**KENYA JUNIOR SCHOOL EDUCATION ASSESSMENT (KJSEA)**

**GRADE 9: INTEGRATED SCIENCE (THEORY)**  
**CODE: 011 YEAR: 2025 TIME: 2 HOURS**

**Candidate’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Assessment Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**School Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. School Code: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**Candidate’s Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**INSTRUCTIONS TO CANDIDATES:**

1. This paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in Section A and B.
3. All answers **MUST** be written in the spaces provided.
4. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
5. Candidates should answer the questions in **English**.

**INTEGRATED SCIENCE (THEORY)**

**FOR OFFICIAL USE ONLY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Task | Question | Score per question | Maximum score | Candidate’s score |
| Task 1 | 31 |  | 03 |  |
|  | 32 |  | 02 |  |
| Task 2 | 33(a) |  | 02 |  |
|  | 33(b) |  | 01 |  |
|  | 34 |  | 03 |  |
|  | 35 |  | 03 |  |
| Task 3 | 36 |  | 03 |  |
|  | 37 |  | 03 |  |
|  | 38 |  | 03 |  |
|  | 39(a) |  | 01 |  |
|  | 39(b) |  | 01 |  |
| Task 4 | 40(a) |  | 02 |  |
|  | 40(b) |  | 02 |  |
|  | 41 |  | 02 |  |
|  | 42 |  | 02 |  |
|  | 43 |  | 02 |  |
|  | 44 |  | 03 |  |
|  | 45 |  | 02 |  |
|  | 46 |  | 02 |  |
|  | 47 |  | 01 |  |
|  | 48 |  | 02 |  |
|  | 49 |  | 02 |  |
|  | 50 |  | 03 |  |
| **Total Section B** |  |  | **40** |  |
| **Overall Total** |  |  | **70** |  |

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**Section A: Multiple Choice Questions (30 marks)**

*Answer all questions*

1. Which of the following is an example of a permanent change?  
   A. Freezing water into ice  
   B. Boiling water to steam  
   C. Rusting of iron  
   D. Melting butter
2. The symbol for the element Sodium is:  
   A. So  
   B. S  
   C. Na  
   D. Sn
3. The particle that moves around the nucleus in shells or energy levels is:  
   A. Proton  
   B. Neutron  
   C. Electron  
   D. Nucleon
4. Which organelle is responsible for energy production in animal cells?  
   A. Ribosome  
   B. Mitochondrion  
   C. Vacuole  
   D. Chloroplast
5. Why is oxygen important in respiration?  
   A. It produces chlorophyll  
   B. It breaks down glucose to release energy  
   C. It stores genetic information  
   D. It forms cell membranes
6. A light microscope has an eyepiece magnification of 5× and an objective magnification of 20×. The total magnification is:  
   A. 25×  
   B. 200×  
   C. 100×  
   D. 15×
7. Movement of particles from a region of high concentration to a region of low concentration without a membrane is called:  
   A. Osmosis  
   B. Active transport  
   C. Diffusion  
   D. Absorption
8. Which appliance converts electrical energy into mechanical energy?  
   A. Electric fan  
   B. Solar panel  
   C. Battery  
   D. Torch
9. A pressure of 200N is exerted over an area of 50m². What is the pressure?  
   A. 2Pa  
   B. 4Pa  
   C. 20Pa  
   D. 250Pa
10. Which pair of conditions is necessary for rusting?  
    A. Oxygen and carbon dioxide  
    B. Oxygen and water  
    C. Water and nitrogen  
    D. Heat and carbon dioxide
11. Which ions are responsible for temporary hardness of water?  
    A. Calcium hydrogen carbonate  
    B. Magnesium sulphate  
    C. Sodium chloride  
    D. Potassium iodide
12. The waxy layer on a leaf that reduces water loss is called:  
    A. Stomata  
    B. Cuticle  
    C. Xylem  
    D. Epidermis
13. Which type of nutrition do human beings use?  
    A. Autotrophic  
    B. Heterotrophic  
    C. Saprophytic  
    D. Chemosynthetic
14. The male reproductive part of a flower is the:  
    A. Carpel B. Ovary  
    C. Stamen D. Sepal
15. An ecosystem includes both living and non-living components. The living components are called:  
    A. Abiotic  
    B. Producers  
    C. Biotic  
    D. Decomposers
16. A curved mirror that makes parallel rays converge to a point is a:  
    A. Convex mirror  
    B. Concave mirror  
    C. Plane mirror  
    D. Parabolic lens
17. The number of complete waves produced in one second is called:  
    A. Amplitude  
    B. Frequency  
    C. Wavelength  
    D. Period
18. Bronze is an alloy of:  
    A. Copper and zinc  
    B. Iron and carbon  
    C. Copper and tin  
    D. Aluminium and magnesium
19. Which of the following is a chemical property of water?  
    A. Boils at 100°C  
    B. Dissolves salts  
    C. Reacts with sodium  
    D. Transparent liquid
20. In humans, most water absorption occurs in the:  
    A. Mouth  
    B. Small intestine  
    C. Large intestine  
    D. Stomach
21. The transfer of pollen grains from anther of one flower to stigma of another flower is called:  
    A. Self-pollination  
    B. Cross-pollination  
    C. Fertilization  
    D. Germination
22. Which type of fire is caused by electrical equipment?  
    A. Class A  
    B. Class B  
    C. Class C  
    D. Class D
23. The dental formula of an adult human being is:  
    A.   
    B  
    C.   
    D.
24. Which human activity negatively affects ecosystems?  
    A. Afforestation  
    B. Reforestation  
    C. Overgrazing  
    D. Wildlife conservation
25. In a food web, herbivores are:  
    A. Primary consumers  
    B. Secondary consumers  
    C. Producers  
    D. Decomposers
26. A flower adapted for insect pollination will likely have:  
    A. Small dull petals  
    B. No scent  
    C. Nectar and bright colours  
    D. Light pollen grains
27. Which method can be used to separate salt from sea water?  
    A. Filtration  
    B. Distillation  
    C. Decantation  
    D. Chromatography
28. Which part of a microscope holds the objective lenses?  
    A. Stage  
    B. Diaphragm  
    C. Revolving nosepiece  
    D. Base
29. Which of the following is an element?  
    A. Carbon dioxide  
    B. Iron  
    C. Water  
    D. Sugar
30. The movement of seeds away from the parent plant to reduce competition is called:  
    A. Germination  
    B. Fertilization  
    C. Pollination  
    D. Dispersal

