Histology question

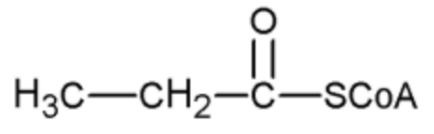
The pancreas is a functionally mixed gland. The basic compartments of part with exocrine secretion are serous acini ✔ , their secretory cells are highly basophilic ✔ . The basic structure forming compartment with endocrine secretion is trabecular epithelium ✔ , its cells are secreting their products into fenestrated capillaries ✔ . In exocrine tissue, we observe several cell populations secreting different products (choose the right combination): A-cells - glucagon, B-cells - insulin, D-cells - somatostatin ✔ .

Genetics

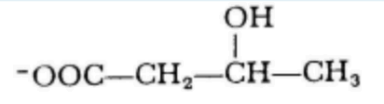
An Askenazi 'Jewish couple, was referred to the genetics clinic for evaluation of their risk for having a child with hereditary disease. Man had a sister who died of the disease as a child. Woman had paternal uncle living in a psychiatric home. Both had declined presymptomatic screening for this disease as teenagers. The disease is one of the **neurodegenerative** diseases, it breaks out from **an early age** to adulthood, the afflicted ones suffer from **psychosis** and have a **cherry spot on the retina**. Enzymatic carrier testing showed that boh had **reduced HEXA activity**. Subsequent molecular analysis for HEXA gene mutation predominant in Ashkenazi Jewish confirmed that man is carrier a disease-causing mutation, whereas woman has only a pseudodeficiency allele, but no disease-causing mutation. Tay-Sachs disease ✔ is described, another name for this disease is GM2 gangliosidosis ✔ , the inheritance of this disease is autosomal recessive ✔ . It belongs to a group of diseases called lysosomal storage diseases ✔ . Since 2016, 18 diseases have been examined in newborn screening in Czech Republic. The described disease is not examined ✔ in Czech Republic as part of newborn screening.

BIOCHEMISTRY question

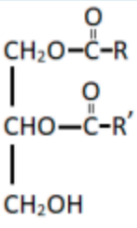
Match the correct characteristic to each of the pictured molecules (you receive 1 point for each correct pair).



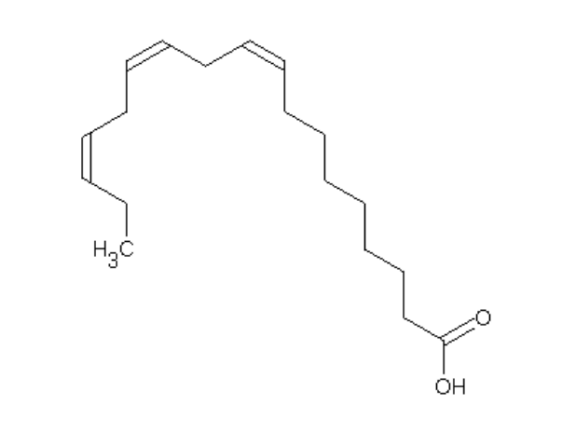
is produced by beta-oxidation of FA with an odd number of C



is oxidised to form acetoacetate



is an intermediate in triacylglycerol synthesis



belongs among omega-3 fatty acids

CH3-(CH2)16-COOH

is formed by elongation from palmitic acid

Choose the BEST answer:

1. Motor proteins that can bind to each other and create bundles include only myosin ✔

2. Motor proteins that always have two ATP-binding heads include kinesin and dynein ✔

3. Nine dublets of microtubules plus two central microtubules anchored with their minus end in the basal body can be found in eukaryotic flagellum and cilia ✔

4. Choose which processes myosin II participates in:
it is a part of myofibrils, contractile ring, and participates in ameboid moves of cells ✔

5. kinesin and myosin II ✔ move(s) towards the plus end of cytoskeletal fibers.

6. Which motor protein(s) participate(s) in the function of the mitotic spindle? kinesin and dynein ✔

7. Katarger syndrome can be caused by the mutation of the gene for dynein ✔

8. dynein ✔ moves along microtubules to the center of the cell.

9. The complex that connects the cargo (vesicle) to the transporting dynein is called dynactin complex ✔

10. The growth of filopodia is connected with the elongation of actin filaments ✔

BIOCHEMISTRY question

For each molecule, select the most appropriate characteristic from the list (you get 1 point for each correct assignment).

glucose-1-phosphate: is an intermediate in both glycogenesis and glycogenolysis ✔

pyruvate: in mitochondria it is oxidatively decarboxylated to acetyl-CoA ✔

glycerol-3-phosphate: is oxidized to dihydroxyacetone phosphate, which enters gluconeogenesis ✔

oxaloacetate: is formed by transamination of aspartate ✔

malonyl-CoA: inhibits the entry of fatty acids into the mitochondria ✔

Histology question

Hematopoiesis during embryogenesis first takes place: extraembryonally in the yolk sac ✔ . Which cell type does not develop from the myeloid lineage? lymphocyte ✔ . Cell with polyploid nucleus is megakaryocyte ✔ . The connective tissue that is present in the bone marrow consists mainly of reticular fibers ✔ . The successive stages in granulocyte maturation are in this order meyloblast, promyelocyte, myelocyte, metamyelocyte ✔ .

BIOCHEMISTRY question

Amino acids are taken with food mainly in the form of proteins ✔ . In the body these amino acids serve mainly for the synthesis of proteins ✔ .

