pattern

source
RDA
function
deficiency manifest

Vitamin - A.

Essay ✓

pro-vitamin A - Beta carotene (plants)

{precursor of VA}
1 mark.

→ sometimes 4 mark then write pro vitamin of all vitamin.

Sources:

- yellow and dark green vegetables and fruits
  ↓
  good source of carotene.

- Animal source.
  ↓
  milk, butter, cream, egg yolk, fisher liver oils.

RDA {1 mark} (recommended daily allow...

Men — 750 - 1000 ug/day

women — 750 ug/day

children — 400-600 ug/day

pregnancy — 1000 ug/day.

Retinoids

- compounds with vitamin A activity are collectively called as retinoids.

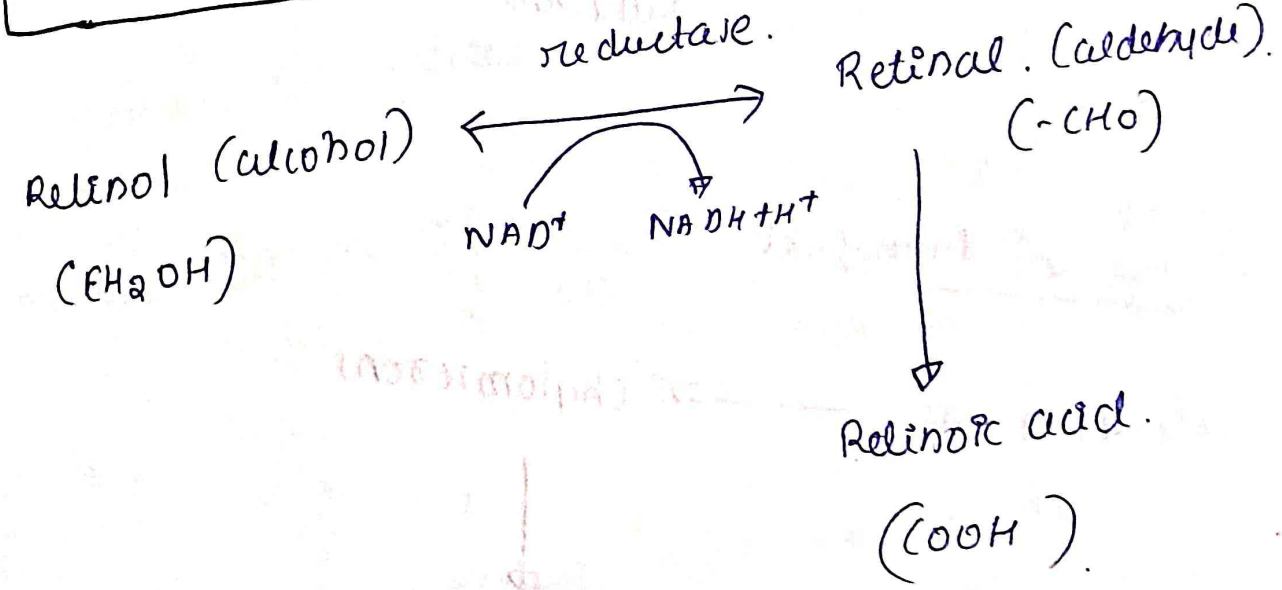
- alltrans retinal (vit A1) → most common.

- 11 cis retinal → Biologically active.

Compounds with Vitamin A activity.

- retinol (Vit A alcohol)
- retinal (Vit A aldehyde)
- retinoic acid (Vit A acid).

Interconversion of Vit A molecules.



Absorption.

- major site – Intestine.
- Beta carotene $\xrightarrow{\text{dioxygenase}}$ retinal.

retinal $\xrightarrow[\text{reductase}]{NADH\ H^+ \rightarrow NAD^+}$ retinol

retinol $\rightleftharpoons$ retinyl esters (fatty acid)

Storage & transport.

retinyl esters → Chylomicrons → lymphatic system → retinyl palmitate (liver) (storage form)

Release from liver.

retinol

retinol binding protein (RBP)

Extra hepatic tissues.

Uptake by tissues.

retinol - RBP complex ⟶ receptors. (on surface of cells of peripheral tissues).

Retinol ⟶ Retinoic acid ⟶ cytoplasm.

CRBP.

nucleus

cellular retinol Binding protein.