**Section B: Structured Questions (40 marks)**

**Part 1: Biology (15 marks)**

1. A teacher places a peeled beetroot into a beaker of warm water. After some time, the water turns red.  
   a. Explain why the water changes colour. (2 marks)  
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b. State two factors that affect the rate of osmosis in plant cells. (2 marks)

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c. Give two differences between diffusion and osmosis. (2 marks)

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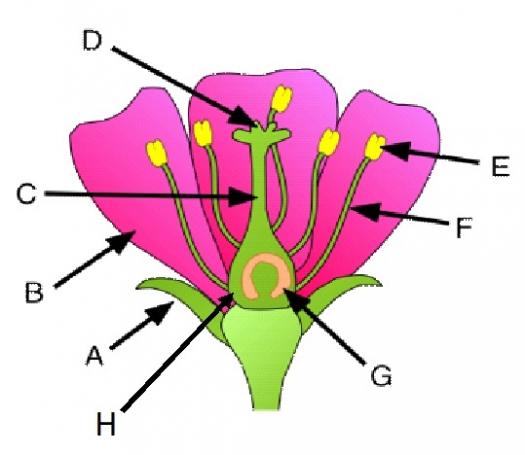
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1. The diagram below shows a typical flower.



a. Name two parts of the flower involved in reproduction. (2 marks)

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b. Explain how insect-pollinated flowers differ from wind-pollinated flowers. (4 marks)  
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c. State two roles of flowers in plants. (3 marks)

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**Part 2: Chemistry (15 marks)**

1. A student mixed iron filings with sulphur and heated the mixture strongly.  
   a. State the product formed. (1 mark)

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b. Explain why the change is permanent. (2 marks)

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c. Write a word equation for the reaction. (2 marks)

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1. Water hardness is a common problem in homes.  
   a. Name two methods of removing temporary hardness in water. (2 marks)

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b. State one advantage and one disadvantage of soft water. (2 marks)

