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Sub : Biology

Grade : 11

Unit – 4 (cell theory)

4.1 cell theory

4.2 types of cell

4.3 parts of the cell & their function

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Part 3

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3 osmosis

- Is a net diffusion of water down its concentration gradient.
- Process by w/h water moves across partially permeable membrane.
- Is a diffusion of water from high ***water potential*** (low solute) to low water potential (high solute).

Water potential :- is concentration of water molecues.

- ♣ Water potential of pure pure water is **0.**

NB:- water of all system except pure water is less than zero this implies that their water potential is ***negative***.

Osmosis is mov,t of water from high water potential (less negative) to low water potential (more negative.

Factor affecting rate of osmosis

- ➢ Surface area
- ➢ Difference in water potential
- ➢ Thickness of membrane

If a cell is placed in solution of d/t conc the ff condtion occur

- ❖ ***Isotonic :-*** having the same water potential as the cell.
  There is no net mov,t of wter molecules.
- ❖ ***Hypertonic :-*** occur when water potential of the the solute (dissolve subs) is greater than conctration in the cell.
  When there is low water potential than the cell.
- ❖ ***Hypotonic*** :- occur when water potential of solute (dissolved subs) is less than concentration in the cell.
  When there is high water potential than the cell.
  What happen when animal cell is placed in :-
  - ♣ Isotonic : -there is no change.
  - ♣ Hypertonic cell lose water & shrink .
  - ♣ Hypotonic cell gain water & swell , finally get brust
- ❖ Burst of weak plasma membrane is called ***Heamolysis.***
  What happen when acell is placed in palnt cell :-
  - ♣ Isotonic :- there is no change

- ♣ Hypertonic :- loss water by osmosis & shrink . & the cell is said to be flaccid . As the cell lose more water the cytoplasm shrinks too much , loose it's contact with the cell wall & become ***plasmolysed.***
- ♣ Hypotonic :- gain water by osmosis & swell up .

- ❖ As more water enter to the cell wall the cell become turgid .
- ❖ Turgidity is important in supporting of young , none woody plants.
- ❖ aS th cell become turgid the plant grow upright.
- ❖ As the plant didn't get sufficient water the cell will plasmlaysed become flaccid ; so the cell lose it's support & become wilt.

Active process

4 Active transport

- ⇝ Is energy consuming transport across membrane against natural tendency to diffuse in opposite direction.
- ⇝ Is movement of subs from region of lower concn to higher aginst concentration gradient .
- ⇝ Require energy in the form of ATP from the metabolic process to transport subs.
- ⇝ Proteins are needed to carry subs across the plasma membrane.
- ⇝ The proteins used to drive subs actively across the plasma membrane are called pumps.

5 Endocytosis

- ⇝ Process by w/h large particles are engulfed by the cell.
- ⇝ Infolding (extension) of cell surface membrane by forming extention .

There are mainly 3 types of endocytosis

5.1 phagocytosis (cell eating)

- Create pseudopodia to engulf large paricles .
- Take material In solid form.

5. 2 pinocytosis (cell drink)

- Ingestion of small paricles as compared to phagocytosis .
- Taken material are in liquid form.

NB : unlike phagocytosis there is no creation of pseudopodia in pnocytosis .

Pinocytosis is used by human egg cell to take nutrient up from follicle cell.

5.3 receptor – mediated endocytosis

- Specific proteins combined with receptor proteins binds in plasma membrane
- The binding stimulate infolding .

6 Exocytosis

- Is reverse(opposite) of endocytosis.
- Waste material such as undigested solid remains are removed from the cell.
- Is process by w/h enzymes & hormones are secreted .
- Plants use exocytosis to export material needed to formation of cell wall.

process	Active / passive	Molecules that move	direction	Energy needed?	Protein needed
Diffusion	Passive	Small, hydrophobic(lipid soluble, small , non polar)	Down gradient (toward low conc)	No	no
osmosis	Passive	water	Toward high conc of solute	No	no
	Passive	Ion & medium sized particles	Down gradient(toward low conc)	No	yes
Active transport	Active	Ions , medium sized, non lipid particles	Up gradient (toward high conc)	Yes	yes
endocytosis	Active	Very large particles	Occur either way (in to the cell)	Yes	Yes
Exocytosis	Active	Very large particles	Occur either way (out of the cell)	Yes	yes

