SAQs File

Neuropsychiatry block

MED439

DISCLAIMER

This is done by the effort of students and may fall short of what will actually come on the exam. **You are expected to study the whole theoretical material before the exam.**

This file is only for revision.

We are not held liable or responsible for any content in the exam out of this file.

Thank you all the best!

All of the questions in this file were mentioned by dr. Sumbul

Please make sure you check the answer from the original slides

Dr. Sumbul:

- **Mid lecture is included in the SAQs exam.**
- **Anything can be asked**
- SAQ well be **one question** with **sub-questions** which will be about **different parts from different lectures (not only one lecture).**
- **You don't have to memorize the chemical structures**

- Click here to check out 438 summary
- Click here to check out 437 summary & Questions
- Click here to check out the editing file

This file was done by Rand AlRefaei

Special thanks to Shatha Aldhohair

1st lec: Sphingolipidoses & myelin structure

★1- What is ceramide made of?

- Sphingosine + Fatty acid

★2- What is Sphingomylein made of?

- Ceramide + Phosphorylcholine

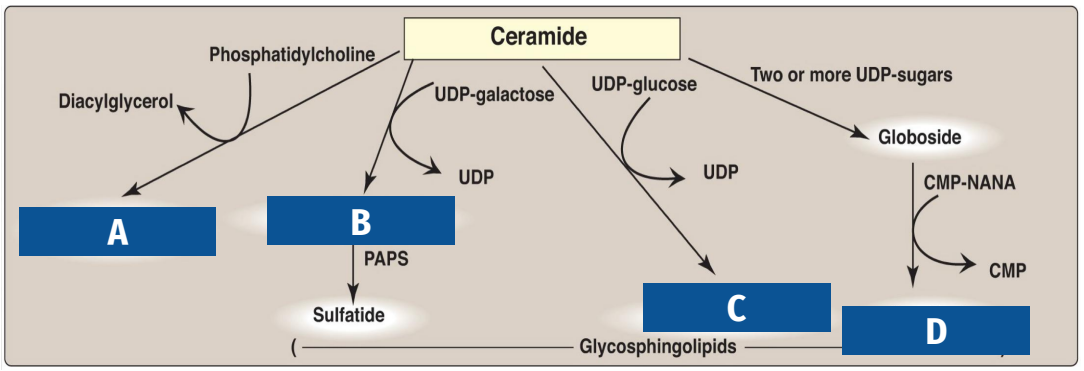
★3- What is Cerebroside made of?

- Ceramide + Monosaccharides

★4- What is Gangliosides made of?

- Ceramide + oligosaccharides + NANA

5- identify the marked area: (please be familiar with the whole figure)



A- Sphingomyelin (sphingophospholipids)
B- Galactocerebroside
C- Glucocerebroside
D- Gangliosides

6- what is myelin composed of?

- Lipids (80%):
  - Main component: Cerebrosides
  - Other component: Sphingomyelin
- Proteins (20%) :
  - e.g. Myelin basic protein

7- myelin is produced by what cells?

- Schwann cells : Peripheral nerves.
- Oligodendrocytes : CNS.

8- Define sphingolipidoses :

- A partial or total missing of a specific lysosomal acid hydrolase leads to accumulation of a sphingolipid.

★9- Name two conditions that lead to accumulation of sphingolipids:

- Niemann-Pick disease
- Gaucher Disease

10- Give 2 characteristics of Gaucher disease:

- Crumpled tissue paper appearance of the cytoplasm of gaucher cells.
- Most common lysosomal storage disease.
- Accumulation of glucocerebrosides.

11- Give 2 characteristics of Niemann-Pick disease:

- sphingomylinase deficiency.
- Enlarged liver.
- Severe intellectual disability .

2nd lec: Vitamins B6 & B12

1- what are vitamins?

