

DOT POINT

WACE HUMAN BIOLOGY UNITS 1 AND 2



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Words to Watch

account, account for State reasons for, report on, give an account of, narrate a series of events or transactions.

analyse Interpret data to reach conclusions.

annotate Add brief notes to a diagram or graph.

apply Put to use in a particular situation.

assess Make a judgement about the value of something.

calculate Find a numerical answer.

clarify Make clear or plain.

classify Arrange into classes, groups or categories.

comment Give a judgement based on a given statement or result of a calculation.

compare Estimate, measure or note how things are similar or different.

construct Represent or develop in graphical form.

contrast Show how things are different or opposite.

create Originate or bring into existence.

deduce Reach a conclusion from given information.

define Give the precise meaning of a word, phrase or physical quantity.

demonstrate Show by example.

derive Manipulate a mathematical relationship(s) to give a new equation or relationship.

describe Give a detailed account.

design Produce a plan, simulation or model.

determine Find the only possible answer.

discuss Talk or write about a topic, taking into account different issues or ideas.

distinguish Give differences between two or more different items.

draw Represent by means of pencil lines.

estimate Find an approximate value for an unknown quantity.

evaluate Assess the implications and limitations.

examine Inquire into.

explain Make something clear or easy to understand.

extract Choose relevant and/or appropriate details.

extrapolate Infer from what is known.

hypothesise Suggest an explanation for a group of facts or phenomena.

identify Recognise and name.

interpret Draw meaning from.

investigate Plan, inquire into and draw conclusions about.

justify Support an argument or conclusion.

label Add labels to a diagram.

list Give a sequence of names or other brief answers.

measure Find a value for a quantity.

outline Give a brief account or summary.

plan Use strategies to develop a series of steps or processes.

predict Give an expected result.

propose Put forward a plan or suggestion for consideration or action.

recall Present remembered ideas, facts or experiences.

relate Tell or report about happenings, events or circumstances.

represent Use words, images or symbols to convey meaning.

select Choose in preference to another or others.

sequence Arrange in order.

show Give the steps in a calculation or derivation.

sketch Make a quick, rough drawing of something.

solve Work out the answer to a problem.

state Give a specific name, value or other brief answer.

suggest Put forward an idea for consideration.

summarise Give a brief statement of the main points.

synthesise Combine various elements to make a whole.



Introduction

What the book includes

In this book you will find typical examination questions and answers for each dot point in the syllabus for WACE Human Biology Units 1 and 2:

- Unit 1 The Functioning Human Body
- Unit 2 Reproduction and Inheritance

Format of the book

The book has been formatted in the following way:

1. Main topic statement.

1.1 Syllabus requirement.

Note that the numbering of these statements is the authors' choice and has been used to make referencing questions and answers clearer. The individual requirements are not numbered in the syllabus, they are simply bulleted – hence our use of 'dot points' when we refer to them.

1.1.1 First typical question which could be asked in an examination for dot point 1.1

1.1.2 Second typical question which could be asked in an examination for dot point 1.1.

The number of lines provided for each answer gives an indication of how many marks the question might be worth in an examination. As a rough rule, every two lines of answer might be worth 1 mark.

How to use the book

Completing all questions will provide you with an overview of all the work you need to know from the syllabus. You may have done work in addition to this with your teacher as extension work. Obviously this is not covered. You may need to know this additional work for your school exams, but not for the external examinations.

When working through the questions, write the answers you have to look up in a different colour to those you know without having to research the work. This will provide you with a quick reference to work you should spend more time revising later, and allow you to spend your study time more productively.

