401 S. H. S. C. E.
May 2013
BIOLOGY 1 & 2
Objective and Essay Tests
2½ hours

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Index Number: 111002024

THE WEST AFRICAN EXAMINATIONS COUNCIL

Senior High School Certificate Examination

BIOLOGY

May 2013 **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 Sagbeh Bondoe FANIA. His identification number is 101123456; his first entry is in 2013 and he is offering **Biology**.

THE WEST AFRICAN EXAMINATIONS COUNCIL-LIBERIA

PRINT IN BLOCK LETTERS

TOE-BROWNE ACADEMY (CENTER NAME)	500104 (CENTER No.)
WYNNA GAYVOLOR HIGH SCHOOL (SCHOOL NAME)	101123 (SCHOOL No.)
FANIA, Sagbeh Bondoe (STUDENT NAME)	456 (STUDENT No.)
BIOLOGY (SUBJECT)	12TH (GRADE)

IDENTIFICATION NUMBER

1	0	1	1	2	3	4	5	6	

YEAR OF FIRST ENTRY

2	0	1	3

SUBJECT CODE

4	0	1

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

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

PAPER 1
OBJECTIVE
[40 marks]

1 hour

Answer **all** *the questions.*

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.*

[■] [B] [C] [D]

Think carefully before you shade the answer space 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. The branch of biology concerned with the principles of classification is called
A. anatomy.
B. physiology.
C. taxonomy.
D. ecology.

2. Which of the following can be classified into the kingdom Protista?
A. Algae and paramecium
B. Yeast and mold
C. Mushrooms and bacteria
D. Worms and amoebas

3. The optical or light microscope has lens which can magnify objects from
A. 10x to 20x.
B. 20x to 10x.
C. 10x to 500x.
D. 500x to 600x.

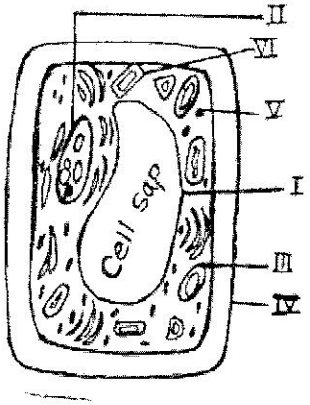
4. The *scientific name* of the caterpillar worm that destroyed crops and other vegetation in rural Liberia is
A. *Army worm.*
B. *Taenia sinesis.*
C. *Dirofilaria immitis.*
D. *Achae catacaloid.*

5. The differences between eukaryotic and prokaryotic cells include all of the following **except**
A. eukaryotic cells have mitochondria.
B. prokaryotic cells have no genetic material.
C. prokaryotic cells have more complex cell walls.
D. eukaryotic cells have cilia and flagella with complex structure.

6. Which level of organization crosses the boundary from microscopic to gross anatomy?
A. Cell
B. Tissue
C. Organ
D. Organ system

7. Which of the following phyla contains the species foraminifera?
A. Mastigophora
B. Ciliophora
C. Sarcodina
D. Chordate

The diagram below represents a plant cell. Use it to answer Questions **8** *and* **9**.



8. The structure that is responsible for protein synthesis is labeled
- A. II.
- B. III.
- C. V.
- D. VI.

9. One of the differences between plant and animal cells is portrayed by the structure labeled
- A. II.
- B. III.
- C. V.
- D. VI.

10. Which of the following does **not** influence the rate at which a solute diffuses from one region to another?
- A. Changes in pressure
- B. Traces of other solutes
- C. Size of the solute molecules
- D. The concentration gradient

11. Which of the following processes takes place when fertilization occurs that leads to formation of a zygote?
- A. The nucleus of the sperm fuses with the egg cell.
- B. The tail of the sperm fuses with the egg cell.
- C. The egg cell develops on its own without the sperm.
- D. Both tail and head of the sperm fuse with the egg cell.

12. A similarity between the bronchi and trachea is that they both
- A. branch into finer tubes.
- B. descend into the stomach.
- C. contain C-shaped bands of cartilage.
- D. contain rings of smooth muscle fibres.

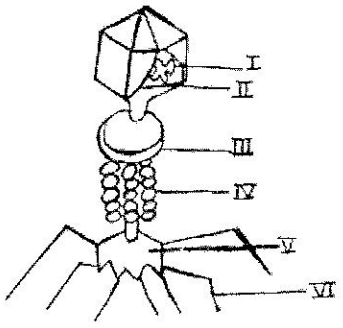
13. An increase in the amount of ADP in a cell during cellular respiration will result in
- A. electron transfer being inhibited.
- B. the enzymes of glycolysis being activated.
- C. the enzymes of Kreb's cycle being inhibited.
- D. the rate of protein synthesis being decreased.

