JOINT UNIVERSITIES PRELIMINARY EXAMINATIONS BOARD

JUNE 2019 EXAMINATIONS

JUPEB/003E

BIOLOGY: SCI-J152 **Time Allowed: 3 hours**

SECTION A: MULTIPLE CHOICE QUESTIONS

Answer all questions in this section.

Use the OMR answer sheet provided to answer the questions, follow the instructions on the OMR sheet.

SECTION B: ESSAY QUESTIONS

Answer FOUR Questions in ALL; ONE Question from each Course

SECTION A: MULTIPLE CHOICE QUESTIONS

Answer all questions in this section.

1. Protozoa that move by pseudopodia belong to the Class _____
   A. Ciliophora.
   B. Sarcodina.
   C. Mastigophora.
   D. Apicomplexa.

2. The bonding between two complementary bases in a nucleotide is _____
   A. Van der Waal's force.
   B. Covalent bond.
   C. Hydrogen bond.
   D. Bi-polar force.

3. _____ is the basic unit of inheritance.
   A. Allele
   B. Locus
   C. Gene
   D. Chromosome

4. Which statement describes events during interphase of mitosis?
   A. Chromosomes start to coil, becoming shorter and fatter.
   B. Chromosome line up on the equator of the spindle.
   C. Chromosome are pulled apart by spindle fibres.
   D. Chromosome are replicated ready for the next division.

5. Which process occurs during prophase of the mitotic cell cycle in an animal cell?
   A. Division of centromeres.
   B. Formation of chromosomes.
   C. Replication of DNA.
   D. Separation of centrioles.

6. The intermediate host of *Taenia saginata* is _____
   A. pig.
   B. dog.
   C. cattle.
   D. horse.

7. The formal system for organizing, classifying, and naming living things is known as …
   A. nomenclature.
   B. classification.

C. taxonomy.
D. hierarchy.

8. The group of insects that have mouth parts adapted for both piercing and sucking is …
   A. cockroaches, aphids and mosquitoes.
   B. aphids, houseflies and moths.
   C. mosquitoes, tse-tse flies and aphids.
   D. aphids, bee and grasshoppers.

9. Cells consist of a number of different components. Which row shows the components present in both a prokaryotic and an eukaryotic cell?

OPTION	LYSOSOME	GOLGI APPARATUS	RIBOSOME	CELL SURFACE MEMBRANE
A.	Absent	Present	Absent	Present
B.	Present	Present	Absent	Absent
C.	Absent	Absent	Present	Present
D.	Present	Absent	Present	Nil

10. Four different juices A, B, C and D were tested with Benedict solution. A second sample of each juice was hydrolysed and tested with Benedict solution. The table below shows the masses of the precipitate formed. Which juice contains the greatest mass of non-reducing sugar?

Option	Mass of precipitate before hydrolysis	Mass of precipitate after hydrolysis
A.	30	55
B.	55	55
C.	65	85
D.	70	80

11. The gas exchange of CO_2 and O_2 in plants occurs through small regulated opening called…
   A. mesophyll.
   B. stomata.
   C. chloroplast.
   D. thylakoids.

12. Moss is an example of _____ plant.
   A. vascular
   B. haplontic
   C. diplontic
   D. flowering

13. Which of these options is an example of a pair of thallus liverwort?
    A. *Pellia* and *Lophocolea*.
    B. *Pellia* and *Marchantia*.
    C. *Lophocolea* and *Marchantia*.
    D. *Lophocolea* and *Funaria*.

14. The base of ferns, is protected against drought or frost by …
    A. ramenta.
    B. strobili.
    C. sori.
    D. rhizome.

15. Which of these is true about protoplast at incipient plasmolysis?
    A. It ceased to exert pressure against the cell membrane.
    B. It ceased to exert pressure against the cell wall.
    C. It adhered to the cell wall under high pressure.
    D. It adhered to the cell membrane under high pressure.

16. The main function of a companion cell in phloem tissue during translocation is …
    A. to provide cytoplasmic contact with the sieve tube for loading.
    B. to provide structural support for the sieve tube.
    C. to provide nucleus during cell division in the phloem.
    D. to provide assimilates for storage of the transported sucrose.

17. The fastest and simplest pathway of water in the root and leaf is the …
    A. cell wall.
    B. cell membrane.
    C. cytoplasm.
    D. vacuole.

18. The pollen grains in the pollen sacs of an anther consist of …
    A. two coats, diploid generative nucleus and haploid nucleus.
    B. two coats, haploid generative nucleus and haploid nucleus.
    C. one coat, diploid generative nucleus and diploid nucleus.
    D. one coat, haploid generative nucleus and haploid nucleus.

19. The use of natural enemy to control a particular pest can be regarded as …
    A. chemical control.
    B. physical control.
    C. biological control.
    D. natural control.