Unit 1 The Functioning Human Body

Dot Point	Page	Dot Point	Page
1. Cells and tissues	3	2.3	15
1.1 The human body is comprised of cells, tissues and organs within complex systems that work together to maintain life.	3	Cellular respiration occurs, in different locations in the cytosol and mitochondria, to catabolise organic compounds, aerobically or anaerobically, to release energy in the form of adenosine triphosphate (ATP).	
1.2 Cell organelles maintain life processes and require the input of materials and the removal of wastes to support efficient functioning of the cell.	4	2.4	16
1.3 The cell membrane separates the cell from its surroundings with a structure, described by the fluid mosaic model, which allows for the movement of materials into and out of the cell by diffusion, facilitated diffusion, osmosis, active transport and vesicular transport (endocytosis/exocytosis).	5	For efficient metabolism, cells require oxygen and nutrients, including carbohydrates, proteins, lipids, vitamins and minerals.	
1.4 Factors affecting exchange of material including surface area to volume ratio, concentration gradients and the physical and chemical nature of the materials being exchanged.	7	3. The respiratory system	17
1.5 The various tissues of the human body perform specific functions and can be categorised into four basic tissue types: epithelial, connective, muscular and nervous.	10	3.1 The exchange of gases between the internal and external environments of the body is facilitated by the structure and function of the respiratory system at the cell, tissue and organ levels.	17
2. Metabolism	11	3.2 Efficient exchange of gases in the lungs is maintained by the actions of breathing, blood flow and the structure of the alveoli.	20
2.1 Biochemical processes including anabolic and catabolic reactions in the cell are controlled in the presence of specific enzymes.	11	4. The circulatory system	21
2.2 Enzyme function can be affected by factors including pH, temperature, presence of inhibitors, coenzymes and cofactors and the concentration of reactants and products.	12	4.1 The transport of materials within the internal environment for exchange with cells is facilitated by the structure and function of the circulatory system at the cell, tissue and organ levels.	21
		4.2 The components of blood facilitate the transport of different materials around the body (plasma and erythrocytes), play a role in clotting the blood (platelets) and in the protection of the body (leucocytes).	24
		4.3 The lymphatic system functions to return tissue fluid to the circulatory system and to assist in protecting the body from disease.	27

Dot Point	Page	Dot Point	Page
5. The digestive system	29	7. The excretory system	48
5.1 The supply of nutrients in a form that can be used in cells is facilitated by the structure and function of the digestive system at the cell, tissue and organ levels.	29	7.1 The excretory system regulates the chemical composition of body fluids by removing metabolic wastes and retaining the proper amounts of water, salts, and nutrients; components of this system include the kidneys, liver, lungs, and skin functioning at the organ level.	48
5.2 Digestion involves the breakdown of large molecules to smaller ones by mechanical digestion (teeth, bile and peristalsis) and chemical digestion (by enzymes with distinctive operating conditions and functions that are located in different sections of the digestive system.	30	7.2 Deamination of amino acids in the liver produces urea, which then is transported to the kidneys for removal.	50
5.3 The salivary glands, pancreas, liver and gall bladder produce or store secretions which aid the process of digestion.	34	7.3 The nephrons in the kidney facilitate three basic processes: filtration, reabsorption and secretion during urine formation to maintain the composition of body fluids (hormone control is not required).	51
5.4 Absorption requires nutrients to be in a form that can cross cell membranes into the blood or lymph and occurs at different locations, including the small intestine and large intestine.	35	8. Science as a human endeavour	55
5.5 Elimination removes undigested materials and some metabolic wastes from the body.	37	8.1 Blood transfusions rely on determining blood groups and can be used to treat many different diseases and conditions.	55
6. The musculoskeletal system	38	8.2 The treatment of conditions due to system or organ dysfunction has changed through improvements in early diagnosis and appropriate use of drugs, physical therapy, radiation therapy, and removal and/or replacement of affected parts.	57
6.1 The muscular system is organised to maintain posture and produce movement; muscle fibre contraction can be explained using the sliding filament theory.	38	8.3 Osteoporosis and osteoarthritis are diseases, primarily of ageing, that cause disability. Increased understanding of the causes of these conditions leads to improved practices for management and prevention.	59
6.2 Movement results from the actions of paired muscles, with others acting as stabilisers, to produce the required movement.	41	8.4 Lifestyle choices, including being active or sedentary, the use of drugs and type of diet, can compromise body functioning in the short term and may have long-term consequences.	60
6.3 The skeletal framework of the body consists of bone and cartilage which function to provide body support, protection and movement, and is facilitated by the structure and function at cell and tissue levels.	43		
6.4 Articulations of joints of the skeleton are classified according to their structure or the range of movements permitted.	46		
		Answers to The Functioning Human Body	159

