SC5172&1
WASSCE 2021
INTEGRATED SCIENCE 2&1
Essay and Objective
2½ hours

2&1

THE WEST AFRICAN EXAMINATIONS COUNCIL

West African Senior School Certificate Examination
for School Candidates

SC 2021 INTEGRATED SCIENCE 2&1 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* **index number** *in the spaces provided above.*

This booklet consists of two papers. Answer Paper 2, *which comes first, in your answer booklet and Paper* 1 *on your Objective Test answer sheet. Paper* 2 *will last* 1½ hours *after which the answer booklet will be collected. Do* **not** *start Paper* 1 *until you are told to do so. Paper* 1 *will last* 1 hour.

PAPER 2 — 1½ hours
ESSAY
[80 marks]

Answer **four** *questions* **only** *from this section.*

Credit will be given for clarity of expression and orderly presentation of material.

All questions carry equal marks.

1. (*a*) (i) Define *classification* as used in science.
(ii) State **one** contribution to science by the following scientists:
(α) Mendeleev;
(β) Linnaeus;
(γ) Aristotle.
[5 marks]

(*b*) (i) Define *mechanical energy*.
(ii) A body of mass 10 kg is placed at a height 200 cm above the ground.
Calculate the potential energy possessed by the body. [**g** = 10 m s^{-2}]
[5 marks]

(*c*) (i) Distinguish between a *base* and an *alkali*.
(ii) Name **one** natural source of **each** of the following bases:
(α) ammonia;
(β) potassium hydroxide;
(γ) calcium oxide.
[5 marks]

(*d*) (i) Explain the term *mulching*.
(ii) List **three** materials used for mulching.
[5 marks]

2. (*a*) (i) Differentiate between a *pest* and a *parasite*.
(ii) Name the stages in the life-cycle of a weevil.
[5 marks]

(*b*) A solution was prepared by dissolving 25 g of KOH in 250 cm^3 of distilled water.
(i) Calculate the concentration of the solution in mol dm^{-3}.
[K = 39, O = 16, H = 1]

(ii) If 125 cm^3 of the solution is diluted to 1000 cm^3, calculate the concentration of the diluted solution in mol dm^{-3}.
[6 marks]

(*c*) Name the discrete electronic component described by **each** of the following statements:
(i) it stores electric charge;
(ii) it stores magnetic field when electric current flows through it;
(iii) it opposes the flow of electric charge;
(iv) it is made of two parallel plates separated by an insulator;
(v) it allows electric current to flow in one direction only.
[5 marks]

(*d*) Copy and complete the table below.

Blood group	Antigen on surface of red blood cell	Antibody in the serum of the same individual
A		
B		
AB		
O		

[4 marks]

3. (*a*) (i) Explain the statement, *pure water is neutral.*

(ii) State **two** causes of hardness of water.

[4 marks]

(*b*) (i) What is a

(α) bisexual flower?

(β) unisexual flower?

(ii) Give an example of a

(α) bisexual flower;

(β) unisexual flower.

[6 marks]

(*c*) (i) Define the term *weaning.*

(ii) Give **three** reasons for weaning piglets.

[5 marks]

(*d*) (i) Name **three** components of the middle ear of humans.

(ii) State the function of **two** of the components named in (i).

[5 marks]

4. (*a*) (i) What are *organic compounds*?

(ii) Name the **three** main sources of organic compounds.

[5 marks]

(*b*) (i) What is *litter* as used in poultry?

(ii) Explain the term *brooding* as used in animal production.

[4 marks]

(*c*) (i) What is meant by *non-heritable characteristic*?

(ii) Give **three** examples of non-heritable characteristic.

[5 marks]

(*d*) (i) Differentiate between *speed* and *velocity.*

(ii) A body of mass 10 kg in motion, changes its speed from 50 m s^{-1} to 100 m s^{-1} in 10 s. Calculate the:

(α) acceleration of the body;

(β) force that caused the acceleration.

