SMART EXAM RESOURCES

0610 IGCSE BIOLOGY PAST PAPER SOLUTION

PAPER 2- MULTIPLE CHOICE PAPER-EXTENDED

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1-A	A. All animals and all plants Respiration, growth, movement, and excretion are basic life processes that occur in both animals and plants. Animals carry out these life processes as part of their metabolic activities. Plants also undergo respiration, growth, movement (though limited to growth-related movements), and excretion processes. Option B (animals only) is incorrect, as plants also carry out these life processes. Option C (arthropod) is too specific. While arthropods are a diverse group of invertebrates, the mentioned life processes are not exclusive to arthropods but are common to a broader range of organisms, including animals and plants.
2-B	The correct answer is: B. F. peregrinus The scientific name "Falco peregrinus" is the binomial nomenclature for a specific species. In the binomial system, the first part of the name (genus) represents a group of related species, and the second part (species epithet) identifies the particular species within that genus. "Falco" is the genus, and "peregrinus" is the species epithet. Therefore, "Falco peregrinus" refers to the species commonly known as the Peregrine Falcon. Options A, C, and D are broader classifications: A: "Bird" is a higher taxonomic category that includes a wide range of species, including different genera and species. C: "Falco" is the genus, encompassing multiple species of falcons. D: "Vertebrate" refers to a larger group of animals with a backbone, including various species and genera.
3-C	C. Moist without scales Amphibians typically have moist and glandular skin without scales. Their skin is permeable, allowing for the exchange of gases, such as oxygen and carbon dioxide, through the skin.

	This adaptation is important for respiration, especially in amphibians like frogs, which can breathe through their skin in addition to lungs. Options A (dry without scales) and B (dry with scales) are not characteristic of amphibian skin. Amphibians generally need to keep their skin moist to facilitate gas exchange. Option D (moist with scales) is not accurate for amphibians. Scales are more characteristic of reptiles, and amphibians typically lack scales on their moist skin.
4-D	Practice the skill needed to interpret plant parts and use appropriate vocabulary to identify organisms using keys.
5-B	B. Mitochondrion Aerobic respiration, the process that involves the complete breakdown of glucose with the use of oxygen to produce energy (ATP), primarily takes place in the mitochondria of eukaryotic cells. The mitochondrion is often referred to as the "powerhouse" of the cell due to its role in energy production through aerobic respiration. Options A (cytoplasm), C (ribosome), and D (vesicle) are not the primary sites for aerobic respiration: A: The cytoplasm is the site of photosynthesis,. C: Ribosomes are cellular structures involved in protein synthesis, not aerobic respiration. D: Vesicles are membrane-bound sacs involved in various cellular processes, but they are not the primary site for aerobic respiration.
6-B	B. To increase the surface area of the cells Root hairs are small, finger-like extensions that protrude from the surface of root cells. They play a crucial role in increasing the surface area of the root for absorption of water and minerals from the soil. The larger surface area allows for more efficient absorption of nutrients and water. Option A is not correct because root hairs are not primarily involved in maintaining the temperature of the cell sap. Option C is also incorrect because root hairs do not increase the volume of the cell sap; they mainly increase the surface area for absorption. Option D is not accurate because cell nuclei are typically found within the main body of the root cell, not specifically within the root hairs.

7-B	Diffusion is always from a region of high concentration to a region of low concentration.CO2 goes from the blood vessel to alveolus to be expelled out
8-B	B. The cell surface membrane The cell surface membrane, also known as the plasma membrane or cell membrane, is partially permeable in plant root hairs. It regulates the passage of substances, allowing some molecules to pass through while restricting the movement of others. This selective permeability is essential for controlling the uptake of water and minerals from the soil into the root hairs. Option A (the cell sap) refers to the fluid inside the vacuole, and while the vacuole has a membrane, the term "cell sap" is not typically associated with the permeability of membranes. Option C (the cell vacuole) is incorrect because the vacuole itself is not partially permeable; it is the membrane surrounding the vacuole that exhibits selective permeability. Option D (the cell wall) is not permeable; it provides structural support and protection but does not control the passage of substances into and out of the cell.
9-C	The test for proteins is known as the Biuret test, and the test for reducing sugars is often referred to as the Benedict's test. Since the results of these tests are positive, it confirms the presence of protein and reducing sugar
10-A	The rate of reaction is affected by pH and hence option A is correct.
11-B	The color change observed in the experiment, where the green indicator turned blue, indicates a decrease in the concentration of carbon dioxide. This suggests that the process occurring in test-tube X is: B. Photosynthesis During photosynthesis, plants take in carbon dioxide from the surrounding environment and convert it into glucose and oxygen. As carbon dioxide is utilized in the process, its concentration decreases. The green indicator turning blue in test-tube X suggests that carbon dioxide is being absorbed by the plant during photosynthesis, leading to a decrease in its concentration. Option A (germination), Option C (respiration), and Option D (transpiration) are not directly related to the observed color change in this context:

	A: Germination is the process of a seed developing into a new plant, and it does not involve a direct decrease in carbon dioxide concentration. C: Respiration involves the release of carbon dioxide, not the absorption or utilization of it. D: Transpiration is the loss of water vapor from plants, and it is not directly related to the absorption or decrease of carbon dioxide.
12-A	A. For making amino acids Nitrate ions (NO_3^-) are an important source of nitrogen for plants. Plants take up nitrate ions from the soil and use them primarily for the synthesis of amino acids, which are the building blocks of proteins. Nitrogen is an essential component of proteins, and amino acids are the monomers that make up protein molecules. Option B (for making fatty acids) is incorrect because fatty acids are primarily synthesized from other sources, such as carbohydrates. Option C (for making glucose) is also incorrect because nitrate ions are not directly involved in the synthesis of glucose. Glucose is synthesized through photosynthesis using carbon dioxide and water. Option D (for making starch) is incorrect because starch is composed of glucose molecules, and the synthesis of starch is not directly dependent on nitrate ions.
13-C	Both chemical digestion and mechanical digestion take place in: C. Mouth Chemical Digestion in the Mouth: Salivary glands in the mouth release saliva, which contains enzymes like amylase. Amylase breaks down starches into simpler sugars, initiating the chemical digestion of carbohydrates. Mechanical Digestion in the Mouth: Mechanical digestion in the mouth involves the physical breakdown of food through processes like chewing (mastication). Teeth play a crucial role in breaking down food into smaller particles, increasing the surface area for further digestion. The other options are not primarily associated with both chemical and mechanical digestion:

	A: Colon is involved in the absorption of water and electrolytes but is not a site for significant digestion. B: Duodenum is the first part of the small intestine where further chemical digestion occurs, but it is not a site of prominent mechanical digestion. D: Esophagus is a tube that transports food from the mouth to the stomach and does not contribute significantly to digestion.
14-D	The majority of water absorption takes place in the small intestine, particularly in the jejunum and ileum, the two lower parts of the small intestine.
15-D	The structures that stained red in the celery stalk are most likely: D. Xylem The movement of water through a plant, including celery stalks, occurs primarily through the xylem vessels. The xylem is responsible for transporting water and dissolved minerals from the roots to the rest of the plant. The process is known as transpiration, where water evaporates from the leaves, creating a negative pressure that pulls water upward through the xylem. In this experiment, the red stain appearing at the top of the celery stalk indicates the movement of water (and the red dye) through the xylem vessels. The xylem is the main tissue responsible for upward water transport in plants. Options A (cortex cells), B (mesophyll cells), and C (phloem) are not typically associated with the primary transport of water in plants. The cortex is a region of ground tissue, mesophyll cells are found in leaves and are involved in photosynthesis, and phloem is responsible for the transport of organic nutrients (like sugars) in plants.
16-B	The environmental conditions that should be kept constant during this investigation are: humidity/light intensity and wind-speed as they affect transpiration rate. Temperature is being studied and hence it cannot be kept constant and needs to be varied.
17-B	The sample in beaker P, which received pectinase solution, will likely have more volume of juice compared to the sample in beaker Q that received water. This is because pectinase is an

