THE COPPERBELT UNIVERSITY

SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

**BI 110 DEFERRED Test 2 - 11/08/2023**

**Answer All Questions (45 marks)** **Duration: 1hr30 minutes**

1.a. Fungi can also be classified based on spore formation, discuss the five categories of fungi based on spores they produce. (4 marks)

b). Discuss the function following parts of the virus:

**Spikes** (2 marks)

**nucleic acid** (2 marks)

**viral RNA polymerase** (2 marks)

c. Discss the differences between prions and viroids (6 marks)

d. state the differences between open and closed mitosis (3 marks)

2. a. Discuss nutrition in euglena (3 marks), explain how this organism responds to **phototaxis** (4marks)

b. Viruses are classified according to the nature of their genomes, state the three groups of viruses (3 marks)

c. Harmful algal blooms of cyanobacteria grow out of control and produce toxic or harmful effects on people, fish, shellfish, marine mammals and birds. State three toxins released from cyanobacteria. (3 marks)

3.a. Briefly give an account of the following categories of archaea: **Extreme halophiles, Methanogens** and **Extreme thermophiles** (6 marks)

**b.** Define the following terms: (i) **couplet** (ii) **lead** (iii) **character state**(iv) **taxon** (v) **Species** (5 marks)

**c.** Write brief notes on the following types of bacteria; **filamentous bacteria, budding bacteria** and **spiral bacteria.** (6 marks)

END OF EXAM

**The Copperbelt University**
**School Of Mathematics And Natural Sciences**

**BI 110 Test one (60 marks)** **03/04/2023**

**Answer All Questions** **Duration 2hrs**

**1.** Multiple choice (10 marks), Negative one (-1) for a wrong answer, Zero for I don't know, 1 mark for each correct answer.

**i)** Which of the following would be most appropriate method to observe and measure the size of ribosomes in a eukaryotic cell?
A) a hand lens (magnifying glass) B) standard light microscopy C) scanning electron microscopy D) transmission electron microscopy E) I don't know

**ii)** You disrupt all hydrogen bonds in a protein. What level of structure will be preserved?
A) primary structure B) secondary structure C) tertiary structure D) quaternary structure E) I don't know

**iii)** If one strand of a DNA molecule has the sequence of bases 5′-ATTGCA-3′, the mRNA synthesized following the template will be _____.
A) 5′-TAACGT-3′ B) 5′-TGCAAT-3′ C) 3′-UAACGU-5′ D) 5′-UGCAAU-3′ E) I don't know

**iv)** A cell with a predominance of smooth endoplasmic reticulum is specialized in.....
A) transporting carbohydrates to neighbouring cells B) import and export large quantities of protein C) actively secrete large quantities of protein D) synthesize large quantities of lipids E) I don't know

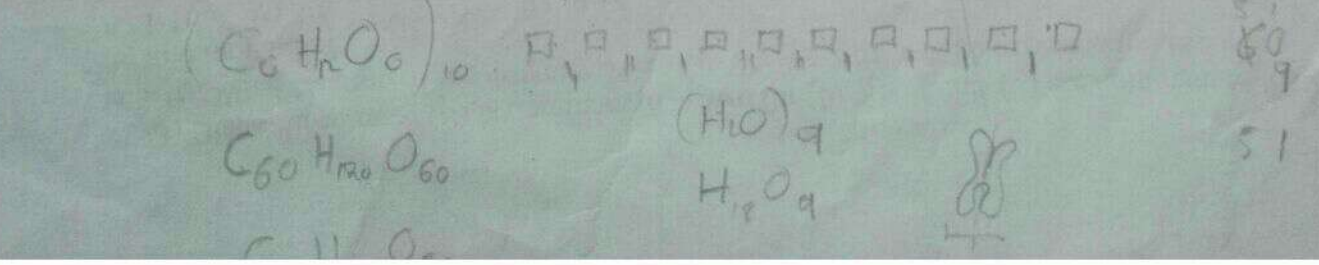
**v)** Motor proteins provide for molecular motion in cells by interacting with what types of cellular structures?
A) membrane proteins of the inner nuclear envelope B) free ribosomes and ribosomes attached to the ER C) components of the cytoskeleton D) cellulose fibers in the cell wall E) I don't know

**vi)** The molecular formula for glucose is $C_6H_{12}O_6$. What would be the molecular formula for a polymer made by linking ten glucose molecules together by dehydration reactions?
A) $C_{60}H_{120}O_{60}$ B) $C_{60}H_{102}O_{51}$ C) $C_{60}H_{100}O_{50}$ D) $C_{60}H_{111}O_{51}$ E) I don't know

**vii)** If a cell at metaphase of mitosis contains 20 sister chromatids, how many chromosomes will be present in a G1 cell?
A) 5 B) 10 C) 20 D) 40 E) I don't know

**viii)** Mendel continued some of his experiments into the F2 or F3 generation in order to __
A) obtain a larger number of offspring on which to base statistics
B) observe whether or not a recessive trait would reappear
C) observe whether or not the dominant trait would reappear
D) distinguish which alleles were segregating E) I don't know

**ix)** Mendel's observation of the segregation of alleles in gamete formation has its basis in which of the following phases of cell division?
A) prophase I of meiosis B) anaphase II of meiosis C) metaphase II of meiosis
D) anaphase I of meiosis E) I don't know



x) 23) Black fur in mice (*B*) is dominant to brown fur (*b*). Short tails (*T*) are dominant to long tails (*t*). What fraction of the progeny of crosses *BbTt* × *BBtt* will be expected to have black fur and long tails?

A) 1/16 B) 3/8 C) 1/2 D) 9/16 E) I don't know

**2.a.** Compare and contrast the imaging capabilities and applications of the differential interference microscope and scanning tunnelling microscope. (6 marks)

**b.** How do the three postulates of the cell theory help us understand the fundamental properties and behaviours of living organisms? (2 marks)

**c.** State the structural differences between a gram positive and gram negative bacteria. (2 marks)

**3.a.** List and recognize four major components of an amino acid, and explain how amino acids may be grouped according to the physical and chemical properties of the side chains. (4,4 marks)

**b.** Identify an alpha glycosidic linkage and describe how it is formed. (3 marks)

**c.** What role does complementary base pairing play in the functions of nucleic acids? (3 marks)

**d.** What is the relationship between DNA and RNA, and how do they differ in terms of their structure and function? (6 marks)

**4. a.** Differentiate between chromatin and chromatid. (2 marks)

**b.** How is a G1 arrest different from G0 in the cell cycle? (2 marks)

**c.** Write the phases of the cell cycle against each of the events.

i. The disintegration of the nuclear membrane.
ii. The appearance of the nucleolus.
iii. Division of centromere.
iv. Replication of DNA (4 marks)

**d.** Telophase is the reverse of prophase. Elucidate the statement (4 marks)

**e.** You have an individual who is totally heterozygous for 2 genes that are not linked (i.e., not on the same chromosome). One gene is for ear size (**AA** and **Aa** being big ears whereas **aa** is for small ears) and the other gene is for buggy eyes (**BB** and **Bb** for buggy eyes whereas **bb** represents normal eyes). If you test cross this individual, what are the resulting genotypes and phenotypes? (8 marks)

(AA and Aa) (BB Bb)

Aa Bb

**END OF EXAM**

basic, acidic, polar, non-polar hydrophobic hydrophilic

**The Copperbelt University**
**School Of Mathematics And Natural Sciences**

**BI 110 Test 2 (50 marks)** **26/06/2023**
**Answer All Questions** **Duration 2hrs**

**1. i)** Which of the following statements supports the argument that viruses are nonliving?
A) They do not carry out metabolic processes. B) Their DNA does not encode proteins.
C) They have RNA rather than DNA. D) They do not evolve.

**ii)** Which of the following characteristics is typical of the lytic cycle of a bacteriophage?
A) Viral DNA is incorporated into the host genome.
B) The viral genome replicates without destroying the host.
C) A large number of phages are released at a time.
D) The virus-host relationship usually lasts for generations.

**iii).** Two populations of birds with somewhat different coloration live on opposite sides of Lake Bangweulu. The habitat between the populations is not suitable for these birds. When birds from the two populations are brought together, they produce young whose appearance is intermediate between the two parents. These offspring will breed with each other or with birds from either parent population, and all offspring of these pairings appear intermediate to various degrees. What keeps the two populations separate?
A) temporal reproductive isolation B) lack of hybrid viability
C) behavior isolates reproductive activities D) habitat isolation

**iv)** Which postzygotic barriers prevent formation of hybrids beyond the first generations?
A) increased hybrid vulnerability B) increased hybrid fertility
C) hybrid breakdown D) hybrid gamete isolation

**v)** When a mosquito infected with *Plasmodium* first bites a human, the *Plasmodium*.....
A) gametes fuse, forming an oocyst B) infect the human liver cells
C) cells cause lysing of the human red blood cells D) oocyst undergoes meiosis

**vi)** Some fungal species live in plants and can kill herbivores that feed on the plant. What type of relationship does this fungus have with its host?
A) parasitic B) mutualistic C) commensal D) predatory

**vii)** Which of the following is most likely to be aquatic?
A) Filter feeder B) mass feeder C) deposit feeder D) fluid feeder

**viii)** Against which hard structure do the circular and longitudinal muscles of annelids work?
A) cuticle B) shell C) endoskeleton D) hydrostatic skeleton

**ix)** Which statement describes unity within a species?
A) A species can be distinguished by body shape and other structural features.
B) Members have the potential to interbreed in nature and produce viable, fertile offspring.
C) A species is described in terms of its interaction with living and non-living environment.
D) The DNA sequence lacks similarities.

**x.** In the current taxonomic system, families are grouped into..... A) classes B) phyla
C) orders D) Genus

DK. PROOFS

endo

**2. a.** Define the following terms: **Arbusicular mycorrizhae, Reproductive isolation.** (4 marks)

**b.** State **three** reasons why we assign names to organisms. (3 marks)

**c.** Explain what happens at synthesis stage of **HIV**. (3 marks)

**3. a.** Outline **any two** differences between archaea and protists in terms of cellular structure and organisation. (2 marks)

**b.** State **two** categories of protozoans according to their mode of locomotion? (2 marks)

**c.** Protozoans are a diverse group of eukaryotic organisms that may constitute members that cause serious protozoan diseases in both animals and plants. Describe the **key stages** in the life cycle of malaria plasmodium. (6 marks)

**4. a.** Explain sexual reproduction in Oomycetes. (4 marks) zoospores

**b.** By what standards are bacteria classified? Name the classification. (3 marks)

**c.** Nostoc and Anabaena have specialised cells called heterocytsts, State the **characteristics** and **function** of these cells? (3 marks)

- deeply segmented
- mitogenase

**5. a.** State **two** key distinguishing characteristics that define each of the following: Phylum Annelida Phylum Nematoda (4 marks)

bristle structures setae segmented unsegmented

**b.** Schistosoma causes a disease called bilharzia. Describe the various stages of development that occur during the life cycle of Schistosoma? (4 marks) sporocyst miracidia

sites

**c.** Discuss the function of the following in mollusks: **Tentacles, Mantle Cavity** (2 marks)

cercaria

bowels/rectum
eggs are released with faeces
penetrates snail tissue

END OF EXAM

sarcaria

THE COPPERBELT UNIVERSITY

SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

BI 110- INTRODUCTORY BIOLOGY TEST ONE DURATION: 2HRS MARKS: 100

**INSTTRUCTION: ANSWER ALL QUESTIONS** DATE: 13/05/2022

**1.a**. What is the relationship between wavelength and magnification of a microscope? (3 marks)

**b.** A compound microscope has the following specifications; resolution: 2, numerical aperture: 0.5, magnification of objective lenses 25X, and total magnification 500X. If the image size is 18,000 and magnification obtained after viewing the specimen is 750X, calculate the following

**Wavelength of the microscope** (2 marks)

**Magnification of the ocular lenses** (2 marks)

**Size of the specimen** (2 marks)

**c.** what are the key distinguishing features of the following microscopes;

**Phase contrast microscope** (3 marks)

**Atomic force microscope** (3 marks)

**Differential interference contrast** (3 marks)

**d.** Describe how a transmission electron microscope works. (4 marks)

**e.** Why is microscopy important in agriculture? (3 marks)

**2.a.** Write short notes on the following: lysosome, Golgi apparatus, rough endoplasmic reticulum, nucleus, mitochondrion, and ribosome. (6 marks)

**b.** How are prokaryotes different from eukaryotes in terms of their cell walls, interior organization, and flagella? (6 marks)

**c.** Explain the theory of endosymbiosis and what are the pieces of evidence that supports this theory? (3 marks)

**d.** Describe the role of membrane receptors and ligands? (3 marks)

**e.** Why are bacteria classified as prokaryotic organisms? (3 marks)

**f.** Robert Hooke first described cells in 1665, when he used a microscope he had built to examine a thin slice of a non-living tissue found in the bark of certain trees. A few years later, Dutch naturalist Antonie van Leeuwenhoek, who called the tiny organisms that he observed "animalcules," meaning little animals. For another century and a half, however, biologists failed to recognize the importance of cells. In 1838, botanist Matthias Schleiden made a careful study of plant tissues and developed the first statement of the cell theory.
(i)What is the cell theory? (1 mark)

(ii) Explain the postulates of the cell theory? (3 marks)

**3.a.** Explain why cells undergo **Go** phase. Why is important that the cell has to undergo this cycle. (3 marks)

**b.** At what stage do we find the spindle check point? Explain its role (4 marks).

**c.** Why do chromosomes condense during mitosis? (3 marks)

**d.** Explain how the orientation of homologous chromosomes during metaphase I of meiosis contributes to greater variation in gametes.5 marks

**e.** Though the stages of meiosis have the same names as the stages of mitosis, they exhibit fundamental differences. Compare and contrast the two processes to accurately state their main differences (5 marks)

**f.** Compare and contrast cytokinesis in plants and animal cells. (3 marks)

**g.** Define a karyotype (2 marks)

**4.a.** Draw and explain the differences between alpha and beta glucose. (3 marks)

**b.** Explain the two types of starch and the linkage types (3 marks)

**c.** what are the differences between ;**a leading and a lagging strand, Nucleoside and a nucleotide, visceral fats and subcutaneous fats** (6 marks)

**d.** Using molecular structures, describe how phosphodiester bonds are formed (4 marks)

**e.** Why is DNA negatively charged? Why does the synthesis of DNA start at 5' and end at 3'? (3 marks)

**f.** A strand of DNA has the sequence 5'-ATATGCGAT-3'. State its corresponding sequence of DNA (2 marks) and RNA (2 marks).

**g.** Explain how peptide bonds are formed. (2 marks)

**BI 110 Test1 Solutions**

1.a. The relationship between wavelength of light and magnification of microscope, the wavelength is inversely proportional to the magnification of microscope. The lower the wavelength the higher the resolution, the higher the magnification. The wavelength is represented as lambda.

b. resolution=0.5*wavelength

$$\frac{Resolution}{1} = \frac{0.5 * \lambda}{Numerical\ Aparture\ (NA)}$$

**Hence wavelength** $(\lambda) = \frac{resolution*NA}{0.5} = \frac{2*0.5}{0.5} = \frac{1}{0.5} = 2$

Total magnification=Objective lenses*Ocular lenses

Therefore **Ocular lenses**$= \frac{Total\ magnification}{Objective\ lenses} = \frac{500}{25} = 20$

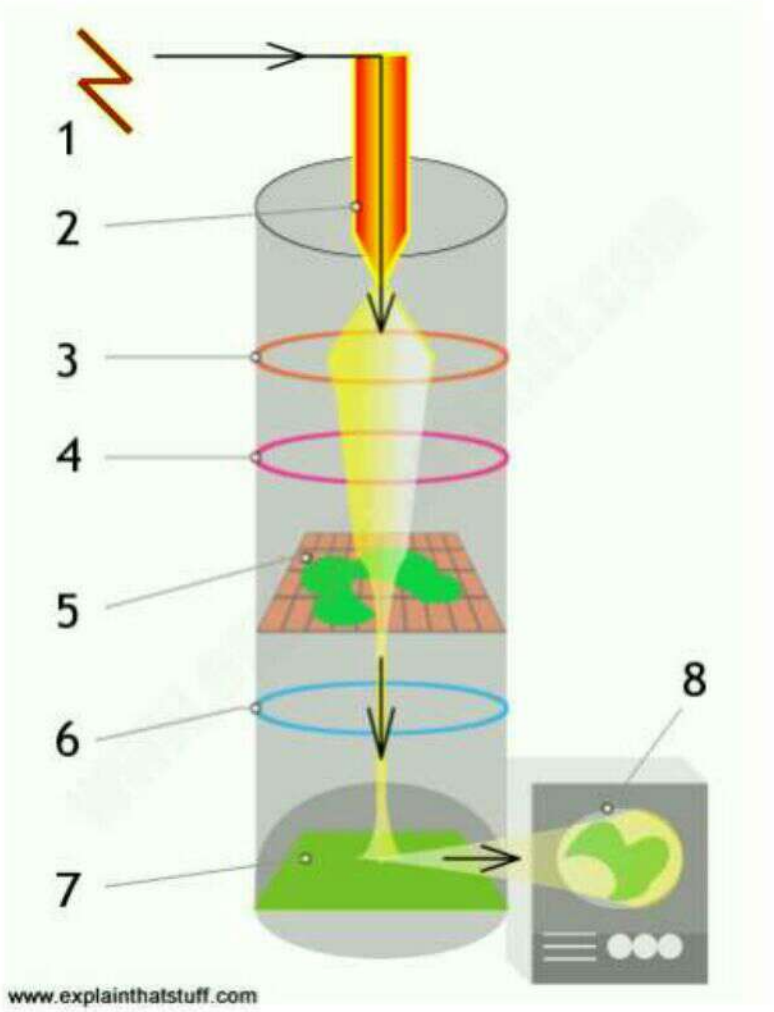
Magnification$= \frac{Image}{Specimen}$

Therefore **Specimen**$= \frac{Image}{Magnification} = \frac{18{,}000}{750} = 24$

**c.**

| Phase contrast | Atomic force | DIC |
|---|---|---|
| • Views live specimen<br>• Views unstained specimen<br>• Uses an Annular ring/plate<br>• Uses a phase ring/plate<br>• Creates an image by combining different wavelengths | • Uses a diamond tip with a silicon arm<br>• Creates images by moving back and forth on the surface of the specimen or simply by contact<br>• Views surfaces at a molecular and atomic level | • Uses prisms to modify light coming from one source<br>• It creates an image by combining different refractive indices and thickness of the specimen<br>• It produces pseudo 3D images |

# d. **How a transmission electron microscope (TEM) works**




A **transmission electron microscope** fires a beam of electrons *through* a specimen to produce a magnified image of an object.