Functions of vitamin A.

- In vision
- growth & differentiation of tissues.
- reproduction
- maintenance of epithelium and skin
- anti-oxidant
- preventing heart attacks.

Role in vision.

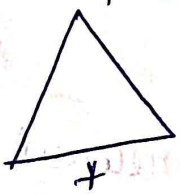
- George wild Nobel prize (
- vitamin A is a component of visual pigments of rod and cone cells.
- Rhodopsin is the visual pigment in rod cells (dark vision)
- conopsin is responsible for color vision in conce cells.

~~Role in~~

- rhodopsin → membrane protein
  ↓
  photoreceptors cells of retina.

- vision in dim light.

Rhodopsin = opsin + 11 cis retinal.



(a G protein receptor).

- when rhodopsin is exposed to light, series of isomerization take place.
- rhodopsin ~~dissociates~~ releases ~~all-trans~~ ~~11-cis~~ all-trans retinal & opsin
- This will activate G-protein, ~~transducin~~ transducin.
- Transducin triggers nerve impulse, transmitted by optic nerve to brain.

Vision —

Series of Isomerisation

Single photon

↓

rhodopsin

↓

Batho - rhodopsin

↓

meta - rhodopsin 1

↓

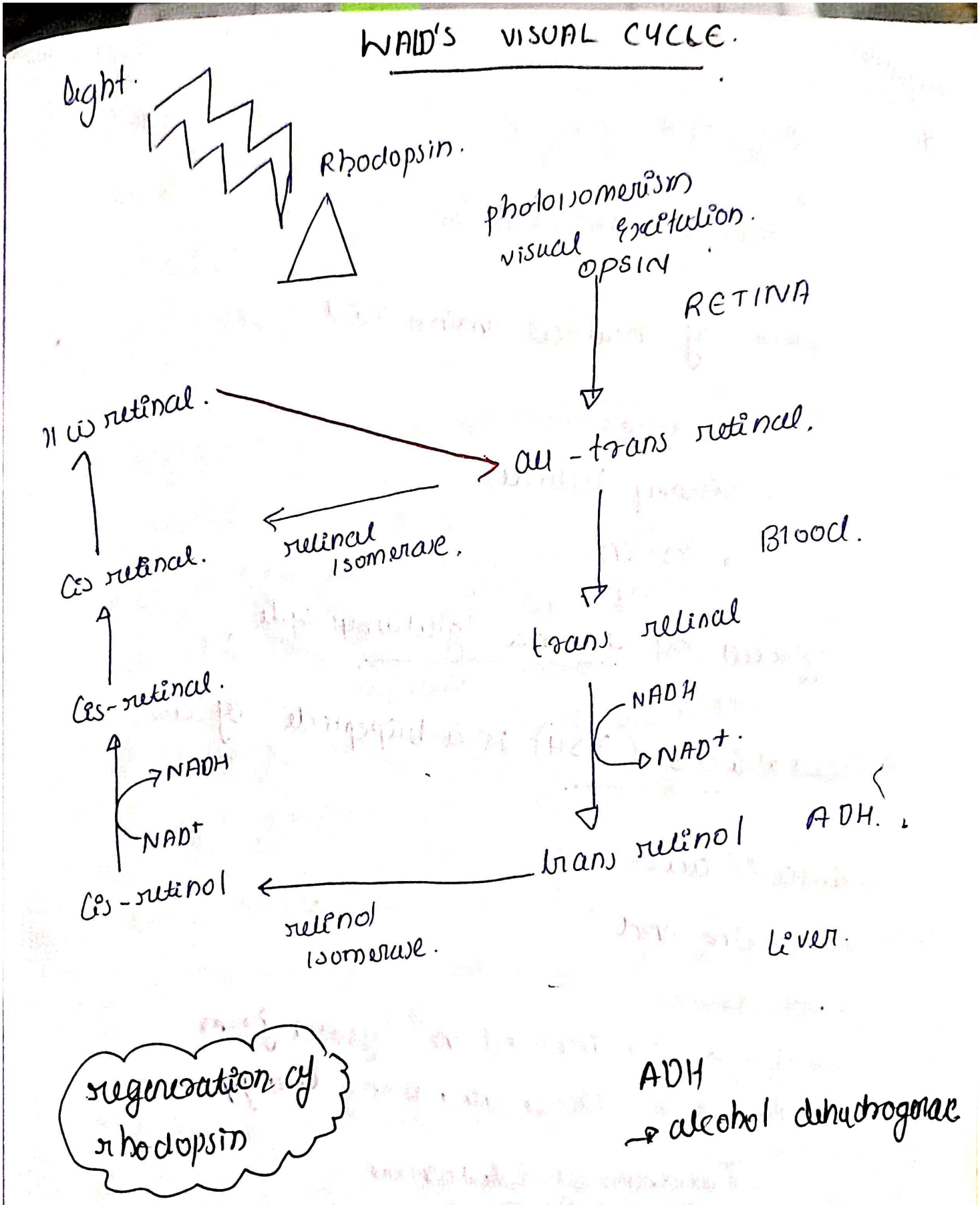
meta - rhodopsin 2

↓

opsin + ~~11-cis~~ all ~~trans~~ all trans retinal. { Takes place in retina }

Isomerisation steps

WALD'S VISUAL CYCLE.



regeneration of rhodopsin

ADH
→ alcohol dehydrogenase

Visual pigments - G protein coupled receptors.

transducin - G protein in retina.

Locking of 11-cis retinal with opsin.

↓

critical for pigment's catalytic activity.

activated rhodopsin.

↓ rhodopsin kinase

phosphorylation of serine residue in rhodopsin

↓

β arrestin binds

↓

inactivation

Activated rhodopsin.

↓ rhodopsin kinase.

phosphorylation of serine residue in rhodopsin.

↓

β-arrestin binds.

↓

Inactivate rhodopsin.

Dark adaptation time.

. Time required for re-synthesis of rhodopsin, when a person shifts suddenly from bright to dim light area.

. An increase in vit A deficiency.

Stargadt's disease.

all trans retinal / ABC proteins.

all trans retinal from retinal epithelium.

ABC protein.

Liver

Symptoms: macular degeneration + Blindness.

Deficiency manyestation =>

