



**ZIAUDDIN UNIVERSITY**  
EXAMINATION BOARD

**RESOURCES FOR  
“SSC-I BIOLOGY”**

**ZUEB EXAMINATIONS 2021**



**PREFACE:**

The ZUEB examination board acknowledges the serious problems encountered by the schools and colleges in smooth execution of the teaching and learning processes due to sudden and prolonged school closures during the covid-19 spread. The board also recognizes the health, psychological and financial issues encountered by students due to the spread of covid-19.

Considering all these problems and issues the ZUEB Board has developed these resources based on the condensed syllabus 2021 to facilitate students in learning the content through quality resource materials.

The schools and students could download these materials from [www.zueb.pk](http://www.zueb.pk) to prepare their students for the high quality and standardized ZUEB examinations 2021.

The materials consist of examination syllabus with specific students learning outcomes per topic, Multiple Choice Questions (MCQs) to assess different thinking levels, Constructed Response Questions (CRQs) with possible answers, Extended Response Questions (ERQs) with possible answers and learning materials.

**ACADEMIC UNIT ZUEB:**

# 1. Extended Response Questions (ERQs)

## HOW TO ATTEMPT ERQs:

- Write the answer to each Constructed Response Question/ERQs in the space given below it.
- Use black pen/pencil to write the responses. Do not use glue or pin on the paper.

### **SECTION C ( LONG ANSWER QUESTIONS)**

**1. What is mitosis? Explain different stages of mitosis**

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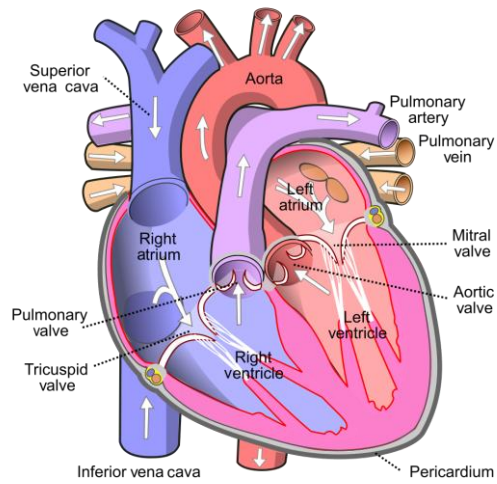
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S.NO	ERQ	ANSWER	CL	DL
1.	<b>What is mitosis? Explain different stages of mitosis</b>	<p>In this type of cell division a parent cell divides into two daughter cells in a way that the number of chromosomes in the daughter cells remains the same as in the parent cell. Although mitosis is a continuous process, but for the study point of view we can divide it into two phases; (a) Karyokinesis - nuclear division (b) Cytokinesis - cytoplasmic division.</p> <p>(a) The karyokinesis can be divided further for convenience into four phases which are Prophase, Metaphase, Anaphase and Telophase. Let us study mitosis in an animal cell.</p> <p>MITOSIS (i) Prophase: During early prophase chromatin material condenses and become visible as thick coiled, thread like structures called chromosomes. Each chromosome at this stage is already double, consists of two chromatids. The chromatids are attached to each other at centromere. The nuclear membrane gradually disappears and at the same time centrosome divides to form two centrioles, each moves towards the opposite pole of the animal cell and forms the spindle fibres. The centrioles are absent in plant cells.</p> <p>(ii) Metaphase: During this phase each chromosome arranges itself on the equator of the spindle. Each chromosome is attached to separate spindle fibre by its centromere.</p> <p>(iii) Anaphase: In this phase the spindle fibre contract, centromere of a chromosome divides and the chromatides of each chromosome separates from each other and begin to move towards the other poles. In this way one set of the chromatids (each chromatid is now an independent chromosome) move towards one pole while the other set towards the other pole.</p> <p>(iv) Telophase: This is a stage when the chromatids (now called chromosomes) reach at the respective poles and their movement ceases. Each pole receives the same number of chromosomes as were present in the parent cell. The nuclear membrane is reformed around each set of chromosomes. In this way two daughter nuclei formed in each cell.</p>	K/R-U	E

