KENYA NATIONAL EXAMINATION AND ASSESSMENT PREDICTION SERIES

ENDTERM 2 ASSESSMENT 2025

GRADE 7

INTEGRATED SCIENCE PAPER 1

MARKING SCHEME

SECTION A.

1. **D. 7**
   - δ **Explanation:** In the female reproductive system, the **ovary** is the organ responsible for the production and release of ova (eggs).
2. **A. (i) and (ii)**
   - δ **Explanation:** Integrated Science focuses on connecting different scientific disciplines.

     (i) Understand the interactions between different scientific fields: This is a core purpose of integrated science, showing how biology, chemistry, and physics are interconnected.

     (ii) Develop critical thinking and problem-solving skills for real-world issues: By understanding these connections, learners can apply scientific principles to solve complex, interdisciplinary problems.

     (iii) Becoming experts in one specific scientific discipline is more typical of specialized science courses, not integrated science.

     (iv) Memorizing facts without understanding application is rote learning and not a desired outcome of any science education, especially integrated science which emphasizes application.

3. **C. R.**
   - δ **Explanation:** In the human urinary system diagram:

     P is the Kidney (filters blood).

     Q is the Ureter (tube carrying urine from kidney to bladder).

     R is the Bladder, which is a muscular sac that temporarily stores urine before it is excreted.

     S is the Urethra (tube through which urine leaves the body).

4. **C. Burns from a hot plate.**
   - δ **Explanation:** This question asks for an accident specifically due to *improper use of equipment*.

     A. Falling due to a wet floor is a general lab accident, not directly from equipment use.

B. A cut from broken glassware could be from improper handling, but a *hot plate* explicitly relates to heat and therefore a burn.

D. A fracture from dropping heavy equipment is a general accident, not specific to chemical or heat-related lab equipment. Improper use of a hot plate (e.g., touching it when hot, leaving flammable materials near it) directly leads to burns.

5. **B. Cleaning the wound with soap and water and applying a sterile dressing.**
   - **Explanation:** For minor cuts, the primary first aid steps are to prevent infection and protect the wound.
     - Cleaning with soap and water removes dirt and bacteria.
     - A sterile dressing (like a bandage) protects the wound from further contamination.
     - Applying burn cream is for burns, not cuts. Immobilizing a limb is for fractures/sprains. Calling emergency services is for severe injuries.
6. **C. Ensuring there are no flammable materials nearby.**
   - **Explanation:** A Bunsen burner produces an open flame.
     - Flammable materials (like paper, alcohol, certain chemicals) must be kept away to prevent fires or explosions.
     - Wearing open-toed shoes (A) is unsafe. Leaving long hair untied (B) is unsafe. Working alone (D) is unsafe.
7. **B. Measuring cylinder**
   - **Explanation:**
     - A **measuring cylinder** is designed to measure approximate volumes of liquids with reasonable accuracy.
     - A beaker (A) is for holding and mixing, not accurate measurement.
     - A conical flask (C) is for holding and mixing, especially during titrations, not accurate measurement.
     - A burette (D) is used for very precise measurement of variable volumes, usually in titrations, but for general "accurate volumes," a measuring cylinder is the common and suitable choice. If "highly accurate" was specified, a pipette or burette would be better.
8. **C. Observing**
   - **Explanation:** When a learner uses a microscope, they are actively looking at and noting the characteristics of the specimen (the plant cell). This direct use of senses (sight) to gather information is the definition of **observing**.
     - Predicting involves foreseeing outcomes. Classifying involves grouping. Inferring involves drawing conclusions based on observations.
9. **B. Kilogram (kg)**
   - **Explanation:** The **kilogram (kg)** is the internationally recognized Standard International (SI) unit for mass. While grams (g) and milligrams (mg) are also units of mass, they are derived from the kilogram. Pound (lb) is a unit from the imperial system.
10. **C. Diaphragm**
    - **Explanation:**
      - The eyepiece (A) is what you look through and provides further magnification.
      - The objective lens (B) provides the primary magnification.
      - The stage clips (D) hold the slide in place.

- The **diaphragm** is located below the stage and controls the amount of light that passes through the specimen, affecting the contrast and brightness of the image.

