.	renin
Understanding the renovascular hypertension pathophysiology background is based on understanding the angiotensin's function in the glomeruli.		
7 B	What is activated in the external or internal pathway of blood coagulation?	prothrombin
7 C	Which vitamin is necessary for the synthesis of coagulation factors?	vitamin K
Vitamin K is necessary for the synthesis of the first coagulation factor and the purpose of the whole coagulation cascade is the activation of that same coagulation factor.		
8 B	How many grams of sodium chloride need to be dissolved in the 100 mL of solution to prepare physiological solution?	0.9
8 C	Physiological solution is _____ % solution of sodium chloride.	0.9
"Percent solution" stands for the mass concentration and therefore students should be able to calculate grams of NaCl necessary to prepare 100 mL of 0.9% saline.		
9 B	In the deficiency of carbohydrates (diabetes, starvation), acetyl-CoA	oxaloacetate

	resulting from the oxygenation of fat acids cannot accede the first reaction of the citrate cycle, which is to react with _____.	
9 C	Acidosis in diabetes or during starvation arises from accumulation of _____.	ketones
<p>Since the Krebs cycle is the central crossroad of metabolism, we asked students about the first reaction of the cycle. Acetyl-CoA molecules interact with each other and form ketones because they cannot interact with oxalacetate. This is due to the fact that, when the cell lacks glucose (diabetes, starving), all of the remaining oxalacetate is converted into glucose instead of entering the Krebs cycle</p>		
10 B	Which enzyme hydrolyses the esteric bond between fat acid and glycerol in the molecule of phospholipids in the cell membrane?	phospholipase
10 C	Which enzyme is inhibited by acetylsalicylic acid?	cyclo oxygenase
<p>Phospholipase produces arachidonic acid, which is the substrate for cyclooxygenase to produce prostaglandins. Cyclooxygenase is the target enzyme of acetylsalicylic acid therapy effect.</p>		
11 B	Which hormone is the most potent stimulator of gluconeogenesis?	cortisol
11 C	In adrenal (Addisonian) crises blood concentration of glucose is _____.	decreased
<p>Insufficiency in gluconeogenesis stimulation, one of the hyperglycemic effects of cortisol, results in hypoglycemia in Addisonian crises.</p>		
12 B	Which component of triglyceride can be used as a substrate in the process of gluconeogenesis?	glycerol
12 C	Glucose excess in the liver that surpasses the energetic needs is converted into acetyl-CoA for the synthesis of _____.	fat acids
<p>It is important to remember that in human metabolism it is only possible for carbohydrates to convert into fat, while fat acid conversion to carbohydrates is impossible. Glucose cannot be produced from fat acids.</p>		
13 B	Which organ(s), in anaerobic condition, produce(s) the main raw for the process of gluconeogenesis?	muscles
13 C	Which acid causes acidosis during excessive activity of muscles?	lactic acid
<p>Lactate produced during excessive muscle activity is used in the liver to produce the necessary glucose for the muscle work. Lactic acid accumulation is also the reason for metabolic acidosis.</p>		
14 B	Which dinucleotide – derivate of vitamin niacin, after reduction in the citrate cycle, transmits its electrons to the cytochroms of the respiratory chain?	NADH
14 C	Niacin (vitamin B3) deficit causes so-called 3 D syndrome or _____.	pellagra
<p>Consequences of the vitamin niacin deficiency in human organism are the symptoms of pellagra. Niacin's derivate nicotinamide-dinucleotide has an important role as a transmitter of electrons to the cytochroms of the respiratory chain, after the reduction of NAD to NADH in the citrate cycle.</p>		

*Question pairs 1-7 tested basic science knowledge of physiology, while question pairs 8-14 tested the knowledge of biochemistry.