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c. Explain why permanent hardness cannot be removed by boiling. (2 marks)

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1. A student carried out an experiment to collect oxygen gas.  
   a. State two properties of oxygen that make it useful in hospitals. (2 marks)

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b. Name two roles of oxygen in fire combustion. (2 marks)

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**Part 3: Physics (10 marks)**

1. A concave mirror is used in a torch.  
   a. Explain why it is suitable for this use. (2 marks)

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b. An object is placed 12 cm from a concave mirror. A real image is formed 24 cm away. Calculate the focal length of the mirror. (3 marks)

1. A wave travels with a wavelength of 1.5m and frequency of 20Hz.  
   a. Calculate the speed of the wave. (2 marks)

b. State two characteristics of transverse waves. (3 marks)

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**MARKING SCHEME**

**SECTION A: Multiple Choice Questions (30 Marks)**

|  |  |  |
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| **Q.No** | **Answer** | **Explanation** |
| 1 | C | Rusting of iron is a chemical and permanent change; freezing, boiling, and melting are physical and reversible. |
| 2 | C | Sodium has the chemical symbol Na. |
| 3 | C | Electrons move around the nucleus in shells. |
| 4 | B | Mitochondria produce energy (ATP) through respiration. |
| 5 | B | Oxygen is needed to break down glucose during respiration. |
| 6 | C | Total magnification = Eyepiece × Objective = 5 × 20 = 100×. |
| 7 | C | Diffusion is the movement of particles from high to low concentration without a membrane. |
| 8 | A | Electric fan converts electrical energy to mechanical energy. |
| 9 | A | Pressure = Force ÷ Area = 200 ÷ 50 = 4 Pa (Answer: B). |
| 10 | B | Rusting requires both oxygen and water. |
| 11 | A | Calcium hydrogen carbonate causes temporary hardness. |
| 12 | B | Cuticle is the waxy layer reducing water loss. |
| 13 | B | Humans are heterotrophic, relying on other organisms for food. |
| 14 | C | Stamen is the male reproductive part. |
| 15 | C | Biotic components of an ecosystem are living. |
| 16 | B | Concave mirror converges parallel rays to a focus. |
| 17 | B | Frequency = number of waves per second. |
| 18 | C | Bronze is an alloy of copper and tin. |
| 19 | C | Reacting with sodium is a chemical property. |
| 20 | B | Small intestine absorbs most water. |
| 21 | B | Transfer of pollen from one flower to another is cross-pollination. |
| 22 | C | Class C fire involves electrical equipment. |
| 23 | D | Adult human dental formula is 2/2, 1/1, 2/2, 3/3. |
| 24 | C | Overgrazing negatively affects ecosystems. |
| 25 | A | Herbivores are primary consumers. |
| 26 | C | Insect-pollinated flowers have nectar and bright colors. |
| 27 | B | Salt can be separated from water by distillation. |
| 28 | C | Revolving nosepiece holds the objective lenses. |
| 29 | B | Iron is an element. |
| 30 | D | Seed dispersal reduces competition with the parent plant. |

**SECTION B: Structured Questions (40 Marks)**

**Part 1: Biology (15 Marks)**

**31. Beetroot in warm water**  
**a) Explain why the water changes colour (2 marks)**

* Cell membranes of beetroot are damaged by heat.
* Betalain pigment leaks from cells into water.
* Water turns red.

**b) Two factors affecting osmosis in plant cells (2 marks)**  
i) Temperature – higher temp increases rate.  
ii) Concentration gradient – greater difference increases rate.  
**Other possible answers:**  
iii) Surface area of cells.  
iv) Type of solute.  
v) Time of exposure.  
vi) Pressure.  
vii) Thickness of membrane.  
viii) Water potential.  
ix) Cell age or maturity.  
x) Salinity of solution.