11. **B. Homogeneous mixture**
    - **Explanation:** A **homogeneous mixture** (also known as a solution) has a uniform composition throughout. When sugar dissolves completely in water, the sugar particles are evenly distributed, and you cannot visually distinguish the sugar from the water; it appears as a single substance.
        - A heterogeneous mixture has visibly distinct components (e.g., sand and water).
        - A suspension has particles that settle over time.
        - A colloid has particles dispersed but not settled, often appearing cloudy.
12. **C. Magnetism**
    - **Explanation:** Iron is a magnetic material, while sand is not. Therefore, a **magnet** can be used to attract and separate the iron filings from the non-magnetic sand.
        - Filtration, decantation, and evaporation are not suitable for separating a magnetic solid from a non-magnetic solid.
13. **C. Crystallization**
    - **Explanation: Crystallization** is the process where a solid forms from a solution, typically by evaporating the solvent to increase the concentration of the solute until it precipitates out as crystals. This is the method used to obtain pure salt from a salt solution by heating.
        - Simple distillation (A) separates a liquid from a dissolved solid by collecting the evaporated liquid.
        - Fractional distillation (B) separates liquids with different boiling points.
        - Sublimation (D) is when a solid turns directly into a gas without passing through a liquid phase.
14. **C. Litmus paper**
    - **Explanation:**
        - **Litmus paper** is a classic indicator that turns red in acidic solutions (pH < 7) and blue in basic/alkaline solutions (pH > 7).
        - Phenolphthalein (A) is colorless in acid and pink in base.
        - Methyl orange (B) is red in acid and yellow in base.
        - Turmeric extract (D) is yellow in acid and reddish-brown in base.
15. **D. They have a sour taste.**
    - **Explanation:** This is a physical property because it describes how the substance interacts with our senses without undergoing a chemical change.
        - A. Reacting with metals to produce hydrogen gas is a chemical property.
        - B. Feeling slippery to the touch is a characteristic of bases.
        - C. Turning red litmus paper blue is a characteristic of bases.
16. **C. Antacids to relieve indigestion.**
    - **Explanation:** Antacids are **bases** (e.g., magnesium hydroxide, calcium carbonate) that neutralize excess stomach acid (which is an acid). This makes them useful for treating indigestion caused by too much stomach acid.
        - Car batteries (A) use acids (sulfuric acid).
        - Soft drinks (B) are generally acidic (e.g., carbonic acid, phosphoric acid).
        - Vinegar (D) is an acid (acetic acid).
17. **C. V**
    - **Explanation:** The sweat pore is the opening of the sweat gland duct on the surface of the skin, through which sweat is excreted..
18. **C. Kidney**

- **Explanation:** The **kidney** is the primary organ of the urinary system responsible for filtering waste products (like urea, excess salts, and water) from the blood to form urine.
  - The bladder (A) stores urine.
  - The ureter (B) transports urine from the kidney to the bladder.
  - The urethra (D) transports urine from the bladder out of the body.

19. **B. Kidney stones**
    - **Explanation:** Kidney stones are hard deposits made of minerals and salts that form inside the kidneys. They are often caused by insufficient water intake (leading to concentrated urine) and diets high in certain minerals like calcium, oxalate, and uric acid.
      - Diabetes (A) is a metabolic disorder affecting blood sugar.
      - High blood pressure (C) can damage kidneys but isn't a disorder *of* the kidney in this context.
      - Anemia (D) is a blood disorder.
20. **C. Solar energy**
    - **Explanation: Renewable energy sources** are naturally replenished on a human timescale.
      - **Solar energy** (from the sun) is inexhaustible and renewable.
      - Coal (A), Natural gas (B), and Petroleum (D) are fossil fuels, which are finite and non-renewable energy sources.
21. **B. It stops.**
    - **Explanation:** An electric circuit needs to be a **closed loop** for electricity to flow. If the wire is broken, it creates an open circuit, interrupting the path for electrons, and thus the flow of electricity ceases immediately.
22. **C. Toaster**
    - **Explanation:**
      - A **toaster** works by heating electrical resistance wires, which convert electrical energy primarily into heat energy to toast bread.
      - An electric fan (A) converts electrical energy into kinetic energy (movement of air).
      - A television (B) converts electrical energy into light and sound energy.
      - A refrigerator (D) uses electrical energy to power a compressor for cooling, converting it into mechanical work and heat transfer.
23. **D. Avoiding overloading electrical sockets.**
    - **Explanation:** Overloading electrical sockets means plugging in too many appliances, drawing excessive current, which can cause wires to overheat, melt insulation, and lead to fires. This is a critical safety measure.
      - A, B, and C describe unsafe practices.
24. **D**
    - **Explanation:** A **biohazard symbol** indicates biological substances that pose a threat to the health of living organisms, primarily humans. This includes medical waste, microbial cultures, or toxins from biological sources. The symbol warns against potential exposure to infectious agents.
25. **C. Excreting excess salts and water through sweat.**
    - **Explanation:** While the kidneys are the primary excretory organs, the skin also plays a role in excretion through sweating. Sweat contains water, salts (like sodium chloride), and a small amount of urea, thus helping the body eliminate excess substances.
      - Filtering blood (A) and producing urine (B) are functions of the kidneys.
      - Storing waste products (D) is not a primary function of the skin in excretion; waste is eliminated.