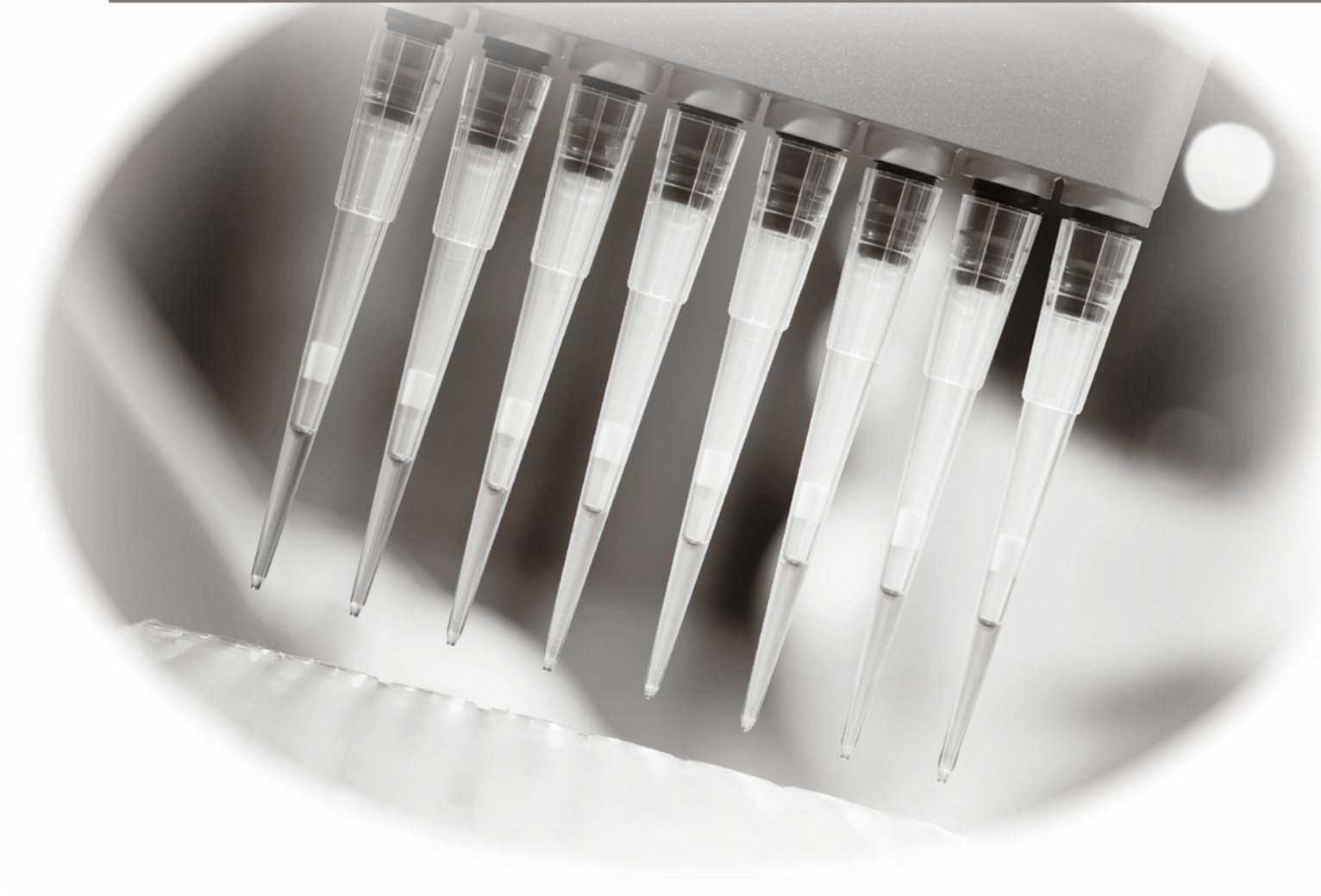
Unit 2 Reproduction and Inheritance

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1. DNA	65	3.7 Contraception.	111
1.1 DNA bound to proteins in nucleus and unbound DNA in mitochondria.	65	3.8 Sexually transmitted infections (STIs).	114
1.2 DNA stores the information for the production of proteins that determines the structure and function of cells.	67	3.9 Reproductive technologies.	116
1.3 Properties of the DNA molecule.	68	3.10 Embryo screening.	119
1.4 Protein synthesis.	69	4. Types of inheritance	123
1.5 Epigenetics.	71	4.1 Probable frequencies of genotype and phenotype.	123
2. Cell reproduction	76	4.2 Pedigree charts.	133
2.1 Mitosis and the cell cycle.	76	4.3 DNA profiling.	143
2.2 DNA replication.	79	5. Science as a human endeavour	149
2.3 Stem cells and differentiation.	81	5.1 Genetic profiling and genetic screening of adults and embryos have implicit ethical considerations.	149
2.4 Development of tumours and cancers.	83	5.2 Modern biological techniques have increased understanding of DNA and gene expression.	150