[6 marks]

Turn over

5. (*a*) Explain why the:
(i) tip of needles are made pointed;
(ii) wheels of earth moving machines are broad.
[4 marks]

(*b*) Explain **each** of the following terms:
(i) Balanced ration;
(ii) Maintenance ration.
[4 marks]

(*c*) (i) What are *metalloids*?
(ii) Give **two** examples of metalloids.
(iii) Name **two** alloys and state the constituents of **each** of them.
[6 marks]

(*d*) (i) Describe the process of fat digestion in humans.
(ii) Name **two** disorders that affect the liver.
[6 marks]

6. (*a*) (i) What is meant by the term *decomposers*?
(ii) State **two** ways in which decomposers are important in an ecosystem.
[4 marks]

(*b*) (i) What are *secondary colours* of light?
(ii) Name **two** secondary colours of light.
(iii) Name **two** electromagnetic radiations that have frequencies higher than violet light.
[6 marks]

(*c*) (i) List **three** scientific principles involved in the production of palm oil.
(ii) State **two** hazards in the school laboratory.
[5 marks]

(*d*) (i) Differentiate between *sedimentary rocks* and *metamorphic rocks*.
(ii) List **three** characteristics of igneous rocks.
[5 marks]

END OF ESSAY 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.

WHILE YOU ARE WAITING, READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

PAPER 1 — 1 hour
OBJECTIVE TEST
[50 marks]

1. Use 2B pencil throughout.
2. On the pre-printed answer sheet, check that the following details are **correctly** printed:
   (*a*) In the space marked *Name*, check your **surname** followed by your **other names**.
   (*b*) In the spaces marked *Examination, Year, Subject* and *Paper*, check 'WASSCE', 'SC 2021', 'INTEGRATED SCIENCE', and '1' respectively.
   (*c*) In the box marked *Index Number,* your **index number** has been printed vertically in the spaces on the left-hand side, and each numbered space has been shaded in line with each digit. **Reshade** each of the shaded spaces.
   (*d*) In the box marked *Subject Code*, the digits 517113 are printed vertically in the spaces on the left-hand side. **Reshade** the corresponding numbered spaces as you did for your index number.
3. An example is given below. This is for a male candidate whose *name* is Adams Smith ACKAH. His *index number* is 7102143958 and he is offering *Integrated Science*1.

THE WEST AFRICAN EXAMINATIONS COUNCIL

PRINT IN BLOCK LETTERS

Name: ACKAH ADAMS SMITH — GHA

Examination: WASSCE — Year: SC2021

Subject: INTEGRATED SCIENCE — Paper: 1

INSTRUCTIONS TO CANDIDATES
1. Use grade 2B pencil throughout.
2. Answer each question by choosing one letter and shading it like this: ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
3. Erase completely any answer you wish to change.
4. Leave extra spaces blank if the answer spaces provided are more than you need.

INDEX NUMBER

7	⊏0⊐ ⊏1⊐ ⊏2⊐ ⊏3⊐ ⊏4⊐ ⊏5⊐ ⊏6⊐ ⊏7⊐ ⊏8⊐ ⊏9⊐
1	⊏0⊐ ⊏1⊐ ⊏2⊐ ⊏3⊐ ⊏4⊐ ⊏5⊐ ⊏6⊐ ⊏7⊐ ⊏8⊐ ⊏9⊐
0	⊏0⊐ ⊏1⊐ ⊏2⊐ ⊏3⊐ ⊏4⊐ ⊏5⊐ ⊏6⊐ ⊏7⊐ ⊏8⊐ ⊏9⊐
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4	⊏0⊐ ⊏1⊐ ⊏2⊐ ⊏3⊐ ⊏4⊐ ⊏5⊐ ⊏6⊐ ⊏7⊐ ⊏8⊐ ⊏9⊐
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9	⊏0⊐ ⊏1⊐ ⊏2⊐ ⊏3⊐ ⊏4⊐ ⊏5⊐ ⊏6⊐ ⊏7⊐ ⊏8⊐ ⊏9⊐
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8	⊏0⊐ ⊏1⊐ ⊏2⊐ ⊏3⊐ ⊏4⊐ ⊏5⊐ ⊏6⊐ ⊏7⊐ ⊏8⊐ ⊏9⊐

SUBJECT CODE

5	⊏0⊐ ⊏1⊐ ⊏2⊐ ⊏3⊐ ⊏4⊐ ⊏5⊐ ⊏6⊐ ⊏7⊐ ⊏8⊐ ⊏9⊐
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3	⊏0⊐ ⊏1⊐ ⊏2⊐ ⊏3⊐ ⊏4⊐ ⊏5⊐ ⊏6⊐ ⊏7⊐ ⊏8⊐ ⊏9⊐

For Supervisors only
If candidate is absent shade this space ☐

Answer **all** *the questions.*

Each question is followed by four options lettered A *to* D. *Find 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.*

Which of the following elements is a metal?