1. A high-voltage electricity supply powers the cathode.
2. The cathode is a heated filament, a bit like the electron gun in an old-fashioned cathode-ray tube (CRT) TV. It generates a beam of electrons that works in an analogous way to the beam of light in an optical microscope.
3. An electromagnetic coil (the first lens) concentrates the electrons into a more powerful beam.
4. Another electromagnetic coil (the second lens) focuses the beam onto a certain part of the specimen.
5. The specimen sits on a copper grid in the middle of the main microscope tube. The beam passes through the specimen and "picks up" an image of it.
6. The projector lens (the third lens) magnifies the image.
7. The image becomes visible when the electron beam hits a fluorescent screen at the base of the machine. This is analogous to the phosphor screen at the front of an old-fashioned TV .
8. The image can be viewed directly (through a viewing portal), through binoculars at the side, or on a TV monitor attached to an image intensifier (which makes weak images easier to see).

**e.** • Analyse the quality of your compost/ compost tea

• Analyse compaction and anaerobic conditions

• Find out about diseases before they become a problem

• Find out about changes in your soil and how effective your techniques are

**2. a.** Write short notes on the following: lysosome, Golgi apparatus, rough endoplasmic reticulum, nucleus, mitochondrion, and ribosome. [*6 marks*]

- *Lysosome:* Small, spherical, single membrane sac, found throughout the cytoplasm filled with hydrolytic enzymes. Occur in most animal cells and in few type of plant cells

  • Help in hydrolysis/digestion/break down of large molecules
  • Protect cell by destroying foreign invaders like bacteria and viruses
  • Degradation of worn out organelles
  • In dead cells perform autolysis

- *Golgi apparatus*: synthesis/sorting/transporting/secretion of cell products

  • Modifies, sorts and packs materials synthesized in the cell
  • Delivers synthesized materials to various targets inside the cell and outside the cell
  • Produces vacuoles and secretory vesicles
  • Forms plasma membrane and lysosomes

- *Rough endoplasmic reticulum*: is so named for the appearance of its outer surface, which is studded with protein-synthesizing particles known as ribosomes. It is a site of protein synthesis. RER synthesize secretory proteins and membrane proteins

- *nucleus:* controls cells activities/mitosis/replication of DNA/transcription of DNA (to RNA)/directs protein synthesis

  • Control all the cell activities like metabolism,
  • Protein synthesis, growth and cell division
  • Nucleolus synthesizes ribonucleic acid (RNA) to constitute ribosomes
  • Store hereditary information in genes

- *mitochondrion*: Mitochondria are membrane-bound cell organelles (mitochondrion, singular) that generate most of the chemical energy needed to power the cell's biochemical reactions. Chemical energy produced by the mitochondria is stored in a small molecule called adenosine triphosphate (ATP). (aerobic) respiration/generates ATP

  • Generate large quantities of energy in the form of ATP.

• Store calcium for cell signaling activities, generate heat, and mediate cell growth and death.

- ***ribosome***: produce proteins from amino acids during a process called protein synthesis or translation

**b**. How are prokaryotes different from eukaryotes in terms of their cell walls, interior organization, and flagella? [6 *marks*]

| | **prokaryotes** | **eukaryotes** |
|---|---|---|
| cell walls | cell wall is composed of *peptidoglycan* which consists of a carbohydrate matrix (polymers of sugars) | Cell walls lack *peptidoglycan.*<br><br>Plant cells-have a cell wall composed of cellulose, hemicellulose, pectin, proteins, etc. but animal cells do not have a cell wall |
| interior organization | There are few, if any, internal compartments, and while they contain simple structures like ribosomes, most have no membrane-bounded organelles | The interiors of eukaryotic cells contain numerous organelles, membrane-bounded structures that close off compartments within which multiple biochemical processes can Proceed simultaneously and independently. |
| flagella | Some prokaryotes have a flagellum and use it for locomotion and feeding and are able to rotate. Many prokaryotes swim using flagella and cilia. | Many multicellular and some unicellular eukaryotes today no longer possess flagella and are non-motile, but structures called **cilia** can still be found within them, cellular projections that lash back and forth. |

**c**. Explain the theory of endosymbiosis and what are the pieces of evidence that supports this theory? [3 *marks*]

- The theory of endosymbiosis proposes that some of today's eukaryotic organelles evolved by a symbiosis in which one species of prokaryote was engulfed by and lived inside another species of prokaryote that was a precursor to eukaryotes.

THE PIECES OF EVIDENCE OF THE ENDOSYMBIOTIC THEORY ARE THAT:

- Mitochondria divide by simple fission, splitting in two just as bacterial cells do, and they apparently replicate and partition their DNA in much the same way as bacteria.

- Mitochondrial ribosomes are also similar to bacterial ribosomes in size and structure
- Both mitochondria and chloroplasts contain circular molecules of DNA similar to those in bacteria.
- The organelles like mitochondria and chloroplast are self-replicating organelles with their DNA that shares similarities with the prokaryotic genetic material and have double membrane-like prokaryotes (Both mitochondria and chloroplasts are surrounded by two membranes; the inner membrane probably evolved from the plasma membrane of the engulfed bacterium, while the outer membrane is probably derived from the plasma membrane or endoplasmic reticulum of the host cell.)
- The organelle chloroplast can perform photosynthesis and has the machinery to harvest light energy, which is also present in primitive organisms like cyanobacteria.
- The genetic material of prokaryotes and organelles like mitochondria and chloroplast is circular and encodes a few genes.

**d.** Describe the role of membrane receptors and ligands? [3 *marks*]

- Membrane receptors are specialized protein molecules attached to or integrated into the cell membrane. Through interaction with specific ligands (e.g., hormones and neurotransmitters), the receptors facilitate communication between the cell and the extracellular environment. Receptors are also involved in translocation of substances (e.g., nutrients and waste products) across the membrane.

- When a ligand binds to its respective receptor, the shape and/or activity of the ligand is altered to initiate several different types of cellular responses. Such cellular responses are vital for the proliferation, migration, survival, and differentiation of cells within all multicellular organisms.

e. Why are bacteria classified as prokaryotic organisms? [3 *marks*]

**Bacteria** are a group of microscopic single-celled organisms that live in enormous numbers in almost every environment on Earth, from deep-sea vents to deep below Earth's surface to the digestive tracts of humans.

Bacteria lack a membrane-bound nucleus and other internal structures and are therefore ranked among the unicellular life-forms called prokaryotes.

**f. (i)What is the cell theory? [1 *mark*]**

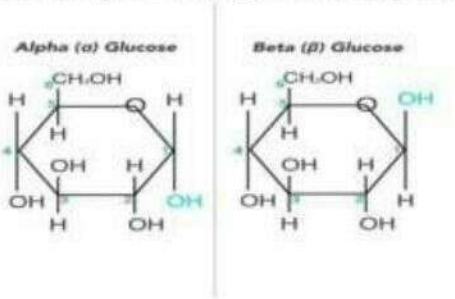
The cell theory is a scientific theory formulated in the mid-nineteenth century, a basic tenet of modern biology, first stated by Matthias Schleiden and Theodor Schwann in 1838–39, that cells are the basic units of structure and function in living organisms.

**(ii) Explain the postulates of the cell theory? [3 *marks*]**

1. All organisms are composed of one or more cells, and the life processes of metabolism and heredity occur within these cells.
2. Cells are the smallest living things, the basic units of organization of all organisms.
3. Cells arise only by division of a previously existing cell.

**4.a.** the orientation of the hydroxide at first carbon differs. Alpha glucose the OH at first prime is at the bottom, the beta glucose at first prime has the OH at the Top of H

Alpha glucose is higher in energy than beta glucose



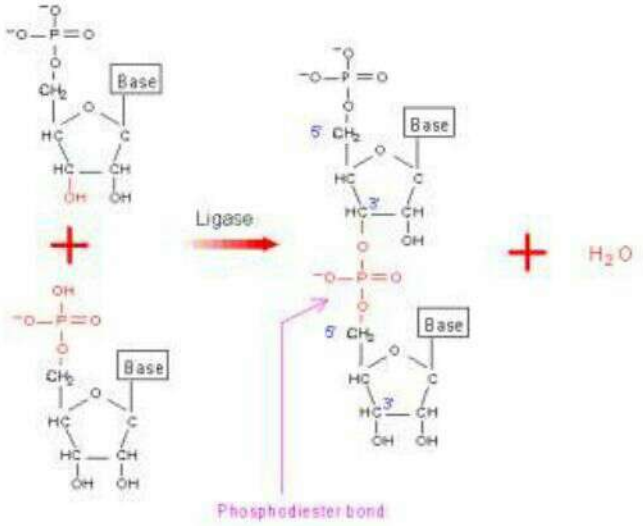

b. The two types of starch: Amylopectin is highly branched, leaving more surface area available for digestion. It's broken down quickly, which means it produces a larger rise in blood sugar (glucose) and subsequently, a large rise in insulin.
Amylose is a straight chain, which limits the amount of surface area exposed for digestion. This predominates in RS. Foods high in amylose are digested more slowly. They're less likely to spike blood glucose or insulin.
In amylose these are linked α(1-4), with the ring oxygen atoms all on the same side, whereas in amylopectin about one residue in every twenty or so is also linked α(1-6) forming branch-points.

c. .A **leading** strand is the strand which is synthesized in the 5'-3'direction while a **lagging** strand is the strand which is synthesized in the 3'-5' direction.The leading strand is synthesized continuously while a lagging strand is synthesized in fragments which are called Okazaki fragments.

A **nucleotide** is composed of three components, namely a nitrogenous base, phosphate group, and sugar. A **nucleoside** is composed of two components, namely a nitrogenous base and sugar

Subcutaneous fats are found under the skin whose primary function is insulating the animal body. Visceral fats are also known as belly fats, they are stored in the abdomen and around major organs such as the liver instestines etc, function is that it ensures some distance between organs

d. . The phosphodiester bonds are formed as the result of the *condensation reaction* between phosphate groups and hydroxyl groups of two sugar groups. For instance, the group that is being formed by the bonding of one oxygen atom and one hydrogen atom is called the hydroxyl group. Such groups are written as **-OH** or **-HO.** The "–" represents the carbon to which the hydroxyl group will be attached. Moreover, the molecules containing a single atom of phosphorus covalently bonded to four oxygen atoms are called phosphate groups. The other name for the phosphodiester bond is p*hosphoester bond*. See the diagram below



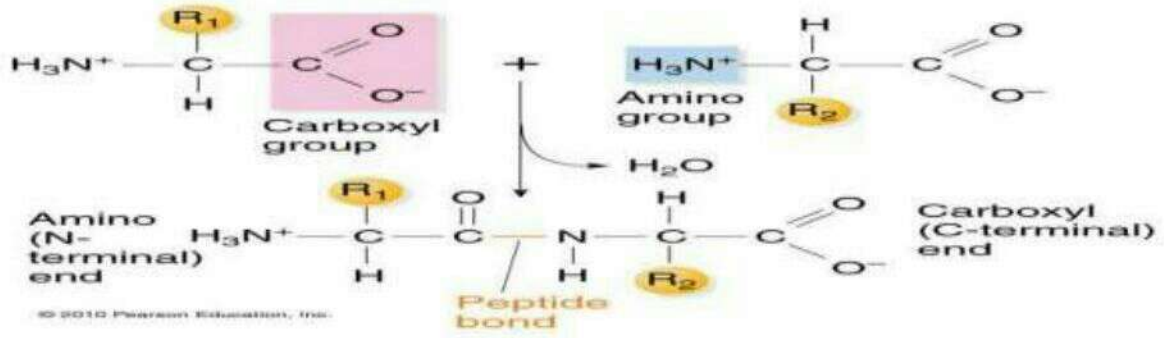

e. Because of the presence of the phosphate group in the backbone of the DNA strand. DNA is always synthesized in the 5'-to-3' direction, meaning that nucleotides are added only to the 3' end of the growing strand. As shown in Figure 2, the 5'-phosphate group of the new nucleotide binds to the 3'-OH group of the last nucleotide of the growing strand.

f. DNA: TATACGCTA

RNA: UAUACGCUA

**g.** A peptide bond is formed by a dehydration synthesis or reaction at a molecular level. This reaction is also known as a condensation reaction which usually occurs between amino acids. two amino acids bond together to form a peptide bond by the dehydration synthesis. During the reaction, one of the amino acids gives a carboxyl group to the reaction and loses a hydroxyl group (hydrogen and oxygen). The other amino acid loses hydrogen from the $NH_2$ group. The hydroxyl group is substituted by nitrogen thus forming a peptide bond. This is one of the primary reasons for peptide bonds being referred to as substituted amide linkages. Both the amino acids are covalently bonded to

each other


Carboxyl group
Amino group
$H_2O$
Amino (N-terminal) end
Carboxyl (C-terminal) end
Peptide bond
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**THE COPPERBELT UNIVERSITY**

**SCHOOL OF MATHEMATICS AND NATURAL SCIENCES**

BI 110- INTRODUCTORY BIOLOGY TEST TWO DURATION: 2HRS MARKS: 100

**INSTTRUCTION: ANSWER ALL QUESTIONS** DATE: 05/08/2022

**1. a.** Describe how organisms are classified in the taxonomic classification system. (3 marks)

**b.** What is the correct way to format a two-word scientific name? (3 marks)

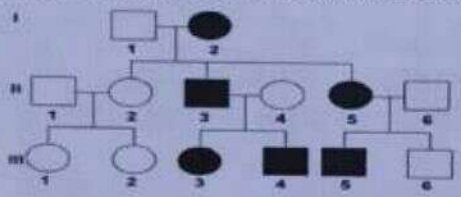
**c.** Distinguish between the following

**Traits and alleles** (2 marks)

**Codominance and incomplete dominance** (2 marks)

**Temporal isolation and hybrid breakdown** (2 marks)

**d.** The diagram shows the inheritance of freckles in a family. The allele for freckles (**F**) is dominant to the allele for no freckles (**f**).



Determine what kind of trait this is and give reasons for your answer (3 marks)

**e.** During his di-hybrid crosses between round yellow peas (RRYY) and wrinkled green peas (rryy), Mendel obtained a genetic ratio of 9:3:3:1 of the off-springs. Describe in detail how Mendel came up with the above ratio. (6 marks)

f. Discuss how genotypes and phenotypes are related. (4 marks)

**2. a. i.** cyanobacteria are also refered to as blue green algae because they contain three pigments, State the three pigments. (3 marks)

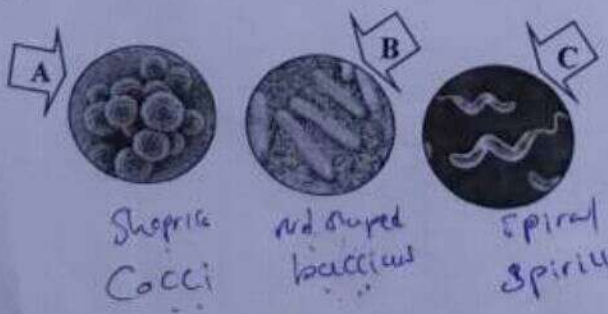
ii. Explain the function of Heterocyst of cyanobacteria? (2 marks)

b. State the differences between a dichotomous and poly-clave key? (2 marks)

**c.** Briefly give an account of the following categories of archaea: **Extreme halophiles, Methanogens** and **Extreme thermophiles** (3 marks)

**d.** Explain the common symptoms of gonorrhea. (3 marks)

**e.** State the types of bacteria labelled A, B, C (6 marks) **AND** give three examples of bacterial diseases (3 marks)




Shapes Cocci

Rod shaped bacilli

Spiral Spirillum

Sphere
Cholera
Tuberculosis

f. Harmful algal blooms of cyanobacteria grow out of control and produce toxic or harmful effects on people, fish, shellfish, marine mammals and birds. State three toxins released from cyanobacteria. (3 marks)

**3.a. i.** Explain why viruses are not considered as organisms and why they are not classified in the kingdom of life. (4 marks)

**ii.** Viruses are classified according to the nature of their genomes, state the three groups of viruses (3 marks)

**b. i.** State three functions of viral protein coat or **viral capsid** (3 marks)

**ii.** What is the difference between Prions and viroids. (2 marks)

**c.** HIV is a complex animal virus that causes AIDS.

**i.** How does this virus compromise the immune system of a person? (4marks)

**ii.** Describe the HIV infection at synthesis stage. (5marks)

**d.** COVID 19 affects different people in different ways. Most infected people will develop mild to moderate illness and recover without hospitalization. State the 2 common symptoms and 2 less common symptoms of COVID 19. (4marks)

**4. a.** State one disease caused by **Amoeba** (1 mark) and **Euglena** (1 mark)

**b.** state the differences between the following

Open and closed mitosis (2 marks)

Arbuscular mycorrhizae and ectomycorrhizae (2 marks)

autotrophism heterotrophism.

