401 S. H. S. C. E.
MAY 2012
BIOLOGY **1&2**
Objective and Essay Tests
2½ hours

Name:.....

Identification Number: .....

THE WEST AFRICAN EXAMINATIONS COUNCIL

Senior High School Certificate Examination

May 2012 **BIOLOGY** 2½ hours

*Do **not** open this booklet until you are told to do so. While you are waiting, read and observe the following instructions carefully. Write your **name** and **identification number** in the space provided above.*

*This paper consists of **two** parts: Papers 1 and 2. Answer Paper 1 on your Objective Test Answer Sheet and Paper 2 in your Answer Booklet. **Paper 1** will last for **1 hour** after which the answer sheet will be collected. Do **not** start Paper 2 until you are told to do so. **Paper 2** will last for **1½ hours**.*

PAPER 1

OBJECTIVE TEST

[40 marks] 1 hour

1. Use **2B** pencil throughout.
2. On the objective answer sheet supplied, provide the following details **correctly:**
   (a) Supply the information required in the spaces marked *CENTER NAME, CENTER No, SCHOOL NAME and SCHOOL No.*
   (b) In the space marked *STUDENT'S NAME,* write your **surname** followed by your **other names.** Write your **identification number** in the space marked *STUDENT No.*
   (c) In the spaces marked *SUBJECT and GRADE,* write BIOLOGY and 12TH in that order.
   (d) In the box marked *IDENTIFICATION NUMBER,* provide your **identification number** vertically in the spaces on the left-hand side, and shade each numbered space in line with each digit. This identification number must be the same as the one indicated on your Admission Slip. Repeat the process with the correct information for the box marked *YEAR OF FIRST ENTRY.*
   (e) In the box marked *Subject Code,* write the digits 401 vertically in the spaces on the left-hand side. **Shade** the corresponding numbered spaces as you did for your identification number.
3. An example is given below. This is for a male candidate whose *name* is Michael J. GAYFLOR. His *identification number* is 101123456, his first entry is in 2012 and he is offering *BIOLOGY.*

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PRINT IN BLOCK LETTERS	
SOMAH TAMBA INSTITUTE	500104
CENTER NAME	CENTER No.
TUKPEI PREPARATORY SCHOOL	101123
SCHOOL NAME	SCHOOL No.
GAYFLOR, MICHEAL J.	456
STUDENT NAME	STUDENT No.
BIOLOGY	12TH
SUBJECT	GRADE

IDENTIFICATION NUMBER

1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
0	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
2	⇨	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨
3	⇨	⇨	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨
4	⇨	⇨	⇨	⇨	■	⇨	⇨	⇨	⇨	⇨
5	⇨	⇨	⇨	⇨	⇨	■	⇨	⇨	⇨	⇨
6	⇨	⇨	⇨	⇨	⇨	⇨	■	⇨	⇨	⇨

For Supervisors only.
If a candidate is absent ▭
shade this space.

YEAR OF FIRST ENTRY

2	⇨	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨
0	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
2	⇨	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨

SUBJECT CODE

4	⇨	⇨	⇨	⇨	■	⇨	⇨	⇨	⇨	⇨
0	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨

Shade the space marked
M (for Male) or F(for Female) M ■ F ▭
In this box

PAPER 1
OBJECTIVE
[40 marks]

Answer **all** *the questions.* **1 hour**

Paper **1** *consists of* **sixty** *objective questions. Each question is followed by* **four** *options lettered* **A** *to* **D**. *Choose the correct option for each question and shade in* **pencil** *on your answer sheet the answer space which bears the same letter as the option you have chosen. Give only* **one** *answer to each question. An example is given below.*

The study of the spread of disease is called

A. epidemiology.
B. biochemistry.
C pathology.
D. physiology.

The correct answer is **epidemiology** *which is lettered* **A** and *therefore the answer space* A *would be shaded like this.*

[A] [B] [C] [D]

Think carefully before you shade the answer spaces on the answer sheet. Erase completely any answers you wish to change.

Do all rough work on this question paper. Now answer **all** *the following questions.*

1. Which classification level contains subgroup within orders?
- A. Family
- B. Class
- C. Phylum
- D. Domain

2. Which of the following statements is **not** true about the living cell?
- A. All living organisms are either single or groups of cells.
- B. All the cells in organisms are the same.
- C. There is no life apart from the life in cells.
- D. The cell is the basic unit of life.