26. **C. Cancer and genetic mutations.**
    - δ **Explanation:** Radioactivity involves the emission of ionizing radiation (alpha, beta, gamma particles). Exposure to this radiation can damage DNA, leading to cellular damage, increased risk of **cancer**, and potentially heritable **genetic mutations** in offspring.
        - While intense radiation exposure can cause burns (A), cancer and genetic mutations are the more significant long-term biological hazards. Respiratory irritation (B) is for inhaled chemicals, and explosion risk (D) is for unstable chemicals/explosives.
27. **C. Cool the affected area with cool running water for at least 10 minutes.**
    - δ **Explanation:** For any burn or scald, the immediate and most crucial first aid step is to cool the affected area. Cool running water helps to reduce the skin temperature, minimize tissue damage, and relieve pain.
        - Applying ice directly can cause frostbite. Wrapping tightly can trap heat. Puncturing blisters increases the risk of infection.
28. **A. Communicating**
    - δ **Explanation:** Drawing a graph is a way to present data clearly and effectively to others. This process of sharing information, ideas, and results in a clear and organized manner is the definition of **communicating** scientific findings.
        - Measuring involves using instruments. Hypothesizing involves proposing explanations. Experimenting involves conducting tests.
29. **C. Heterogeneous mixture.**
    - δ **Explanation:** When oil and water are mixed, they do not dissolve in each other and remain as separate layers or droplets that can be visually distinguished. This means they are not uniformly distributed, characteristic of a **heterogeneous mixture**.
        - A homogeneous mixture (A) would imply they mix uniformly (like sugar in water).
        - A solution (B) is a type of homogeneous mixture.
        - A compound (D) is a substance formed when two or more elements are chemically bonded.
30. **A. An ammeter** (A) measures current.

SECTION B (40 marks)

Answer ALL the questions in this section in the spaces provided.

Task 1

31. **(a) During a class activity, learners were asked to classify different types of laboratory hazards. (i) Give one example of a material that is classified as flammable. (1 mark)**

i. Alcohol (e.g., ethanol, methanol)
ii. Petrol / Gasoline
iii. Acetone
iv. Propane / Butane gas
v. Paper / Wood (common lab materials)
vi. Kerosene

(ii) State one first aid measure for a person who has ingested a corrosive substance. (1 mark)

i. Immediately rinse the mouth with plenty of water (do not induce vomiting).
ii. Seek immediate medical attention.
iii. Drink small amounts of water or milk to dilute the substance (only if the person is conscious and able to swallow).
iv. Do not try to neutralize the substance.

(b) Explain why it is important to report all laboratory accidents, no matter how minor. (2 marks)

i. **To prevent recurrence:** Reporting helps identify the cause of the accident and implement corrective measures to prevent similar incidents in the future.
ii. **For safety records and analysis:** It helps in maintaining a record of incidents, which can be analyzed to improve overall laboratory safety protocols and training.
iii. **To provide appropriate first aid/medical attention:** Even minor accidents can have delayed symptoms or lead to complications if not properly addressed.
iv. **Legal/Insurance requirements:** Many institutions require all incidents to be reported for legal and insurance purposes.