**c.** Discuss nutrition in euglena (3 marks), explain how this organism responds to **phototaxis** (3 marks)

heterotrophic

**d.** Both male and female mosquitoes feed on nectar, but why does the female mosquito need **a blood meal** from humans. (2 marks)

**e.** Explain in detail the life cycle of a plasmodium (7 marks)

**f.** Explain sexual reproduction in zygomycetes (4 marks)

gametang

**END OF EXAM**

THE COPPERBELT UNIVERSITY

SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

2021/2022 SESSIONAL EXAMINATION

BI 110: INTRODUCTORY BIOLOGY

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**DURATION: 3 HOURS** **100 MARKS**

**INSTRUCTIONS**

1. Clearly indicate your Group, Program and SIN on the Exam Booklet used.
2. There are seven questions in this paper and you are expected to answer a total of five questions.
3. Section **A is COMPULSORY** and Answer any **THREE** questions in section **B.**
4. Each question carries 20 marks.

## Section A- Answer ALL questions

**1a** In which situation(s) would the use of a scanning microscope be ideal, and why? (3marks)

**b.** What are the disadvantages of using the light and electron microscope? (4marks)

**c.** What are the structural and functional similarities and difference between mitochondria and chloroplasts? (4marks)

**d.** Describe the delivery system of the Golgi apparatus. (3marks)

**e.** Describe how the phase contrast microscope works (6 marks)

**2 a.** Explain the biological species concept and elaborate the problems associated with it. (4 marks)

**b.** What is the importance of using a binomial nomenclature system to name species? (3 marks). A Tiger whose scientific name is **PANTHERA TIGRIS**. Write its name in accordance with the system of binomial nomenclature (2 marks)

**c.** Define the following terms: (i) **couplet** (ii) **lead** (iii) **character state**(iv) **taxon** (v) **Species** (5 marks)

**d.** Write brief notes on the following types of bacteria; **filamentous bacteria, budding bacteria** and **spiral bacteria.** (6 marks)

## Section B- Answer any Three (3) questions

**3 a.** What are the functions of the following structural components of viruses (i) **Capsid** (ii) **Nucleic acid core** (iii) **Spiral protein sheath** (iv) **Tail fibres** (4 marks)

**b.** Describe how HIV destroys CD4 cells in human beings (3 marks)

**c.** Explain what happens at viral assembly point stage (4 marks)

**d.** Explain the function of each cell **check point** in the cell cycle. (6 marks)

**e.** Describe the composition of plant cell walls (3 marks)

**4 a.** After a cow is given antibiotics to treat an infection, a vet gives the animal a drink of "gut culture" containing various prokaryotes. Why is this necessary? (3 marks)

**b.** Compare the structure of a fat (triglyceride) with that of a phospholipid. (4marks)

**c.** Why are human sex hormones considered lipids? (3marks)

**d.** Compare and contrast DNA and RNA nucleotide structures. (6marks)

e. What parts of a polypeptide participate in the bonds that hold together secondary structure? (1 mark) Tertiary structure? (1 mark)

f. The molecular formula for glucose is $C_6H_{12}O_6$. What would be the molecular formula for a polymer made by linking ten (10) glucose molecules together by dehydration reactions? (2marks)

$CH_2O$ $C_{60}H_{120}O_{60}$

5 a. Pea plants heterozygous for flower position and stem length (BbTt) are allowed to self-pollinate, and 400 of the resulting seeds are planted. Draw a Punnett square for this cross. How many offspring would be predicted to have terminal flowers and be dwarfs? (6marks)

b. In Mendel's pea plant crosses, some pea plants were self-pollinated. Is self-pollination considered asexual or sexual reproduction? Explain.(2marks)

c. Distinguish between pleitropy and lethality in genetics (2 marks)

d. Explain why Mendel opted for the pea plant to conduct his experiments (3marks)

e. In what ways do dominant traits differ from recessive ones? (2 mark)

f. Explain which generation of pea plants are referred to as $F_2$ in Mendel's experiment? (2marks)

g. Define a pedigree and explain key points on how to read it. (3marks)

6.a. State two features of the following animals Oligochaeta, Hirudinea, Polychaeta (6 marks)

b. Discus the life cycle of schitosoma (4 marks)

c. State the function of the following parts of the snail Mantle, Radula and mantle (6 marks)

d. Explain feeding in earthworms (4 marks)

7. a. Draw and label all the parts of an insect leg, what is the function of the coxa? (4 marks)

b. Describe the how the thorax and abdomen are segmented in Order hymenoptera (4 marks)

c. List three types of insect mouthparts (3 marks)

d. Give one example of insects in the following orders; orthoptera, Lepidoptera, Isoptera. (3 marks)

e. What are the key distinctive features of amoeba, state the functions of the ectoplasm in Amoeba. (4 marks)

f. Explain nutrition in basidiomycetes (2 marks)

**END OF EXAMINATION**

THE COPPERBELT UNIVERSITY

SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

BI 110 – INTRODUCTORY BIOLOGY TEST 1 (2021) DURATION: 2HRS

**Instruction: There are three (3) questions in this paper, Answer all Questions**

1) ) Briefly describe how you would use a light microscope to view a slide. (5 marks)

**b)** Compare the advantages and disadvantages of light and electron microscopes. (4marks)

**c)** What does it mean when a microscope has a resolution of 0.2 nm? (2marks)

**d)** Briefly explain how the invention of the microscope is important to life sciences.(6 marks)

**e)** With clear illustrations explain why different kinds of bacteria react differently to gram stain. (6marks)

**f)** Give an explanation why basic dyes are more commonly used than acidic dyes in staining. (2marks)

**2. a)** Explain the importance of smooth endoplasmic reticulum to human beings? (3 marks)

**b)** How do prokaryotic and eukaryotic cells differ? (4 marks)

**c)** State the key principles of the cell theory? (3 marks) And mention the scientists who were involved in its formulation? (3 marks)

**d)** Outline the gram stain procedure (6 marks).

**e)** Explain the functions of **lignin, middle lamella, plasmodesmata** and **granum** in plant cells (4 marks)

**f)** Describe how membrane receptors transmit messages across the cell membranes (5 marks)

3. **a)** What is the role of filamentous temperature sensitive mutant (Ftsz) in prokaryotic cell division? (2 marks)

**b)** What is the major difference between metaphase of mitosis and metaphase of meiosis? (2 marks)

**c)** Explain how a tumor suppressor gene (TSG) prevent the development of cancerous cells (4 marks)

**d)** How does meiosis contribute to the genetic **variation** of children born from the same mother and father? Explain. (6 marks)

**e)** Explain why histones are positively charged. (3 marks)

**f)** Distinguish between autosome chromosomes and sex chromosomes (2 marks)

**g)** What causes Aneuploidy in cell division? Explain the consequences of Aneuploidy. (3 marks)

**h)** How do chromosomes condense? (3 marks)

THE COPPERBELT UNIVERSITY

SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

2020/2021 SESSIONAL EXAMINATION

BI 110: INTRODUCTORY BIOLOGY

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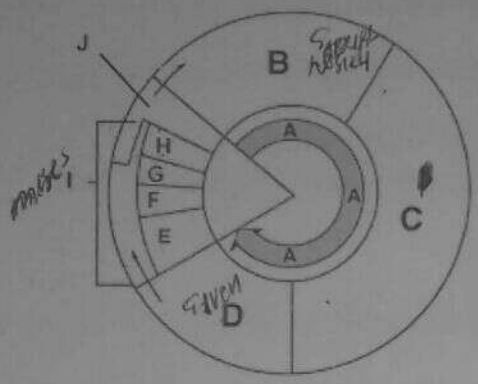
**DURATION: 3 HOURS** **100 MARKS**

**INSTRUCTIONS**

1. Clearly indicate your group/program and Student ID. Number on the Exam Booklet used.
2. There are seven questions in this paper.
3. Answer **ALL** in section **A** and any **THREE** in section **B**
4. Each question carries 20 marks

**SECTION A: Answer ALL questions**

**1.** Study the diagram of the cell cycle during mitosis below.




a) Label the parts labelled B to J (9 marks)
b) There are 3 checkpoints in the cell cycle. Mention the names of these check points and state the importance of each of these points in the cell cycle (6 marks)

c. Distinguish cytokinesis from karyokinesis (2 marks)

d Explain how the p53 gene prevents cancer in somatic cells of human beings (3 marks)

**2.** a. Pea plants heterozygous for flower position and stem length (AaTt) are allowed to self-pollinate,and 400 of the resulting seeds are planted. Draw a Punnett square for this cross. (8 marks)

b. Draw and label the following symbols found on a family pedigree. (4marks)

i) Deceased individual
ii) Adopted individual
iii) Twins
iv) Miscarriage

c. Explain the law of independent assortment and describe how it works. (4 marks)

d.Give two examples of **globular proteins** and **fibrous proteins** (4 marks)

**SECTION B Answer any THREE questions**

3.a. Using nucleotides, Explain how phosphodiester bonds are formed. (6 marks)

b. What is hybrid breakdown? What causes hybrid breakdown? (4 marks)

c. Give a detailed example of mechanical isolation. (3 marks)

d. distinguish between a polyclave key and a dichotomous key. (4 marks)

e. The scientific name for ground nuts is **ARACHIS HYPOGAEA,** Explain how this scientific name is supposed to be properly written. (3 marks)

4. **a.** What is the difference between Magnification and Resolution? (2 marks)

b. Outline the gram stain procedure (6 marks)

c. Explain how cell wall structure determines the gram stain reaction of a bacterium (3 marks)

d. Explain the role of the following in the gram stain procedure:
(i) Primary stain (ii) Counter-stain (iii) Mordant (iv) Decolorizing agent (4 marks)

e. Briefly explain how the invention of a microscope is important to life sciences (5 marks)

5. a) What is the difference between the lytic and the lysogenic cycles of viruses. Are viruses prokaryotic or eukaryotic? (4 marks)

b). Discuss the function following parts of the virus:

**Spikes** (2 marks)

**nucleic acid** (2 marks)

**viral RNA polymerase** (2 marks)

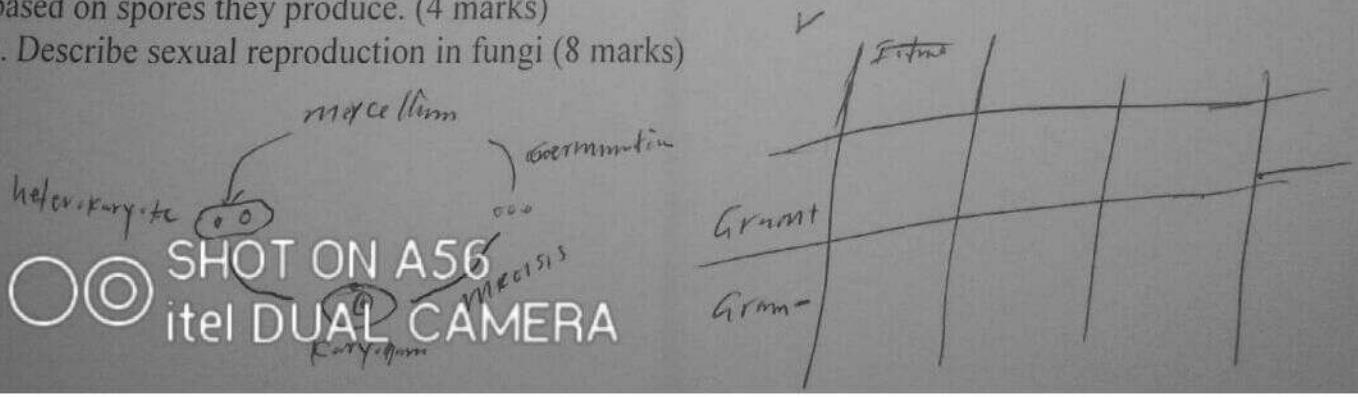
c). What type of organisms do prions and viroids infect? (2 marks)

d). Describe the mechanism of HIV infection once it enters the human body (8 marks)

6. a) What is the importance of mychorrizhae in agriculture? Explain the two types of mychorrizhae exhibited by fungi (8 marks)

b). Fungi can also be classified based on spore formation, discuss the five categories of fungi based on spores they produce. (4 marks)

c. Describe sexual reproduction in fungi (8 marks)



7. a. Give three points of evidence supporting the theory that mitochondria and chloroplasts may have arisen from prokaryotic organisms. (6 marks)

b. Describe how membrane receptors transmit messages across the cell membranes (3 marks)

c. What are the key principles of the cell theory (3 marks)

d. Explain the importance of the smooth endoplasmic reticulum in the cells? (2 marks)

e. Describe (all the stages) how a transmission electron microscope (TEM) works. (6 marks)

**END OF EXAM**

1. What property distinguished Mendel's investigation from previous studies?

a) Mendel used true-breeding pea plants.
b) Mendel quantified his results.
c) Mendel examined many different traits.
d) Mendel examined the segregation of traits

2. The F1 generation of the monohybrid cross purple (PP) × white (pp) flower pea plants should

a) all have white flowers.
b) all have a light purple or blended appearance.
c) all have purple flowers.
d) have . purple flowers, and . white flowers

3. The F1 plants from the previous question are allowed to selffertilize.The phenotypic ratio for the F2 should be *

a) all purple.
b) 1 purple:1 white.
c) 3 purple:1 white.
d) 3 white:1 purple.

4. Which of the following is NOT a part of Mendel's five-element model? *

a) Traits have alternative forms (what we now call alleles).
b) Parents transmit discrete traits to their offspring.
c) If an allele is present it will be expressed.
d) Traits do not blend

5. An organism is determined by its…….. *

a) genotype; phenotype
b) phenotype; genotype
c) alleles; phenotype
d) genes; alleles

6. Phenotypes like height in humans, which show a continuousdistribution, are usually the result of *

a) an alteration of dominance for multiple alleles of a single gene.
b) the presence of multiple alleles for a single gene.
c) the action of one gene on multiple phenotypes.
d) the action of multiple genes on a single phenotype

7. The experiments with nutritional mutants in Neurospora by Beadle and Tatum provided evidence that *

a) bread mold can be grown in a lab on minimal media.
b) X-rays can damage DNA.
c) cells need enzymes.
d) genes specify enzymes

8. What is the central dogma of molecular biology? *

a) DNA is the genetic material.
b) Information passes from DNA directly to protein.
c) Information passes from DNA to RNA to protein.
d) One gene encodes only one polypeptide

9. In the genetic code, one codon *

a) consists of three bases.
b) specifies a single amino acid.
c) specifies more than one amino acid.
d) Both a and b are correct

10. Eukaryotic transcription differs from prokaryotic in that *

a) eukaryotes have only one RNA polymerase
b) eukaryotes have three RNA polymerases.
c) prokaryotes have three RNA polymerases.
d) Both a and c are correct

11. All of these obeys Mendel's laws except *

a) Linkage
b) Independent assortment
c) dominance
d) Purity of gametes

12. The geometrical device that helps to find out all the possible combinations of male and female gametes is called *

a) Punnete square
b) Bateson square
c) Mendel square
d) Morgan square

13. The title of Mendel's paper while presenting at Brunn Natural History Society in 1865 was *

a) Laws of inheritance
b) Laws of heredity
c) Experiments of pea plants
d) Experiments in plant hybridization

14. In a dihybrid cross, if you get 9:3:3:1 ratio it denotes that: *

a) The alleles of two genes are interacting with each other.
b) It is a multigenic inheritance.
c) It is a case of multiple allelism.
d) The alleles of two genes are segregating independently

15. Which of the following traits studied by Mendel in garden pea is a dominant trait? *

a) Terminal flowers.
b) Inflated pod.
c) Green colour of seed.
d) Yellow colour of pod

16. When 'Aa' is crossed with 'aa', (A is dominant over a) *

a) all the offspring will have dominant phenotype.
b) all the offspring will have recessive phenotype.
c) 50% of offspring will have dominant phenotype and 50% will have recessive phenotype.
d) 75% of offspring will have dominant phenotype and 50% will have recessive phenotype.

17. A heterozygous violet-flowered pea plant is crossed to another homozygous violet-flowered pea plant. What percent of the progeny plants will have the recessive trait, i.e., white flowers? *

a) 0%
b) 25%
c) 50%
d) 75%

18. Mutations used in agriculture are commonly *

a) induced
b) spontaneous
c) lethal
d) recessive and lethal

19. 'Lac operon' in E. coli, is induced by *

a) I' gene
b) promoter gene
c) P-galactosidase
d) lactose.

20. Diploid chromosome number in humans is *

a) 46
b) 44
c) 48
d) 42

21. What was the most significant conclusion that Gregor Mendel drew from his experiments with pea plants? *

a) There is considerable genetic variation in garden peas.
b) Traits are inherited in discrete units and are not the result of "blending."
c) Recessive genes occur more frequently in the F1 generation than do dominant ones.
d) Genes are composed of DNA.