		(b) Cytokinesis; soon the cytoplasm of the cell also divides and two daughter cells are formed. In animal cell cytokinesis takes place by developing a constriction. This constriction become deep to divide cytoplasm in two equal halves and two daughter cells are formed. In plant cells it occurs by developing cell plate. In this way the daughter cells become the exact copies of their parent cell.		
2.	<b>What is Heterotrophic nutrition , Name It's types with examples</b>	<p>Heterotrophic nutrition: The word 'heterotroph' is derived from two Greek words-heteros (other) and trophe (nutrition). Unlike autotrophes, which manufacture their own food, heterotrophic organisms obtain food from other organisms. As heterotrophs depend on other organisms for their food, they are also called consumers. All animals, non-green plants like and fungi come under this category. Consumers which consume herbs and other plants are called herbivores, and those which consume animals are called carnivores. After taking complex organic materials as food, heterotrophs break them into simple molecules with the help of biological catalyts, i.e., enzymes and utilize them for their own metabolism. Depending upon the mode of living and the mode of intake of food, heterotrophs may be parasitic, saprotrophic or holozoic.</p> <p>Parasitic nutrition: Parasitic organisms, or parasites, live on or inside other living organisms, called hosts, and obtain their food from them. The host does not get any benefit from the parasite. This mode of nutrition is called parasitic nutrition. Different parasites, like Cuscuta (akash-bel), hookworms, tapeworms, leeches, etc., have different modes of feeding, depending upon habit, habitat and modifications.</p> <p>Saprotrophic nutrition:(Gr: Sapro=rotten, Trophic=nutrition) Saprotrophic organisms, or saprotrophes, derive their food from dead and decaying organic material. This mode of nutrition is called saprotrophic nutrition. They secrete enzymes that are released on food material outside their body. These enzymes break down complex food into simple forms. Common examples of saprotrophes are fungi (moulds, mushrooms, yeasts) and many bacteria.</p> <p>(iii) Holozoic nutrition: (Gr:Holo=Whole, Zoikos=of animal) In holozoic nutrition complex organic substances are ingested</p>	<b>K/R-U</b>	<b>E</b>

		(taken in) without their being degraded or decomposed. After intake, such food is digested by enzymes produced within the organism. Digested food is absorbed into the body and the undigested product is egested (expelled out) from the body. This kind of nutrition is found mainly in non-parasitic animals-simple ones like Amoeba and complex ones like human beings.		
3.	<b>Explain the structure of human heart with the help of labeled diagram</b>	<p>Heart:</p> <p>Heart is the major organ of Circulatory system. It is a muscular pump which keeps the blood circulating through out the body. It is located in the thorax slightly at the left side. It is enclosed in a fibrous bag like protective cover called Pericardium. It is conical in shape externally. The space between pericardium and heart is pericardial cavity which is filled with a fluid called pericardial fluid. This fluid reduces friction and Pericardium protects the heart, prevent it from over extension. Internally, it consists of four chambers, the upper two are thin walled called atria (sing: artrium) the lower two are thick walled called ventricles. Atria are completely separated from each other by a septum called interatrial septum. Similarly, the two ventricles are also separated from each other by a muscular partition called inter-ventricle septum. Each atrium is connected with its ventricle by an auriculo-ventricular aperture. Theright atrium and right ventricle are connected by Tricuspid Valve. Similarly, left atrium and left ventricle are connected by bicuspid valve. These valves prevent the backward flow of blood from the ventricles to the atria. Two main blood vessels are arising from ventricles to carry blood from heart to all parts of the body.</p>	<b>K/R-U</b>	<b>M</b>



**4. What are enzymes? Mention factors affecting enzymatic activity**

The high amount of activation energy cannot be provided by organism itself therefore they require some facilitators to reduce this activation energy. These facilitators are special molecules made up of mostly protein called enzymes (En=inside, zyme = yeast). The name was coined due to observation when yeast was introduced in fruit sap which converted it into alcohol. Now the enzyme are defined as the biocatalyst which facilitate chemical reaction by lowering activation energy

**Factors affecting the activity of an enzymes:**

In nature, organisms adjust the conditions of their enzymes to produce an optimum rate of reaction, where necessary, or they may have enzymes which are adopted to function well in extreme conditions where they live.

