

BECE 2025 SCIENCE FINAL MARKING SCHEME (All Questions)

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 2025 Examination Series

 Complete Mark Scheme

 All Questions (1-5)

SECTION A [40 marks]

Question 1

(a) Carbon Cycle Components

(i) **Components:** A (Plants), B (Carbon dioxide in the atmosphere), C (Animals), D (4 marks - Likely another component e.g., burning/decomposition)

(ii) **Processes:** P (Decay/decomposition), S (Combustion/Burning), T (3 marks - Likely Photosynthesis)

(iii) Sources of Carbon Dioxide (Any 3):

- Dead/decaying organisms/organic matter
- Photosynthesis (Incorrect as a source, likely meant as a process utilizing CO₂ in context of a diagram) / Burning
- Raising of livestock
- Growing of crops
- Burning of wood
- Burning of fossil fuels/coal/industrial pollution
- Reducing amount of forest cover/deforestation

(b) Farming Systems

(i) **System K:** Land rotation (1 mark)

(i) **System L:** Crop rotation (1 mark)

(ii) **Definition K (Land rotation):** The farmer moves from one farmland to another (1 mark).

(ii) **Definition L (Crop rotation):** The farmer moves /rotates the crops from one plot to another (1 mark).

(iii) Advantages of L (Crop rotation) (Any 2):

- The soil regains its fertility / prevents soil exhaustion
- There is control in the build-up pests and diseases
- It helps to maintain good yield
- Saves money

(iv) Disadvantages of K (Land rotation) (Any 3):

- Time, energy and money is wasted in clearing new land each time land is abandoned.
- System does not encourage large scale farming
- There is rampant deforestation
- Cultivated lands are generally small and scattered
- Land is getting scarce / a growing population

(v) Crops used in L: Leguminous crops (1 mark)

(c) Simple Machines and Work

(i) Examples of Simple Machines (Any 3):

- Stair case
- Ladder
- Plank of wood at an angle
- Hill
- Ramps
- Screws

(ii) Calculations (Work and Efficiency)

(α) Work Output (W_{out}):

$$W_{out} = 100 \text{ N} \times 5 \text{ m}$$

$$W_{out} = 500 \text{ J}$$

(β) Work Input (W_{in}):

$$W_{in} = 400 \text{ N} \times 10 \text{ m}$$

$$W_{in} = 4000 \text{ J}$$

(γ) Efficiency (η):

$$\text{Efficiency} = (\text{Work output} / \text{Work input}) \times 100\%$$

$$\eta = (500 \text{ J} / 4000 \text{ J}) \times 100\%$$

$$\eta = 12.5\%$$

(d) Separation of Mixtures (Distillation)

(i) **Process:** Separation of mixtures (1 mark)

(ii) **Function of VI (Condenser):** Cools the vaporized components of the mixture back to liquid (1 mark).

(iii) (a) **Examples of mixtures separated:** alcohols and water / kerosene and diesel oil (2 marks)

(iv) **Function of VII (Water circulation):** To ensure complete condensation of the vapour (1 mark).

(iii) (b) **Magnetic separation example:** iron filings and powdered Sulphur (2 marks)

SECTION B (Answer three (3) questions only)

Question 2

(a) Energy

(i) **Ways to Conserve Energy (Any 3):**

- By ironing in bulk
- Switching off lights when not in use
- Switching off gadgets when not in use
- Using energy efficient appliances

(ii) Calculations (Electrical Energy)

Method 1 – kWh:

$$E = P \times t$$

$$E = 4 \text{ kW} \times 12 \text{ h}$$

$$E = 48 \text{ kWh}$$

Method 2 – Joules (SI):

$$E = P \times t$$

$$E = 4000 \text{ W} \times (12 \times 60 \times 60) \text{ s}$$

$$E = 172,800,000 \text{ J} = 1.728 \times 10^8 \text{ J}$$

(b) Indicators

(i) Examples of Indicators (Any 2):

- methyl orange
- methyl red
- phenolphthalein
- litmus
- universal indicator

(ii) Colour Change in Acid (Any 2):

- Litmus - red
- Methyl orange / Methyl red - red/pink
- Phenolphthalein - colourless
- Universal indicator - orange/yellow

(c) Mitigating Climate Change (Any 4)

- Waste management / recycling / re-use
- Investing in renewable energy
- Adapting to the effects of climate change
- Prioritizing human health
- Use resources more efficiently
- Afforestation
- Use of public transport / electric vehicle

(d) Greenhouse Gases and Composting

(i) Greenhouse Gases (Any 2):

- carbon dioxide / Carbon (IV) oxide
- methane
- nitrous oxide / nitrogen (I) oxide