22. Mendel continued some of his experiments into the F2 or F3 generation in order to *

a) obtain a larger number of offspring on which to base statistics
b) observe whether or not a recessive trait would reappear
c) observe whether or not the dominant trait would reappear
d) distinguish which alleles were segregating

23. A sexually reproducing animal has two unlinked genes, one for head shape (H) and one for tail length (T). Its genotype is HhTt. Which of the following genotypes is possible in a gamete from this organism? *

a) Hh
b) HhTt
c) T
d) HT

24.Mendel's observation of the segregation of alleles in gamete formation has its basis in which of the following phases of cell division? *

a) prophase I of meiosis

b) anaphase II of meiosis
c) metaphase II of meiosis
d) anaphase I of meiosis

25. Mendel's law of independent assortment has its basis in which of the following events of meiosis I? *

a) synapsis of homologous chromosomes
b) crossing over of homologous pairs of chromosomes
c) alignment of pairs of homologous chromosomes along the middle of the cell
d) the division of cells at telophase

26. Skin color in a certain species of fish is inherited by a single gene with four different alleles. How many different types of gametes would be possible in this organism? *

a) 2
b) 4
c) 8
d) 16

27. Albinism is a recessive trait. A man and woman both show normal pigmentation, but both have one parent who has albinism (without melanin pigmentation). What is the probability that their first child will have albinism? *

a) 0
b) 1/2
c) 1/4
d) 1

28. Gray seed color in peas is dominant to white. Assume that Mendel conducted a series of experiments where plants with gray seeds were crossed among themselves, and the following progeny were produced: 302 gray and 98 white. What is the most probable genotype of each parent? *

a) GG × gg
b) Gg × Gg
c) GG × Gg
d) gg × Gg

29. Which of the following inheritance patterns describes the ability of a single allele to have multiple phenotypic effects? *

a) incomplete dominance
b) multiple alleles
c) pleiotropy
d) epistasis

30. Radish flowers may be red, purple, or white. A cross between a red-flowered plant and a white-flowered plant yields all-purple offspring. The part of the radish we eat may be oval or long, with long being the dominant trait. If true-breeding red long radishes are crossed with truebreeding white oval radishes, the F1 will be expected to exhibit which of the following phenotypes? *

a) red and long
b) white and long
c) purple and long
d) purple and oval

31. If biological species are defined in terms of reproductive compatibility, the formation of a newspecies hinges on *

a) gene flow
b) reproductive isolation
c) hybrid formation
d) gene pool expansion

32. Three populations of crickets look very similar, but the males have courtship songs that sound different. What function would this difference in song likely serve if the populations came in contact? *

a) a temporal reproductive isolating mechanism
b) a postzygotic isolating mechanism
c) a behavioral reproductive isolating mechanism
d) a gametic reproductive isolating mechanism

33. Which statement describes unity within a species? *

a) species can be distinguished by body shape and other structural features.
b) Members have the potential to interbreed in nature and produce viable, fertile offspring.
c) A species is described in terms of its interaction with living and non-living environment.
d) The DNA sequence lacks similarities.

34. Which of the various species concepts distinguishes two species based on the degree ofgenetic exchange between their gene pools? *

a) genetic

b) ecological
c) biological
d) morphological

35. The production of sterile mules by interbreeding between female horses (mares) and male donkeys (jacks) is an example of *

a) reduced hybrid viability
b) hybrid breakdown
c) reduced hybrid fertility
d) mechanical isolation

36. Plant species 'A' has a diploid number of 12. Plant species 'B' has a diploid number of 16. Anew species, 'C', arises as an allopolyploid from 'A' and 'B'. The diploid number for species 'C' would probably be *

a) 14
b) 16
c) 28
d) 56

37. Organizing taxonomic information in logical classification is called *

a) Systematics
b) Phenetic
c) Phylogenetic
d) Dendogram

38 . Name the organization which provides rules for naming animals. *

a) ICZN
b) ICN
c) ICBN
d) IBM

39. Arrange the following in the correct order (1 ) Class (2) Kingdom (3)Phylum (4)Order (5)Genus (6)Family (7)Species *

a) 6, 2, 4, 1, 5, 7, 3
b) 7, 1, 3, 4, 5, 6, 1
c) 1, 2, 3, 4, 5, 6, 7
d) 2, 3, 1, 4, 6, 5, 7

40. The book which has left the maximum influence on the thinking of taxonomists is *

a) Species Plantarum
b) Origin of Species
c) Systema Naturae
d) Historia Plantarum

41. The term taxon was given by *

a) Meyer
b) Linnaeus
c) Lamarck
d) De Candolle

42. New Systematics differs from Classical Systematics in employing *

a) Experimental Taxonomy
b) Biochemical and Cytotaxonomy
c) All biological parameters
d) Numerical Taxonomy

43. Genetic drift is *

a) is due to chance events
b) can involve a loss of alleles from the population
c) results in a change in allele frequencies from generation to generation
d) all of the above

44. For classification of angiosperms floral characters are preferred over vegetative characters because *

a) Reproductive axis shows a large degree of prominent variations
b) Floral characters show less variations than vegetative traits
c) Shape of flower is diagnostic feature in many families
d) It is more handy to study floral features than vegetative characters

45. Several genera resembling one another in their major anatomical and reproductive characters are placed together in *

a) Species
b) Genus
c) Family
d) Order

46. Species having many subspecies are *

a) Monotypic/Microspecies
b) Allopatric
c) Sibling
d) Polytypic/Macrospecies

47. Natural system of classification of plants differs from artificial system of classification in *

a) taking in to account only one vegetative character
b) taking in to account only one floral character
c) taking in to account all the similarities between plants
d) all of the above

48) one of the best methods for understanding general relationships of plants is *

a) Cytotaxonomy
b) Experimental taxonomy
c) Numerical taxonomy
d) Chemotaxonomy

49. Panthera is a taxon at which level? *

a) order
b) family
c) phylum
d) genus

50. What is the primary role of a mushroom's underground mycelium? *

a) absorbing nutrients
b) anchoring
c) sexual reproduction
d) asexual reproduction

51. Which of the following is the least limiting level of classification? *

a) Class
b) Genus
c) Order
d) Species

52. One type of organism has some photosynthetic members but is primarily unicellular. They do have a true nucleus and organelles. Into which kingdom does this organism most likely belong? *

a) inheritance of genes
b) habitat variation
c) genes affecting reproductive fitness
d) genetic variation

53. One type of organism has some photosynthetic members but is primarily unicellular. They do have a true nucleus and organelles. Into which kingdom does this organism most likely belong? *

a) Protists
b) Fungi
c) Plantae

d) Animalia

54. Which of the following traits do chimpanzees and pigeons have in common? *

a) Lungs, claws, fur
b) Jaws, lungs
c) Fur, mammary glands
d) Jaws, lungs, claws/nails

55. When proceeding down the classification system from kingdom to species, there is increasing *

a) Activity
b) Diversity among individuals
c) Individuality
d) Similarity among individuals

56. Which modern classfication technique is based upon similar bone structures *

a) Comparative Anatomy
b) Comparative biochemistry
c) Comparatve embryology
d) Phylogeny

57. The evolutionary history of an organism is referred to as which of the following? *

a) Cladistics

b) Classification
c) Phylogeny
d) Taxonomy

58. Which one of the following is incorrect when writing the scientific name of an organism? *

a) the name can be underlined
b) the name can be in italics
c) the generic name starts with an upper case letter
d) the specific name starts with an upper case letter

59. Which one of the following taxonomic groups will contain the highest number of species?

a) class
b) order
c) phylum
d) family

60. When a gene has several different versions that create slightly different gene products, each version of the gene is called *

a) heterozygote
b) a sister chromatid
c) an allele
d) mutation

# THE COPPERBELT UNIVERSITY

## SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

### DEPARTMENT OF BIOLOGICAL SCIENCES

2019/2020 SESSIONAL EXAMINATION

BI 110: INTRODUCTORY BIOLOGY

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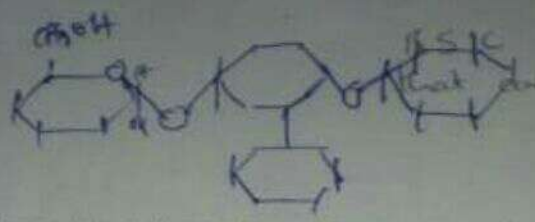
**DURATION: 3 HOURS** **100 MARKS**

## INSTRUCTIONS

1. Clearly indicate your group/program and Student ID. Number on the Exam Booklet used.
2. There are seven questions in this paper. Answer **Any FIVE (5)** questions.
3. Each question carries 20 marks



1. a) During his di-hybrid crosses between round yellow peas (RRYY) and wrinkled green peas (rryy), Mendel obtained a genetic ratio of 9:3:3:1 of the off-springs. Describe in detail how Mendel came up with the above ratio. (10 marks)

b) What are the problems in applying the biological species concept? (5 marks)

c) Explain the **Economic** importance of protists. (5 marks)

2. a) Describe the process of chromosome condensation in eukaryotes. (6 marks)

b) Using your knowledge in cell division, discuss why despite having the same father and mother all the children have variations in the genetic makeup (8 marks)

c) Explain how the p53 gene prevents cancer in human beings. (6 marks)

3. a) Define the following terms, Taxon, character state, taxonomy, species concept, reproductive isolation. (5 marks)

b) HIV is a retro-virus that attack the CD4+ cells particularly T-helper cells which are responsible for mounting the response against foreign invaders. Explain in detail how this virus multiplies once it enters the T-helper cells. (10 marks)

c) Explain the importance of mycorrhizae in agriculture and forestry. (5 marks)

4. a) Give a description of the two classes of starch. (4marks)

(b) After a cow is given antibiotics to treat an infection, a veterinary officer gives the animal a drink of "gut culture" containing various prokaryotes. Why is this necessary? (6marks)

c) Compare the structure of a fat (triglyceride) with that of a phospholipid. (3marks)

d) Why are fats considered to have more energy than carbohydrates? (7marks)

5. a) Draw and label the general structure of an amino acid. (5marks)

b) What parts of a polypeptide participate in the bonds that hold together the....

i) Secondary structure? (1mark)

ii) Tertiary structure? (1mark)

c) Briefly describe the primary structure of a protein (3marks)

d) Using diagrams compare the structures of RNA and DNA nucleotides (5marks)

**c) i)** In a DNA double helix, a region along one DNA strand has this sequence of nitrogenous bases: 5'-TAGGCCT-3'. Copy this sequence, and write down its complementary strand, clearly indicating the 5' and 3'ends of the complementary strand (2marks)

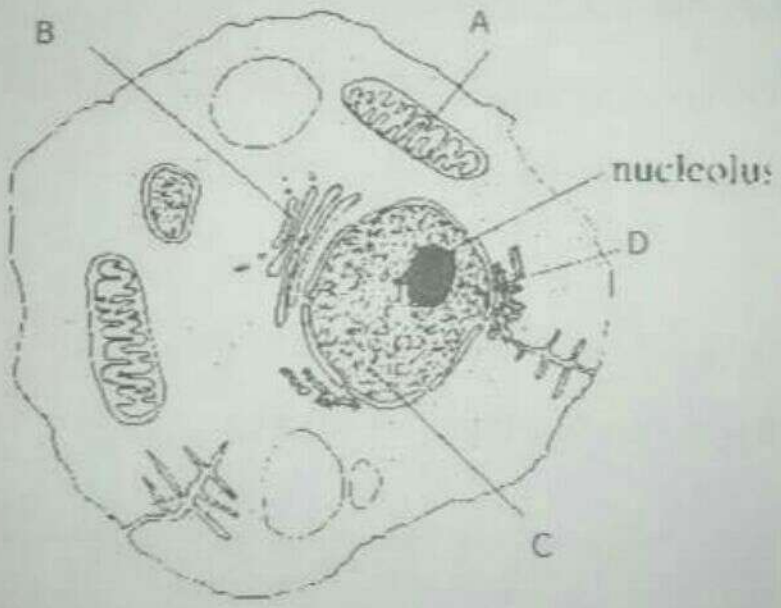
**ii)** Draw the structural formular of the nitrogenous base Cytosine (3marks)

**6. a)** Explain the functions of a cell wall in plants. (3 marks)

**b)** How do prokaryotic and eukaryotic cells differ? (6marks)

**c)** Describe the similarities between enzymes and receptors. (4 marks)

**d)** Study the diagram below. Identify organelle B and what are its functions in a cell? (7marks)




**7. (a)** Describe how membrane receptors transmit messages across the cell membranes. (6 marks)

**(b)** Discuss the primary functions of membranes. (6 marks)

**(c)** Describe what makes up the cytoskeleton of eukaryotic cells and its functions. (8 marks)

**END OF EXAMINATION**

THE COPPERBELT UNIVERSITY

SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

BI 110 – INTRODUCTORY BIOLOGY TEST 1 (2019) DURATION: 2HRS

**Section A: Answer all Questions**

1. During the S – phase in animal cells, DNA replication takes place in the.....while Centriole duplication takes place in the ..... . (2 marks)
2. The full set of DNA instructions in a cell is described as..... (2marks)
3. Mitosis is an ..... division, while meiosis is a..... division. (2 marks)
4. Stage between two meiotic divisions is ..... (2marks)
5. Asexual reproduction from a single parent is based on ..... (2 marks)
6. Meiosis usually results in the formation of ..... genetically, and ..... cells.
7. The ploidy of somatic cells is ..... and that of gamete cells is..... (2 marks)
8. In which cell organelle would RNA polymerase be found? (2marks)
9. The endoplasmic reticulum is an extension of which membrane? (2marks)
10. What is the role of the contractile vacuole in a protist? (2marks)
11. Which type of microscope would you use to study (a) the changes in shape of a living white blood cell and (b) the details of surface texture of a hair? (2marks)
12. What structure in eukaryotic cells is more easily seen in DIC than in bright-field microscopy? (2marks)
13. What organelle serves as a primary "packaging" area for molecules that will be distributed throughout the cell? (2marks)
14. The head of a glycerophosholipid is made up of.....(2marks)
15. The hydrolysis of lipids gives rise to.....(2marks)
16. When an amino acid is ionised, the COOH and $NH_2$ change to.....(2marks)
17. What products are formed when ATP is hydrolysed? (2marks)
18. The repeating units in both DNA and RNA are called.....(2marks)
19. In eukaryotes fatty acid breakdown occurs in the.....(2marks)
20. Name two isomers of glucose.....(2marks)

**Section B Answer any five Questions**

1. There are 3 check points in the cell cycle. Briefly explain the importance of each of these check points in the cell cycle. (4 marks)

2. Explain the significance of crossing over. (4 marks)

3 A classmate proposes that mitochondria and chloroplasts should be classified in the endomembrane system. Argue against the proposal. (4 marks)

4 Mitochondria and chloroplasts are sometimes referred to as 'cells within cell'. However, this does not make them completely autonomous. Give reasons why this is so. (4 marks)

5 Describe the characteristics of two poly-unsaturated fatty acids. (4 marks)

6 Describe the two classes of starch, their linkages and branching type. (4 marks)

ALL THE BEST

BI 110: INTRODUCTORY BIOLOGY 2019 TEST 1

Marking Scheme

SECTION A

1. Nucleus; Cytoplasm
2. Genome
3. *Equal; Reduction*
4. *Interkinesis*
5. *Mitosis*
6. Four (4) ; Different/ unidentical/non identical ***(the question was not asking on the ploidy of the cells, in which case they are the same or haploid)***
7. Diploid(y) / 2n ; Haploid(y) / n ***(46 or 23 is wrong as question not restricted to human cells)***
8. The nucleolus
9. Nuclear envelope 'outer membrane'
10. Osmoregulation
11. . (a) Light microscope, (b) scanning electron microscope
12. Nucleus
13. Golgi apparatus
14. phosphate ($PO_4^-$) and cholin
15. Fatty acids and glycerol
16. COO- and $NH_3^+$
17. Energy + ADP + Pi
18. Nucleotides
19. Mitochodria (walls)
20. Galactose, fructose

SECTION B

1.M – check point /mitosis check point OR spindle assembly check point

Checks for **correct attachment of chromosomes to the spindle**; (1 mark)

G1- checks point for **DNA damage;** *and any one of* **cell size, nutrients, and growth factors;** (2 marks) G2 - check point for **DNA replication** and **cell size.** (1 mark)

TOTAL = 4 MARKS

2. The non-sister chromatids in a homologous pair/ homologous chromosomes exchange genetic *material resulting in*

- *New allele combinations in the daughter cells/* new combinations of genes

- *Source of* (creates) variation/ genetic diversity in the offspring 4 MARKS

3. Mitochondria and chloroplasts are not derived from the ER, nor are they connected physically or via transport vesicles to organelles of the endomembrane system. Mitochondria and chloroplasts are structurally quite different from vesicles derived from the ER, which are bounded by a single membrane.

4. Most of the genes that encode the enzymes used in oxidative metabolism (mitochondria) and chloroplast components are located in the cell nucleus. --The components required for ~~mitochondrial division are encoded by genes in the nucleus and are translated into proteins by~~ *cytoplasmic ribosomes*

5. -They have more double bonds in their fatty acid chains, this causes the fatty acid chains to bend.

- They are liquid at room temperature.

-They have low melting points.

-There is no free rotation in the C-C bonds because of double bonds.

6. The two types of starch: **Amylopectin** is highly branched, leaving more surface area available for digestion. It's broken down quickly, which means it produces a larger rise in blood sugar (glucose) and subsequently, a large rise in insulin.

**Amylose** is a straight chain, which limits the amount of surface area exposed for digestion. This predominates in RS. Foods high in amylose are digested more slowly. They're less likely to spike blood glucose or insulin.

In amylose these are linked (1⟶4), with the ring oxygen atoms all on the same side, whereas in amylopectin about one residue in every twenty or so is also linked -(1⟶6)- forming branch-points.

BANDA PAUL
GROUP B.