2.5 Meiosis.	85	5.3 Understanding of the menstrual cycle, conception and implantation has produced improved methods to establish pregnancy, along with advancements in contraceptive methods; both have ethical considerations.	152
2.6 Crossing over, non-disjunction and random assortment.	87	5.4 New technologies, including the Pap smear, breast screening and blood tests for prostate cancer, have made early detection of cancers possible.	153
2.7 Comparing mitosis and meiosis.	92	5.5 Lifestyle choices, including diet, illicit drugs, alcohol and nicotine, may affect foetal development.	155
2.8 Offspring genotype, meiosis and fertilisation.	94	Answers to Reproduction and Inheritance	180
3. Human reproduction	98		
3.1 Female and male reproductive systems.	98		
3.2 Hormonal control of reproductive systems.	101		
3.3 Spermatogenesis and oogenesis.	104		
3.4 Conception.	105		
3.5 Embryo development.	107		
3.6 Labour, birth and circulatory systems.	109		



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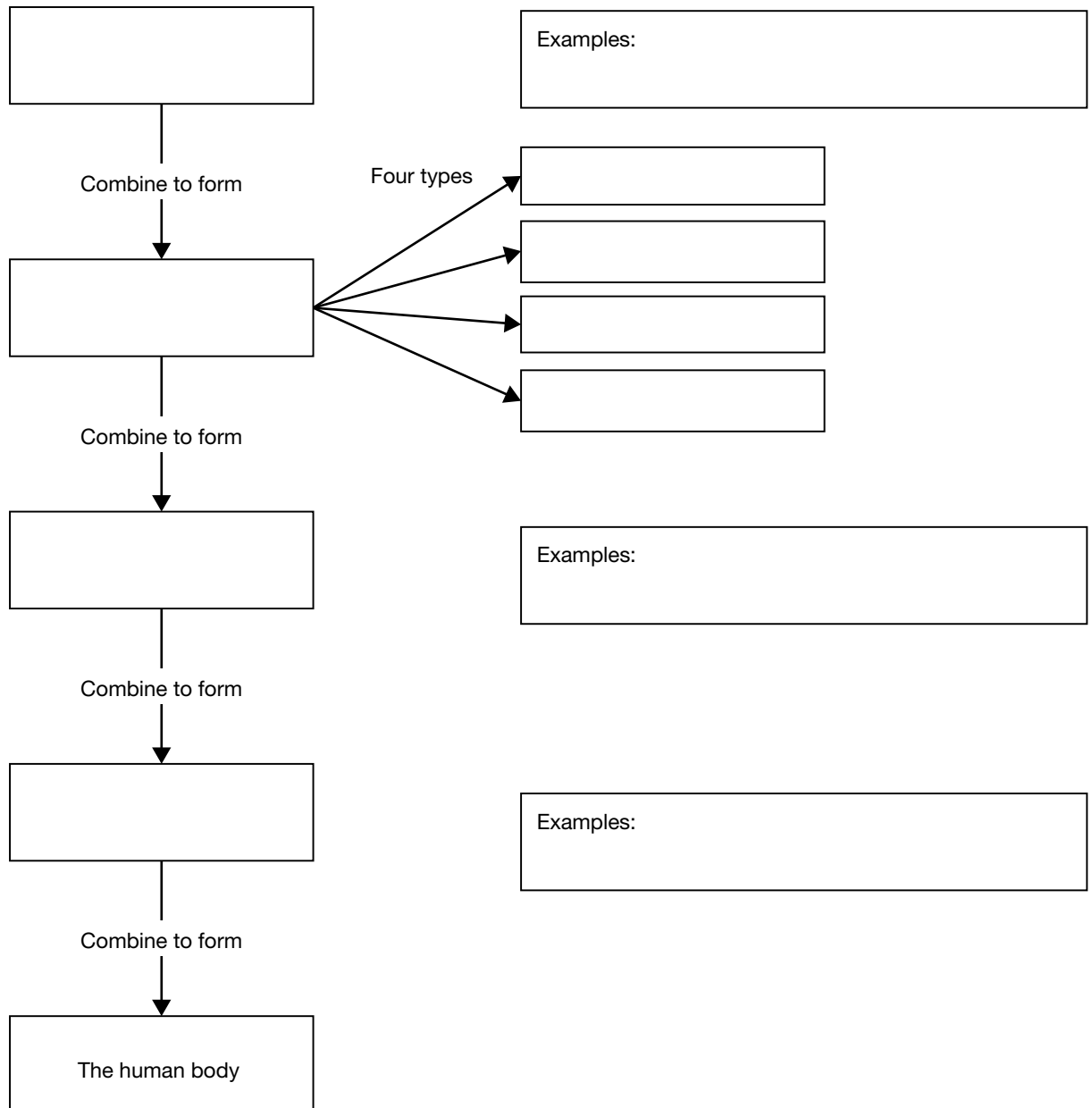
Unit 1 The Functioning Human Body