20. The female reproductive organ of a typical flower is known as …
    A. gynoecium.

B. androecium.
C. calyx.
D. corolla.

21. Ada wants to get her fruits ripened. Which plant hormone will you advise her to use for this purpose?
A. Giberellin.
B. Indole Acetic Acid.
C. Cytokinin.
D. Ethylene.

22. Which statement about thylakoids in eukaryotes is true?
A. Thylakoids exist as a maze of folded membrane.
B. The space surrounding thylakoids is called stroma.
C. Chlorophyll contains the folded thylakoid.
D. Thylakoids bring about the separation of water.

Use the equations below to answer Questions 23 and 24 respectively.

Pyruvate -**A**→ $2C_2H_5OH + 2CO_2 + 2ATP$
Pyruvate -**B**→ Lactate + 2ATP

23. What does **A** represent, and in what condition does this reaction occur in non-photosynthetic plants?
A. Cytochrome oxidase, aerobic.
B. Pyruvate decarboxylase, anaerobic.
C. Pyruvate dehydrogenase, aerobic.
D. NAD. Anaerobic.

24. What does **B** represent, and in what condition does this reaction occur in animal cell?
A. Lactate dehydrogenase, anaerobic.
B. Cytochrome oxidase, aerobic.
C. NAD, aerobic.
D. Lactate decarboxylase, anaerobic.

25. The transport of water from the root through the xylem vessels to the leaves is affected by environmental factors. A decrease in one of the following environmental factors would lead to increase in water transport.
A. Wind direction.
B. Temperature.
C. Humidity.
D. Light intensity.

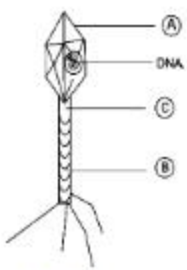
26. Genetically Modified Crops (GMCs) are important in combating food insecurity among the world ever increasing population, however, their major challenge is …
    A. pest resistance.
    B. adaptation.
    C. enabling law.
    D. high cost of production.

27. The scientist whose findings resolved the debate on spontaneous generation was …
    A. Louis Pasteur.
    B. Rudolf Virchow.
    C. Lazzaro Spallanzani.
    D. John Needham.

28. Bacteria that require Oxygen for growth are called …
    A. Aerobes.
    B. Oxygenic bacteria.
    C. Anoxygenic bacteria.
    D. Anaerobes.

29. Viruses have a core of either DNA or RNA surrounded by a …
    A. Lipid envelope.
    B. Protein coat.
    C. Cell wall.
    D. Cell membrane.

Use the diagram below to answer Questions 30-32



30. The parts labeled A, B, and C are _____ respectively.
    A. Head, Collar, Sheath
    B. Head, Neck and Sheath
    C. Head, Sheath and Neck
    D. Head, Sheath and Collar

31. What is the name of the diagram represented above?
    A. Bacteriophage virus.

B. Sperm cell.
C. Stem cell.
D. Bacteria.

32. Which of the following occurs at the part labeled DNA?
A. Replication.
B. Death.
C. Growth.
D. Development.

33. The undifferentiated body of Thallophyta is called _____
A. thallus.
B. thallophytes.
C. false stems.
D. false roots.

34. Mr Tari is reported to have a swollen region and localized pains around his leg injury. What best describes this situation?
A. Infection leading to inflammation.
B. Immunity decline.
C. Reflex response.
D. Metabolic internal process.

35. _____ are heterotrophic plants which depend on other living organisms (plants and animals) for their nutritional requirements.
A. Parasites
B. Symbionts
C. Saprophytes
D. Weeds

36. The stored carbohydrate nutrient in animals is known as _____
A. glycogen.
B. chitin.
C. starch.
D. glucose.

37. How many embryonic layers are present in Phylum Mollusca?
A. Two.
B. Three.
C. Four.
D. Five.

38. The main function of epithelial tissue is _____
A. movement.

B. protection and defense.
C. covering.
D. binding and support.

39. Which of these is a connective tissue?
A. Blood.
B. Epidermis.
C. Fallopian tube.
D. Nervous tissue.

40. Which of the following is not a member of the phylum Chordata?
A. Lung fish.
B. Star fish.
C. Frog.
D. Parrot.

41. Some unicellular animals have developed different organelles for locomotion. Which of the combinations indicated below provides a corresponding pair?
A. Sarcodina and cilia.
B. Sarcodina and flagella.
C. Mastigophora and flagella.
D. Mastigophora and cilia.

42. In embryology, three earliest membranes to be reckoned with are _____ membranes.
A. plasma, chorion and embryonic
B. chorion amnion and yolk sac
C. chorion, placenta and umbilical
D. plasma, amnion and umbilical

43. Phycology is the study of _____
A. algae.
B. nematodes.
C. viruses.
D. protozoa.

44. The conversion of a nutrient into a molecule in the body of a consumer is referred to as ___
A. digestion.
B. assimilation.
C. absorption.
D. inhibition.