**c) Differences between diffusion and osmosis (2 marks)**

|  |  |
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| **Diffusion** | **Osmosis** |
| Movement of particles from high to low concentration | Movement of water from high to low water potential |
| Occurs in solids, liquids, gases | Only involves water across a semi-permeable membrane |
| No membrane required | Membrane is required |
| Can move solutes | Only moves solvent |
| Does not involve osmotic pressure | Driven by osmotic pressure |
| Passive process | Passive process |
| Random movement of molecules | Selective movement of water |
| Equalizes concentration of solutes | Equalizes water potential |
| Can be fast or slow | Usually slower than gas diffusion |
| Occurs naturally | Occurs naturally |

**32. Flower Reproduction**  
**a) Name two reproductive parts (2 marks)**  
i) Stamen (male)  
ii) Carpel/Pistil (female)  
**Other possible answers:**  
iii) Anther  
iv) Ovary  
v) Stigma  
vi) Style

**b) Difference: Insect vs. wind pollinated flowers (4 marks)**

* Insect-pollinated: bright colors, scent, nectar.
* Wind-pollinated: small, dull petals, light pollen, no nectar.  
  **Other possible answers:**  
  i) Sticky pollen in insects, smooth/light pollen in wind.  
  ii) Insects: larger flowers, wind: small inconspicuous.  
  iii) Insects: pollination by visiting animals; wind: pollination by air.  
  iv) Insects: stigma sticky; wind: stigma feathery.  
  v) Timing: flowers open when insects are active.  
  vi) Shape adaptation for insect landing.

**c) Roles of flowers (3 marks)**  
i) Reproduction – producing seeds  
ii) Attracting pollinators  
iii) Forming fruits  
**Other possible answers:**  
iv) Aid genetic variation  
v) Provide nectar and food for insects  
vi) Protect reproductive organs  
vii) Produce pollen  
viii) Facilitate cross-pollination  
ix) Contribute to ecosystem balance  
x) Aid seed dispersal

**Part 2: Chemistry (15 Marks)**

**33. Iron + Sulphur**  
**a) Product formed (1 mark)**

* Iron sulfide (FeS)

**b) Why permanent change (2 marks)**

* New substance is formed with new properties.
* Change is not reversible by physical means.

**c) Word equation (2 marks)**

* Iron + Sulphur → Iron sulfide

**34. Water hardness**  
**a) Two methods removing temporary hardness (2 marks)**  
i) Boiling water  
ii) Adding lime (Ca(OH)₂)  
**Other possible answers:**  
iii) Distillation  
iv) Ion-exchange methods  
v) Addition of washing soda

**b) Advantage & disadvantage of soft water (2 marks)**

* Advantage: Forms lather easily
* Disadvantage: Corrodes pipes

**c) Permanent hardness cannot be removed by boiling (2 marks)**

* Contains calcium/magnesium sulphates, which do not precipitate on boiling.

**35. Oxygen properties**  
**a) Two properties useful in hospitals (2 marks)**  
i) Supports respiration  
ii) Colourless and non-toxic at normal concentrations  
**Other possible answers:**  
iii) Supports combustion (for sterilization)  
iv) Purity can be controlled  
v) Can be liquefied and stored  
vi) Reacts with organic matter to sterilize

**b) Two roles in fire combustion (2 marks)**  
i) Supports burning  
ii) Combines with fuel to release energy  
**Other possible answers:**  
iii) Intensifies flames  
iv) Required for chemical reaction  
v) Oxidizes materials

**Part 3: Physics (10 Marks)**

**36. Concave mirror in torch**  
**a) Why suitable (2 marks)**

* Concave mirrors converge light to a beam
* Produces a bright, focused light

**b) Focal length calculation (3 marks)**  
Mirror formula: 1/f = 1/v + 1/u

* v = 24 cm (image), u = -12 cm (object, negative for real image)
* 1/f = 1/24 + 1/(-12) = 1/24 - 1/12 = -1/24
* f = -24 cm (negative sign shows concave mirror focal length)

**37. Wave speed**

* Formula: v = f × λ
* f = 20 Hz, λ = 1.5 m
* v = 20 × 1.5 = 30 m/s

**38. Characteristics of transverse waves (3 marks)**  
i) Particle motion perpendicular to wave direction  
ii) Has crests and troughs  
iii) Can be reflected and refracted  
**Other possible answers:**  
iv) Can be polarized  
v) Carries energy without mass transport  
vi) Can interfere  
vii) Has wavelength, frequency, amplitude  
viii) Examples: light, water waves  
ix) Energy travels faster in solids  
x) Displacement oscillates up and down