A. Carbon
B. Copper
C. Helium
D. Krypton

The correct answer is Copper, *which is lettered* **B**, *and therefore answer space* **B** *would be shaded.* ⊏A⊐ ▬B▬ ⊏C⊐ ⊏D⊐

Think carefully before you shade the answer spaces; erase completely any answers you wish to change.

Do all rough work on this question paper.

Now answer the following questions.

1. Natural fats are composed of
   A. carbon, hydrogen and oxygen.
   B. carbon, hydrogen and nitrogen.
   C. carbon, oxygen and nitrogen.
   D. hydrogen, oxygen and nitrogen.

2. Ash from burnt plant material can be used to prepare local soap because it contains
   A. potassium chloride.
   B. potassium hydroxide.
   C. hydrogen sulphide.
   D. ammonia.

3. Excessive amount of nitrogen in the soil leads to
   A. proper growth of plants.
   B. increased photosynthesis in plants.
   C. delayed maturity of crops.
   D. well-developed stems of crops.

4. The SI unit of electric charge is
   A. ampere.
   B. coulomb.
   C. ohm.
   D. volt.

5. Which of the following gases is a greenhouse gas?
   A. Nitrous oxide
   B. Ozone
   C. Sulphur dioxide
   D. Carbon dioxide

6. The instrument **most** suitable for the measurement of the thickness of a sheet of paper is
   A. Vernier callipers.
   B. micrometer screw gauge.
   C. metre rule.
   D. engineers callipers.

7. Which of the following indicators can measure pH values?
   A. Litmus
   B. Methyl orange
   C. Phenolphthalein
   D. Universal indicator

8. The **main** function of the rumen is to
   A. act as a chamber of digestion.
   B. absorb excess water.
   C. produce digestive juices.
   D. serve as storage chamber.

9. The fibrous mesocarp of coconut aids its disposal by
   A. explosion.
   B. insects.
   C. water.
   D. wildlife.

10. Which of the following radiations are particles?
   I. Alpha
   II. Beta
   III. Gamma

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

11. A substance that contains 10 electrons and 11 protons is
   A. a halogen.
   B. a noble gas.
   C. an ion.
   D. an atom.

12. Which of the following practices reduces the speed of run-off along sloped lands?
   A. Mulching
   B. Strip cropping
   C. Mixed cropping
   D. Manuring

13. Methods of reducing friction in machines include
I. use of ball bearings
II. use of lubricants
III. use of cooling agents

Which of the following statements above are **correct**?
A. I and II only
B. I and III only
C. II and III only
D. I II and III

14. Leguminous fodder crops are included in pastures to ensure that animals are supplied with
A. minerals.
B. vitamins.
C. lipids.
D. proteins.

15. Which of the following pollutants affect weather conditions?
I. Sulphur dioxide
II. Ozone
III. CFC

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

16. Fresh tomato seeds only germinate after they dry up. This may be due to
A. unstable pH.
B. absence of hormones.
C. hard testa.
D. the presence of inhibitors.

17. The work done by a machine in moving a body is 450 J. If the force applied is 30.0 N, calculate the distance through which the body moved.
A. 1.5 m
B. 1.5×10 m
C. 6.7×10^{-2} m
D. 1.35×10^{4} m

18. In the reflex arc, the
A. sensory nerve sends stimulus to the spinal cord.
B. motor neurone receives the stimulus..
C. intermediate neurone transmits impulse from the sensory neurone to the motor neurone.
D. sensory neurone receives impulse from the motor neurone via the intermediate neurone.

19. How many moles of oxygen are present in 4.0 g of the gas?
A. 0.25
B. 0.50
C. 0.75
D. 1.00

20. An athlete runs an 800 m race in 4 minutes and 40 seconds. Calculate the average speed of the athlete.

A. 2.86 m s^{-1}
B. 3.33 m s^{-1}
C. 4.25 m s^{-1}
D. 6.28 m s^{-1}

21. The volume occupied by 0.02 moles of a gas at standard temperature and pressure is

A. 0.224 dm^3.
B. 0.240 dm^3.
C. 0.448 dm^3.
D. 4.480 dm^3.

22. Which of the following activities **best** describe soil conservation?

I. Ensuring presence of water in the soil
II. Maintaining nutrient in the soil
III. Practising crop rotation on the soil
IV. Protecting the structure of the soil

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

23. Oil applied on the surface of water bodies kills mosquito larvae through

A. dehydration.
B. poisoning.
C. starvation.
D. suffocation.

24. An object weighs 20 N in air and when immersed in a liquid it displaces 0.5 kg of the liquid. Calculate the upthrust on the object. [**g** = 10 m s^{-2}]

A. 40.0 N
B. 15.0 N
C. 10.0 N
D. 5.0 N

Alkanoic acid + alkanol $\underset{}{\overset{H_2SO_4}{\rightleftharpoons}}$ alkyl alkanoate + water

Use the equation above to answer questions **25** *and* **26**.