32. **The diagram below represents a common laboratory apparatus.**

(a) Name the apparatus shown above. (1 mark)

- Test tube rack

(b) State two safety precautions to be observed when using this apparatus in the laboratory. (2 marks)

1. Stability and Placement:

- **Flat, Stable Surface:** Always place the test tube rack on a flat, level, and stable surface to prevent it from wobbling or tipping over. Avoid uneven benches or surfaces near the edge.
- **Clear Work Area:** Ensure the area around the test tube rack is clear of clutter, papers, or other items that could accidentally knock it over.
- **Away from Edges:** Position the rack away from the edges of the lab bench to minimize the risk of accidental knocks or falls.

2. Choosing the Right Rack:

- **Material Compatibility:**
  - **Plastic racks** are good for general use and for holding solutions that are not extremely hot or corrosive. They are generally easy to clean.
  - **Metal racks** are often preferred when heating test tubes (e.g., in a water bath or oven) as they can withstand higher temperatures. Ensure they are designed for heat.
  - **Wooden racks** are generally for holding dry, cool test tubes and are not suitable for wet or hot conditions as they can absorb chemicals, warp, or even burn.
- **Size and Fit:** Use a test tube rack with holes that are the appropriate size for your test tubes.

    - Holes that are too large will allow test tubes to wobble precariously, increasing the risk of spills.
    - Holes that are too small will make it difficult to insert or remove test tubes, potentially causing breakage.
- **Condition Check:** Before use, inspect the rack for any cracks, chips, corrosion, or signs of wear and tear. A damaged rack can be unstable or fail. Do not use a damaged rack.

3. Handling and Loading Test Tubes:

- **Gentle Handling:** Always handle the test tube rack and the test tubes within it with care. Avoid sudden movements, dropping, or rough handling, especially when tubes are full.
- **Secure Placement:** Ensure each test tube is placed securely and upright in its designated slot.
- **Avoid Overloading:** Do not overload the test tube rack with more test tubes than it is designed to hold. Overloading can compromise stability and cause damage to the rack.
- **Point Tube Openings Safely:** When placing test tubes containing chemicals, especially if heating or reacting, ensure the open ends are pointed away from yourself and others.
- **Use Test Tube Holders for Hot Tubes:** If a test tube is hot, use a proper test tube holder to place it into or remove it from the rack. Do not touch hot test tubes with bare hands.

4. Preventing Spills and Contamination:

- **Immediate Clean-up:** In case of a spill on or near the test tube rack, clean it up immediately according to laboratory safety protocols.
- **Prevent Cross-Contamination:** If working with multiple samples, ensure there's enough space between test tubes to prevent accidental splashing or cross-contamination. Consider using racks with numbered slots for organization.
- **Labeling:** Properly label all test tubes before placing them in the rack to avoid confusion and mix-ups.

5. Heating and Chemical Considerations:

- **Heat Resistance:** If the rack is used near a heat source (e.g., for test tubes in a water bath), ensure the rack material is heat-resistant.
- **Chemical Spills:** If corrosive or hazardous chemicals are spilled on a rack, follow appropriate decontamination procedures immediately. Some plastic racks may degrade with certain chemicals.

6. Cleaning and Storage:

- **Regular Cleaning:** Clean test tube racks regularly, especially after use or spills, to prevent accumulation of residues and potential contamination. Use appropriate cleaning agents compatible with the rack's material.
- **Thorough Drying:** Ensure racks are thoroughly dry before storage to prevent microbial growth or corrosion (for metal racks).
- **Proper Storage:** Store test tube racks in a clean, dry, and organized manner to prevent damage and maintain their integrity for future use.

33. Describe how one can separate the following mixtures:

(a) Sand and water. (2 marks)

i. **Method 1: Decantation:** Allow the sand to settle at the bottom of the container. Carefully pour off the water, leaving the sand behind.
ii. **Method 2: Filtration:** Pour the mixture through a filter paper in a funnel. The sand (solid) will be retained on the filter paper, while the water (liquid) will pass through as a filtrate.

(b) Salt and iodine. (2 marks)

- **Method: Sublimation.** Heat the mixture gently. Iodine will sublime (turn directly from solid to gas) and can be collected as solid crystals on a cool surface (e.g., a cold watch glass placed over the beaker). The salt will remain behind as it does not sublime at these temperatures.