**BI 110 TEST 2** 2/09/2019 DURATION 1hr15min **ANSWER ANY TWO (2) QUESTIONS ONLY**

**1.** a) Define the following terms: Hybridization, epigenetic factors. (2 marks)

b) What is the difference between the law of independent assortment and the law of segregation? (2 marks)

c) During his dihybrid experiments on yellow round peas and wrinkled green peas, Mendel noticed four (4) phenotypic categories of the F2 progeny with the ratio 9:3:3:1.

i) Explain and show how he came up with the 9:3:3:1 ratio (8 marks)
ii) List the four phenotypic categories he noted during the experiments. (2 marks)

d) Mr. James has three **tall brown** children; however his family questions whether the fourth child who is **dark** and **short** is his. Both Mr. James and his wife are heterozygous **brown** and **tall.**

i. What law can be applied in solving such an issue? (1 mark)

ii. Explain and show how you would help Mr. James to understand the variation in his family (4 marks)

iii. What are the chances of Mr. James having a similar child in future? (2 marks)

f) What are lethal genes? Describe and show how lethal genes cause death in unborn babies and after birth. (4 marks)

**2.** a) What are characteristics of a species according to the Biological Species Concept? (4 marks)

b) State any 4 operating mechanisms in nature which ensure species are isolated? (4 marks)

c) Biological classification uses ranks. State the most inclusive rank and least inclusive rank. (2mark)

d) What are the taxonomic ranks used to name an organism? (2 marks)

e) State any two reasons for using scientific names? (2 marks )

f) What is a dichotomous key? (3 marks)

g) Explain the following terms as used in biology: Taxonomy (2 marks) Morphology (2 marks) Phylogeny (2 marks) character state (2 marks)

**3.** a) Write the formula for a monosaccharide that has three carbons. (2 marks)

b) Give an example of each of the following carbohydrates:

i. Structural (2 marks) , ii. storage (2 marks) iii. transport (1 mark)

c) A dehydration reaction joins two glucose molecules to form maltose. The formula for glucose is $C_6H_{12}O_6$. What is the formula for maltose? (2marks)

d). What are the four main classes of large biological molecules? Which class does not consist of polymers (5 marks)

e) What parts of a polypeptide participate in the bonds that hold together a) secondary structure? b) Tertiary structure? (2marks)

f) A region along one DNA strand has this sequence of nitrogenous bases: 5'-TAGGCCT-3'. Copy this sequence, and write down its complementary strand. (3marks)

g) Draw and label a DNA nucleotide indicating the position and number of carbons. (6 marks)

ALL THE BEST

MAZIT

THE COPPERBELT UNIVERSITY

SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

**2018/2019 SESSIONAL EXAMINATION**

**BI 110/ INTRODUCTORY BIOLOGY**

**DURATION: 3 HOURS**

**TOTAL: 75 MARKS**

**INSTRUCTIONS**

i) ANSWER THREE QUESTIONS IN TOTAL.
ii) QUESTION **ONE (1)** IS COMPULSORY.
iii) ANSWER **ANY TWO (2)** QUESTIONS FROM THE REST.
iv) EACH QUESTION CARRIES 25 MARKS

1.a) Define the following:

i. Magnification (2marks)
ii. Total magnification (2marks)
iii. Resolution (2marks)
iv. A dark field microscope (2marks)

b) Briefly explain how the following microscopes work:
i. Atomic force microscope (5marks)
ii. Scanning tunneling microscope (5marks)

c) i. Briefly explain the Gram Stain procedure. (5marks)
ii. What is the reason for doing the gram stain procedure? (2marks)

2. a) State three components of the cytoskeleton (3 marks)
b) Describe what happens at prophase I during meiosis. (6marks)
c) What is the P53 gene? Explain how the **p53 gene** works and how it prevents cancer in somatic cells. (5 marks)
d) Briefly describe bacterial cell division (5marks)
e) There are 3 check points in the cell cycle. Briefly explain the importance of each of these check points in the cell cycle. (6marks)

3. a) Define the following terms: Trait, Genome and Variation. (3 marks)

b) What is the difference between an allele and a gene? (2 marks)

c) Hemophilia is a sex-linked trait. Explain. (1 mark)

d) A non-hemophiliac father and a hemophiliac mother have a son. What is the percentage chance that the son will be a hemophiliac? (3marks)

e) For any gene with a dominant allele A and recessive allele a, what proportions of the offspring from an **AA** and **Aa** cross are expected to be homozygous dominant, homozygous recessive, and heterozygous? (4 marks)

f) Mr. Mwape has three **tall brown** children; however, his family questions whether the fourth child who is **dark** and **short** is his. Both Mr. ~~James~~ Mwape and his wife are heterozygous **brown** and **tall.**

i. Explain and show how you would help Mr. Mwape to understand the variation in his family by using a 16 punnet square (8 marks)

g) What are lethal genes? Describe and show how lethal genes cause death in unborn babies and after birth. (4 marks)

4. a) i) What is the biological species concept? (2 marks)

ii. Why can't it be applied to bacteria? (3 marks)

b) State any 4 operating mechanisms in nature which ensure species are isolated? (4 marks)

c) A student writes the scientific name for the housefly as **musca domestica.** What rules can he use to write the correct scientific name? (4 marks)

e) Distinguish the features of binomial and polynomial keys. (6 marks)

f) Explain the following terms as used in Biology: Taxonomy (2 marks) Taxon (2 marks) Phylogeny (2 marks)

5. a) Write the formula for a monosaccharide that has five carbons. (2 marks)

b) Give examples of each of the following carbohydrates: Structural (2 marks) , storage (2 marks) transport (1 mark)

d). Using a labeled diagram, Explain how a disaccharide is formed. (7marks)

e) What parts of a polypeptide participate in the bonds that hold together a) secondary structure? b) Tertiary structure? (2marks)

f) A region along one DNA strand has this sequence of nitrogenous bases: 5'-TAGGCCT-3'. Copy this sequence, and write down its RNA complementary strand. (3marks)

g) Describe the two classes of starch, their linkages and branching type. (6 marks)

—GLASSMAN—

**THE COPPERBELT UNIVERSITY**

**SCHOOL OF MATHEMATICS AND NATURAL SCIENCES**

**BI 110 TEST 2 DATE: 05/06/2018**

**INSTRUCTION: ANSWER ALL QUESTIONS** **DURATION: 2 HOURS**

## Section A (40 marks) one/two word answers

1. The plasmodium can only replicate and release gametocyte after it attacks what type of the cell? (2 marks)
2. Agar is a glue-like substance used in bacterial culturing, which type of algae is agar extracted from? (2 marks)
3. A taxon consisting of closely related species is called.....(2 marks)
4. Mosquito saliva of a female anopheles contain a plasmodium in the form of .....(2 marks)
5. Respiration in amoeba takes place in the.....(2 marks)
6. A group of organisms at any particular level in a classification system is called.....(2 marks)
7. In paramecium and amoeba, osmoregulation is through the use of.....(2 marks)
8. In the current taxonomic system, families are grouped into.....(2 marks)
9. The enzyme that is unique to retroviruses is.....(2 marks)
10. Prions cause disease when they .....(2 marks)
11. A type of ecological relationship called ..... involves one organism living at the expense of another organism.( 2 marks)
12. Organisms most likely to be found in extreme environments are..... (2 marks)
13. Paired rod-shaped bacteria is called.....(2 marks)
14. Fundamental genes that bring about the death of their possessor are called...(2 marks)
15. Genes bringing change in more than one character are called.....(2 marks)
16. Two genes located on the same chromosome locus are known as.....(2 marks)
17. Homologous pair forms a .....(2 marks)
18. Allele affecting the survival of an organism in its homozygous state is.. (2 marks)
19. Which group of Archaea is mostly found in the guts of termites and ruminants?( 2 marks)
20. A Virus that attacks bacteria is called..... (2 marks)

## Section B (40 marks) short answers

1. Explain the mechanism of a plasmodium infection (4 marks)
2. List 4 features of Euglena(4 marks)
3. What is the species concept? And why can't it be applied to Achaea? (4 marks)
4. What are the similarities and differences between viruses and viroids? (4marks)
5. How can organisms such as Halobacterium survive in a high-salt environment (4marks)
6. Briefly explain the phases of virus infection (4marks)
7. Briefly explain the Gram Stain procedure.(4 marks)
8. Write a brief explanation on Cyanobacteria as photosynthetic organism. (4 marks)
9. a) Hemophilia is a sex-linked trait. Explain. (1 mark)

   b) A non-hemophiliac father and a hemophiliac mother have a son.

   What is the percentage chance that the son will be a hemophiliac? (3marks)
10. HIV, the virus that causes AIDS only infects certain cells within the immune system this is because (4marks)

# COPPERBELT UNIVERSITY

## SCHOOL OF MATHEMATICS AND NATURAL SCIENCES

## DEPARTMENT OF BIOLOGICAL SCIENCES

## SESSIONAL EXAMINATION 19TH MAY 2017

## BI 110 INTRODUCTORY BIOLOGY

**DURATION: 3 HOURS**

**INSTRUCTIONS**

1. **ANSWER ALL THE QUESTIONS ON THE GIVEN ANSWER GRID.**
2. **WRITE THE LETTER OF THE CORRECT ANSWER ON THE GRID**
3. **EACH QUESTION CARRIES 1 (ONE) MARK.**

1 Hybrids between some related species of plants are sterile because the parent plants had different chromosome numbers. Occasionally the chromosome number of such a hybrid plant doubles spontaneously. Which of the following best describes the descendants of those plants with the double chromosome number?

A. The plants with the double chromosome number would be genetically defective and have no descendants
B. The descendants would be at a selective advantage because of the increased ability to introgress.
C. The descendants would be reproductively successful because they could backcross with the parental species.
D. The descendants would regain the ability to reproduce sexually because chromosomes could pair normally.

2 Which of the following is made up of pectin?

A. Plasmodesmata
B. Middle lamella
C. Pseudomerein
D. Glucosamine

3 Antibiotics that affect bacterial cells interfere with all of the following EXCEPT

A. Peptidoglycan synthesis
B. Protein synthesis
C. Reverse transcriptase
D. RNA polymerase

4 In fungi, cell walls are reinforced by which of the following?

A. Chitin
B. Silica
C. Collagen fibers
D. Microtubules

5 Ferns undergo alternation of generation in which a

A. Dominant sporophyte alternates with an independent gametophyte.
B. Dominant gametophyte alternates with a dependent sporophyte.
C. Sporophyte and a gametophyte have equal life spans.
D. Gametophyte alternates with a haploid zygote.

6 QUESTIONS 6 and 7 Refer to the following amounts of DNA found in human cell types. The amounts are indicated relative to the amount of DNA (X) found in mature neurons that are in the $G_0$ stage of the cell cycle.
What is the amount of DNA found in a mature spermatozoan

A. 4X
B. 2X
C. 0.5X
D. 1X

7. What is the amount of DNA in the skin cell in $G_2$ of the cell cycle

A. 4X
B. 2X
C. 0.5X
D. 1X

8. Tobacco synthesizes nicotine in plants roots. The branch of biology in which the chemical nicotine is studied is known us

A. Phytochemistry
B. Phytogeography
C. Biotechnology
D. Molecular Biology

9. A grandmother aged 68 yrs has a lump in her breast and has been told to visit the cancer clinic in Lusaka for further investigation. Which branch of Biology deals with the investigation to do with aspects of cell division

A. Cytology
B. Cell Biology
C. Embroyology
D. Anatony

10. *Besidens pilosa* and *Bidens aschiperi* are plants belonging to the same Genus. What is the generic name of the two species of plants

A. Pilo
B. Bid sa
C. Sha
D. Bi

**11.** What is the name of the governing body for naming animals?

A. International code of zoological nomenclature

B. International code of Botanical nomenclature

C. International committee on Taxonomy

D. Nomenclature for cultivated plants and animals

**12.** What are Lysosomes?

A. They are membrane bounded organelles with enzymes

B. They are non-membrane bounded organelles with hydrolytic

C. They are non-membrane bounded organelles with no enzymes

D. They are membrane bounded organelles with DNA

**13.** Which of the following is **not** the role of the vacuoles?

A. Store organic acids and remove toxic secondary metabolites

B. Store sugars and adenosine Triphosphate

C. Store anthocyanin and primary metabolites

D. Store amino acids and organic sugar

**14.** When physicians perform an organ transplant, they choose a donor whose tissues match those of the recipient as closely as possible. Which of the following cell components are being matched?

A. plasma membrane phospholipids
B. plasma membrane proteins
C. cell-surface carbohydrates
D. cytoskeletal elements

**15. What** is common among herbaceous stems, thalli of liverworts and fern prothalli?

A. They all bare spores

B. They bare stomata

C. They all have chlorophyll pigments

D. They have no chlorophyll pigments

16. A student studying prokaryotic organisms observed a microorganism in the laboratory from the urine of a child with the following characteristics; DNA without histones, single chromosome of circular double-strand of DNA. Which organism could this student have been observing?

A. Amoeba

B. Bacterial

C. Bacteriophage

D. Plasmodium

17. Which formula represents the sugars used in the formation of DNA?

A. $C_5 H_{10} O_5$

B. $C_6 H_{12} O_6$

C. $C_3 H_5 O_6$

D. None of the above

18. What is the difference between Amylose and Amylopectin?

A. Amylose is a variant of starch made up of unbranched chains of sucrose and amylopectin is made up of unbranched chains of glucose.

B. Amylose is a variant of starch made up of unbranched chains of glucose while amylopectin is made up of unbranched chains of glucose.

[redacted]

D. L and D

**20.** The statements which applies to organisms that are classified as fungi is:

A. A multicellular and photosynthetic organism.

B. A spore-producing organism with cell walls made up of cellulose

C. A spore-producing organism with cell walls made up of chitin.

D. A seed producing organism with cell walls made up of chitin

**21.** Examine the structure of the compound illustrated as **fig. 2** below

The structure of the compound displayed in **fig. 2** below defines the nature of the compound known as

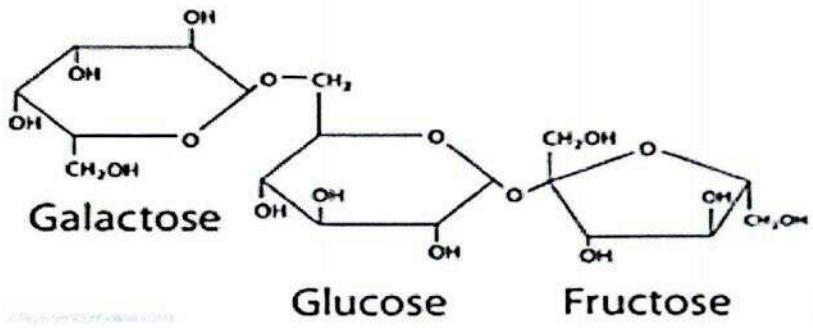



**Figure 2**

A. Oligosaccaride

B. Dissacharide

C. Polysaccharide

D. Carbohyrates

**22.** A non-vascular plant with a thalloid body bearing horn-like structures is called:

A. A moss

B. Marchantia

C. Anthoceros

D. A fern

**23.** Examine the illustration presented as **Fig. 3** below and select the most fitting description linked to this organism:

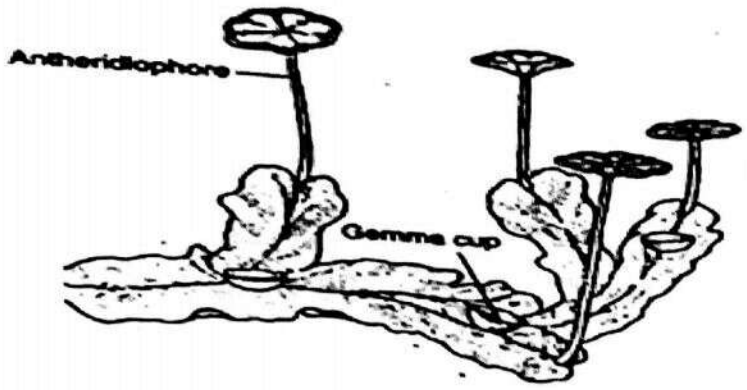



**figure 3**

A. The above organism has features of the moss called *Furnaria.*

B. The above organism exhibits features of hornwort called *Anthoceros*

C. The above organism has features of a female plant of *marchantia.*

D. The above organism reveals features of a male plant of *marchantia*

**24.** The allele whose feature is fully expressed in the internal appearance of the organism referred to as:

A. A recessive allele

B A dominant allele

C. A dormant

D. A passive allele

**25.** Anthoceros is commonly described as:

A. A liverwort with a thalloid plant body

B. A liverwort differentiated into roots, stems and leaves

C. A hornwort with a thalloid plant body bearing antheridiophores

D. A hornwort with a thalloid plant body bearing a sporophyte

**26.** Plants commonly known as the mosses are classified under the division known as:

A. Anthocerotophyta

B. Bryophta

C. Hepatophyta

D. Pteridophyta

27. Some insects, such as the wood feeding termites, are known to use enzymes to hydrolyze or breakdown a certain substance to release glucose. Therefore, the specific substance in this kind of metabolism associated with termites is known as:

A. Cellulase
B. Starch
C. Cellulose
D. Maltose

28. The protistan called Amoeba moves by way of creeping and stretching of their cytoplasm into finger-like extension or false feet called

A. Cilia
B. Flagellu
C. Pseudopodia
D. Pili

29. The mutant phenotype refers to

A. the phenotype expressed by the dominant allele
B. the phenotype expressed by the recessive allele
C. the phenotype that most commonly occurs in nature
D. the phenotype that has the longest survival

30. A Dihybrid cross tests which of the following rules?

A. Rule of Independent Assortment
B. Chromosome Theory of Inheritance
C. Rule of Segregation
D. Cell Theory of Gametes

31. In onions, there are two alleles that affect stem color, one purple (P) and one green (p). The following crosses are performed with these results

| | **parental phenotype** | **offspring phenotypes** |
|---|---|---|
| 1. | Purple x green | 844 purple, 833 green |
| 2. | Purple x purple | 858 purple, 268 green |
| 3. | Purple x green | 1906 purple, 0 green |
| 4. | Purple x green | 808 purple, 773green |

**What is the genotype of the purple parent in cross number 4?**

A. PP
B. Pp
C. pp
D. p

32. As a female mosquito carrying malarial parasites feeds on human blood it....
    A. Injects Plasmodium in the form of merozoites into the human blood stream
    B. Injects Plasmodium in the form of gametocytes into the human blood stream
    C. Injects Plasmodium in the form of sporozoites into the human blood stream
    D. Ingests Plasmodium in the form of sporozoites from the human blood stream.

33. Ebola is a hemorrhagic fever which is caused by
    A. Virus with retrovirus species of tropical origin.
    B. Virus with single stranded retrovirus.
    C. A virus with a single-stranded RNA.
    D. Virus with a double-stranded DNA.