**Substrate Concentration:**  
It has been shown experimentally that if the amount of the enzyme is kept constant and the substrate concentration is then gradually increased, the reaction velocity will increase until it reaches a maximum after which further increase in the substrate concentration produces no significant change in the reaction rate  
In other words, the enzyme molecules are saturated with substrate. The excess substrate molecules cannot react until the substrate already bound to the enzymes has reacted and been released (or been released without reacting)

**Temperature:** The protien nature of the enzymes makes them extremely sensitive to thermal changes. Enzyme activity occurs

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		<p>within a narrow range of temperatures compared to ordinary chemical reactions. Enzymes catalyse by randomly colliding with substrate molecules, increasing temperature and increases collision which also increases the rate of reaction forming more product. However, increasing temperature also increases the vibrations and structure of enzymes is lost i.e denature enzyme. These changes decreases the rate of enzyme action or it may seized completely. In summary, as temperature increases, initially the rate of reaction will increase, because of increased kinetic energy. However, the effect of bond breaking will become greater and greater, and the rate of reaction will begin to decrease. Enzymes are also sensitive to pH due to their protein nature. All enzymes work at their maximum rate at narrow range of pH. The point where the enzyme is most active is known as optimum pH. For example, pepsin works at a low pH i.e. it is highly acidic, while trypsin works at a high pH i.e. it is basic. Most enzymes work at neutral pH. Small changes in pH above or below the optimum do not cause a permanent change to the enzyme, since the bonds can be reformed. However, extreme changes in pH can cause enzymes to denature and permanently lose their function</p>		
5.	<p><b>Write a detailed note on Animal tissues.</b></p>	<p>Animal tissues: Humans and other large multicellular animals are made up of four basic types tissue: epithelial tissue, connective tissue, muscular tissue and nervous tissue.</p> <p>1. Epithelial tissue: Epithelial tissue covers the surface of the body, lines the spaces inside the body and forms glands. For instance, the outer layer of your skin is an epithelial tissue and the lining of small intestine are made up of epithelial tissues. Epithelial cells are polarized, means that they have a top and a bottom side. Simple squamous epithelium is found in the alveoli of lungs, and its structure is important for the exchange of gases between the blood and lungs. Simple cuboidal epithelia line the lumen of collecting ducts in the kidney and are present in the thyroid gland around the follicles that secrete thyroid hormones. Simple columnar epithelia are found in the female reproductive system and in the</p>	K/R-U	M

digestive tract. Stratified epithelia consist of more than one layer of cells and only one layer is in direct contact with the basement membrane. Stratified squamous epithelia are found in skin, with many dead, keratinized cells providing protection against water and nutrient loss. Stratified cuboidal epithelia are found surrounding the ducts of many glands, including mammary glands in the breast and salivary glands in the mouth. Stratified columnar epithelia are rare, found predominantly in some organs of the reproductive system. Transitional epithelia are a special subset of stratified epithelia. They are exclusively found in the excretory system.

#### CONNECTIVE TISSUE:

This tissue which connects or binds the different types of cells called connective tissues. They also bind other tissues of the body with each other. Connective tissue holds structures in the body together, such as tendons. Cartilage is a type of supporting connective tissue. It is a dense connective tissue. Cartilage has limited ground substance and can range from semisolid to a flexible matrix. Bone is another type of supporting connective tissue. Bone can either be compact (dense) or spongy (cancellous), and contains the osteoblasts or osteocytes cells. Adipose is another type of supporting connective tissue that provides cushions and stores excess energy and fat. Blood referred to as connective tissue. It is a type of fluid connective tissue.

#### Muscle tissues:

Muscle tissue contains the cells that are responsible for the contraction of muscles. There are three types of muscular tissues i.e. cardiac, smooth, and skeletal. Skeletal muscle, which is also called striated (striped) muscle, is what we refer to as muscle in everyday life. Skeletal muscle is attached to bones by tendons. For instance, the muscles in your legs and your arms are skeletal muscle. Cardiac muscle is found only in the walls of the heart. Like skeletal muscle, cardiac muscle is striated, or striped. But it's not under voluntary control, so thankfully! you don't need to think about making your heart beat. Smooth muscle is found in the walls of blood vessels, as well as in the walls of the digestive tract, the