1. Cells and tissues.

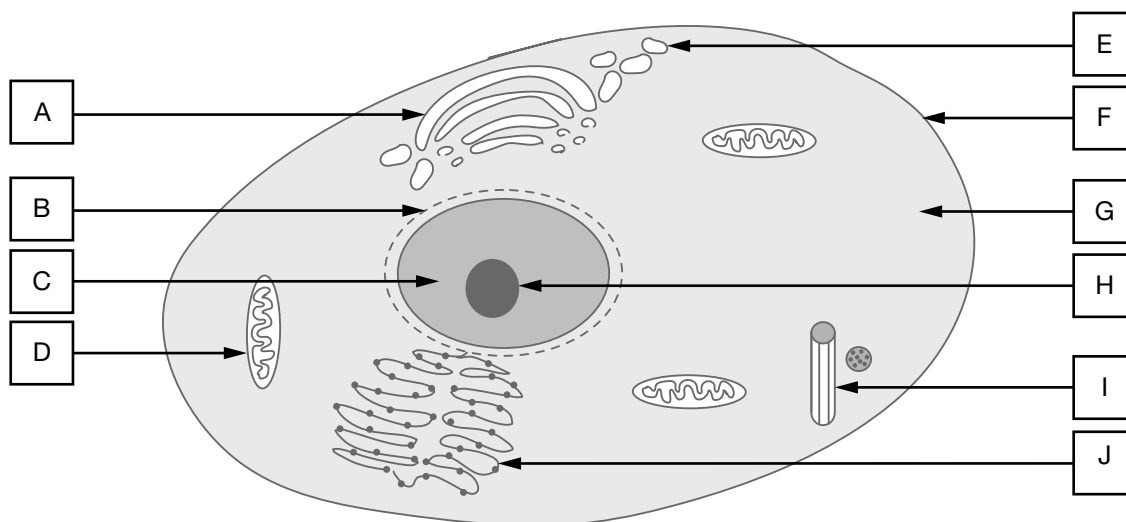
1.1 The human body is comprised of cells, tissues and organs within complex systems that work together to maintain life.

1.1.1 Fill in the concept map concerning the organisation of the human body.



1.2 Cell organelles maintain life processes and require the input of materials and the removal of wastes to support efficient functioning of the cell.

1.2.1 Label the organelles in the cell diagram and give the function of each.



Label	Organelle	Function
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		

1.3 The cell membrane separates the cell from its surroundings with a structure, described by the fluid mosaic model, which allows for the movement of materials into and out of the cell by diffusion, facilitated diffusion, osmosis, active transport and vesicular transport (endocytosis/exocytosis).

1.3.1 Describe the structure of the cell membrane and explain how it is suited to its transportation function.

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1.3.2 Explain the difference between hydrophilic and hydrophobic and relate this to the transport of materials across the cell membrane.

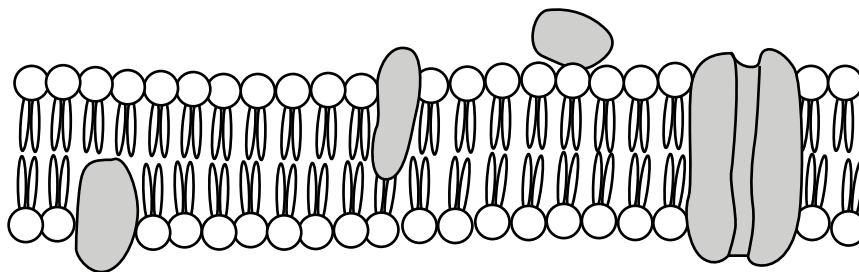
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1.3.3 The diagram shows a stylised drawing of the fluid mosaic model of the cell membrane. Jonathon Singer and Garth Nicholson proposed this model of membrane structure in 1972.