- Organic compounds present in small quantities in different types of food
- Help in various biochemical processes in cell
- Most act as coenzymes
- Important for growth and maintaining good health
- Essential
- Non-caloric
- Required in very small amounts

2- give 4 important characteristics of Vitamins

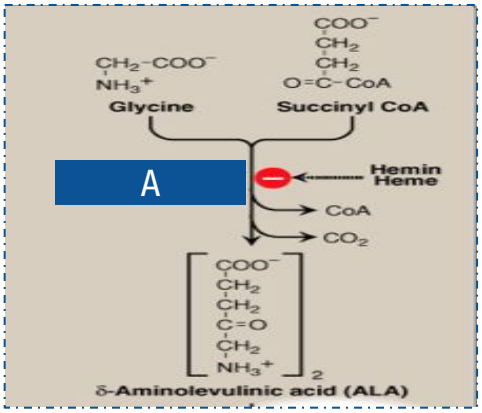
- Important for growth and good health
- Help in various biochemical processes in cell
- Function as coenzymes
- Present in small quantities in different types of food

3- what are the different forms of Vitamin B6 are available and what form is the active form? Can come as MCQs or SAQs

- Pyridoxine
- Pyridoxal
- Pyridoxamine
- Active form is pyridoxal phosphate (PLP)

★ 4- what is the reaction that's shown in the figure?

4.1- identify the marked area: (please be familiar with the whole figure)

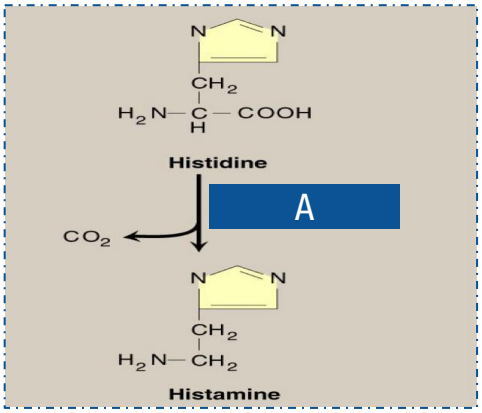


- Condensation Reaction

5.1. A- δ-Aminolevulinate synthase

★ 5- what is the reaction that's shown in the figure?

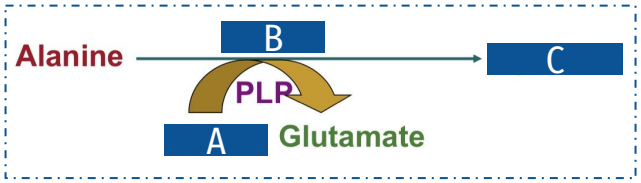
5.1- identify the marked area: (please be familiar with the whole figure)



- Decarboxylation Reaction

6.1. A- Decarboxylase

7- what is the reaction that's shown in the figure?
7.1- identify the marked area: (please be familiar with the whole figure)



- Transamination reaction

7.1. A- αKG (alpha-ketoglutarate)
B- ALT (Alanine Transaminase)
C- Pyruvate

8- Give examples of reactions where Vit B6 is involved ? Or what are the functions of Vitamin B6?

- **Condensation Reaction:**
- hemoglobin synthesis, degradation of heme
- formation of ALA
- **Decarboxylation Reaction:**
- formation of catecholamines (Dopamine, NE, Epinephrine)
- formation of histamine
- formation of serotonin
- **Transamination Reaction**
- convert Alanine to Pyruvate

9- What is the mechanism of Condensation Reaction that vitamin B6 required in?

- Glycine and succinyl CoA condense in the presence of ALA synthase (Vitamin B6 is the coenzyme) to form ALA (δ-Aminolevulinic acid (ALA))

10- What is the mechanism of Decarboxylation Reaction that vitamin B6 required in?

- decarboxylation of Tyrosine to dopamine (then dopamine converted to epinephrine and norepinephrine).
- decarboxylation of histidine to histamine.
- decarboxylation of tryptophan to serotonin.

11- What is the mechanism of Transamination Reaction that vitamin B required in?

- Conversion of alanine to pyruvate via ALT and PLP

12- Name 3 enzymes that require B6:

- decarboxylase enzyme
- ALT
- ALA synthase

13- Vit B6 deficiency disorders (Can come as MCQs or SAQs)

- poor activity of PLP-dependent enzymes causing:
- Deficient amino acid metabolism
- Deficient lipid metabolism
- Deficient neurotransmitter synthesis: Serotonin, epinephrine, norepinephrine and gamma-aminobutyric acid (GABA)
- PLP is involved in the synthesis of sphingolipids Its deficiency leads to demyelination of nerves and consequent peripheral neuritis

11- List 3 of mild Vit B6 deficiency disorders:

- Irritability
- Nervousness
- Depression

12- List 2 of severe Vit B6 deficiency disorders:

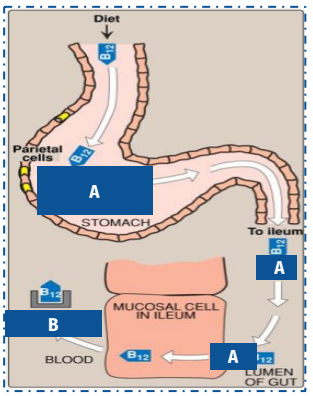
- Peripheral neuropathy
- Convulsions

13- Name the forms of Vit B12 and what are the circulatory and the storage forms:

- Cyanocobalamin
- Hydroxycobalamin
- Adenosylcobalamin (**major storage form** in the liver)
- Methylcobalamin (mostly found in **blood circulation**)

14- How vitamin B12 absorbed by/storaged in the body?

14.1- identify the marked area: (please be familiar with the whole figure)

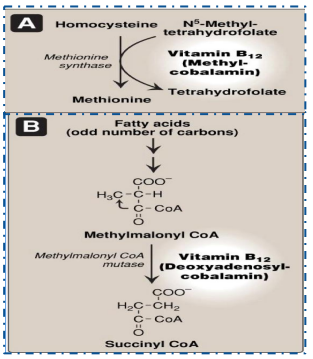


- Not synthesized in the body and must be supplied in the diet
- Then it will bind to intrinsic factor and absorbed by the ileum
- Then this intrinsic factor helps in absorption by enterocytes
- Then it's carried by binding proteins

14.1. A- intrinsic factor (glycoprotein)
B- B12-binding protein

★15- What is the mechanism of Reaction that vitamin B12 required in?

(please be familiar with the whole figure)



- **Conversion of homocysteine to methionine by methionine synthase** (requires Methylcobalamin) (take methyl group N^5-methyltetrahydrofolate which gets converted to tetrahydrofolate)
- **Conversion of propionyl-CoA to methylmalonyl-CoA to succinyl-CoA by methylmalonyl-CoA mutase** (requires vit B12 (deoxyadenosylcobalamin))

16- What is the mechanism of folate trapping?

- (Accumulation of N^5-methyltetrahydrofolate due to dysfunction of methionine synthase) Homocysteine re-methylation reaction is the only pathway where N^5-methyl TH4 can be returned back to tetrahydrofolate pool. Thus, in B12 deficiency, folate is trapped as N^5-methyl TH4 → folate deficiency + deficiency of other derivatives (N^5-N10 methylene TH4 + N10 formyl TH4) required for purine/pyrimidine synthesis.

★17- What is the role of intrinsic factor in absorption of Vit B12:

- has an important role in the absorption of vitamin B12 in the intestine.
- Binds to intrinsic factor (IF: is a protein secreted by cells in the stomach) and absorbed by the ileum.
- Vitamin B12 deficiency is observed in patients with IF deficiency due to autoimmunity or by partial or total gastrectomy

★18- How vitamin B12 deficiency cause neuropathy? (have been asked before in SAQs)

- Deficiency of vitamin B12 leads to accumulation of methylmalonyl CoA which will be used instead of malonyl CoA for fatty acid synthesis (unstable fatty acids)

19- What causes vitamin B12 Deficiency secondary to IF deficiency?

- Intrinsic factor deficiency due to autoimmunity or by partial or total gastrectomy

20- What are the forms of folate trapping? (Can come as MCQs or SAQs)

- N5-methyltetrahydrofolate (trapped form)
- N5-methylene (deficient forms)
- N10-methylene (deficient forms)
- N10-formyl (deficient forms)

★21- What does Vit B12 deficiency lead to?

- Pernicious anemia: Megaloblastic anemia
- Demyelination: Myelin sheath of nerves is chemically unstable and damaged
- Neuropathy: Peripheral nerve damage

22- What are the neurological symptoms of Vit B12 deficiency?

- The Paraesthesia (abnormal sensation) of hands and feet
- Reduced perception of vibration and position
- Absence of reflexes
- Unsteady gait and balance (ataxia)

23- What are the psychiatric symptoms of Vit B12 deficiency?

- Confusion and memory loss
- Depression
- Unstable mood.