(c) Water from a salt solution. (2 marks)

- **Method: Simple Distillation.** Heat the salt solution in a distillation flask. The water will evaporate, turn into steam, and then condense back into liquid water (distillate) when passed through a condenser, leaving the salt (non-volatile solute) behind in the flask.

34. (a) Learners were provided with red cabbage leaves to prepare a natural acid-base indicator. Describe how the learners could have prepared the indicator. (4 marks)

1. **Chop/Cut:** Chop the red cabbage leaves into small pieces.
2. **Heat/Boil:** Place the chopped cabbage in a beaker or saucepan. Add enough hot water (or boil it) to cover the cabbage pieces.
3. **Steep/Extract:** Allow the cabbage to steep in the hot water for about 10-15 minutes, or until the water turns a deep purple color.
4. **Filter:** Filter the mixture (e.g., using a sieve or filter paper) to separate the liquid (red cabbage indicator) from the solid cabbage pieces. The collected purple liquid is the indicator. *Alternatively, the leaves can be crushed and soaked in alcohol (e.g., ethanol) to extract the pigment, then filtered.*

(b) Explain why stomach upset is commonly treated with antacids. (2 marks)

i. Stomach upset (indigestion) is often caused by an **excess production of hydrochloric acid** in the stomach.
ii. **Antacids are bases** (or alkaline substances) that **neutralize this excess stomach acid**, thereby reducing the acidity and relieving the symptoms of heartburn, bloating, and discomfort associated with stomach upset.

35. The flow chart below shows parts of the human urinary system.

(a) Name the parts labelled P, Q, and R in the flow chart. (3 marks)

P: **Kidney**

Q: **Ureter**

R: **Bladder**

(b) State two functions of the human skin, apart from excretion. (2 marks)

i. **Protection:** Acts as a barrier against pathogens, UV radiation, and physical injury.
ii. **Temperature regulation:** Helps regulate body temperature through sweating and vasodilation/vasoconstriction.
iii. **Sensation:** Contains nerve endings that detect touch, pressure, pain, and temperature.
iv. **Synthesis of Vitamin D:** Produces Vitamin D when exposed to sunlight.

(c) Briefly explain one cause of kidney failure. (1 mark)

i. **High blood pressure (Hypertension):** Prolonged high blood pressure can damage the small blood vessels in the kidneys, impairing their filtering ability.
ii. **Diabetes:** Uncontrolled high blood sugar levels can damage the kidney's filtering units over time.
iii. **Glomerulonephritis:** Inflammation of the glomeruli (tiny filters) in the kidneys.
iv. **Polycystic kidney disease:** An inherited disorder where cysts grow in the kidneys, impairing their function.
v. **Blockages:** Obstructions like kidney stones or enlarged prostate can prevent urine flow and damage kidneys.
vi. **Certain medications/toxins:** Long-term use of certain drugs or exposure to toxins can harm the kidneys.

36. (a) During a practical lesson, learners were instructed on the proper use of a Bunsen burner.

(i) Describe the procedure for lighting a Bunsen burner safely. (3 marks)

1. **Connect:** Ensure the rubber tubing is securely connected to both the Bunsen burner and the gas tap.
2. **Close air hole:** Close the air hole at the base of the burner (collar) to produce a luminous yellow flame.
3. **Light match/lighter:** Light a match or use a striker/lighter and hold the flame slightly above the barrel of the Bunsen burner.
4. **Turn on gas:** Slowly turn on the gas tap. The gas will ignite, producing a yellow flame.
5. **Adjust air hole:** Open the air hole gradually until a quiet, non-luminous (blue) flame with a clear inner cone is observed.

(ii) State one observation skill that is important when observing a chemical reaction in the laboratory. (1 mark)

i. Observing changes in color
ii. Observing formation of precipitate (solid)
iii. Observing evolution of gas (bubbles)
iv. Observing changes in temperature (heat released or absorbed)
v. Observing changes in state (solid, liquid, gas)
vi. Observing changes in smell/odor

(b) A learner accidentally splashed a non-corrosive chemical on their skin. Describe the immediate first aid action. (1 mark)

- Immediately **rinse the affected skin area with plenty of cool running water** for at least 10-15 minutes.
- Remove any contaminated clothing.