3. In the absence of a contractile vacuole, an amoeba or paramecium would **not**
- A. excrete carbon dioxide.
- B. move from one place to another.
- C. carry out gaseous exchange.
- D. regulate its water content.

4. Which of the following processes can be found in both bacteria and protists?
- A. Mitosis
- B. Meiosis
- C. Binary fission
- D. Fusion of gametes

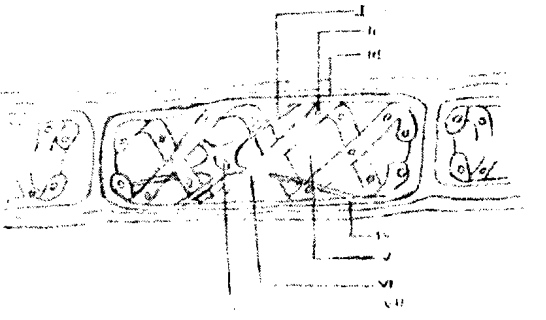
5. What would be the result of cytokinesis being omitted from the cell cycle?
   A. The daughter cells would die.
   B. The cell would lose its mitochondria.
   C. The daughter cells would not have nuclei.
   D. The cell would not divide into two daughter cells.

6. The importance of feedback signals at key checkpoints within the cell cycle is to
   A. indicate the end of the cycle.
   B. indicate the presence of proteins.
   C. identify meiosis and mitosis indicators.
   D. delay or trigger the next phase of the cycle.

7. What factor can cause cells to divide in a culture medium?
   A. Protein signals
   B. Lack of nutrients
   C. Contact with other cells
   D. Contact with the edge of the dish

8. Using iodine solution, Bluret test, Benedict reagents and ethanol respectively in testing for reducing sugars, which of the following trends of color changes would be observed?
   A. Blue→black→blue→brown→clear
   B. Brown→blue→brick red→clear
   C. Brown→violet→blue→clear
   D. brown→blue→violet→milky

Use the diagram of a spirogyra below to answer Questions **9** *and* **10.**



9. What is the function of the part labeled I?
   A. It digests starch.
   B. It protects the chloroplast.
   C. It suspends the nucleus.
   D. It produces proteins.

10. The part labeled II in the diagram is the
   A. pyrenoid.
   B. mucilage.
   C. cell wall.
   D. cytoplasmic strand.

11. Which of the following is **true about a** spinal reflex?
   A. It is a voluntary contraction of muscles.
   B. It is an involuntary response to a stimulus.
   C. It increases blood flow to muscles.
   D. It is controlled by the brain.

12. Which of the following structures **is not** present in the vascular bundles of a dicot stem?
   A. Parenchyma, xylem, and collenchyma
   B. Epidermis, sclerenchyma and xylem
   C. Parenchyma, collenchyma and sclerenchyma
   D. Sclerenchyma, xylem and collenchyma

13. The organs constantly in touch with the liver are the

A. pancreas, colon and caecum.
B. duodenum and stomach.
C. ileum. stomach and colon.
D. stomach and gall bladder.

14. If the cerebellum of a person is slightly damaged, which of the following will be impaired?

A. Vision
B. Walking
C. Breathing
D. Digestion

15. Which of the following divides by meiosis?

A. Cambium
B. Apical meristem
C. Ootids in the ovary
D. Germinative cells of the skin

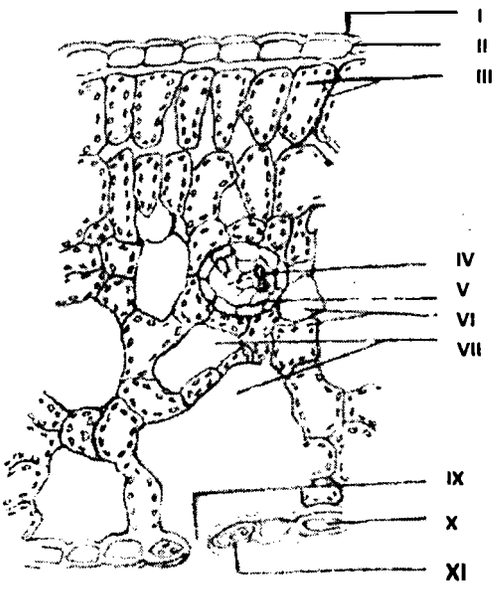
16. What do linkage mapping methods identify?