24- List 4 neurotransmitters which their synthesis is affected by Vit B6 deficiency: (have been asked before in SAQs)

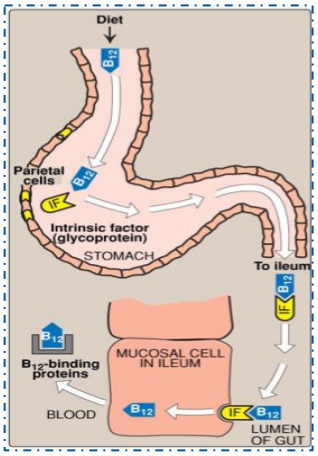
- Dopamine
- Serotonin
- Histamine
- Norepinephrine

25- A man had tuberculosis and was on isoniazid treatment what enzyme is deficient in his case and why? Isoniazid will affect which vitamin and how? (have been asked before in SAQs)

- Pyridoxine Phosphokinase because the drug inhibits it which will lead to vitamin B6 deficiency
- Vitamin B6, by forming an inactive derivative with PLP

26- How vitamin B12 absorbed by/storaged in the body? From 438 team

- salivary glands secrete R protein which bind to vitamin B12 in stomach and will be removed in the intestine by pancreatic enzymes > the free B12 binds to the intrinsic factor which is released from the parietal cells of the stomach > intrinsic factor complex bind to their special receptors present on the intestinal epithelial cells and taken inside the enterocytes—> thrown into the general circulation, bound to transcobalamin —> goes to the liver to be stored. (whole explanation if the pic comes)
- **Short answer** : it is absorbed by intrinsic factor then it help in the absorption by the enterocyte then it's carried by binding protein (released from parietal cells) and stored in the liver
- Special thanks to team 438



Reactions that require Vitamin B6

Reaction	Substrate	Product	Enzymes
Condensation	Glycine + Succinyl CoA	δ-Aminolevulinic acid (ALA)	δ-Aminolevulinate synthase (ALA synthase)
Decarboxylation	Tyrosine	Catecholamines Ex.Dopamine, NE, E	Decarboxylase
	Histidine	Histamine	Decarboxylase
	Tryptophan	Serotonin	Decarboxylase
Transamination	Alanine	Pyruvate	ALT

3rd lec: pathogenesis of cerebral infarction

1- what is the role of Protein kinase C in increasing neuronal activity?

- During periods of increased neuronal activity, ROS & RNS diffuse to the myelin sheath of oligodendrocytes activating Protein kinase C (PKC) ——-> posttranslational modification of myelin basic protein (MBP) by phosphorylation

★ 2- what are the molecular effects and vascular effects of ROS in ischemic stroke? (have been asked before in SAQs)

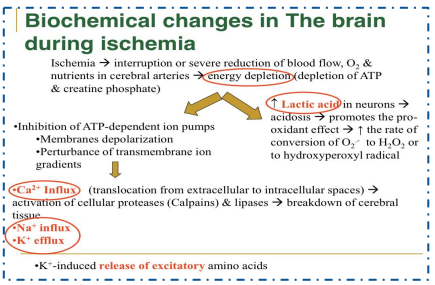
- **Molecular effects:**
- DNA damage
- Chemotaxis
- Protein denaturation
- **Vascular effects:**
- Altered vascular tone and cerebral blood flow
- Increased platelet aggregability
- Increased endothelial cell permeability

3- what are the types of NO?

- endothelial NOS (eNOS) beneficial
- neuronal NOS (nNOS) (harmful)
- inducible form of NOS (iNOS) has detrimental (harmful)

★ 4- list the biochemical changes that happen in the brain during ischemia with explanation (metabolic stress): Or what are the ions that are disturbed during ischemia?

- **Increase lactic** —> acidosis —-> promotes the pro-oxidant effect —-> Increase the rate of conversion of O2.- to H2O2 or to hydroxyperoxyl radical
- **Ca2+ influx** : (translocation from extracellular to intracellular spaces) activation of cellular proteases (Calpains) & lipases breakdown of cerebral
- **Na+ influx**
- **K+ efflux**
- **K+-induced release of excitatory amino acids**
- **Memorize the whole picture**



★ 5- inhibition of ATP dependent leads to what?

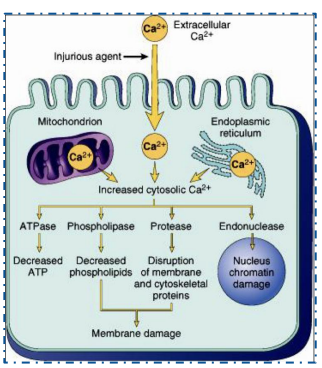
- Inhibition of ATP-dependent ion pumps, Membranes depolarization, Perturbance of transmembrane ion gradients will lead to:
- Ca2+ influx
- Na+ influx
- K+ efflux
- Memorize the previous picture

★ 6- increase of lactic acid during ischemia leads to?