37. (a) Differentiate between homogeneous and heterogeneous mixtures, giving one example for each. (2 marks)

- **Homogeneous mixture:** A mixture in which the components are **uniformly distributed** throughout, and they appear as a single phase. The individual components cannot be easily distinguished visually.
    - *Example:* Sugar dissolved in water, air, salt solution, brass (alloy).
- **Heterogeneous mixture:** A mixture in which the components are **not uniformly distributed**, and they can be clearly distinguished as separate phases.
    - *Example:* Sand and water, oil and water, salad, concrete.

(b) A learner needs to accurately measure 25.0 mL of a liquid. Which laboratory instrument would be most suitable for this task? (1 mark)

- **Measuring cylinder** (for general accurate measurements)
- **Volumetric pipette** (for highly accurate and precise measurements of a specific volume like 25.0 mL)
- **Burette** (for titrations where variable, highly accurate volumes are needed)
- *Note: A measuring cylinder is the most common and appropriate answer for general "accurate measurement" at this level.*

38. Explain how each of the following contribute to safety in the laboratory:

(a) Wearing appropriate personal protective equipment like safety goggles. (1 mark)

- **Safety goggles** protect the eyes from chemical splashes, flying debris, and harmful fumes, preventing eye injuries.

(b) Knowing the location of emergency exits and fire extinguishers. (1 mark)

- Knowing their location enables quick evacuation in case of an emergency (e.g., fire, gas leak) and allows for immediate response to extinguish small fires, minimizing harm and damage.

(c) Avoiding eating or drinking in the laboratory. (1 mark)

- This prevents accidental ingestion of hazardous chemicals or contamination of food/drinks, which could lead to poisoning or illness.

39. (a) During an activity on electrical energy, learners were asked to identify common electrical appliances in their homes.

(i) Name two common electrical appliances found in a typical Kenyan home. (2 marks)

1. Television
2. Refrigerator
3. Radio
4. Electric iron
5. Blender/Mixer
6. Lighting bulbs/LED lamps
7. Mobile phone charger
8. Laptop/tablet
9. Printer
10. Electric kettle
11. Microwave oven (Any two are acceptable)

(ii) Explain one safety measure that should be observed when using electrical appliances to prevent accidents. (2 marks)

i. **Avoid overloading electrical sockets/extension cords:** Plugging too many appliances into one socket can cause overheating, leading to fires or damage to appliances.
ii. **Do not touch electrical appliances with wet hands:** Water is a good conductor of electricity and can lead to electric shock.
iii. **Check for damaged cords/plugs:** Frayed wires or broken plugs can expose live wires, posing a risk of electric shock or short circuits. Replace or repair them immediately.
iv. **Unplug appliances when not in use or before cleaning:** This prevents accidental activation and reduces fire hazards.
v. **Keep electrical appliances away from water:** To prevent short circuits and electric shocks.

(b) Learners drew a simple electric circuit as shown below.

Identify the parts labeled A and B (2 marks)

A: **Cell / Battery / Power source**

B: **Bulb / Lamp**

40. (a) A learner is observing a prepared slide of onion cells under a microscope.

(i) State one function of the objective lens of the microscope. (1 mark)

i. Magnifies the specimen/image.
ii. Gathers light from the specimen.
iii. Forms the real, inverted, magnified image of the specimen.

(ii) Explain why it is important to start with the lowest power objective lens when observing a specimen. (1 mark)

i. Starting with the lowest power objective lens provides the **widest field of view**, making it easier to locate the specimen.
ii. It also allows for initial focusing and prevents the objective lens from hitting or damaging the slide or specimen, especially if the specimen is thick.

(b) If a learner measures the length of a desk as 1.5 meters, what is the SI unit used for this measurement? (1 mark)

- **Meter (m)**

(c) Briefly explain the importance of Integrated Science in addressing environmental challenges. (1 mark)

- Integrated Science helps in understanding the complex interactions between different aspects of the environment (e.g., biology, chemistry, physics) to identify causes of environmental problems and develop holistic solutions for issues like pollution, climate change, and resource depletion.

THIS IS THE LAST PRINTED PAGE