45. Which of these best explains why arthropods are successful?
A. They possess muscular appendages which may be adapted for crawling.
B. Their bodies are divided into segments called septa.

C. Their exoskeletons protect them from predators and water loss.
D. They produce silk from abdominal glands to spin webs from trapping its prey.

46. Determine the major difference between the skeletons of earth worm and arthropods.
A. Earthworms possess exoskeleton while arthropods possess hydrostatic skeleton
B. Earthworm possess skeletons made up of non-living materials while arthropods possess skeletons made of living materials
C. Earthworm possess hydrostatic skeletons which uses fluid pressure for support while arthropods possess exoskeleton
D. Earthworms possess skeletons made up of living materials while arthropods possess skeletons of non-living materials.

47. The method of fertilization among vertebrates in which fertilized eggs are retained in the body of the female until when matured and then hatched out is _____
A. Oviparity.
B. Ovoviviparity.
C. Viparity.
D. Birth.

48. From the adaptive features below, choose the class of organisms it best describes.
i. It has a naked moist skin.
ii. It has a three chambered heart.
iii. It is cold blooded.
iv. It has a pair of five hind limbs in adult stage.
v. It has sticky tongue which can be protruded and retracted quickly.

A. Reptilia.
B. Pisces.
C. Amphibia.
D. Aves.

49. The presence of endoskeleton, gill slits and well developed central nervous system are characteristics of which of these sets of options?
A. Mammalia and Reptilia.
B. Pisces and Arachnida.
C. Myriapoda and Amphibia.
D. Insecta and Reptilia.

50. *Paramecium* moves about by _____
A. floating.
B. looping.
C. crawling.
D. beating of cilia.

SECTION B: BIOLOGY ESSAY QUESTIONS

Answer FOUR questions in all; ONE Question from each Course

BIO 001: GENERAL BIOLOGY

Question 1

Two parents with normal skin and hair colouring had six (6) children, of whom three (3) were albino. Albino people have no colouring in their skin or hair, due to having an inactive form of the enzyme tyrosinase. Tyrosinase is essential for the formation of the brown pigment melanin.

(a) The normal allele of the tyrosinase gene is 'A' and the allele that produces faulty tyrosinase is 'a'. State the genotype of the parents and their albino children. **[5 marks]**

(b) Albinism is a relatively frequent condition in humans, but one (1) of these albino children had a very unusual phenotype. While most of her hair was white, the hair of her eye brows developed some brown colouring, as did the hair on her hands and lower legs. Genetic analysis suggested that a mutation had occurred in the faulty tyrosinase allele. Suggest why it is likely that this mutation occurred in the child with brown coloured eye brows rather than in the testes and ovaries of the parent. **[2 marks]**

(c) A man with normal vision, married a lady with normal vision. Incidentally, their first son is colour blind. Use a genetic diagram to show the possibility of this man being the rightful father of the colour blind child. **[2 marks]**

(d) What was the genotype of the man and his wife? **[1 mark]**

Question 2

As the team leader of an environmental study team, you have been commissioned to undergo a field study to determine the population density and population size of given species in a habitat.

(a) Design a *pro-forma* that would guide your team to success. **[5 marks]**

(b) Mention any four (4) materials that would be required. **[4 marks]**

(c) If the population size of grasshopper is 700 in a sample plot of $100m^2$, what is the population density of grasshopper in the plot? **[1 mark]**

BIO 002: BOTANY

Question 3

(a) Using six (6) points each describe the following:

i. Biological control **[3 marks]**

ii. Chemical control. **[3 marks]**

(b) Enumerate four (4) impacts of climate change on plants. **[4 marks]**

Question 4

(a) Outline eight (8) general characteristics of ferns. **[4 marks]**

(b) With the aid of diagram only, describe the life cycle of *Selaginella*. **[6 marks]**

BIO 003: MICROBIOLOGY

Question 5

(a) State the following characteristics of the Archaea:

i. Mesophiles
ii. Halophiles
iii. Acidophiles
iv. Alkaliphiles
v. Thermophiles. **[5 marks]**

(b) Highlight five (5) biotechnological or beneficial uses of microorganisms. **[5 marks]**

Question 6

(a) List two (2) media that are used for the growth of microorganisms in the laboratory. **[2 marks]**

(b) Briefly write on the structures that prokaryotes use for attachment. **[3 marks]**

(c) With illustration, describe the events in each stage of a microbial growth curve of a batch culture. **[5 marks]**

BIO 004: INTRODUCTORY TO ZOOLOGY

Question 7

(a) Describe the life cycle of *Plasmodium* in man. **[8 marks]**

(b) Mention four (4) economic importance of *Plasmodium*. **[2 marks]**

Question 8

(a) List ten (10) characteristics of the Class Reptilia. **[5 marks]**

(b) Itemize five (5) adaptations of animals in transition from water to land. **[5 marks]**