Fig 4.1 how molecules cross cell membrane

Cellular structur & their functions

By Esmael Abdlkadr

1 nucleus

- is oval (spherical) shaped central structure surrounded double layer membrane .
- nucleus is surrounded by ***nuclear envelope*** contain ***chromatins*** & one or more ***nucleoi (pural nucleolus)***

  Nuclear envelope
  - ✓ surround nuclear material
  - ✓ consist of outer & inner membrane
  - ✓ most ion & water soluble molecules transfer b/n nucles & cytoplasm.

Chromatins :- means " ***coloured material"*** , cocnsist of DNA molecules bound with proteins.

- ♣ Is the inner portion of the nucleus.

Chromatin :- is acompound of of nucleic acid & proteins that make up chromosomes.

Nucleolus :- is organelle in the nucles :

- ✓ it isn't membrane – bound organelle.
- ✓ Synthesise component of ribosomes.
- ✓ Contains large number of RNA & proteins in the ribosomes.
- ✓ Control l cellular activities .

2 mitocondoria

- ❖ Are " power house " of the cell, they extract energy from nutrients in food & transform it in to usable form to run all activity.
- ❖ Are site of most aerobic respiration .
- ❖ Are double – membrane organelle.

Mithocondoria are surrounded by two set of membrane ; the inner membrane is called ***cristea*** ; contains energy that convert in to usable form (electron transport proteins) .

As the cristea infold there is increase in storage of most important proteins .

Fluid matrix :- place for aerobic respiration in the mithocondria

3 Ribosomes

- Are site of protein synthesis.
- Found free In cytoplasm & bound to the endoplasmic reticulum (ER).
- Each ribosome compromise two sub unit made from RNA & protein .
- The sub units are manufactured in the nucleus & leave through nuclear pore .

4 Endoplasmic reticulum (ER)

Fluid filled membrane system membrane system extensively found in cytoplasm of acell.

- Is continuous organelle with many communicating channels.

There are two types of ER these are :-

- ♣ ***Rough ER*** :- has ribososme on its surface & responsible for manufacturing & transport of proteins .
  - ⇝ They manfacture a lot of proteins cell that manfacture enzymes to be secreted of lumen of ntestine
- ♣ ***Smooth ER***:- it doesn't have ribosome on its surface it looks 'smooth' & doesn't produce proteins .

It is concerned with :-

- ➢ Synthesise of lipids
- ➢ Carbohydrate metabolism & detoxification .

5 Golgi apparatus (body)

- Consists of number of flattened membrane bound sac in w/h protein is modified .
- Is stack of flattened membrane in eukaryotic cell.
- It is also called golgi omplex
- It stores , guides & modifies the product of ER

6 Lysosomes

- Are small sac of digestive enzymes that are dispersed in the cytoplasm of acell.
- Serve as ntracelular 'digestive system'.
- Are membrane bound sac containing hydrolytic enzymes capable of digesting & removing of unwanted materials & cellular debris .
- Are single membrane

NB:- lysosomes mostly found in phagocytic red blood cell (RBC).

Organell found only in plant cell :-

1 cell wall

- Is outer layer of plant cell w/h provide support for the cell.

- It contains cellulose .

2 vacuole

- Is fluid filled sac that stores solutes .
- Are membrane bound organell that have no specific shape.
- They are important in maintaining turgidity of plant cell.

3 chloroplast

- Are organelles that carry out photosynthesis
- Are double membrane like mithocondria but unlike mithocondria inner membrane isn't folded
- They are located in outer surface of cell to receive enough light.
- They are green b/c of presence of chlorophyll .

Chloroplast has 2 region these are :-

- ***Grana*** :- membraneous region where light dependet rxn is takes place .
- ***Fluid sroma*** :- where light independent rxn taks place.

Cell fractionatonation

- Is process used to sepaeate organelles .
- It is based on the fact that mass of organell es vary & depend on their size.
- The machine used in cell fractionation is called ***centrifuge***.
- In process of fractionation **nucleus** first settle out & need low centrifuge speed(sette out first) b/c of large mass; where as the smaller ribosomes need high speed(settle at last).