34. What is shown in the **figure 4** below?

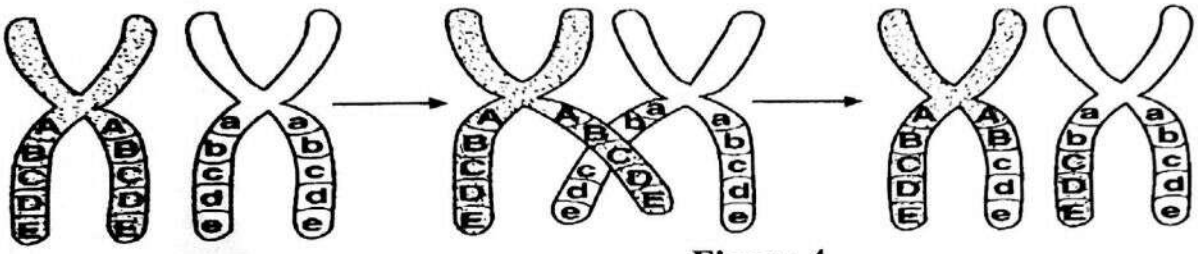


**Figure 4**

    A. independent assortment
    B. anaphase I of meiosis
    C. crossing-over
    D. Replication

35. The **Figure 5** below shows a bumblebee. Which part of the bumblebee is most helpful in identifying it as an insect?

**Figure 5**

    A. Shape of eyes
    B. Number of legs
    C. Presence of wings
    D. Location of antennae

**36.** How many pairs of wings have a bumble bees? And which order of insects does it belong to

A. 2, Othoptera
B. 1, Diptera
C. 2, Coleoptera
D. 1. Lepidoptera



**37.** Study **Figure 6** below

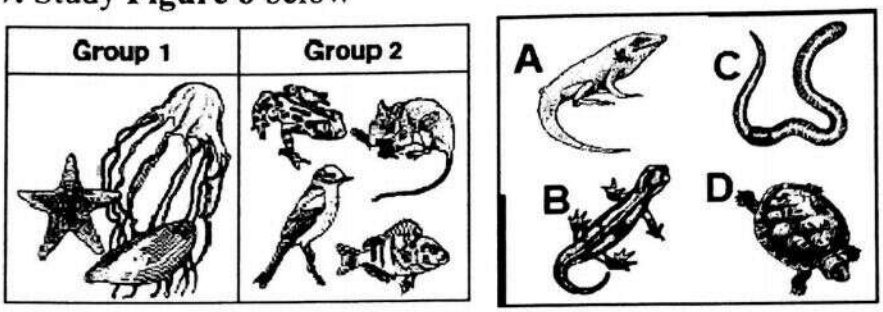



**Figure 6**

Which animal belongs to ***Group*** 1?

A
B
C
D

**38.** A student was asked to examine two insects in the lab and identify them using their wings. The two insects were identified as a lady bird and a cricket. Which one shows the main difference on the two insects?

A. Both have the elytra
B. Both have long hind legs
C. The lady bird has the elytra
D. The crickets have Diptera.

**39.** Low density lipoproteins (LDL's or bad cholesterol) are taken up "in-bulk" into the cytoplasm of a cell. This process is an example of

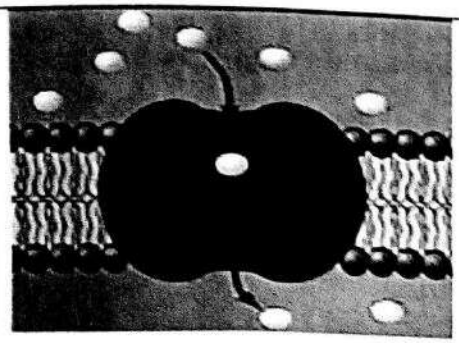
A. Endocytosis.
B. Exocytosis.
C. Molecular transport
D. Diffusion.

**40.** A major function of glycoproteins and glycolipids in the cell membrane is to

A. Allow the cells to recognize each other.
B. Help the cell retain its shape.
C. Help the cell resist swelling.
D. Attach the cell membrane to the cytoskeleton.

41. Which of the following terms is used to describe a membrane protein capable of moving substances from a low to a high concentration?

A. transporter
B. pump
C. oxidizer
D. reducer



42. The model on the left shows small molecules moving through a large "porous" opening. What kind of macromolecule would you expect the opening to be?

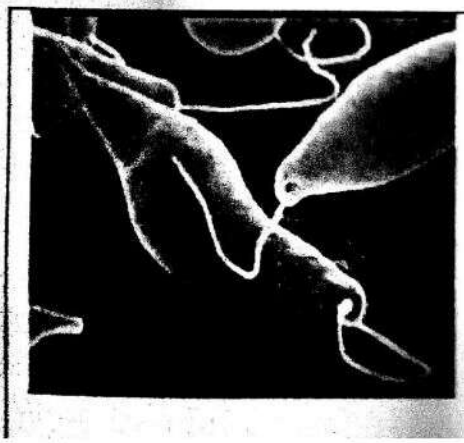
A. phospholipid
B. protein
C. nucleic acid
D. molecular sieve

43. When physicians perform an organ transplant, they choose a donor whose tissues match those of the recipient as closely as possible. Which of the following cell components are being matched?

A. plasma membrane phospholipids
B. cell-surface carbohydrates
C. Plasma membrane proteins
D. cytoskeletal elements

44. A characteristic of all chordates is possession of

A. Dorsal heart with a dorsal blood vessel
B. Ventral heart with both dorsal and ventricle blood vessels
C. Ventral heart with a ventral blood vessel
D. Dorsal heart with both dorsal and ventral blood vessels



45. The image on the left is a picture of a single-celled organism named Euglena. The specimen was viewed with a(n)

A. Fluorescence microscope
B. Transmission electron microscope
C. Scanning electron microscope
D. Dissecting microscope

46. A retrovirus is a type of virion that is identified by:

A. Containing the genome DNA which is surrounded by a protein coat only.
B. Containing the genome DNA which is surrounded by a protein and requires the reverse-transcriptase enzyme to produce several molecules of RNA.
C. Containing the genome DNA which is surrounded by a protein but does not require the reverse-transcriptase enzyme to produce several molecules of RNA.
D. Containing the genome RNA which is surrounded by a protein and requires the reverse-transcriptase enzyme to produce several molecules of DNA.

47. In the cytological staining method used in differentiating two different groups of bacteria, the Gram's positive bacteria are known to:

A. Display the retention of the first **Crystal Violet** pink stain colour because they have a thicker layer of peptidoglycan in their cell walls.
B. Display the retention of the second **Safranin** red stain colour because they have a thinner layer of peptidoglycan in their cell walls.
C. Display the retention of the second **Safranin** red stain colour because they have a thicker layer of peptidoglycan in their cell walls.
D. Display the retention of the first **Crystal Violet** pink stain colour because they have a thinner layer of peptidoglycan in their cell walls.

48. The tapeworms are classified under the phylum known as:

A. Nematoda because bodies of such worms are cylindrical and externally segmented.
B. Platyhelminthes because bodies of such worms are cylindrical and unsegmented.
C. Platyhelminthes because bodies of such worms are dorsiventrally flattened and unsegmented.
D. Annelida because bodies of such worms are smooth, cylindrical and unsegmented.

49. In chloroplasts, a certain protein is found in the lumen of the thylakoid (thylakoid space). It is transcribed in the nucleus and synthesized on cytoplasmic ribosomes. How many membrane bilayers must this protein cross to reach its final location?

A. One
B. Two
C. Three
D. Four

50.

51

**50.** Which of the following statements about mitochondria and chloroplast is generally true?

A. Plants have chloroplast but no mitochondria; animal have mitochondria but no chloroplast.

B. Plants have chloroplast but no mitochondria; fungi have mitochondria but no chloroplast.

C. Plants and fungi have both chloroplast and mitochondria; animals have only mitochondria.

D. Plants have both chloroplast and mitochondria; animals and fungai have only mitochondria.

**51.** Phalloidin is a toxin made by the death cap mushroom. The toxin binds to actin subunits and disrupts actin function. Which of the following structures would be most directly affected by phalloidin?

A. Intermediate filaments

B. Microfilaments

C. Microtubules

D. Keratin fibres

**52.** A Poster below was made by a student who found a trapped young Raven (bird) in the tree nest by synthetic hair. Which studies of biology deals with the problem identified by this student in **figure 7?**


**Figure 7**

A. **Ornithology** and conservation biology

B. **Entomology** and biogeography

C. **Conservation** and Ornithology

D. **Ecology** and conservation biology

53. What is a nucleoside?

A. A nucleotide without sugar

B. A nucleotide without phosphate

C. A nucleotide without nitrogenous base

D. A nucleotide with a phosphate

54. Which one is the most common monomer of carbohydrate?

A. Nucleotides

B. Glucose

C. Amino Acids

D. Maltose

55. In which form does Carbohydrates occur naturally?

A. D-form

B. L-form

C. Both A and B

D. None of them

56. Which of the following organelles has a continuous connection with the nuclear membrane

A. Golgi apparatus

B. Lysosome

C. Rough Endoplasmic Reticulum

D. Smooth Endoplasmic Reticulum

57. Which of the following cells lacks cytoskeleton?

A. Eukaryotic plant cell

B. Prokaryotic bacterial cells

C. Both a and b

D. Prokaryotic cells and eukaryotic animal cells

58. Virus, bacteria and protozoa are studied in

A. Microbiology

B. Parasitology

C. Molecular Biology

D. Genetics

**59.** The vector of malaria is studied in

A. Microbiology

B. Parasitology

C. Entomology

D. Anatomy

**60.** The intermediate filament present in nails and hair is a type 1 if the protein is made of

A. Lamins

B. Vimetins

C. Keratin

D. Tubulin

**61.** Cellulose the most important constituent of plant cell wall is made up of as shown in the **figure 8** below.

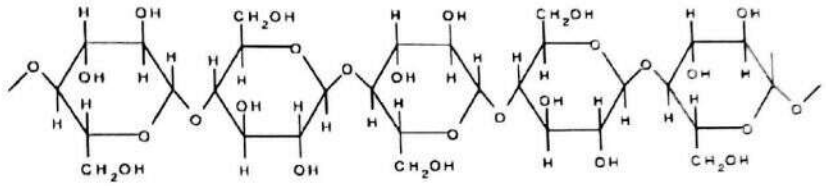


**figure 8**

A. Branched glucose molecules linked by β1, 4 glucosidic bond in straight chain and α 1, 6 glycosidic bond at the site of branching β.

B. Unbranched chain of glucose molecules linked by β 1, 4 glycosidic bond

C. Branched chain of glucose molecules linked by β 1, 4 glycosidic bond

D. Branched chain of glucose molecules linked by , β 1, 4 glycosidic bond in straight chain α 1, 6 glycosidic bond at the site of branching

**62.** Which purine base is found in RNA?

A. Thymine

B. Uracil

C. Cytosine

D. Guanine

63. Which of the following structure of protein are true regarding primary structure of proteins

A. Primary structure denote the number of amino Acids in a protein

B. Primary structure denote the sequence of amino Acids in a protein

C. Primary structure determine the biological activity of a protein

D. All of these

64. If one strand of DNA has the base sequence AAGCAA, the complementary strand has which of the following sequences?

A. UUCGUU

B. TTCGTT

C. AAGCAA

D. TTCGTG

65. Pteridophytes are also called

A. Phanerogams

B. Vascular cryptogams

C. Amphibians of the plant kingdom

D. Spermatophytes

**Question 66 and 67 are based on the Figure**

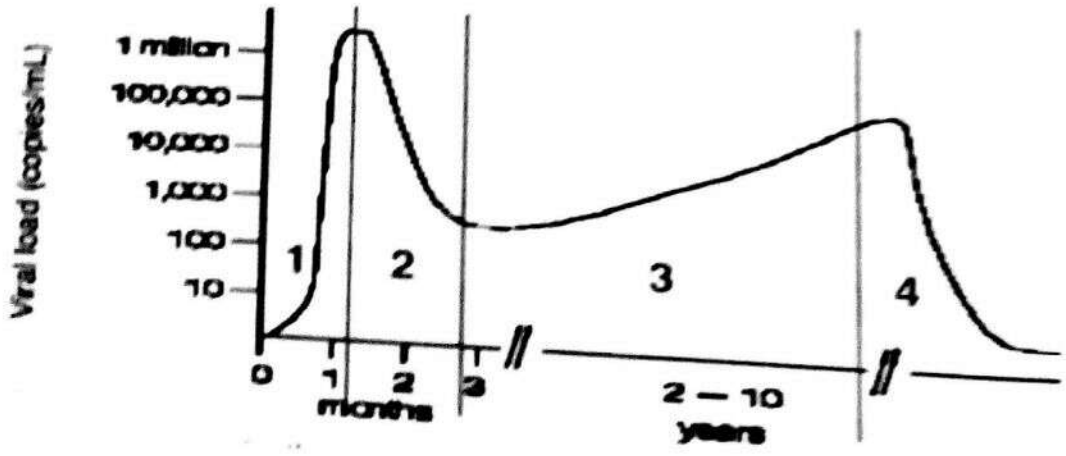



**Figure 9**

**The figure 9** above shows the viral load as infection progresses in human beings. Using the graph, which period is highly infectious?

A. 1

B. 2

C. 3

D. 4

**67** What happens to the immune system in the period indicated by 2?

A. The immune system fights back causing the viral load to reduce
B. The immune system fails to fight back causing the drop in the CD4cells
C. The immune response fights back causing the antibodies to decrease
D. The immune system fights back causing the viral load to reduce.

**68** In which of the following orders do proteins destined to be secreted move through the secretory pathway?

A. Smooth ER → Golgi transport vesicle→Golgi cistern→Golgi cisternae → secretory vesicle→ cell surface
B. Rough ER → Golgi transport vesicle→Golgi cistern→Golgi cisternae → secretory vesicle→ cell surface.
C. Golgi cisternae → ER transport vesicle →smooth ER →secretory vesicles cell → cell surface
D. Golgi cisternae → ER transport vesicle →smooth ER →secretory vesicles cell → cell surface.

**69** Which of the following best explains how mutations in DNA can result in the expression of a new phenotype?

A. Different polypepetidene is produced
B. The polarity of tRNA becomes the opposite of that DNA.
C. The gene is now read I the 3' to 5' direction
D. Eukaryote and prokaryote have the similar ribosomes

**70** The targeting of a newly synthesized protein is most likely to require two different signal peptides for one of the following destinations.

A. Plasma membrane
B. Lysosome
C. Chloroplast
D. Endoplasmic reticulum

**71** Approximately what fraction of the human genome encodes proteins?

A. 2%
B. 25%
C. 50%
D. 99%

**72** Which of the cells besides erythrocytes, does the plasmodium attack in human beings?

A. Muscle
B. Nerve
C. Kidney
D. Hepatocytes

73 In which of the groups would you place a plant which produces spores, has vascular tissue and lacks seed?

A. Algae

B. Pteridophytes

C. Bryophyte

D. Gymnosperms.

74 A fern differs from moss in having

A. An independent gametophyte

B. An independent sporophyte

C. Presence of archegonia

D. Swimming antherozoids

75 .To which group of fungi do fungi producing eight spores in a Gal -like structure belong

A. Phycomycetes

B. Ascomycetes

C. Basidiomycetes

D. Deuteromycetes

76 Extra chromosomal, circular, double stranded, self replicating DNA molecule in bacteria is called

A. Cosmid

B. Plasmid

C. Phademid

D. Mesosome

77 Different staining of bacteria on gram staining is due to

A. Difference in cell wall layer component of gram negative and gram positive bacteria

B. Difference in the cell structure of gram positive and gram negative bacteria

C. Difference in the mode of nutrition of gram positive and gram negative bacteria

D. None of the above

78 Which class has the largest number of animals?

A. Mammals

B. Fishes

C. Insects

D. Reptiles

79 Head, foot, and visceral mass are characters used in the diagnostic of

A. Echinoderms

B. Mollusks

C. Annelida

D. Arthropoda

80 Pronounced cephalization is a characteristic of

A. Echinoderms

B. Annelida

C. Mollusca

D. Arthropoda

81 What anticoagulant is secreted by leeches?

A. Heparin

B. Hirudin

C. Haematin

D. Haemoglobin

82 To which class do leeches belong?

A. Oligochaeta

B. Hirudinea

C. Polycheata

D. Chaetopoda

83 Salamander belong to the class

A. Aves

B. Reptile

C. Pisces

D. Amphibian

84 Where are the most Marsupial and all Monotreme species found?

A. Australia

B. Asia

C. Europe

D. Central and South America

85 What is the value of Methanogens to ruminants?

A. They help to digest lipids

B. They help to break down cellulose

C. They help in converting hydrogen sulphide

D. None of the above.

86 Which one of the following is correct on the action of antiretroviral drugs?

A. Blocks the action of the reverse transcriptase enzyme involved in replication of the virus

B. Slows down CD4 cell production involved in replication of virus

C. Works against the attachment to the host

D. Stop integration to the host cell's DNA

87 The main difference between bacterial cell division and eukaryotic cell division is that

A. Since bacteria have one chromosome, then we can count the number of copies the cell

B. Eukaryotes mark their chromosomes to identify them and bacteria do not

C. Bacteria DNA replication and chromosome segregation are concerted processes but in eukaryotes they are separated in five

D. None of the above is correct

88 Which of the following is not a distinct feature of meiosis?

A. Pairing and exchange of genetic material between homologous chromosomes

B. Attachment of silver kinetochores to spindle microtubules

C. Movement of sister chromatids to the same pole

D. Suppression of DNA replication

89 What property distinguished Mendel's investigation from previous studies?

A. Mendel used true breeding pea plant

B. Mendel quantified his results

C. Mendel examined many different traits

D. Mendel examined the segregation of traits

90 In which phase of meiosis do chromosomes develop two sister chromatids

A. G1 Phase

B. G2 Phase

C. None of the above

D. S Phase.

91 Which of the cells in human beings remain $G_0$?

A. Hair cells and Muscle cells

B. Neurons

C. Mature neuron and muscle cell

D. Ciliated cells and neurons

92 Which activity does not take place in the Anaphase stage of mitosis

A. Nuclear membrane is synthesized

B. Sister chromatids become separated

C. Chromosomes move to opposite poles

D. Protein that bind the sister chromatids together break.

93 Which amino acid is not found in Rice?

A. Isoleucine and lysine

B. Lysine and Tryptophan

C. Isoleucine and Histidine

D. Glycine and Isoleucine

94 Which Amino Acid enhances the production of immunoglobulins and antibodies?

A. Glutamine

B. Aspartic acid

C. Glutamic acid

D. Asparagine

**95** In the, Archaea, Eukarya, and Bacteria represent the three major domains of life. Eukarya utilize the general transcription factors TBP (TATA-binding protein) and TFIIB in transcription, whereas Bacteria do not. At least one member of Archaea has protein similar to TBP and a protein similar to TFIIB. Based on this observation, which of the following scenarios is most likely?