14. Pollen grains differ from sperm cells because sperms cells are
- A. less numerous than pollen grains.
- B. diploid, pollen grains are haploid.
- C. stationary and pollen grains are motile.
- D. unicellular and pollen grains are multicellular.

15. What is the **correct** sequence of the following four events during an animal's development?
- I. Gastrulation
- II. Metamorphosis
- III. Fertilization
- IV. cleavage

- A. III, IV, I and II
- B. IV, III, II and I
- C. IV, III, I and II
- D. III, II, IV and I

Use the diagram below to answer Questions **16** *to* **18**.



16. Which of the following is an appropriate name for the diagram above?
- A. Bacteria
- B. Bacteriophage
- C. *Vibrio bacteria*
- D. *Treponema pallidum*

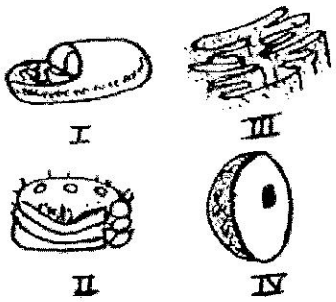
17. The part labeled **VI**, functions in which of the following?
- A. Attachment
- B. Reproduction
- C. Protein synthesis
- D. Ingestion of nucleic acid

18. The part labeled **I** is called the
- A. ribosome.
- B. protoplasm.
- C. nucleic acid.
- D. protein coat.

19. Increasing the adrenaline content of the blood would be expected to decrease the flow of blood to the
- A. liver.
- B. heart.
- C. lungs.
- D. Brain.

20. The process of sodium ions "pumped" from a region of lower concentration to a region of higher concentration in the nerve cells of humans is an example of
- A. osmosis.
- B. diffusion.
- C. passive transport.
- D. active transport.

The diagrams below represent organelles. Use them to answer Question **21**.



21. Which diagram above represents an organelle that contains the enzymes needed to synthesize ATP in the presence of oxygen?
- A. I
- B. II
- C. III
- D. IV

22. Technically, which of the following cavities *surround* organs but do **not** *contain* them?
- A. Cranial, vertebral and ventral
- B. Pleural, pericardial and peritoneal
- C. Thoracic, abdominal and pelvic
- D. Vertebral, abdominal and pelvic

23. Which of the following life processes is **most** likely to *disrupt* the homeostasis within an organism?
- A. Organization
- B. Metabolism
- C. Regulation
- D. Reproduction

24. Which of the following statements is **true**?
- A. All plants have vascular tissues.
- B. An annual ring is composed of alternating rings of phloem and xylem.
- C. When a tree is girdled, it dies because its roots are deprived of food.
- D. There is no acceptable explanation for apical dominance because the growth patterns of plants vary.

25. Which of the following is **not** characteristic of a monocot?
- A. Leaves with parallel venation
- B. Flower parts usually in threes or multiples of three
- C. Lateral meristems occurring rarely
- D. Seed with two cotyledons

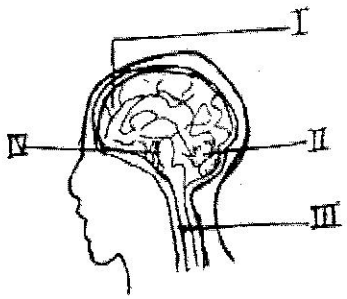
26. Which of the following characteristics is seen in the gymnosperms but **not** in other seeded vascular plants?
- A. Alternation of generation
- B. Exposed seeds
- C. Sporophyte stage
- D. Pollen

27. Transpiration is caused by
- A. hydrogen bonding.
- B. the drying power of air.
- C. cohesion-tension.
- D. stoma.

28. In contrast to most other plant hormones, which hormone has **mostly** inhibitory effects?
- A. Auxin
- B. Gibberellin
- C. Cytokinin
- D. Abscisic acid

29. A student dissecting an animal specimen discovered that it had two auricles and one ventricle. The animal is likely to be a/an
- A. fish.
- B. bird.
- C. reptile.
- D. amphibian.

The diagram below represents the human brain. Use it to answer Questions **30** *to* **32**.



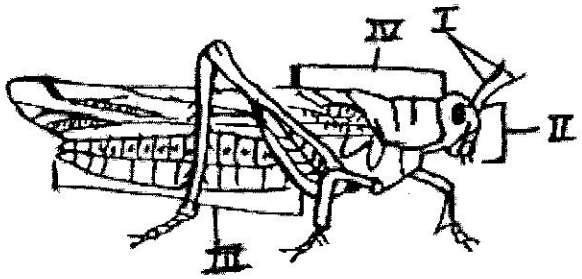
30. Body temperature and blood pressure are regulated by the structure labeled
A. I.
B. II.
C. III.
D. IV.