- Increase Lactic acid in neurons —-> acidosis —-> promotes the pro- oxidant effect —-> Increase the rate of conversion of O2.- to H2O2 or to hydroxyperoxyl radical
- Memorize the previous picture

7- what are the events that can lead to membrane damage (Can come as MCQs or SAQs)

- Decreased ATP
- Decreased Phospholipids
- Disruption of membrane
- Endonucleases.
- Memorize the whole picture



8- what are the sources of cytosolic Ca2+ ?

- Endoplasmic reticulum
- mitochondria
- Memorize the whole picture

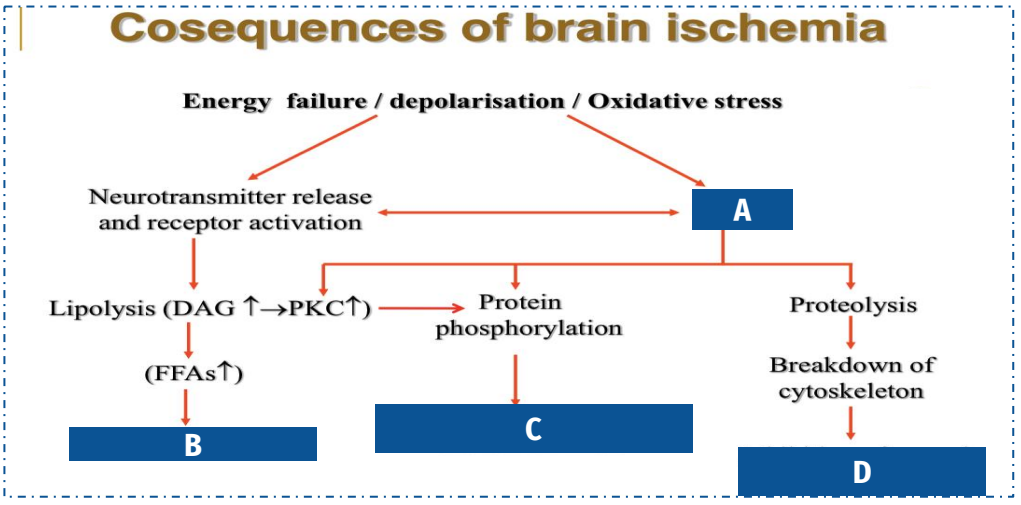
★9- what are the neurotransmitters that will increase following cerebral ischemia?

- Glutamate
- Glycine
- GABA
- Dopamine

10- list Examples of Potential Biochemical Intervention in Cerebral Ischemia:

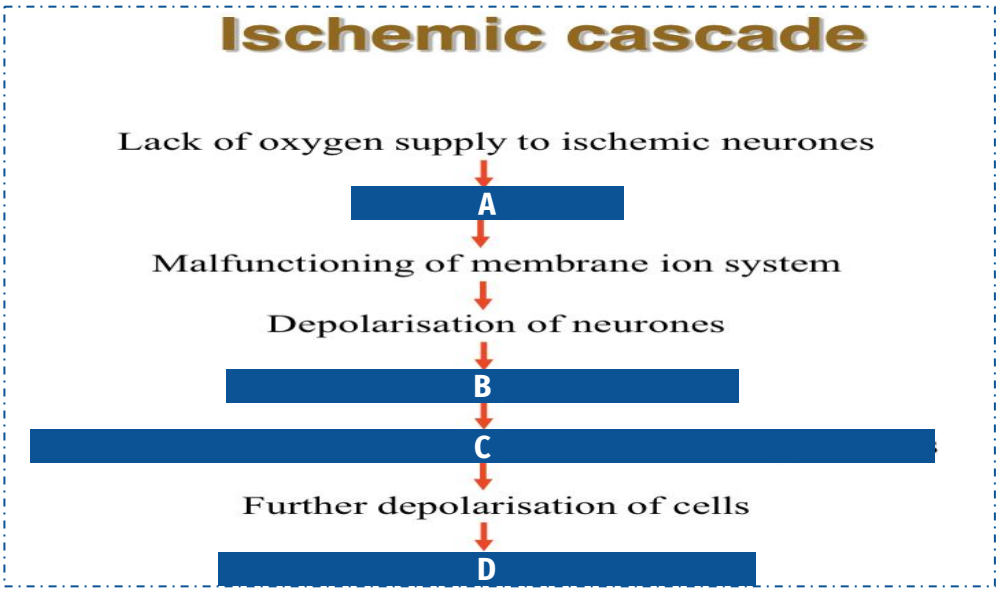
- Inhibitors of glutamate release
- Ca2+ channel blockers
- Nitric oxide synthase inhibitors & free radical inhibition
- Calpain inhibitors