A. Only genes that are inherited together
B. The exact nucleotide sequence of a chromosome
C. The relative position of genes along a chromosome
D. The exact number of base pairs between specific genes

17. Which of the following structures are visible in the cell of a plant during mitosis?

A. Centrioles, chromatids and nucleolus
B. Homologous chromosomes, nuclear membrane and spindle fibers
C. Cell wall, centrioles and chromatids
D. Chromosomes, nuclear membrane and centrioles

The diagram below is the transverse section of a leaf. Use it to answer Questions **18** *to* **20**.



18. Through which of the following structures does carbon dioxide enter the leaf?

A. I
B. II
C. IX
D. X

19. Chloroplast is contained in

A. I,II and III.
B. III, VIII and XI.
C. II, III and VII.
D. III, VIII and IX.

20. The palisade cells are the structures labeled

A. II.
B. III.
C. IV.
D. VI.

21. The densest populations of most organisms that live in the ocean are found near the surface. The **most** probable explanation for this is that the

A. largest primary consumers are found near the surface.
B. bottom contains radioactive materials.
C. water has more nutrients than fresh water.
D. light intensity that reaches the ocean.

22. In Mendel's **first** experiments with pea plants, the average ratio of contrasting traits in the F_2 generation was

A. 1:0.
B. 1:1.
C. 2:1.
D. 3:1.

23. Which law states that the inheritance of one trait has no effect on the inheritance of another?

A. The law of dominance
B. The law of segregation
C. The law of universal inheritance
D. The law of independent assortment

24. If the sequence of nitrogenous bases in one strand of DNA is GAGTC, what is the sequence of bases in the complementary strand of DNA?

A. AGACT
B. ATACG
C. CTCAG
D. TCTGA

25. The process of transcription produces

A. tRNA.
B. RNA.
C. mRNA.
D. DNA.

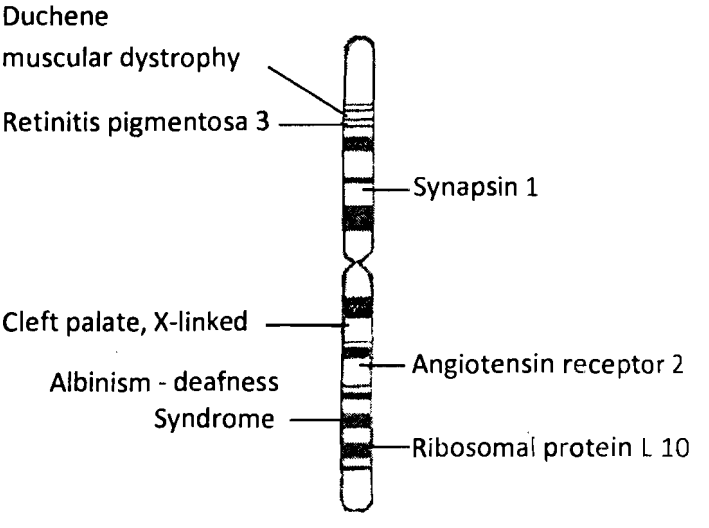
26. How does the karotype of a person with Down syndrome differ from a normal karotype?

A. It lacks a chromosome.
B. It has two sex chromosomes.
C. It has twice the number of chromosomes.
D. It has an extra copy of a single chromosome.

27. Which of the following is an example of non-random mating?

A. Genes are removed from the population when individuals migrate.
B. A change in a population's allele frequency is due to chance.
C. An individual chooses a mate that has the brightest coloration.
D. An individual is eliminated from the gene pool by natural selection.

The diagram below shows the approximate location on an X chromosome of genes for some human traits. Use it to answer Questions **28** *and* **29**.



HUMAN X CHROMOSOME

28. The information shown about genome is called a
- A. chromosome map.
- B. genetic fingerprint
- C. genomic library.
- D. karyotype

29. Many of these genes code for
- A. typical traits.
- B. sex-linked traits.
- C. unlinked traits.
- D. unexpressed traits.