(ii) Steps in Making Compost (Any 3):

- Choose an area / compost bin / home made enclosure / dig a pit
- Add green material / vegetable / scrap / fruit peels / grass / dry straw etc
- Put materials in layers
- Sprinkle water
- Turn pile occasionally

Question 3

(a) Livestock Feed Components (Any 2 each)

(i) Protein Sources:

- Feather meal
- Blood meal
- Fish meal
- Milk by-products
- Meat meal

(ii) Carbohydrate Sources:

- Sorghum
- Millet
- Maize
- Wheat
- Rice
- Wheat bran

(b) Water Cycle (6 marks)

Water evaporates from water bodies into the atmosphere (1), where it condenses into the clouds (1), and falls back into the earth's surface as rain (precipitation) (1). This then flows into water bodies (1) and taken up by plants (1) which transpire to give water vapour (1).

(c) Mixtures and Solvents

(i) Components:

- Vinegar: ethanoic acid (1) and water (1)
- Air: nitrogen (1) and oxygen (1)

(ii) Solvents:

- Vinegar: water is the solvent (1)
- Air: nitrogen is the solvent (1)

(d) Planet Suitability

(i) Conditions making planets unsuitable for life (Any 2):

- Extreme/cold temperatures
- No oxygen
- No water
- Far away from the sun
- Absence of solid surface
- Toxic radiations / gases
- Strong magnetic field

(ii) Outer Planets (Any 2):

- Saturn
- Uranus
- Neptune

Question 4

(a) Pressure and Knife Sharpening

By sharpening the knife, the cutting edge reduces in surface area (1). The pressure then increases (1), hence it cuts easily with the same force (1).

Calculation

$$P = \text{Force (F)} / \text{Area (A)}$$

$$P = 10 \text{ N} / 1 \times 10^{-3} \text{ m}^2$$

$$P = 10 \times 10^3 \text{ Pa}$$

$$P = 10,000 \text{ Pa}$$

(b) Procedure for Determining Soil pH (6 steps)

1. Collect the soil sample (1)
2. Add distilled water and shake gently, and allow to settle (1)
3. Add few drops of universal indicator / pH meter (1)
4. Match the resulting colour with the standard colour chart (1)
5. Estimate / read the pH of the soil sample from the chart (1)
6. (NB: Correct sequence to score)

(c) Blood Pressure

(i) Meaning of 150/90 mmHg: It means the blood pressure of the patient when the heart beats is 150 mmHg (systolic pressure) (1) and the pressure of the patient when the heart rests is 90 mmHg (diastolic pressure) (1).

(ii) Ways to control High Blood Pressure (Any 3):

- Exercising regularly
- Eating healthy diets
- Reducing salt intake
- Easing stress
- Ensuring regular check-ups
- Avoid / reduce alcohol intake

(d) Qualities of Good Livestock Feed (Any 3)

- Has high palatability to animals
- Has laxative ability
- Has high nutrient content
- Easily digestible
- Long shelf-life

Question 5

(a) Farming Definitions (2 marks each)

(i) **Organic farming:** By using plant and animal based materials (1) in the farming process, without use of agrochemicals / using organic fertilizers / biological pesticides (1).

(ii) **Mixed farming:** By growing of crops and raising of animals on the same farm / plot (1) at the same time / season (1).

(iii) **Mixed cropping:** By growing of two or more arable crops on the same piece of land (1), (without any sequence or arrangement) at the same time (1).

(b) Classification of Mixtures (1 mark each)

(i) **Oil and water:** Heterogeneous

(ii) **Salt and water:** Homogeneous

(iii) **Ethanol and water:** Homogeneous

(c) Energy Comparison

(i) Reasons for Solar Energy being Renewable (Any 2):

- Energy from the sun is continuous / constantly replenished (1)
- Energy from the sun does not get exhausted / inexhaustible within a human time scale / non-depletable (1)

(ii) Heat vs Temperature (Any 3 differences):

Heat	Temperature
Form of energy	Measure of/ Degree of hotness of a body
Measured in joules	Measured in Kelvin / °C
Measured using a calorimeter	Measured using a thermometer
Flows from hot body to cold body	Rises when heated and falls when cooled

(d) Interruptions in Nitrogen Cycle

(i) **Leaching:** During heavy rainfall, nitrates in the soil are washed out of the root zone of plants (1) and cannot be taken in by animals (1), preventing the return of the nitrogen into the soil as nitrites (1).

(ii) **Removal of leguminous plants:** This results in the removal of nitrogen-fixing bacteria (1), thereby preventing the conversion of atmospheric nitrogen to ammonia (1), eventually denying the soil of nitrates and subsequently interrupting the cycle (1).

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