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1 Which of the following is not a function of triacylglycerol

- a) Energy storage b) Insulation c) Shock absorption
d) membrane structure

answer: D membrane structure

1 Fatty acids are carboxylic acid

2 The sterol nucleus of steroid is called a gonane ring

3 Chylomicrons transport dietary lipids from the ~~peripheral tissue~~ intestine to peripheral tissue and liver

4 Write concisely on the functional characteristics of Nucleus, mitochondria and Endoplasmic reticulum.

k Nucleus:

i Cell compartmentalization:

The nuclear envelope allows the nucleus to control its contents, and separate them from the rest of the cytoplasm where necessary. This is important for controlling processes on either side of the nuclear membrane.

ii Gene expression:

Gene expression first involves transcription in which DNA is used as a template to produce RNA. In the case of genes encoding proteins, that RNA produced from this process is messenger RNA, which then needs to be translated by

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ribosomes to form a protein. As ribosomes are located outside the nucleus, messenger RNA produced needs to be exported.

iii Processing of Pre-mRNA:

Newly synthesized mRNA molecules are known as primary transcript or pre-mRNA. They must undergo post-transcriptional modification in the nucleus before being exported to the cytoplasm; mRNA that appears in the cytoplasm without these modifications is degraded rather than used for protein translation.

iv Nucleolus produces ribosomes and are known as protein factories

2 Mitochondria:

i Energy conversion:

A dominant role for the mitochondria is the production of ATP, as reflected by the large number of proteins in the inner membrane for this task. This is done by oxidizing the major products of glucose: pyruvate and NADH which are produced in the cytosol.

ii Pyruvate and the Citric acid cycle:

Pyruvate dehydrogenase, pyruvate carboxylase, and Citric acid cycle pyruvate molecules produced by glycolysis are actively transported across the inner mitochondrial membrane, and into the matrix where they can either be oxidized and combined with coenzyme A to form CO_2 , acetyl-CoA and NADH or they can be carboxylated by pyruvate carboxylase to form oxaloacetate.

iii Heat production:

Under certain conditions, protons can re-enter the mitochondrial matrix without contributing to ATP synthesis. This process is known as proton leak or mitochondrial uncoupling and is due to the

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Facilitated diffusion of protons into the matrix
the process results in the unharnessed potential energy
of the proton electrochemical gradient being released
as heat

iv) Regulation of The membrane potential

ii) Endoplasmic reticulum:

i) Bioenergy regulation of ER ATP supply by a Ca²⁺ Ticker
mechanism: The endoplasmic reticulum does not harbor
an ATP-regeneration machinery, and therefore
requires ATP import from mitochondria. The important

ATP is vital for the ER to carry out its housekeeping
cellular function such as for protein folding and trafficking

ii) protein transport:

Secretory proteins, mostly glycoproteins, are moved
across the endoplasmic reticulum membrane. proteins that
are transported by the endoplasmic reticulum through
out the cell. are marked with an address tag
called a signal sequence.

5 Explain the various classes of glycolipids and
draw the structure of one

The classes of glycolipids are

1. Cerebrosides
2. sulfatides
3. Globosides
4. Gangliosides

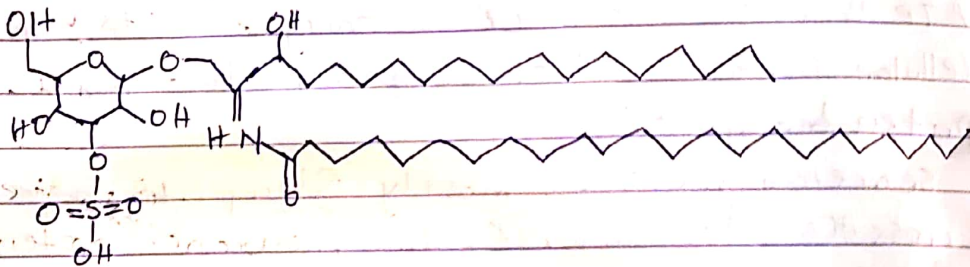
1 Cerebrosides: Cerebrosides are the simplest glycolipid
in which there is only one sugar residue, either
glucose or galactose linked to ceramide and named as
glucocerebroside and galactocerebroside respectively.
Galactocerebroside is found in the nerve tissue membrane,
whereas glucocerebroside is the predominant glycolipid
of extraneural (non-neural) tissues where it acts as a precursor
for the synthesis of more complex glycolipids eg gangliosides.

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2. **Sulfatides:** Sulfatide is also known as 3-O-sulfogalactosylceramide. Sulfatide is synthesized primarily starting in the endoplasmic reticulum and ending in the golgi apparatus where ceramide is converted to galactocerebroside and later sulfated to make sulfatide. Sulfatide is primarily found on the extracellular leaflet of the myelin plasma membrane produced by the oligodendrocytes in the central nervous system and in the schwann cells in the peripheral nervous system.

Structure of Sulfatide:



3. **Globosides:** globoside has more than one sugar as the side chain (or R group) of ceramide. the sugars are usually a combination of N-acetylgalactosamine, D-glucose or D-galactose. The side chain can be cleaved by galactosidase and glucosidase. It is an important constituent of the RBC membrane.

4. Gangliosides:

Gangliosides are complex glycolipids, derived from glucocerebroside. ganglioside contains oligosaccharides and one or more molecules of sialic acid which is usually N-acetylneuraminic acid (NANA) attached to ceramide. Several types of gangliosides such as GM₁, GM₂, GM₃ etc have been isolated from brain and other tissues. The simplest ganglioside found in tissues is GM₃. G represents ganglioside; M represents Mono which indicates presence of one residue of NANA and subscript number assigned on the basis of chromatographic migration of ganglioside. ~~GM~~ GM₁ is a more complex ganglioside derived from GM₃.