- Ocular manyestations.
- Skin and mucous membrane lesions.

X → X { Ency role of vitamin A in vision. }

Ocular manifestation

Nyctalopia.

- Night blindness (Nyctalopia)
- xerophthalmia
- Bitot's spot
- Keratomalacia.
  Keratomalacia.

all trans retinal from retinal. / ABC prot. ↓ Vit A

- reduced vision in dim light.

Nyctalopia (Night blindness).

- vision diminished in dim light ✓
- dark adaptation time increased ✓
- dificiency of vit A (11-cis retinal) ✓

Xerophthalamia.

- conjuctiva becomes dry, thick & wrinkled.
- Cornea keratinized
- Normal transparency is lost.
- Cornea become glazy & lusterless due to keratinisation of Corneal epithelium.

Bitot's spot

- Increased thickness of conjunctiva in some areas.

↓

- Greyish-white triangular plaques in conjunctiva.
- These are completely reversible on supplementation of vitamin A.

Keratomalacia

- softening of cornea.
- degeneration of corneal epithelium.
- corneal epithelium gets vascularised.
- Bacterial infections lead to corneal ulceration
- perforation of cornea. } not reversible
- Total blindness

Dermatological manifestations

- Keratinization of epithelium of.
  - → respiratory tract.
  - → Gastrointestinal tract
  - → Genitourinary tract.

{Increase Occurence of Infections. {anti-Inflammatory vitamin}}

- Formation of urinary calculi.

isotretinone. ✓ {1 mark}

↓

synthetic variant of vit A

↓

reduce sebaceous secretion.

↓

prevents acne formation.

Causes of vitamin deficiency.

- Decreased intake of vitamin A.
- Defective absorption {obstructive jaundice}
- reduced Synthesis of RBP (cirrhosis of liver)
- Severe malnutrition - aminoacids not available for RBP synthesis
- RBP excreted in urine - chronic nephrosis.

Hypervitaminosis A.

- Anorexia
- headache, irritability
- vomiting and drowsiness.
- Peeling of skin
- swelling over long bones (bony exostosis)
- Enlargement of liver in children
- INTRACRANIAL TENSION

ESKIMOS - refrain from eating liver of polar bear due to its high vit A content.

cellular death -

higher conc. of retinol releases lysosomal enzymes leading to cellular death.