★11- identify the marked area: (please be familiar with the whole figure)



A- increase Ca2+
B- membrane damage
C- dysfunction of receptors and ions channels
D- inhibition of axonal transport blebbing

★12- identify the marked area: (please be familiar with the whole figure)



A- ATP depletion
B- influx of calcium
C- Release of neurotransmitters, activation of proteases
D- Further calcium influx

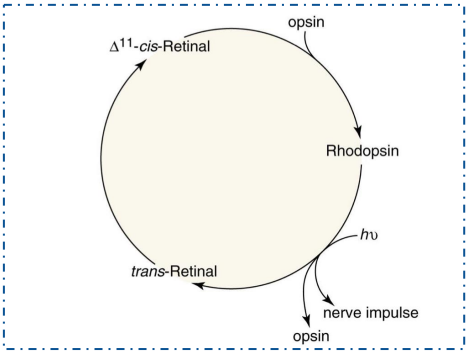
4th lec: Vitamin A & visual cycle

1- What are the functions of vit A?

- Vision
- Immune function
- Gene transcription
- Growth and bone metabolism
- Embryonic development and reproduction
- Skin health
- Antioxidant activity

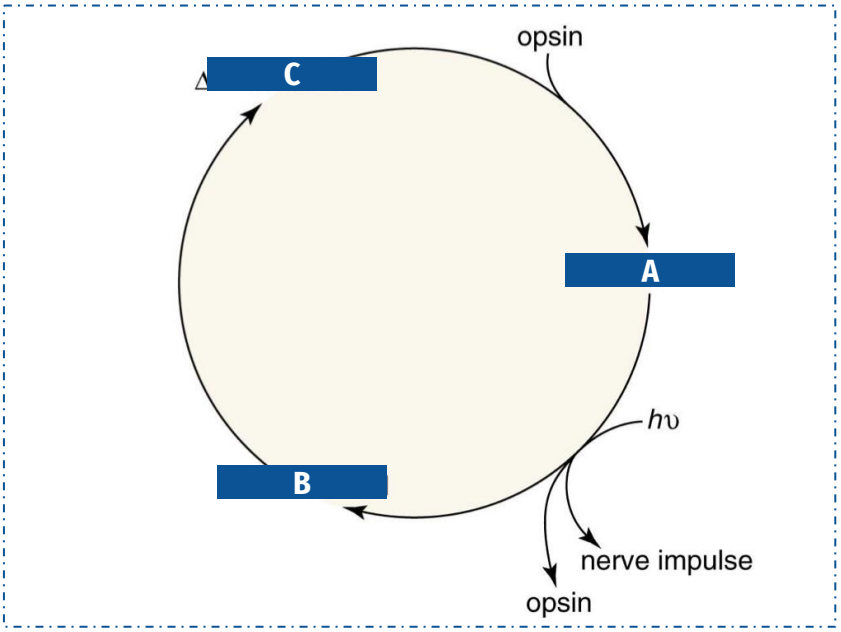
★2- What is visual cycle (you can either write the pathway or draw the figure)

- In the retina, vitamin A in the form of retinal binds to a protein called opsin to make rhodopsin (in rod cells) and iodopsin (in cone cells)
- Rhodopsin and iodopsin are light-sensitive pigments
- When stimulated by light vitamin A isomerizes from its bent cis form to a straighter trans form and detaches from opsin
- The opsin molecule changes shape, which sends a signal to the brain via optic nerve and an image is formed
- Most retinal released in this process is quickly converted to trans-retinol and then to cis-retinal, to begin another cycle



★3- What is the reaction that's shown in the figure?