30. How do scientists use DNA sequences to determine which organisms share the **most** recent ancestry?
- A. They recreate fossil DNA to model ancient organisms.
- B. They compare all of the genes of every organism that exists.
- C. They look for organisms that share the most similar DNA sequences.
- D. They look for any organisms that have differences in DNA sequences.

31. Which of the following is a form of biochemical evidence that can be used to study evolution?
- A. Speciation
- B. Intermediate forms
- C. Homologous structures
- D. Amino-acid similarities

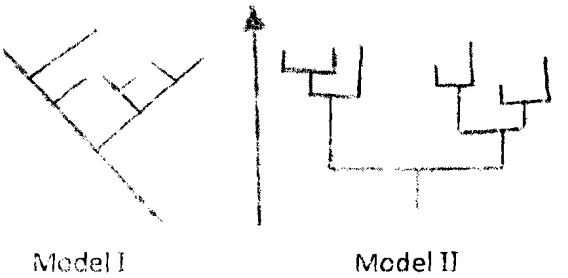
32. Which of the following was a **weakness** in Darwin's ideas about evolution?
- A. Lack of evidence for evolution
- B. Lack of a mechanism for evolution
- C. Lack of a mechanism for inheritance of traits
- D. Lack of recognition of the importance of variation

33. Nitrogen fixation by bacteria is important to all other organisms because it
- A. does not take oxygen away from animals.
- B. captures more energy than photosynthesis alone captures.
- C. is necessary in order for dead organisms to be decomposed.
- D. converts nitrogen gas into a form of nitrogen that plants can take up through their roots.

34. Modern evolutionary theory has incorporated most of Darwin's ideas **except** Darwin's
- A. laws of heredity.
- B. theory of natural selection.
- C. idea that species evolve gradually.
- D. predictions of intermediate forms.

35. Antibiotic resistance arises in a population by
- A. mutation.
- B. crossing-over.
- C. gram staining.
- D. endospore formation.

The diagram below shows two contrasting models of the pace of evolution. Use it to answer Questions **36** *and* **37.**



Model I Model II

36. Which of the following refers to Model I?
A. The model of selection
B. The model of gradualism
C. The model of adaptive radiation
D. The model of punctuated equilibrium

37. In Model I, each point where one line splits into two lines represents
A. selection.
B. speciation.
C. adaptation.
D. punctuation

38. The sum of allele frequencies in a population should be
A. equal to 1.
B. less than 100.
C. equal to the phenotype frequencies.
D. one –half of the genotype frequencies.

39. In the Hardy-Weinberg equation, $p^2+2pq+q^2=1$, what does the term ***2pq*** represent?
A. Frequency of heterozygous individuals
B. Frequency of individuals with two alleles
C. Frequency of homozygous recessive individuals
D. Frequency of homozygous dominant individuals

40. Which of the following is **true** about evolution?
A. Individuals cannot evolve, but populations can evolve.
B. Natural selection is the only mechanism for evolution.
C. Evolution always results in more complex forms of life.
D. Organisms always evolve to have the best adaptation for their environment.

41. HIV infects and destroys
A. skin cells.
B. bacterial cells.
C. red blood cells.
D. white blood cells.

42. Which of the following pairs of characters are analogous but **not** homologous?
A. Eggs of a lizard and eggs of a snake
B. Feet of a dinosaur and feet of a bird
C. Wings of a butterfly and wings of a bat
D. Beak of a bluebird and beak of a blue jay

43. Which of the following is a *nonspecific defense*?
A. Antibody response
B. The B cell response
C. The T cell response
D. The inflammation response

44. Which process would **not** occur during asexual reproduction in protists?
A. Budding
B. Fragmentation
C. Binary fission
D. Fusion of gametes

45. Which of the following does grouping protists by nutrition reflect?
A. Ancestry
B. Ecological roles
C. Importance to humans
D. Evolutionary relationship

46. During sexual reproduction in club fungi, which of the following steps happens **first**?

A. Nuclei in the basidia fuse
B. Fused hyphae form a mushroom
C. Opposite mating types grow together
D. The zygote undergoes meiosis, which forms spores.