Fluid mosaic model of the cell membrane



Explain how channel proteins and carrier proteins assist the movement of substances into and out of a cell.

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1.3.4 Complete the table describing the processes of diffusion, facilitated diffusion, osmosis and active transport.

Transportation method	Description of process	Example of substance that crosses cell membrane this way
Diffusion		
Facilitated diffusion		
Osmosis		
Active transport		

1.3.5 Define endocytosis and exocytosis.

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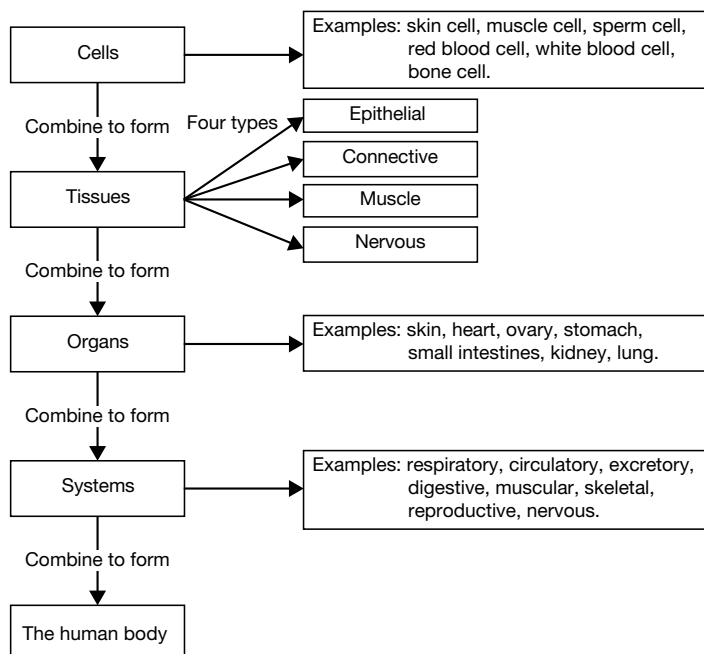
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Answers



Unit 1 The Functioning Human Body

1.1.1



1.2.1

Label	Organelles	Function
A	Golgi apparatus	Modifies, packages and stores proteins in vesicles for secretion.
B	Nuclear membrane	Controls substances entering and leaving nucleus.
C	Cell nucleus/DNA	Contains genetic material that controls cell functions.
D	Mitochondria	Site of cellular respiration where energy is produced.
E	Vesicle	Contains substances for secretion from cell.
F	Cell membrane	Separates cell from surrounds. Controls movement of substances into and out of cell.
G	Cytoplasm	Fluid containing water with many substances dissolved or suspended in it.
H	Nucleolus	Composed of RNA – important in protein synthesis.
I	Centrioles	Involved in cell reproduction.
J	Rough endoplasmic reticulum	Channels to transport materials through cells. Ribosomes sites of protein synthesis.

1.3.1 Made of double layer of phospholipids and cholesterol molecules and proteins. It is semipermeable – allows some substances to pass through tiny pores in the membrane and prevents other molecules doing so.

1.3.2 Hydrophilic – water ‘loving’ or soluble substances. Hydrophobic – water ‘hating’ or fat soluble. Substances which are hydrophobic can pass through the phospholipid bilayer of the membrane. Hydrophilic substances pass through channel proteins.

1.3.3 Channel proteins and carrier proteins span across the entire thickness of the lipid bilayer and act as transport proteins. Carrier proteins bind to the substance being transported and change their shape to carry the substance across the membrane. To carry another molecule across the membrane the carrier protein must regain its original shape and pick up energy in the form of ATP. Channel proteins form water-filled channels to allow substances, e.g. inorganic ions to pass through the channel.

1.3.4

Transportation method	Description of process	Example of substance that crosses cell membrane this way
Diffusion	Movement of particles from a high concentration to a lower concentration, not requiring energy.	Oxygen, carbon dioxide, ions
Facilitated diffusion	Diffusion of particles from an area of high concentration by attaching to a carrier protein to cross the membrane.	Glucose
Osmosis	Specialised form of diffusion allowing water to move from an area of high concentration to low concentration, not requiring energy.	Water
Active transport	Movement of substances from a lower concentration to a higher concentration attached to a carrier molecule. Requires energy.	Glucose, amino acids, Na ⁺ /K ⁺ pump