3.1- identify the marked area: (please be familiar with the whole figure)



3- Visual cycle
3.1- A- rhodopsin
B- trans-retinal
C- cis-retinal

4- What is the role of Vit A in visual cycle ?

- process by which light impacting on the retina of the eye is converted to an electrical signal
- The optic nerve carries the electrical signal to the brain (nerve impulse)
- The brain processes the signal into an image

★5- What is dark adaptation time?

- The time required to synthesize rhodopsin in the dark

5th lec: Alzheimer's disease

1- What are the classical features of AD?

- neuritic plaque
- Neurofibrillary tangles
- Amyloid angiopathy

2- What is the pathogenic form of APP?

- Aβ42 , because it's more neurotoxic and more sticky so will make the aggregate more.

★ 3- Give examples of less abundant proteins in neuritic plaque:

- Proinflammatory cytokines
- Components of the complement cascade
- Apolipoproteins
- α1-Antichymotrypsin

4- How is tau protein involved in pathogenesis of AD ? Or what is the role of tau protein in AD?

- Presence of Aβ causes hyperphosphorylation of tau protein in neurons.
- This leads to redistribution and aggregation of tau protein into tangles in neurons (from axon into dendrites and cell body).
- The process results in neuronal dysfunction and cell death.

5- What is the role of tau protein in normal physiological form?

There was no answer to this question in the slides so the answer was obtained from the internet
(Click here to check the resource of the answer)

- The tau protein is predominantly found in brain cells (neurons). Among tau's multiple functions in healthy brain cells, a very important one is stabilization of the internal microtubules.

★ 6- What is the mechanism of amyloid generation ? Or what is the difference between the 2 pathways that is involved in APP?

- When APP is cleaved by α secretase ,Subsequent (followed) cleavage by γ secretase does not yield Aβ (normal).
- Cleavage by β-secretase followed by γ-secretase result in: Production of Aβ .
- Aβ can then aggregate and form fibrils.

★ 7- What are the biochemical markers that correlate to the injury of dementia? (have been asked before in SAQs)

- Loss of choline acetyltransferase
- Synaptophysin immunoreactivity
- Amyloid burden

8- What does stem cell therapy offer in AD treatment?

- Cellular replacement and/or provide environmental enrichment to attenuate neurodegeneration.
- Neurotrophic support to remaining cells.
- Prevent the production or accumulation of toxic factors that harm neuron

9- What is the consequence of Aβ accumulation?

- Accumulation of Aβ protein affects neurons and neuronal function:
- Small aggregates of Aβ alters neurotransmission
- Aggregates can be toxic to neurons and synaptic endings
- Larger deposits (plaques) also cause neuronal death
- Elicit a local inflammatory response leading to further cell injury

6th lec: CSF

Dr. Sumbul :
This lecture is more likely will come as MCQs or OSPE

★ **1- If multiple banding (oligoclonal bands) of the γ-globulin is detected, what are the differential diagnosis you suspect?**

- Multiple Sclerosis
- Subacute sclerosing panencephalitis (SSPE)
- Inflammatory diseases

★ **2- what are the indications and contraindications of laboratory investigation of CSF?** (have been asked before in SAQs)

- **Indications** :
- CNS infection
- Demyelinating diseases
- CNS malignancy
- Hemorrhage in CNS
- **Contraindications** :
- Bleeding diathesis
- Increased intracranial pressure
- Infection at site of needle insertion

You should know this very well

Abnormal findings of CSF in some pathological conditions

Parameters (reference range)	Condition		
	Bacterial Meningitis (pyogenic)	**Tuberculous Meningitis**	**Viral Meningitis**
Appearance	Often turbid	Often fibrin web	Usually clear
Predominant cell	Polymorphs	Mononuclear (lymphocytes)	Mononuclear (lymphocytes)
Cell count/mm^3	90-1000+	10-1000	50-1000
Bacteria/virus	+ve smear & culture	Often none in smear	-ve smear or culture
Protein (0.15-0.45 g/L)	**>1.5 (↑ ↑)**	**1-5 (↑ ↑)**	**<1 (Normal)**
Glucose (2.8-4.2 mmol/L)	**<1/2 plasma (↓ ↓)**	**<1/2 plasma (↓ ↓)**	**>1/2 plasma (Normal or slightly ↓)**
Chlorides (115 - 130 mmol/L)	**↓ ↓**	**↓ ↓**	**Normal or ↓**