47. Which of the following is an association between a fungus and a plant?

A. Lichen
B. Rhizoid
C. Mycorrhiza
D. Microrhizoid

48. Which of the following fungi reproduces **only** sexually?

A. Chytrids
B. Zygote fungi
C. Sac fungi
D. Club fungi

49. Which characteristic is found in roundworms but **not** in other simple invertebrates?

A. A head end
B. Three tissue layers
C. Circulatory system
D. Tissues organized into organs

50. Which of the following is **not** a characteristic of sponges?

A. Body wall penetrated by many pores
B. Cells organized into tissues
C. Collar cells that trap food particles
D. Amoebocytes that transport food

51. Which of the following is a function of choanocytes in a sponge?

A. Supporting the body
B. Fertilizing eggs
C. Distributing nutrients
D. Moving water

52. Which of the following is the sequence of structures in the life cycle of a fluke?

A. Larva, egg, intermediate host, final host
B. Egg, larva, intermediate host, final host
C. Final host, larva, egg, intermediate host
D. Egg, larva, final host, intermediate host

53. How are bivalves different from all other mollusks?

A. They have a coelom.
B. They have a shell.
C. They lack a radula.
D. They lack a stomach.

54. In which of the following ways do annelids differ from most mollusks?

A. They lack a mantle.
B. They have a coelom.
C. They lack cerebral ganglia.
D. They have trochophore larvae.

55. Parapodia are a distinguishing characteristics of which group of annelids?

A. Earthworms
B. Leeches
C. Marine worms
D. Cephalopods

56. Which characteristic of monotremes differentiate them from other mammals?
- A. They lay eggs.
- B. They have scales.
- C. They don't have hair.
- D. They don't have mammary glands.

57. Which of the following describe **two** unique features of primates?
- A. Binocular vision and grasping hands
- B. Slow metabolic rate and binocular vision
- C. Grasping hands and two-chambered heart
- D. Two-chambered heart and slow metabolic rate

58. Which of these animals is a marsupial?
- A. Lion
- B. Echidna
- C. Opossum
- D. Duckbill platypus

59. A primate's depth perception is produced by the
- A. large frontal lobe of the brain.
- B. rods and cones found in the retina.
- C. ability to see bright light.
- D. position of the eyes at the front of the face.

60. The only surviving species of our genus, Homo, is
- A. Homo habilis.
- B. Homo erectus.
- C. Homo ergaster.
- D. Homo sapiens sapiens.

END OF OBJECTIVE TEST

DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

YOU WILL BE PENALIZED SEVERELY IF YOU ARE FOUND LOOKING AT THE NEXT PAGE BEFORE YOU ARE TOLD TO DO SO.

PAPER 2

ESSAY

[60 marks]

1½ hours

Answer **all** *the questions.*

Paper **2** *contains* **six** *compulsory questions. Use black or blue* **pen** *only. Where possible, illustrate your answers with large, clear and carefully labeled diagrams. Credit will be given for clarity of expression, orderly presentation of material and accuracy of details.*

1. *(a)* Explain the steps necessary in preparing materials to be viewed with the light microscope.

(b) How is the total magnification of a compound microscope calculated?

(c) Explain the following laboratory techniques:

(i) centrifugation;

(ii) tissue culture; and

(iii) chromatography.

2. *(a)* Draw a well labeled diagram of the structure of a bacteriophage.

(b) Describe the steps involved in viral replication in a bacteria.

(c) Name and describe the **three** types of emerging diseases.

3. *(a)* Describe the structure of a typical bone.

(b) Discuss **three** injuries and **three** disorders that affect bones and joints respectively.

(c) Name the bones that make up the following:

(i) pectoral girdle; and

(ii) pelvic girdle.

4. In a tabular form, provide the following information:

(a) Name the **three** types of tissue systems that make up vascular plants;

(b) State the location in the plant of each tissue system named in 4(a) above; and

(c) State **two** functions each, of the named tissue systems under the headings: roots, stems, and leaves.

(i) roots

(ii) stems

(iii) leaves

5. (a) Name the **three** main groups of modern cnidarians.

(b) Summarize the similarities and differences in the groups named above.

(c) Compare the polyp and medusa body forms of cnidarians and give an example of each.

6. *(a)* Outline Darwin's theory of evolution by natural selection; include the **four** logical steps.

(b) Compare the strengths and weaknesses of Darwin's ideas.

END OF PAPER