		<p>uterus, the urinary bladder, and various other internal structures. Smooth muscle is un-striated, (unstriated), it is involuntary, not under conscious control. That means you don't have to think about moving food through your digestive tract!</p> <p>Nervous tissues: Nervous tissue is composed of neurons, which transmit information to other cells. Nervous tissue is found in the brain, spinal cord, and nerves. It is responsible for coordinating and controlling many body activities. It stimulates muscle contraction, creates an awareness of the environment, and plays a major role in emotions, memory, and reasoning. To do all these things, cells in nervous tissue need to be able to communicate with each other by way of electrical nerve impulses.</p>		
6.	<p><b>What is transpiration? Explain the importance of transpiration.</b></p>	<p>TRANSPIRATION: Plants absorb water continuously from soil. Some of its quantity utilized in photosynthesis and other metabolic functions while the rest is retained in cell to maintain turgidity of cell. Some water is removed in the form of vapours. This loss of internal water of plant in the form of vapours from aerial part of plant is called transpiration. Transpiration mainly takes place through special pores guarded by specialized guard cells called stomata (sing: stoma).</p> <p>Significance of transpiration: Transpiration maintains low concentration of water and high concentration of solutes in cell i.e. high solute potential. The high solute potential of leaf cells attract more water and draw more water from xylem. This continuous withdrawal of water from xylem develops deficit of water in xylem which develops a pull or tension called transpiration pull. As a result of this transpiration pull and water attraction for other water molecule i.e cohesion of water, water is pulled upward in the xylem vessels through a continuous column called transpiration stream, which helps in ascent of sap. By active transpiration, transpiration pull is created which helps in the ascent of sap. 180 The experiment shows that most of the water vapour is lost from the surface where stomata are present. Surface area of leaf is also an important factor for the rate of transpiration, because the larger size leaves have high number of stomata which</p>	K/R-U	M

		<p>increases the rate of transpiration. The desert plants require to save their water so they have smaller size leaves or their leaves become spines to reduce number of stomata as well as rate of transpiration. Stomata and its opening/closing mechanism: Stomata are the pores usually found in the leaf epidermis surrounded by two kidney shaped guard cells, these cells contain chloroplast while other epidermal cells do not. The guard cells control the opening and closing of stomata. The inner wall of guard cells is thick and inelastic whereas the outer wall is thin, elastic and permeable. The changes in the turgidity of guard cells controls the opening and closing of stomata. Stomata open when the guard cell become turgid and close when the guard cells become flacid. The turgidity of guard cell is regulated by concentration of solutes present in it which mainly depends upon the rate of photosynthesis. Opening and closing of stomata is one of the important factor to control rate of transpiration. The stomata remain open during the sunny day, as a result rate of transpiration increases. But at night they are closed, hence transpiration also stops.</p> <p>Fig: 9.5 Diagram showing opening and closing of stoma Guard cells Guard cells Nucleus vacuole vacuole Chloroplast Chloroplast Epidermal cell Inner thick wall Outer thin wall Closed Stoma Opened Stoma</p> <p>• Transpiration also increases the rate of absorption because the loss at one end increases demand on other end. • Transpiration gets rid of the excess amount of water from plant. • Transpiration helps in mantaining the temperature of plant for its metabolism and survival because evaporation causes cooling. • Opening and closing of stomata is also regulated by transpiration, which indirectly influences upon the rate of photosynthesis and respiration. Every year number of plants die in hot summer day due to excessive loss of water from aerial parts which results in wilting and dehydration and ultimately may lead to death of plant in extreme conditions. Transpiration is considered as necessary element for plant due to its advantages which are discussed above but on the other hand, it is also considered as an evil for plant because million of plants</p>		
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		die every year due to excessive transpiration.		
7.	<b>What is photosynthesis? Write a detailed note on Light reaction.</b>	<p>Photosynthesis is the fundamental process in which basic organic molecules and O are produced for all bio-molecules and living organisms. This process is carried out by chlorophyll containing organisms like plants, algae, some protozoans and some bacteria. Word photo means light and synthesis means to prepare. Plants utilize simple inorganic molecules carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O) which react by using light energy in the presence of pigments like Chlorophyll to form glucose and oxygen.</p> <p><b><u>Light Reaction or Light Dependent Reaction</u></b></p> <p>The term light reaction or light dependent reaction is used due to the reason that during this phase of photosynthesis light energy is captured and converted into chemical energy. Some of the light is utilized to split water into oxygen and H<sup>+</sup> with e<sup>-</sup> (electrons), this splitting of water is called Photolysis. Oxygen which is produced during photolysis is released in the environment whereas H<sup>+</sup> together with CO<sub>2</sub> are used in building Glucose. 2 In chloroplast, different pigments absorb light of different wave lengths. Among them chlorophyll is the main light capturing molecules in thylakoid membrane which absorbs violet, blue and red light but reflects green therefore it appears green. In the thylakoid membrane other pigments and electron carrier molecules form highly organized assemblies in a series called photosystems. Each thylakoid contains thousands of copies of two different kind of photosystems called photosystems I and II. Each consists of two major parts, a light harvesting complex and an electron transport system.</p> <p>The conversion of light energy takes place when the chlorophyll of reaction center receives energy. One of the electrons from chlorophyll "a" molecule leaves and jumps over the electron transport system. This energized electron moves from one carrier to next. The electron releases energy, when it comes down, this energy drives reactions and produces two energy rich compounds. These are:</p>		