A. Archaea and Eukarya diverged after their common ancestor diverged from bacteria.
B. Archaea and Bacteria diverged after their common ancestor diverged from Eukarya.
C. Bacteria and Eukarya diverged after their common ancestor diverged from Archaea.
D. Archaea, Eukarya, and Bacteria each evolved from different ancestral organisms

**96.** . Anthoceros is commonly described as:

A. A liverwort with a thalloid plant body
B. A liverwort differentiated into roots, stems and leaves
C. A hornwort with a thalloid plant body bearing antheridiophores
D. A hornwort with a thalloid plant body bearing a sporophyte

**97.** Which of the following would you advise a patient with growing tumors to increase in their diet in order to retard the growth of tumors?

A. Arginine from fruits
B. Arginine from peanuts
C. Alanine from vegetables
D. Alanine from fish

**98.** What are the functions of the rough Endoplasmic Reticulum?

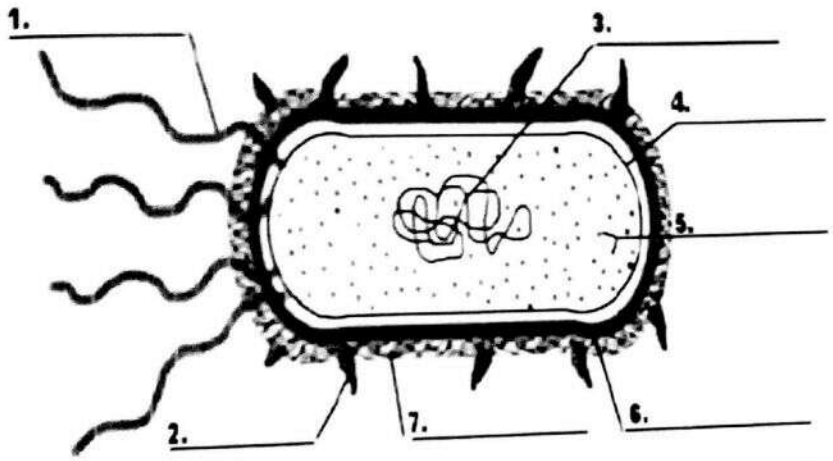
A. Protein synthesis and detoxification
B. Protein synthesis and post translational modification
C. Protein synthesis and phospholipid biosynthesis
D. Protein synthesis only

**99.** A cell nucleus contains which of the following?

I. DNA II Protein III RNA

A. I Only
B. II only
C. I and II only
D. I,II, and III only

**100.** Study the figure below and answer the question below.




**Which part would integrate with a virus and would be stained purple if it is a gram positive bacteria?**

A. 1 and 2
B. 7and 6
C. 3 and 6
D. 7 and 6

**END OF EXAMINATION**

GROUP C: MRS MWALE.
NAME: KENNY KAONGA
SIN: 16103665.

**THE COPPERBELT UNIVERSITY**

**SCHOOL OF MATHEMATICS AND NATURAL SCIENCES**

**BIOLOGY BI 110 TEST 1 DECEMBER 2016**

**DURATION: 2 HOURS**

**SECTION A**

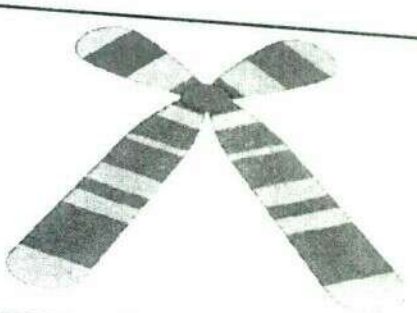
**ANSWER: ALL Questions using the answer Sheet provided attached to the question paper. Do not detach the answer sheet from the question paper.**

1. Which of the following statements are true regarding scientific names?
   1) They are (often) in Latin.
   2) The are italicized or underlined.
   3) The genus is lowercase and species is capital
   4) May be descriptive (e.g. Deinococcus radiodurans) or honor a scientist
   5) After the first use in a manuscript, paper, or report, scientific names are abbreviated with the first letter of the genus plus the species name.

   A. 1, 2, 3, 4, 5 B. 1, 2 C. 1, 3, 4
   D. 1, 2, 4, 5
2. Which of the following all belong to the domain Eukarya?
   A. Bacteria, Protists, Plantae
   B. Plantae, Archaea, Fungi
   C. Animalia, Bacteria, Protists
   D. Bacteria, Archaea, Protists
   E. Animalia, Fungi, Protists
3. A biologist who investigates the documents and restores the population of the edible caterpillars eaten among Zambia people would be studying

   A. Aeriobiology B. Conservation biology C. Ecology
   D. Biogeography E. Aeriobiology
4. Which of the following levels of organization would an ecologist be most interested in studying?

   A. Cells B. Organs C. Communities
   D. Tissues



5. The figure above represents
   A. a single chromosome
   B. two chromosomes in metaphase plate.
   C. an original chromosome with a duplicate.
   D. the entire genome of the organism.

A — 39
B — 08
C — 05

6. 10.Eukaryotic DNA molecules have

A. no proteins.
B. small amounts of protein at each end.
C. large amounts of protein at each end.
D. small amounts of protein dispersed among them.
E. large amounts of protein around which DNA is wound.

7. When the chromosome is most condensed, which of the following is true?
A. Proteins are used to wind up the DNA.
B. They are less susceptible to radiation.
C. Lipid droplets form "beads on a string.
D. Carbohydrates wind the DNA into clusters.

8. Which of the following is NOT an example of the results of mitosis?
A. a pair of identical twins
B. a group of rooted plant cuttings from a single plant
C. the cells produced by the asexual reproduction of a single-celled organism
D. the offspring produced by two parents
E. healing of a wound

9. Strictly speaking, mitosis and meiosis are divisions of the
A. nucleus. B. cytoplasm. C. chromosomes.
D. nucleus and chromosomes. E. nucleus, cytoplasm, and chromosomes.

10. Which of the following is NOT associated with meiosis?
A. spore formation B. somatic cells C. sexual reproduction
D. sperm and egg E. germ cells

11. Four of the five answers listed below are related by a common phase of mitosis. Select the EXCEPTION.
A. beginning of microtubule assembly outside the nucleus
B. division of centromeres
C. disappearance of nucleolus
D. disappearance of nuclear membrane
E. shortening and condensation of chromosomes

2. Four of the five answers listed below are related by a common phase of mitosis. Select the EXCEPTION.
A. chromosomes decondense B. spindle microtubules disappear
C. nucleolus reappears D. chromosomes separate
E. nuclear envelop re-forms

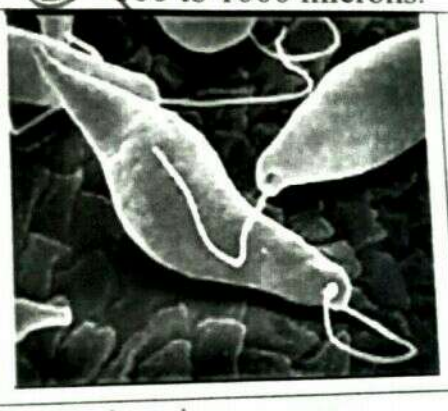
. Four of the five answers listed below are events occurring during mitosis. Select the EXCEPTION.
A. crossing over
B. division of centromeres
C. chromosomes line up at the cellular equator
D. attachment of spindle microtubules to centromeres
E. migration of chromosomes to opposite ends of the cell

14. The cell theory is one of the unifying themes of biology. Which of the following statements would be part of the cell theory?
A. All life is made of cells.
B. Cells are the smallest units of life.
C. Cells come from preexisting cells.
D. All of the above

15. You are told that the cells on a microscope slide are plant, animal, or bacterial. You look at them through a microscope and see cell walls and membrane-bound organelles. You conclude that the cells
A. are plant cells.
B. could be either plant or bacterial.
C. are animal cells.
D. could be plant, animal, or bacterial.
E. are bacteria.

16. All cells
A. are enclosed in a membrane that maintains internal conditions different from the surroundings.
B. can interconvert chemical materials.
C. have DNA as the genetic material.
D. interconvert forms of energy.
E. All of the choices are correct.

17. The diameter of most animal and plant cells ranges from
A. 10 to 10 microns.
B. 0.01 to 0.1 microns.
C. 10 to 100 microns.
D. 100 to 1000 microns.
E. 0.1 to 1.0 microns.



18. The image on the left is a picture of a single-celled organism named Euglena. The specimen was viewed with a(n)
A. Light microscope
B. Fluorescence microscope
C. Transmission electron microscope
D. Scanning electron microscope
E. Dissecting microscope

18. Light microscopes
A. work by reflecting electrons off the surface of an object being studied.
B. can generally magnify objects about 10,000 times without blurring.
C. use light and glass lenses to magnify an image.
D. typically provide more resolution than an electron microscope.
E. All of the choices are correct.

19. A scraping of material from a person's tooth revealed many bacteria found on the tooth surface. Such bacteria remain attached to the tooth surface by structures called
A. pili
B. anchoring junctions
C. mitochondria
D. flagella
E. cell wall

20. Rods, spheres and spirals are shapes of cells observed in
A. Plants
B. animals
C. fungi
D. bacteria
E. archea

21. Cells without a membrane-bound nucleus and membrane systems in the cytoplasm are ____ cells.
A. prokaryotic
B. eukaryotic
C. fungal



06

D. protist E. plant cells

22. A bacterial cell's DNA is found in its
A. capsule. B. nucleoid region. C. nucleus.
D. ribosomes. E. Bacteria do not have DNA

23. Bacteria do not have a nucleus. Since the nucleus contains DNA, it can be concluded bacteria do not contain DNA.
A. True B. False

24. The nucleus of a cell
A. is the region of the cell where ribosomes are degraded.
B. contains DNA and controls cell activities
C. is contained inside the nucleolus.
D. is surrounded by a single layer of membrane.

25. Organelles found outside a eukaryotic cell and usually involved in movement of the cell or movement of substances past the cell are called
A. cilia and flagella B. Cell walls and plasmodesmata
B. Nucleus and nucleolus D. cytoplasm and endoplasm

26. In eukaryotic cells, internal membranes
A. provide additional area where many metabolic processes occur.
B. form membranous compartments called organelles.
C. contain proteins essential for metabolic processes.
D. greatly increase a cell's total membrane area.
E. All of the choices are correct.

27. When a cell is deprived of oxygen, its lysosomes tend to burst and release their contents into the cell. (This statement is true.) As a result of this, that cell would be expected to
A. undergo self-digestion and die. B. recycle damaged organelles.
C. produce additional ER. D. undergo cell division.
E. produce replacement lysosomes.

28. Rough endoplasmic reticulum
A. contains ribosomes for protein synthesis.
B. creates an enormous surface area for cell metabolism
C. contains a compartment to transfer and modify products of metabolism
D. all of the above

29. Insulin is a hormone that is produced by certain pancreatic cells and secreted into the bloodstream. Which of the following choices best describes the route of insulin from its production to its exit from the cell?
A. rough ER, transport vesicles, cell membrane
B. rough ER, transport vesicles, Golgi apparatus, transport vesicles, cell membrane
C. rough ER, lysosomes, transport vesicles, cell membrane
D. rough ER, Golgi apparatus, smooth ER, cell membrane

). Lysosomes
A. destroy harmful bacteria engulfed by white blood cells.
B. help to digest worn-out or damaged organelles.
C. recycle materials within the cell.
D. fuse with food vacuoles to expose nutrients to lysosomal enzymes.
E. All of the choices are correct.

The function of chloroplasts is

A. intracellular transport of proteins.
B. intracellular digestion.
C. lipid synthesis.
D. photosynthesis.
E. cellular respiration.

32. The cytoskeleton is a system of ___ in ___ cells.
A. proteins – prokaryotic
B. proteins – eukaryotic
C. DNA – prokaryotic
D. DNA – eukaryotic

33. Microtubules, microfilaments and intermediate filaments are components of the
A. cell wall in plants
B. plasma membrane in prokaryotes
C. chromosome in eukaryotes
D. chromosome in prokaryotes
E. cytoskeleton

34. Which of the following functions could be assigned to the cytoskeleton?
A. chromosome movement during mitosis.
B. change in shape of an amoeba.
C. movement (streaming) of cytoplasm in plant cells
D. A & B
E. A, B & C

35. Eukaryotic cells have transport vesicles, endoplasmic reticulum, Golgi apparatus and a nuclear envelope. Taken together, all these membranes represent the
A. transfer system
B. nuclear system
C. endomembrane system
D. cytoskeletal system

36. The membranous compartmentalization of a cell
A. allows different metabolic processes to occur simultaneously.
B. divides the cell into two equal-sized halves.
C. requires the presence of a cell wall.
D. is common in prokaryotes and eukaryotes.
E. requires the presence of a large central vacuole.

37. Unlike animal cells, plant cells have _____ and _____ and _____.
A. chloroplasts . . . cell walls… mitochondria.
B. centrioles . . . cell walls… glycocalyx
C. chloroplasts . . . cell walls… vacuoles
D. centrioles . . . chloroplasts… vacuoles
E. chloroplasts . . . cell walls… nucleoplasm

38. The functions of the central vacuole of plant cells include _____
A. storing pigments that will help attract pollinating insects.
B. storing poisons.
C. storing products of metabolism (e.g. sugar in sugar beet root cell vacuoles)
D. helping increase the size of cells by absorbing water and producing pressure (turgor) against the wall.
E. All of the choices are correct.

38. Membrane phospholipids
A. have hydrophilic heads that face outward and are exposed to water.
B. have hydrophobic tails that face inward and are shielded from water.
C. Both A & B are correct
D. None of the choices are correct.

39. The cholesterol associated with cell membranes

.04

A. is attached to membrane proteins and extends into the watery environment surrounding the cell.
B. helps to stabilize the cell membrane at higher or lower temperature.
C. is an abnormality resulting from a diet high in cholesterol.
D. makes the cell membrane fluid at room temperature.
E. None of the choices are correct.

40. Low density lipoproteins (LDL's or bad cholesterol) are taken up "in-bulk" into the cytoplasm of a cell. This process is an example of
A. endocytosis.
B. exocytosis.
C. molecular transport.
D. osmosis.
E. diffusion.

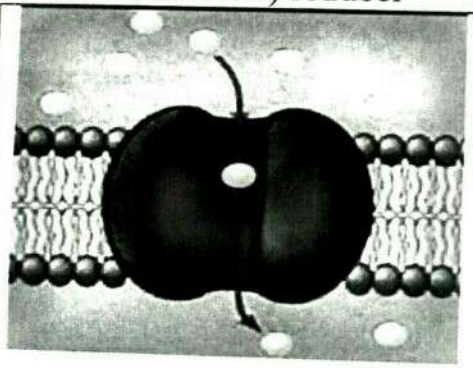
41. A major function of glycoproteins and glycolipids in the cell membrane is to
A. allow the cells to recognize each other.
B. help the cell retain its shape.
C. help the cell resist swelling.
D. glue cells together to form tissues.
E. attach the cell membrane to the cytoskeleton.

42. Which one of the following is not a function of the plasma membrane? The plasma membrane …
A. has receptors for chemical messages.
B. plays a role in signal transduction.
C. is involved in self-recognition.
D. is the control center of the cell.
E. forms a selective barrier around the cell.

43. Which one of the following is not a function of membrane proteins? Membrane proteins
A. provide cellular identification tags.
B. attach the membrane to the cytoskeleton.
C. serve as enzymes.
D. form junctions between cells.
E. All of the choices are membrane protein functions.