25. The reaction is called

A. hydrolysis.
B. hydration.
C. dehydration.
D. esterification.

26. The H_2SO_4 is acting as

A. catalyst.
B. enzyme.
C. drying agent.
D. dehydrating agent.

27. In which of the following applications is cooling by evaporation used?

I. Temperature regulation in humans
II. Cooling of water in a local clay pot
III. Cooling by an air conditioner

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

28. The earthworm is important to the farmer because it

A. improves soil structure.
B. improves soil texture.
C. destroys soil pathogen.
D. reduces amount of air in the soil.

29. Which of the following blood types are safe to use for a person with type B blood?

I. A
II. B
III. O

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

30. Smoke is a mixture of

A. liquid and gas.
B. gases.
C. solid and gas.
D. solid, liquid and gas.

31. Which of the following crops is a fruit vegetable?

A. Cabbage
B. Carrot
C. Cucumber
D. Onion

32. The elements in bronze are

A. copper and zinc.
B. copper and lead.
C. copper and nickel.
D. copper and tin.

33. The acrosome in the sperm cell
A. serves as a source of nutrients for the sperm.
B. facilitates the penetration of the sperm into the egg cell.
C. provides energy required by the sperm to swim.
D. carries the genetic material from the father to the foetus.

34. Which of the following pollutants cause(s) acid rain?
I. CO_2
II. NO_2
III. SO_3

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

35. The part of the human ear that helps to balance pressure between the ear and the atmosphere is
A. cochlea.
B. Eustachian tube.
C. pinna.
D. malleus.

36. Digestion of food is completed in the
A. small intestine.
B. large intestine.
C. stomach.
D. liver.

37. A maize cob showing large mass of black spores on some of the grains indicates infection of
A. maize streak.
B. maize smut.
C. maize rust.
D. maize blight.

38. Which of the following unit(s) is/are derived?
I. Ohm
II. Volt
III. Ampere

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

39. When anaerobic respiration and aerobic respiration are compared, the energy yield
A. are the same.
B. is less in anaerobic respiration.
C. is less in aerobic respiration.
D. cannot be compared.

40. An example of a unisexual flower is
A. *Hibiscus*.
B. Pride of Barbados.
C. flamboyant.
D. watermelon.

Turn over

41. Which of the following materials is non-magnetic?
A. Brass
B. Steel
C. Nickel
D. Cobalt

42. Plastics have become important substitutes for metals in manufacturing industries because of their
I. anti-rust properties.
II. relative cheapness.
III. ability to be moulded into shapes.

Which of the statements above are **correct**?
A. I and II only
B. I and III only
C. II and III only
D. I, II and III

43. Species, genus and family are examples of
A. binomial classification.
B. taxa.
C. phyla.
D. genera.

44. The **correct** order in which food moves through the digestive system of a fowl is
A. crop → proventriculus → gizzard → duodenum.
B. crop → gizzard → proventriculus → duodenum.
C. proventriculus → gizzard → crop → duodenum.
D. proventriculus → crop → gizzard → duodenum.

45. Which of the following properties of carbon dioxide is useful in fire fighting?
I. It does not support combustion.
II. It is heavier than air.
III. It does not produce toxic compounds.

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

46. If the genotype of the parents are Aa and Aa, the offspring **most** probably will be

A. $\frac{1}{2}$ AA and $\frac{1}{2}$ aa.

B. all Aa.

C. $\frac{1}{4}$ AA, $\frac{1}{2}$ Aa and $\frac{1}{4}$ aa.

D. $\frac{3}{4}$ AA and $\frac{1}{4}$ aa.

47. Sound waves travel **fastest** in
A. gas.
B. liquid.
C. solid.
D. vacuum.

48. Pricking of yam is done to
A. prevent vegetative growth.
B. encourage development of clusters of tubers.
C. prevent hardening of tubers.
D. prevent disease infestation.

49. An example of a wind instrument is
A. xylophone.
B. guitar.
C. flute.
D. cymbals.

50. Which of the following descriptions **best** fit the structure of the incisor in humans?
A. Sharp and pointed
B. Sharp and chiselled
C. Flat and cusped
D. Pointed and chiselled

END OF PAPER