Attention :- order of cellular organelles that settles during centrifuge from first to last in order are

Nucleus , chloroplast , lysosomes , endoplasmic reticulum (ER) , ribosomes

Questions from university entrance exam (uee) from this topic

1 what is the best term that express the mov't of subs in cell against conc gradient ? (2008 EC)

A) active transport C) osmosis

B) passive transport D) diffusion

2 w/h one of the ff has bigger size than all the other ? (2008 EC)

A) ribosome taken from animal cell.

B) mitochondria taken from plant cell .

C) nerve cell taken from human brain .

D) glucose molecules taken from plant cell.

3 w/h of the ff organelles is common to both plant & Animal cell ? (2009 EC)

A) cell wall C) mitochondria

B) chloroplast D) central vacuole

4 what happen when plant cell absorb more water ?(2009 EC)

A) shrink C) become wilted

B) become turgid C) swell & burst

5 what happen when human red blood cell are kept in hypertonic solution ? (2009 EC)

A) the same net gain & loss of water.

B) more water get in to the cell thn living it.

C) more water goes out of the cell than getting in .

D) the cell prevent water getting in or living out.

6 if a cell fail to rom lysosomes , w/h of the ff cellular function will get disrupted first ? (2009 EC)

A) protein synthesis

B) chromosome replication

C)removal of cellular debris

D) transport across cell membrane.

7 for subs to easily pass cross the cell membrane by simple diffusion , w/h one of the ff properties should it possess? (2009 EC)

A) large cell C) positive charge

B) ability to dissolve in lipids D) negative charge

8 w/h of the ff organelles settles out last when homogenized cells are centrifuged ? (2010 EC)

A) chloroplast C) ribosomes

B) nucleus D) mitochondria

9 w/h part of cell makes necessary change , packages & proteins ? (2010 EC)

A) mitochondria C) golgi apparatus

B) endoplasmic reticulum D) cell wall

10 cell organelles that contains hydroiytic enzymes are called :

A) peroxisomes C) mesosomes

B) ribosomes D) lysosomes

11 w/h of the ff is not requirement for molecules to directly diffuse across the membrane ? (2010 EC)

A) small size C) lipid solubility

B) non – polarity D) large size and polarity

12 the organelle of the cell w/h one is concerned with synthesise of lipid in addition to being associated with carbohydrate metabolism & detoxification ?

A) smooth ER C) thylakoid membrane

B) golgi body / apparatus D) rough ER

13 through w/h process can inorganic ions from the soil b absorbed in to the root hair ? (2010 EC)

A) dehydration C) osmosis

B) diffusion D) active transport

14 for w/h purpose do biologist use centrifuges ?(2011 EC)

A) fractionation of cell component

B) magnifying cell part

C) culturind microscope

D) measuring volume

15 organelles in cytoplasm that are known as ‘power house ‘ of the cell are : (2011 EC)

A) cellulose B) chloroplast C) mitochondria D) ribosome

16 w/h of the ff is not function of lysosoms ? (2011 EC)

A) autophagy C) digeston

B) synthesis D) autolysis

17 w/h procedures allows biologist to separate d/t cellular organelles & study their structure & composition separately ? (2011 EC)

A) dehydrogenation C) cell fractionation

B) phosphorylation D) polymerization

18 w/h of the ff happens if nucleous is missing in acell?

A) ribosomal function will be disrupted

B) nuclear pore will be blocked

C) DNA synthesis will be enhanced

D) ER will unfolded

19 w/h of the ff has highest water potential than all the other ? (2011 EC)

A) animal cell C) d/t solutions

B) pure liquid water D) d/t suspensions

20 through w/h of the ff methods can blood be separated in to it's cellular & fluid parts ? (2011 EC)

A) centrifuging C) separating funnel

B) fractional distillation D) simple distillation

21 of homogenate of eukaryotic cell is spun in centrifuged , w/h of the cellular organelles settle out first ? (2011 EC)

A) mitochondria C) lysosomes

B) ribosomes D nucleus

THE END by esmael Abdlkadr