31. The reticular formation runs through the structure labeled
A. I.
B. II.
C. III.
D. IV

32. The gray matter of the brain is found in the structure labeled
A. I.
B. II.
C. III.
D. IV.

33. What does the reaction below represent?
$C_6H_{12}O_6 + 6O_2 + 6H_2O \rightarrow 6CO_2 + 12H_2O$ + energy
A. Aerobic respiration
B. Anaerobic respiration
C. Glycolysis
D. Photosynthesis

The diagram below represents a grasshopper. Use it to answer Questions **34** *and* **35**.



34. The structures labeled **I** are
A. reproductive organs.
B. used to take in air and water.
C. similar to structures found on spiders.
D. specialized for sensing the environment.

35. Mandibles are attached to the structure labeled
A. I.
B. II.
C. III.
D. IV.

36. All of the following stages are considered aerobic processes **except**
A. the Kreb's cycle.
B. electron transport chain.
C. formation of acetyl CoA.
D. glycolysis.

37. The **correct** sequence between genes and their phenotypic expression is
A. RNA-DNA-protein-trait.
B. DNA-RNA-protein-trait.
C. protein-DNA-RNA-trait.
D. trait-DNA-RNA-protein.

38. Which of the following statements is **not** true of the light stage of photosynthesis?
A. Water is formed.
B. Chlorophyll is energized by sunlight
C. Water molecules split into hydrogen and hydroxyl ions
D. Carbon dioxide is reduced by hydrogen atoms in $NADPH_2$.

Use the following cellular components of blood to answer Question **39**.
I. Hemoglobin
II. Erythrocytes
III. Leucocytes
IV. Platelets

39. The cellular components of the mammalian blood constitute
A. I, II and III only.
B. I, III and IV only.
C. II, III and IV only.
D. I, II, III and IV.

Turn over

40. Which of the following specialized structures is stimulated by touch, pressure, pain, heat and cold?
A. Myelin sheath
B. Relay neurons
C. Receptors
D. Cell bodies

41. Most fishes do **not** sink in water because of the presence of
I. swim bladder.
II. air bladder.
III. air sacs.
IV. air in spongy bones.

A. I and II
B. II and III
C. III and IV
D. I, II, III, and IV

42. Our **major** foods, fibres, spices, fruits and beverage crops are examples of
A. flowering plants.
B. gymnosperms plants.
C. pteridophytes.
D. bryophytes.

43. Which of the following occurs during Lactic acid fermentation?
A. O_2 is used, CO_2 is liberated
B. O_2 is not used, CO_2 is liberated
C. O_2 is used, CO_2 is not liberated
D. Neither O_2 is used, nor CO_2 is liberated

44. Glomerular filtrate contains
A. water and salt only.
B. plasma proteins, red and white blood cells.
C. all the components of blood except mineral salts.
D. all the components of blood except plasma protein and cells.

45. A thunderstorm can be beneficial to plants because it
A. adds lime to the soil.
B. adds nitrates to the soil.
C. kills the pest that attacks crops.
D. destroys some of the major crops.

46. Which of the following processes is **not** involved in the carbon cycle?
A. Decay
B. Respiration
C. Transpiration
D. Photosynthesis

47. What trophic level would support the highest human population?
A. First trophic level
B. Second trophic level
C. Third trophic level
D. Fourth trophic level

48. Which of the following statements about energy flow and nutrient cycling is **incorrect**?
A. Energy flows through an ecosystem while nutrients cycle.
B. Elimination of feces represents nutrients lost from an ecosystem.
C. Only about 55% of food made by producers is available to heterotrophs.
D. The laws of thermodynamics support the concept of energy flow through an ecosystem.

49. Which of the following represents the genotype of the parents if R is for red gene and r for white gene?
A. RR x Rr
B. RR x rr
C. rr x rr
D. Rr x Rr

50. What would be the result of a union between a color blind woman and a normal man?
A. Half carrier females; half color blind females
B. Half carrier females; half normal males
C. Half carrier females; half color blind males
D. Half carrier males; color blind males

51. What do animals as diverse as corals and monkeys have in common?
A. Type of body symmetry
B. Presence of *Hox* genes
C. Number of embryonic tissue layers
D. Body cavity between body wall and digestive system

52. An animal that swims rapidly in search of prey that it captures using visual senses concentrated at its anterior end is likely to be
A. heterotrophic and sessile.
B. eumetazoan and asymmetrical.
C. diploblastic and radially symmetrical.
D. bilaterally symmetrical and cephalized.