		<p>i) ATP (Adenosine Triphosphate) ii) NADPH (Reduced Nicotinamide Adenosine Dinucleotide Phosphate) 2 ADP is the compound which is already present in cell. It combines with phosphate by using energy of photon released from when moving through e - carriers in photosynthesis.  <math>ADP + P \rightarrow ATP</math>  NADP also present in chloroplast is reduced into NADPH by 2 accepting Hydrogen ions (H ), released from splitting of water.  <math>NADP + 2 H + 2e \rightarrow NADPH_2</math>  ATP and NADPH both are energy rich compounds which provide 2 energy, Hydrogen (H ) and e for the conversion of atmospheric CO into 2 + - carbohydrates in chloroplast during light independent Phase of photosynthesis</p>		
8.	<p><b>What is biological method? Write in detail the steps involved in the biological method</b></p>	<p><b>BIOLOGICAL METHOD</b> As you know that biology is the branch of science concerned with the study of living things, or organisms. The system of advancing knowledge by formulating a question, collecting data about it through observation and experiment, and testing a hypothetical answer about living things is called biological method.</p> <p><b>Observation:</b> The first step is to identify the reason of the problem followed by the formulation of a question about what has been observed. The solution of biological problem starts with observation. Your observation can be on anything from plant movement to animal behavior. An observation is a statement of knowledge gained through the senses (qualitative) or through the use of scientific equipment (quantitative).</p> <p><b>Hypothesis:</b> Hypothesis is a key component of the scientific process. It is defined as “the intelligent guess made by a scientist in the form of statement”. It is important to note that a hypothesis must be testable. That means, you should be able to test your hypothesis through experimentation. Your hypothesis must either be supported or falsified by your experiment</p> <p><b>Reasoning:</b> Biologists collect information about the problem and formulate the hypothesis by using a reasoning process i.e. 'inductive reasoning and deductive reasoning'.</p> <p><b>Experiment:</b> Once a problem has been observed and a hypothesis is suggested, the next step in the scientific method is to design an experiment based on reasoning. Experiment is a practical performance of a</p>	U/R	E

		<p>scientist to identify the real cause of a problem based on inductive and or deductive reasoning. A key assumption is that the experiment will be repeated many times by other scientists.</p> <p>Result The results are where you report what happened in the experiment. That includes detailing all observations and data made during your experiment. Result verifies the hypothesis. In the case of malaria, it was found that all the malaria patients (experimental group) had Plasmodium in their blood whereas the blood samples of healthy persons (control group) were free from Plasmodium.</p> <p>Conclusion: The final step of the scientific method is developing conclusion. This is where all the results from the experiment are analyzed and a determination is reached about the hypothesis. If your hypothesis was supported, its great. If not, repeat the experiment or think of other ways to improve your procedure.</p> <p>Theory: Scientists use the word “theory” in a very different way than nonscientists. When many people say “I have a theory“, they really mean “I have a guess”. Scientific theories, on the other hand, are well-tested and highly reliable scientific explanations of natural phenomena. They unify many repeated observations and data collected from lots of experiments.</p> <p>For example: Theory of Evolution. Law and principle: A scientific law is a uniform or constant fact of nature, it is virtually an irrefutable theory. Biology is short in laws due to puzzling nature of life.</p>		
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