An excess of amino acids received from food is first converted by the reaction called transamination into alpha-ketoacids ✔ , for which vitamin B6 ✔ is necessary.

The product of the transamination reactions of various amino acids in whose molecule amino-nitrogen accumulates is glutamate ✔ . This molecule formed by transamination then reacts with ammonia to give rise glutamine ✔ ., which is released from tissues into the blood.

Blood transports the above mentioned substance to the liver. In the mitochondria of hepatocytes ammonia is released from this substance by glutaminase ✔ .

Released ammonia then enters a reaction catalyzed by carbamoyl phosphate synthetase ✔ ., which is a regulatory enzyme of the metabolic pathway called ornithine cycle ✔ .

The final product of this metabolic pathway , which is excreted by urine from the body, is called urea ✔

Question from Histology

Select appropriate morphological features for the given cell types

proteins producing cell

euchromatic nucleus, rough endoplasmic reticulum, Golgi complex, secretory granules, basophilic cytoplasm

✔

mucus producing cell

euchromatic nucleus, rough endoplasmic reticulum, Golgi complex, PAS-positive secretory granules

✔

cell transporting ions

baso-lateral complex, apical microvilli

✔

steroid-secreting cell

euchromatic nucleus, smooth endoplasmic reticulum, tubular mitochondria, lipid droplets

✔

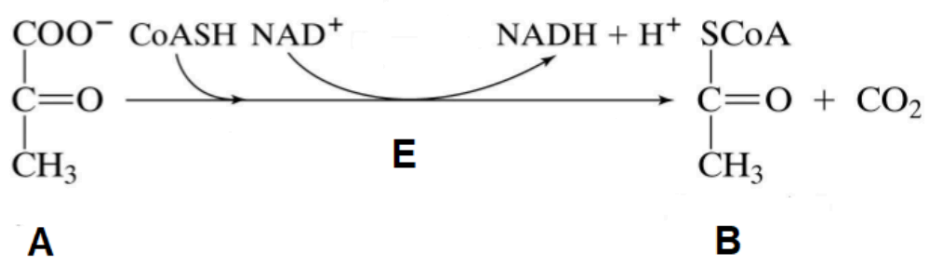
myoepithelial cell

actin, myosin, cytokeratins, hemidesmosomes

✔

BIOCHEMISTRY question

Complete the sentences below the picture: you get 0.5 point for every correct selection.



The reaction shown is localized [in mitochondria] ✔ , and the increased NADH/NAD$^+$ ratio [inhibits] ✔ this reaction. Substance A [is a product of one of the irreversible reactions in glycolysis] ✔ . Enzyme E, which is involved in the metabolic conversion shown in the figure, is [pyruvate dehydrogenase] ✔ and its activity is increased by the action of [insulin] ✔ . One of the cofactors of the above reaction is coenzyme A, which contains [vitamin B5] ✔ in its structure, while [vitamin B3] ✔ is necessary for the formation of the cofactor NAD$^+$. The electrons released during the conversion of substance A to substance B enter the electron transport chain by an enzyme called [NADH-dehydrogenase] ✔ . The product of the reaction, substance B, can then [be used to synthesize fatty acids] ✔ . For that purpose, substance B must first be converted to [citrate] ✔ , as there is no carrier for substance B in the inner mitochondrial membrane.

Question from Histology

Select correct answers for secretory cell of mammary gland.

Lipid component of the milk is secreted by apocrine secretion ✔

Protein component of the milk is secreted by merocrine secretion ✔

Milk is secreted by exocrine secretion ✔

Imunoglobulins (Ig A) are transported by transcytosis ✔

Water and ions are secreted by eccrine secretion ✔

Histology question

Perimysium Layer of connective tissue around the bundle of muscle fibers ✔

Triads Are complexes of T tubule and two terminal cisternae ✔

Muscle cells with the ability to synthesis elastic fibers
Are the smooth muscle cells ✔

Gap junctions Are only in cardiac and smooth muscle ✔

Satelite cells Are stem cells of cardiac muscle ✖

BIOCHEMISTRY question

The cause of microcytic anaemia is a reduced ability of erythrocyte precursors to synthesize hemoglobin. The reason is most often the lack of iron in the organism. Other reasons include hereditary or acquired disorders of enzymes involved in the synthesis of heme or a hereditary disorder of the hemoglobin polypeptide chains synthesis.

Hemoglobin is an oxygen-carrying protein in the blood, 1 molecule of hemoglobin carries [4 molecules] ✔ of oxygen.

The amount of iron in the body is regulated by the hormone [hepcidin] ✔ , whose increased concentration [decreases transport of Fe2+ from enterocyte into blood] ✔ .

Blood iron is transported mainly in the form of [Fe3+ bound to transferrin] ✔ , it enters that oxidation state thanks to [hephaestin] ✔ .

With iron deficiency in the body, blood concentration of [transferrin increases] ✔ .

In case of a disorder of enzymes involved in the heme synthesis, various [porphyrins] ✔ or [delta-aminolevulinic acid] ✔ accumulate in the body.

The vitamin necessary for heme synthesis is [pyridoxine] ✔ .

The most serious disorder of the hemoglobin polypeptide chains synthesis is the deficient formation of [alpha-globin] ✔ , since this chain occurs in all types of hemoglobin.