53. Which of the following names the **three** main ecological categories of organisms found in aquatic ecosystems?
A. Freshwater, marine, brackish
B. Benthos, plankton, nekton
C. Plankton, littoral, benthos
D. Nekton, fish, plankton

54. Which one of the following statements regarding the structure of the DNA is **true**?
A. Guanine is the opposite of cytosine
B. Adenine is the opposite of cytosine
C. The double helix are held together by covalent bonds
D. Nucleotide is made up of ribose, phosphate and organic nitrogen compound

55. Organisms that ferment glucose may produce any of the following end products **except**
A. oxygen.
B. alcohol.
C. lactic acid.
D. propionic acid.

56. Which of the following is **not** a behavioral adaptation used by social insects?
A. Cryptic
B. Mimicry
C. Flash
D. Season

57. The process of evolution is **best** illustrated by a
A. plant loosing its leaves during drought.
B. population of foxes increasing as more prey becomes available.
C. population of mosquito developing resistance to a pesticide.
D. lizard changing color from green to brown to match the rock it is sitting on.

58. Which of the following statements about natural selection is **true**?
A. Only the strongest individuals survive to reproduce
B. Individuals evolve traits that allow them to survive and pass those on to their offspring.
C. Individuals most adapted to their environments are most likely to survive and reproduce
D. Traits randomly accumulate as a population increases and are passed on to succeeding generations.

59. Which of the following will have the **least** effect on the rate of change of the numbers in a population?
A. Food supply
B. Mutation
C. Predation
D. Disease

60. After observing fourteen species of finches, Darwin came to the conclusion that
A. each of the species had not changed over evolutionary time.
B. all of the species inhibited identical lifestyles including diet
C. all of the species decended from fourteen different founder finches.
D. all of the finch species had descended from a single common ancestor.

END OF OBJECTIVE TEST

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

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

PAPER 2
ESSAY
[60 marks] **1½ hours**

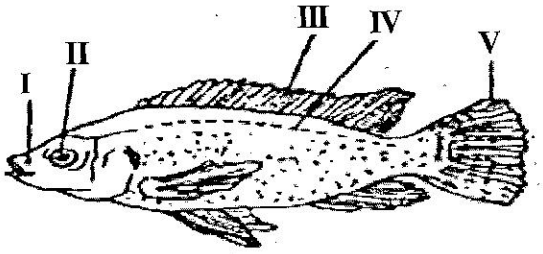
Answer **all** *the questions in this part. Use black or blue* **pen** *only.*
Illustrate your answers with large, clear and carefully labeled diagrams wherever possible.
Credit will be given for clarity of expression, orderly presentation of material and accuracy of details.

1. (*a*) Define *food web*.

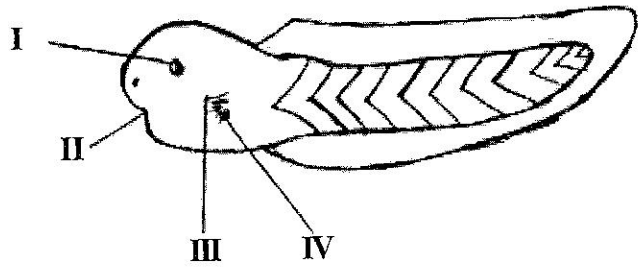
(*b*) Differentiate between *food chain* and *food web*.

(*c*) With the aid of diagrams write explanatory notes on
(i) pyramid of energy;
(ii) pyramid of number.

Use the diagrams below to answer Questions **2** (*a*) *to* (*e*).



SPECIMEN A



SPECIMEN B

2. (*a*) Identify specimens **A** and **B** without reasons.

(*b*) Name the adult stage of specimen **B**.

(*c*) List **four** external features which are common to both organisms.

(*d*) In a tabular form, list four observable differences between the specimens.

(*e*) Name **two** classes of food that specimen **A** provides in human nutrition.

3. (*a*) Name **three** of the five different vertebrae found in mammals.

(*b*) State where each of the vertebrae named in (a) above is found.

(*c*) Name and discuss the **five** features of a typical vertebra.

4. (*a*) State Mendel's *first* and *second laws of inheritance*.

(*b*) In a monohybrid cross between a pure breeding plant that produces blue flowers and a pure breeding plant that produces white flowers, the F_1 generation produces only blue flowers. By means of labeled cross diagrams, state the type of flowers you would expect if the F_1 generation is
(i) self pollinated;
(ii) cross pollinated with a pure breeding plant that produces white flowers.

5. (*a*) What is a *fruit*?

(*b*) What are the differences between *fruits* and *seeds*?

(*c*) Write short notes on the following with examples
(i) true and false fruits;
(ii) simple and composite fruit.

6. (*a*) What is *behavioral adaptation*?

(*b*) Discuss **four** behavioral adaptations each in
(i) plants;
(ii) animals.

END OF PAPER

Chordata