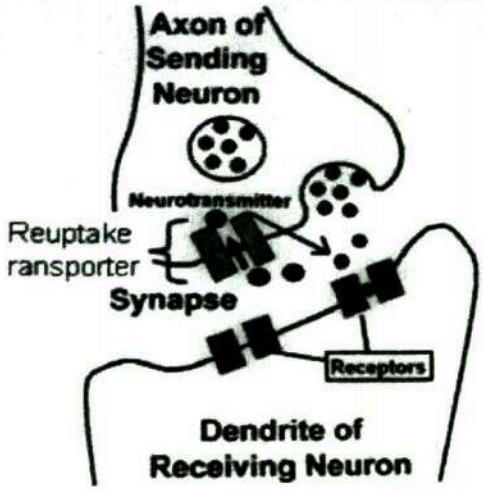
44. What is the immediate source of energy for active transport?
A. carbohydrates
B. lipids
C. ATP
D. A & B

45. Which of the following terms is used to describe a membrane protein capable of moving substances from a low to a high concentration?
A. transporter
B. pump
C. diffuser
D. oxidizer E) reducer



46. The model on the left shows small molecules moving through a large "porous" opening. What kind of macromolecule would you expect the opening to be?
A. phospholipid
B. protein
C. nucleic acid
D. molecular sieve

47. When physicians perform an organ transplant, they choose a donor whose tissues match those of the recipient as closely as possible. Which of the following cell components are being matched?
A. plasma membrane phospholipids
B. cell-surface carbohydrates
C. plasma membrane proteins
D. cytoskeletal elements




48. Examine the diagram on the left. The process illustrated by the neurotransmitter leaving the sending neuron is called
   A. endocytosis
   B. exocytosis
   C. passive transport
   D. protein synthesis

49. The cell theory is one of the unifying themes of biology. Which of the following statements would be part of the cell theory?
   A. All life is made of cells.
   B. Cells are the smallest units of life.
   C. Cells come from preexisting cells.
   D. All of the above

50. The Golgi apparatus performs which of the following functions?
   A. sorting
   B. oxidative phosphorylation
   C. intracellular degradation
   D. modification of proteins
   E. packaging of lipids

51. Binomial nomenclature means writing the name of plants in two words which designate
   A. order and family
   B. family and genus
   C. species and variety
   D. genus and species

52. The bonding of two amino acid molecules to form a larger molecule requires
   A. the release of a water molecule
   B. the release of a carbon dioxide molecule
   C. the addition of a nitrogen atom
   D. the addition of a water molecule
   E. an increase in activation energy

53. Which of the following is not a characteristic of prokaryotes?
   A. Peptidoglycan cell walls.
   B. Lacking nuclear pores.
   C. Generate energy using mitochondria.
   D. Grow by binary fission.

54. Which one of the following molecules has the highest amount of energy?
   A. Glucose.
   B. Amino acids.
   C. Adenine triphosphate.
   D. Carbon dioxide

05

55. Lipids and proteins are transported within cells by----
A. cytoskeleton.
B. Ribosomes.
B. Golgi apparatus.
D. Endoplasmic reticulum.

56. Any molecule containing both a carboxylic group and a long hydrocarbon chain is a
A. Organic ion.
B. Cholesterol.
B. Amino acid.
D. Fatty acid.

57. Which of the following statements is correct?
A. Monosaccharides are released by complete hydrolysis of nucleic acids.
B. Monosaccharides are insoluble in water.
C. Monosaccharides are released by complete hydrolysis of cellulose.
D. Monosaccharides in a polymer are linked by ester bonds.

58. DNA and RNA are similar in that both have ----
A. Uracil as nitrogen base.
B. A single stranded helix shape.
C. Nucleotides containing sugars, nitrogen bases and phosphates.
D. The same sequence of nucleotides for the amino acid phenylalanine.

59. Dehydration synthesis is involved in the synthesis of all the following except---
A. Polysaccharides.
B. Proteins.
C. DNA.
D. Monosaccharides.

60. In proteins, α helices and β pleated structures are associated with the -----
A. Primary structure.
B. Secondary structure.
C. Tertiary structure.
D. Quaternary structure.

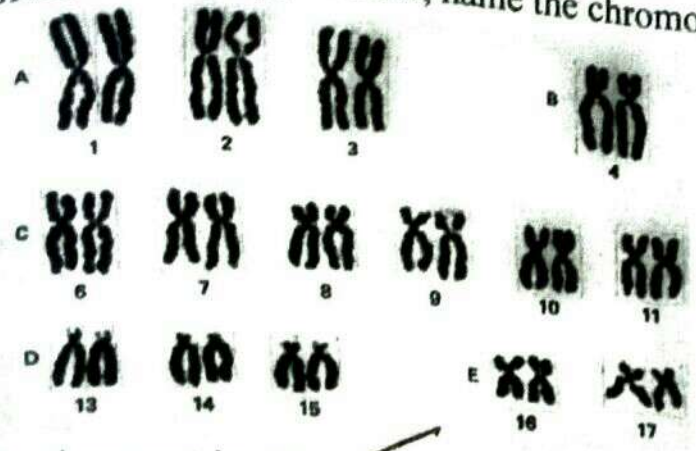
61. What is the difference between the membranes that form all eukaryotic cells organelles from the membranes that form the mitochondrion and the chroloplasts?
A. Other organelles of eukaryotic cells are made up of two membranes
B. The mitochondria and the chroloplasts have two membranes
C. The mitochondria and the chloroplasts generate energy while other organelles use energy
D. Mitochondria and chloroplast have leucoplasts while other organelles have chromoplasts

62. The number of genes predicted in a mosquito (*Anopheles gambiae*) is 13,683 while *Homosapiens* have20.251,*Schizosaccharomyces Pombe* is 4,824. What term describes figures given above?
A. Deoxyribomucleic acids
B. Genome
B. Chromosomes
D. Nucleosome

63. Two examples of pyrimidines are-----
A. Guanine and Cytosine.
B. Adenine and Guanine.
C. Thymine and Uracil.
D. Uracil and Cytosine..

64. What is the function of the cellulose synthase?
A. Provide mechanical strength to cells
B. Make cellulose microfibrils
B. Form lignified cellulose
D. Form glucose from cellulose

65. Given the karyotype below, name the chromosomes 1, 4 and 14.

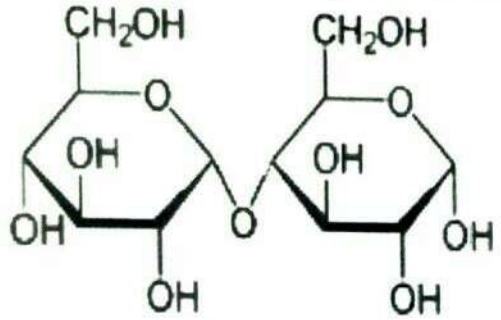


A. Acrocentric, telocentric and metacentric
B. Metacentric, telocentric and acrocentric
C. Metacentric, acrocentric and telocentric
D. Metacentric , metacentric and acrocentric

66. The dehydration reaction of two sugars yield disaccharides, a short chain of glucose molecules bonded to glycosidic bonds form sugars called

A. Oligosaccharides
B. Disaccharides
B. Polysaccharides
D. Monosaccharides

67. Two simple sugars are joined by a dehydration reaction( action in which water is removed). In the diagram below what kind of a bond is shown.




A. α (1-4) glycosidic bond
B. α (1-6) glycosidic bond
B. α glycosidic bond
D. glycosidic bond

68. Polysaccharides are macromolecules of simple sugars. Glycogen, starch, and cellulose are all composed entirely of glucose residues. What are the differences between starch and cellulose?

A. Starch is made up of glucose residues joined by β (1→4) only
B. Starch is made up of α (1-4) glycosidic bonds α β (1→4) glycosidic bond
C. Cellulose is not branched and is made up of α β (1→4) glycosidic bond
D. Cellulose is not branched but made up of α (1-4) glycosidic bonds

69. Protein structure is generally described as having four levels: the primary, secondary, tertiary and quaternary structures. Which statement correctly describes the primary structure?

A. The primary structure is the regular arrangement of amino acids within localized regions of the polypeptides
B. The primary structure of a protein is the sequence of amino acids in its polypeptide chain.

C. Primary structure is the folding of the polypeptide chain as a result of interactions between the side chains of amino acids that lie in different regions of the primary sequence

D. Primary structure consists of the interactions between different polypeptide chains in proteins composed of more than one poly peptide

70. What are the similarities between myoglobin and Haemoglobin both transport oxygen in mammals. Which of the following animals will have more myoglobin?

A. Whales and seals
B. Monkey and giraffe
C. Lion and leopards
D. Whales and lions

71. Fatty acids consist of long hydrocarbon chains terminating in a carboxyl group (COO -). Given Palmitate stearate and Oleate, which ones would you recommend to be given to person diagonised with the coronary heart disease with the problem of obesity?

A. Palmitate and Oleate
B. Oleate and stearate
B. Stearate only
D. Oleate only

72. What kind of nucleic acid molecule is represented by 5' – ATTCTGG – 3'

A. RNA
B. DNA
B. RNA and DNA
D. Nucleoside

73. What is the function of the checkpoint in the metaphase of the cell cycle?

A. Monitors the alignment of chromosomes on the mitotic spindle, thus ensuring that a complete set of chromosomes is distributed accurately to the daughter cells.
B. Prevents cell transfer of damaged DNA to daughter cells preventing cancers
C. Monitors the alignment of chromosomes on the mitotic spindle so that the dividing cells have the right size
D. Ensuring that a complete set of chromosomes is distributed accurately to the daughter so that cytokinesis is correct

74. The division cycle of most eukaryotic cells is divided into four discrete phases: M, G 1, S, and G 2. M phase (mitosis) is usually followed by cytokinesis. At which stages of interphase are the cells arrested factors arrested in skin cells if nutrients are deficient?

A. S and G1
B. G1
C. G2
D. G1 and S

75. Mapitya Banda (10 years old girl) has wounds on the skin that never heal. What explanation can you give to such a condition of this child.

A. The cells of the skin are not dividing meiotically.
B. The skin cells are only in the S phase of mitosis
C. The skin cells remain in the $G_1$ phase and not undergoing Mitosis
D. The skin cells have are in $G_0$ and not leaving to Mitosis

6. Phosphate diester bonds in the formation of DNA are between----

A. Nitrogenous bases.
B. The two strands of DNA.
C. The 3' and 5' carbon atoms in the sugar phosphate backbone.
D. The 2' and 4' carbon atoms in the sugar phosphate backbone..

**SECTION B**

Write brief notes on any **TWO** (2) of the following biological terms or concepts:

1. Phytochemistry and conservation biology **[6]**
2. Globular proteins **[6]**
3. Crossing over **[6]**
4. Mitotic interphase **[6]**

**SECTION C**

Write brief notes on any **TWO** (2) of the following biological terms or concepts:

1. Cigarette Smoking, a main cause of small cell and non-small cell **lung cancer**, contributes to 80 percent and 90 percent of **lung cancer** deaths in women and men, respectively. Men who **smoke** are 23 times more likely to develop **lung cancer**
   i. Explain how cigarette smoking can lead to lung cancer. **[2]**
   ii. Explain the causes of cancer. **[4]**
2. A young woman having won a gold medal as the fastest runner in the 800m race in the world has been having chronic fatigue. The diet recommended for this lady is such that she must increase the intake of sprouting seeds.
   i. What is the cause of chronic fatigue? **[2]**
   ii. How can sprouting seeds prevent chronic fatigue in this lady? **[4]**
3. Adrenaline is secreted by the adrenal glands.
   i. Explain the role of DNA in the formation of adrenaline. **[5]**
   ii. What is the function of Endoplasimic reticulum in the secretion of this hormone to target cells. **[1]**
4. Briefly explain why, the egg albumen coagulates when boiled while boiled fresh milk does not. **[6]**

SECTION B

3. Crossing over is the process by which the homolo pair of chromosomes (similar chromosomes) for a tetrad The process of crossing over is called Synapsis. Crossing over is done to achieve what is calle genetic variation which is simply the change of genes of the homologus chromosomes.

2. Globular Proteins are proteins that are disc (com disc or round shaped and are able to dissolve water. This proteins include enzymes, antibo Hemoglobin and collagen.

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Grobular Proteins are proteins that are ~~disc~~ compact disc or round shaped and are able to dissolve in water. This proteins include enzymes, antibodies, hemoglobin and collagen. (4)

2(i) Cigarette Smoking can lead to lung Cancer in way that, the Smoke inhaled during go to the lungs and Cause abnormality in the lung cells therefore leading to Cancer.

(ii) Cancer is Simply a disease caused by an abnormal number of cells in the body. This happens when the P53 gene fails to Monitor or destroy cells that are replicating themselves. When the P53 gene fails to Monitor the intergrity of the DNA, this leads to a uncontrollable division of cells leading to Cancer.

3(i) DNA plays a role in the formation of all Cell structures and organelles because the instruction to Create any structure Comes from the DNA. Therefore DNA plays the a role in the Manufacture of adrena line because it Controls all activities and programs that takes place in the Cell. DNA is therefore the instructor of all activities that go on in the Cell This Means that no activity can go on in the Cell Minus permission from the DNA.

(ii) The function of Endoplasmic reticulum is that it acts a network of transport of the secret Hormone adrenaline to the targeted organ. We can Safely say that the Endoplasmic reticulum is More like a transport vessel in which Adrenaline hormone has to pass through for it to to the targeted organ.

# THE COPPERBELT UNIVERSITY

MICHAEL CHILUFYA SATA SCHOOL OF MEDICINE

MBI 110-BIOLOGY TEST 2

29th May, 2018

*Duration: 1:30MIN*

Instructions: ***Use your own answer sheets***

**SECTION A:** *(20mks)* Fill in the missing spaces to complete the statements.

1.. ..... gene controls the Blood group.

2. The blood group AB is .....

3. The surface of red blood cells carry protein molecules called .....

4. .....is a condition in which a single gene may affect several characteristics.

5. The two types of mutation are..... and .....

6. A mutation resulting from a change in the amount of DNA is known as..... mutation.

7. .....is the name of a scientist who coined the concept of mutation.

8..... is the cyanobacteria species that stabilizes soil using a polysaccharide sheath that binds to sand particles and absorbs water.

9. ..... is an example of fungi where an antibiotic is extracted.

10. Cyanobacteria is also referred to as.....

11. The..... is an enzyme that copies the retroviral RNA into DNA.

12.....blocks HIV from reproducing, and returns your immune system back to an almost normal state.

13. The reproductive cells in fungi are called.....

14. In sexual reproduction of fungi, the male gamatangia is called.....

15. Complete the table below by filling in (i) to (v).

| Causative agent (Bacteria/Virus) | Disease it causes/Area it attacks |
|---|---|
| (i) | Tuberculosis (TB) |
| (ii) | Urinary tract infection |
| *Staphylococcus aureus* | (iii) |
| (iv) | Cholera |
| HIV | (v) |
| | |

**SECTION B (30mks)**

1. With the help of a diagram describe the three (3) stages of sexual reproduction in fungi. *(10mks)*

2. List 4 allergies or diseases associated with cyanobacteria to the lives of people. *(4 mks)*

3. Taxonomy is the major part of systematics that involves the process of description, identification, nomenclature and classification. Briefly describe the process of nomenclature citing a lot to enhance your answer. *(6mks)*

4. Define the following terms: *(5mks)*

(i) Virion (ii) Capsid (iii) Norovirus (iv) Hepatitis (v) Bacteriophages

5. (i) List three (3) symptoms associated with Urinary tract infection. (3mks)

(ii) What is the meaning of immunization? *(1mk)*

(iii) What do the letters CD, in relation to CD4 count stand for? *(1mk)*

KPCOFGS

TCBN
TCNB
TCTV

fortha mutinta Hembaya (1f130f65)

80%

# THE COPPERBELT UNIVERSITY

## SCHOOL OF MEDICINE

## MBI 110 TEST 2

**DATE: 11TH JUNE, 2019** **DURATION: 2HOURS**

**INSTRUCTIONS**

1. Answer all questions in this paper
2. Marks for each question are indicated in square [ ] at the end of each question.

**SECTIONS A (40 MARKS) SHORT ANSWERS**

1. Genetics is the study of .....and ..... [2]
2. ..... are alternative form of a gene [2]
3. The law that states that introduction organism carry pairs of alleles for each traits [2]
   .....
4. The plants with Td alleles is said to be ..... [2]
5. The physical appearance of an organism is called ..... [2]
6. When both alleles of a pair are fully expressed in a heterozygous organisms, such alleles are said to be ..... [2]
7. Animals or plants that carry .....have their viability placed at great risk. [2]
8. The three domains of life are ....., ..... and [3]
   .....
9. What comes next after class in the hierarchy of classification of organisms [2]
   .....
10. Apart from cloning name other two problems in applying the species concept to living organisms [2]
    ..... and ..... [2]
11. In the taxonomic system, families are grouped into ..... [2]
12. Biological species concept can only be applied to .....organisms

13. What are viruses? ..... [2]

14. Viruses are neither a cell no an organism, explain? ..... [2]

15. A virus that attacks bacteria is called ..... [2]

16. The enzyme that is unique to retroviruses is ..... [2]

17. Prions cause disease when they ..... [2]

18. State any two roles of nucleic acid in living organisms ..... [3]

19. What are the similarities between viruses and viroids? .....

**SECTION B: ESSAY TYPE [20 MARKS]**

1. The four human blood groups A, B, AB and O are determined by a single gene on chromosome 9. Three alleles of this gene exist, $I^A$, $I^B$ and $I^O$. $I^A$ and $I^B$ are co-dominant while $I^O$ is recessive to both $I^A$ and $I^B$. the gene codes for an enzyme (glycosyltransferase) which modifies the carbohydrates portion of a cell surface glycoprotein. The $I^O$ allele has a single base deletion which causes a frame shift resulting in an inactive protein being produced. The two functional forms of the enzyme codes for by alleles $I^A$ and $I^B$ add different carbohydrates to the surface glycoproteins.

   (a) Explain what is meant by the terms pure breed and hybrid [2]

   (b) Using symbols given draw a genetic diagram to show how two parents may have children with all four blood groups. [4]

2. The taxonomies of the wolf, spider and maize plant are given in the following table fill in the missing spaces. [3]

| TAXON | WOLF | SPIDER | MAIZE PLANT |
|---|---|---|---|
| Kingdom | Animalia | Animalia | Plantae |
| Physical | Chordate | Arthropoda | Angio spermophyta |
| Class | Mammalian | Arachinida | monocotyledonae |
| Order | Carnivora | Araneae | Commelinales |
| Family | Canidae | saltadae | Poaceas |
| Genus | Canis | Galus | Zea |
| Species | Canis lupus | Galus | Zea mays |

3. Explain the dichotomous key [3]

4. State and explain the three tertiary structure interactions of the protein structure [6]

5. HIV, the virus that cause AIDS only infects certain cells within the immune system this is because ..... [2]