	enzyme that breaks down pectin, a complex polysaccharide found in plant cell walls, especially in fruits like apples.
18-D	Platelets initiate the clotting process by forming a plug at the site of injury. The coagulation cascade, involving factors like thromboplastin, factor X, prothrombin, and thrombin, leads to the conversion of fibrinogen to fibrin. The fibrin mesh reinforces the platelet plug, creating a stable blood clot that helps prevent further bleeding. During the process of blood clotting: L: Platelets M: Fibrinogen N: Fibrin
19-A	Memory cells are produced as part of the immune response after vaccination. Vaccination involves the introduction of a harmless or weakened form of a pathogen or its components into the body, stimulating the immune system to recognize and remember the specific pathogen. Memory cells, specifically memory B cells and memory T cells, are key components of the adaptive immune system.
20-A	During the inspiration of air, the diaphragm and external intercostal muscles play crucial roles in expanding the chest cavity, allowing air to flow into the lungs. Here's how their actions are described during inspiration: Diaphragm: Contracts and moves downward. External Intercostal Muscles: Contract and lift the ribcage upward and outward.The internal intercostal muscles relax.
21-B	Learn to balance equations.
22-A	The renal artery carries oxygenated blood to the kidneys, and the renal vein carries deoxygenated blood away from the kidneys. As a result, carbon dioxide (CO_2) is present in a higher concentration in the renal vein than in the renal artery, reflecting the metabolic activity and production of carbon dioxide in the body's tissues.
23-D	In a reflex arc, a synapse refers to the junction or connection between two neurons (nerve cells) where the transmission of nerve impulses occurs. Learn the basic structure of a reflex arc really well.
24-A	Accommodation is the process by which the eye adjusts its focus to clearly see objects at different distances. When viewing a near object, the following changes occur in the eye:

	Ciliary Muscle Contraction: The ciliary muscle, located around the lens of the eye, contracts. This contraction reduces the tension in the suspensory ligaments (zonular fibers) that are attached to the lens. Suspensory Ligaments Slackening: As the ciliary muscle contracts, it exerts force on the suspensory ligaments. The suspensory ligaments slacken or become less tense due to the contraction of the ciliary muscle. Lens Shape Changes to More Spherical: The slackening of the suspensory ligaments allows the elastic lens to become more spherical in shape. This change in lens shape increases its refractive power. Increased Refractive Power: The more spherical lens increases its refractive power, enabling it to converge light rays more effectively. By making these adjustments, the eye is able to focus on the near object, ensuring that the image is formed directly on the retina. This process is necessary because light rays from close objects need more converging power to bring them to a clear focus on the retina. The ability to change the shape of the lens to adjust for different viewing
25-C	The correct statement about the control provided by hormones is: C. Slow response and long-lasting Hormones are chemical messengers produced by endocrine glands and released into the bloodstream. They travel throughout the body and exert their effects on target cells or organs. The response to hormonal control is generally slower compared to the rapid signaling of the nervous system. However, the effects of hormones are often long-lasting and contribute to the regulation and coordination of various physiological processes over time.
26-B	Heroin is a central nervous system (CNS) depressant. Heroin is an opioid drug that belongs to the class of depressants, and it acts at the synapse by binding to specific receptors known as opioid receptors. Opioid receptors are found in the brain and spinal cord.

27-D	The advantage of asexual reproduction for an organism is: D. Population increases rapidly. Asexual reproduction allows for rapid reproduction and population growth because it involves the production of offspring from a single parent without the need for the union of gametes (sperm and egg). Since there is no genetic recombination, the offspring are genetically identical to the parent, leading to the efficient production of numerous identical individuals in a short period. This can be advantageous in situations where environmental conditions are favorable and there is a need for rapid colonization or adaptation. However, it's important to note that a lack of genetic variation can be a disadvantage when environmental conditions change or when dealing with diseases and other challenges.
28-C	The diploid number (2n) represents the total number of chromosomes in the somatic cells of an organism. In the case of Ovis aries (sheep) with a diploid number of 54, this means that the sheep has 54 chromosomes in its somatic cells. When a zygote is formed through sexual reproduction, it is formed by the fusion of gametes (sperm and egg), each carrying half the diploid number. Therefore, the number of chromosomes in a zygote is equal to the diploid number. So, the correct answer is: C. 54
29-D	The adaptive feature of sperm that provides the energy for swimming is: D. The mitochondria Mitochondria are the energy-producing organelles in cells, and they play a crucial role in generating ATP (adenosine triphosphate), which is the primary energy currency of cells. In sperm cells, the mitochondria are typically located in the midpiece of the flagellum (tail). This arrangement ensures that the energy produced by the mitochondria can be efficiently utilized to power the movement of the sperm's tail, allowing it to swim towards the egg during fertilization.
30-C	Oestrogen progesterone are secreted by the ovaries. The concentrations of these hormones in the blood during one complete menstrual cycl is high around 12 and 21 days.

