P530/1
BIOLOGY
Paper 1
1 Hour 30 Minutes

CLEVERLAND HIGH SCHOOL-MAYA
END OF TERM I EXAMS-2025
SENIOR FIVE
BIOLOGY
Paper One

INSTRUCTIONS:

- **Answer all items**

SECTION A

Item1

There is a debate among botanists about whether plant cells have lysosomes, as these structures are normally associated with animal cells, as some vacuoles in plant cells have hydrolytic enzymes and perform liposomal activities. Some botanists think that plant cells have lysosomes. This view is not universally accepted, as the lysosomes in plants do not carry out all the usual activities of the lysosomes found in animal cells.

a) What are the usual activities carried out by lysosomes?

Activities of lysosomes

- ***Destroy foreign material inside or outside the cell as follows:***
- ***Immune response; break down material ingested by phagocytic cells such as macrophages and neutrophils.***
- ***Autophagy; digest worn out cells so that the useful chemicals f which they are made can reused.***
- ***Autolysis; completely breakdown cells after they have died***
- ***Exocytosis; some have a role in releasing hydrolytic enzymes to the outside of the cell to destroy material around the cell e.g. reabsorption of tadpole tails.***

b) As a student of Cleverland high school who has studied the ultrastructure of plant and animal cells, other than lysosomes what other cellular features are found in animal cells but not in plant cells.

- ***Structures found in animals cells only***
- ***Cilia and flagella in some cells***
- ***Glycogen granules***
- ***Centriole/ centrosome***
- ***Microvilli in certain cells***

Item2

Microscopy, the science of using microscopes to examine small objects, has diverse applications in fields like biology, medicine and forensics and materials science, enabling the study of cells, tissues, microorganisms, and materials at a microscopic level. As a student who has studied microscopy, you have been approached by a colleague for assistance who has been presented with a forensic report with unfamiliar terms. Use the knowledge of microscopy to explain to him the unknown terms

a) Magnification and resolution

Magnification (Mg)

Is the ability to make small objects seem larger, making microscopic organisms visible OR the magnification of an object is how many times bigger the image is when compared to the object

I.e. Mg=size of image/size of object

Resolution

The degree of detail which can be seen with a microscope, distinguishing objects close together OR is the minimum distance apart that two objects can be in order for them to appear as separate items.

b) Gram positive and gram negative

Gram positive

Show blue/purple with gram staining.

Gram positive bacteria possess a thick peptidoglycan layer in their cell wall, making them appear purple under a microscope after a gram stain procedure

Gram negative

Show red/pink on gram staining

Gram negative bacteria have a thin peptidoglycan layer surrounded by an outer membrane leading to them appearing pink or red after the same staining.

c) Light microscope and Electron microscope.

Light microscope

Uses light to investigate sell structures X1500 times

Electron microscope

Uses a beam of electrons to investigate cell structures X500, 000 times

d) Artifacts and organelles.

Artifacts

Damage caused in specimen preparation. May be mechanical or chemical action during sample preparation or due to irradiation y the electron beam during examination of the specimen in the microscope.

Organelles

Functional units within cells. Are specialized sub units, usually within cells that have a specific function May be membrane bound structures like plasma membrane, nucleus, endoplasmic reticulum, Golgi apparatus, mitochondria, lysosomes, vacuoles, chloroplasts ,peroxisomes or non-membrane bound structures like cytoskeleton(cytoplasm) and centrosomes.

SECTION B

Item3

During a senior five biology class, a teacher taught students that; in 1977, American microbiologist Carl Richard Woese and his co-workers discovered the third domain of life called Achaea (Kingdom-Arhaebacteria) based on distinctive 16S RNA signature sequences which had long been categorized as prokaryotic organisms. This became widely accepted as the third

domain in 1990.Archaebacteria are known to be the oldest living organisms on earth. They are completely distinct from prokaryotes. They can easily survive under very harsh conditions such as the bottoms of the sea the volcanic vents. However one of the students further requested for more information about their types and importance during study. With the knowledge that you have acquired about Arhaebacteria;

a) Name any two types of Arhaebacteria

Crenarchaeota-thermophiles, mesophiles, psychrophiles

Euryarecheota-methanogenes, halophiles

Korarcheota

b) How can the knowledge of Arhaebacteria be used to benefit society and the environment.

Environmental importance

- ***Nutrient recycling; oxidation of ammonia, a crucial step in the nitrogen cycle. Contribute to soil nutrient transformation impacting ecosystem functions and sustainability.***
- ***Bioremediation; remove harmful chemical wastes, metals and pollutants from contaminated environments.***
- ***Ecosystem function; Achaea are abundant and diverse members of microbial communities, contributing to various ecosystem functions.***
- ***Methanogenesis; produce methane important in understanding the early earth and other beneficial effects.***

Societal importance

Biotechnological application

- ***Biogas production; produce biogas a renewable energy source***
- ***Thermo stable enzymes; produce thermos table enzymes such as polymerases, which are valuable in biotechnology research.***
- ***Extreme conditions; survive in extreme conditions (high temperature, salinity, acidity) making them valuable for studying the nature of life and for developing new biotechnology tools.***
- ***Human micro biome; Achaea are present in the human micro biome with some like methanobrevibacter smithii playing a role in digestion and even potentially impacting on health. Achaea potential applications in various fields including medicine, agriculture and industrial processes.***
- ***In addition to these specific roles, Achaea's evolutionary relationships with both bacteria and eukaryotes provide valuable insights into the evolution of life on earth. They are essentially living fossils that offer clues about the origins of life and the evolution of various biological processes.***

Item 4

Cleverland high school and Maya farmers Sacco under the parish development model entered into a partnership to grow tomatoes from a piece of land they had hired from the school, which would also later act as a demonstration garden to students. One day on a sunny day students found out that the farmers had transplanted their tomato seedlings to the main garden but to their surprise almost all the plants were weak and could not support themselves upright.

a) What physiological processes could have been affected during the seedling transplantation?

- ***Physiological processes affected during the transplantation of the seedlings***
- ***Water and mineral uptake-reduced due to affected or disturbed roots***
- ***Photosynthesis- reduced due to yellowing and drying of leaves***
- ***Growth and development-retarded due to transplantation shock***
- ***Flowering and fruiting-delayed to transplantation shock***
- ***Root growth or formation- delayed of affected due to uproot/root disturbance /root destruction***
- ***Turgidity –lost due to reduced turgor pressure to zero as a result of diminished water uptake.***
- ***Transpiration-reduced due to wilting as leaves expose less surface area***

b) How would the problem be mitigated?

Mitigation

- ***Watering the plant thoroughly***
- ***Proper timing of weather; transplanting during cool weather to avoid direct sunlight preferably in the evening***
- ***Use high phosphorous fertilizer to promote root growth***
- ***Digging well sized holes to accommodate the roots and also covering the whole root system thoroughly***
- ***Mulching to conserve water in the soil.***

END

The Lord Our Banner