31-A	To calculate the percentage of 25 out of 80, you can use the following formula: $\text{Percentage} = \left(\frac{\text{Part}}{\text{Whole}}\right) \times 100$ In this case, the part is 25, and the whole is 80. $\text{Percentage} = \left(\frac{25}{80}\right) \times 100$ $\text{Percentage} = 0.3125 \times 100$ $\text{Percentage} = 31.25\%$ **So, 25 is 31.25% of 80.**
32-C	**The features associated with meiosis are:** **C. 1, 3, and 4** **Haploid cells are produced: Meiosis involves two consecutive divisions (Meiosis I and Meiosis II) that result in the formation of haploid cells (gametes). The number of chromosomes is halved during meiosis.** **New cells are genetically identical: This statement is not associated with meiosis. In fact, meiosis is characterized by the generation of genetically diverse cells due to the processes of crossing over and independent assortment.** **Reduction division: Meiosis involves reduction division during Meiosis I, where the chromosome number is reduced by half.** **Results in variation: Meiosis introduces genetic variation through processes such as crossing over (exchange of genetic material between homologous chromosomes) and independent assortment of chromosomes.** **So, the correct answer is C. 1, 3, and 4.**
33-A	**Sickle-cell anemia is caused by a mutation in the hemoglobin gene, and individuals who are heterozygous for the sickle-cell trait (carry one normal hemoglobin allele and one sickle-cell allele) are more resistant to malaria. The specific genotypes associated with increased resistance to malaria are:** **HbAHbA (normal hemoglobin homozygous): This individual does not carry the sickle-cell trait and is not resistant to malaria.** **HbSHbA (heterozygous for sickle-cell trait): This individual carries one normal hemoglobin allele and one sickle-cell allele. Heterozygotes have increased resistance to malaria compared to individuals with normal hemoglobin homozygous genotype.**

	So, individuals with the genotype HbSHbA (heterozygous for the sickle-cell trait) would have increased resistance to malaria.
34-C	Fitness is defined as the probability of an organism surviving and reproducing in the environment in which it is found.
35-A	A producer with a large biomass, supports primary consumer with a comparative smaller biomass, who then support a small number and hence a smaller biomass of carnivorous insects.
36-C	This is because this the only section with a positive gradient
37-D	The correct answer is D: they mutate frequently. One disadvantage of using bacteria to produce human insulin is that bacteria have a high mutation rate. This can lead to genetic variations in the bacterial population over time. Mutations can affect the characteristics of the bacteria, potentially leading to changes in the production of human insulin or the production of unwanted substances. It may also introduce unpredictability in the manufacturing process. To address this, rigorous quality control measures are implemented to ensure the consistency and safety of the produced insulin.
38-A	A: a length of DNA from a human. In the context of producing insulin using bacteria, the plasmid would typically be modified to include a segment of human DNA that codes for the insulin gene. This modified plasmid is then introduced into bacterial cells, and the bacteria use the inserted human DNA to produce human insulin. This process is a part of genetic engineering techniques used in biotechnology to create recombinant organisms for the production of specific proteins or substances.
39-D	D: the use of pesticides on crops. The use of pesticides on crops is unlikely to increase the risk of human famine. Pesticides are typically used to control and eliminate pests that can damage or destroy crops. While it's essential to use pesticides responsibly to minimize environmental impact, the targeted use of pesticides can help protect crops and increase agricultural productivity, reducing the risk of famine. On the other hand: A: a rapidly increasing human population can strain available resources, potentially contributing to food scarcity. B: flooding of land can damage crops and reduce yields, increasing the risk of famine.

	C: lack of rain causing a drought can lead to water scarcity and negatively impact crop growth, contributing to the risk of famine. So, among the given options, the use of pesticides is less likely to increase the risk of human famine.
40-A	A: fewer coal-powered power stations. The main reason for the significant reduction in sulfur dioxide emissions since 1970 in some parts of the world is the decrease in the use of coal-powered power stations. Sulfur dioxide is a major air pollutant released during the combustion of coal, and efforts to reduce air pollution have often involved transitioning to cleaner energy sources or implementing technologies that capture and reduce emissions from coal-fired power plants. The reduction in sulfur dioxide emissions is a positive outcome for air quality and environmental health.