

KENYA CERTIFICATE OF BASIC EDUCATION (K.C.B.E)

MARKING SCHEME

GRADE 10: CHEMISTRY (Theory) – TERM 1 – JANUARY 2026

SECTION A (40 MARKS)

1. A mother reading detergent labels

(a) Define Chemistry (1mk)

- ✓ Chemistry is the science of **matter, its composition, structure, properties, and the changes it undergoes.**
- ✓ Study of **substances and their reactions.**
- ✓ Science that deals with **atoms, molecules, ions, and chemical bonds.**
- ✓ Study of **energy changes during chemical reactions.**

(b) Branches of Chemistry (1mk)

- ✓ Organic Chemistry – study of **carbon compounds.**
- ✓ Inorganic Chemistry – study of **non-carbon compounds.**
- ✓ Physical Chemistry – study of **energy and rate of reactions.**
- ✓ Analytical Chemistry – study of **composition and analysis of substances.**
- ✓ Biochemistry – study of **chemical processes in living organisms.**
- ✓ Environmental Chemistry – study of **chemical processes in the environment.**
- ✓ Industrial Chemistry – study of **chemical processes for industrial applications.**

(c) Careers related to the branch (1mk)

- ✓ Organic → Pharmacist, organic chemist, petrochemical engineer.
- ✓ Inorganic → Metallurgist, ceramic engineer, industrial chemist.
- ✓ Physical → Materials scientist, chemical engineer, thermochemist.
- ✓ Analytical → Quality control analyst, forensic chemist, lab technician.
- ✓ Biochemistry → Food technologist, clinical chemist, molecular biologist.
- ✓ Environmental → Environmental scientist, toxicologist.
- ✓ Industrial → Production manager, chemical process engineer.

2. Clinic issues medicine

(a) Define drug (1mk)

- ✓ Substance used to **diagnose, treat, or prevent disease.**
- ✓ Chemical that **alters body function.**
- ✓ Natural or synthetic compound with **therapeutic effect.**
- ✓ Substance that can **relieve pain or treat conditions.**

(b) What is a prescription (1mk)

- ✓ Written instruction by a **qualified medical professional** specifying medicine and dose.
- ✓ Authorization for **dispensing medicine.**
- ✓ Instructions on **how, when, and what dosage** to take.

(c) Dosage meaning (1mk)

- ✓ The **amount of drug given at a specific time.**
- ✓ The **frequency and duration of drug administration.**
- ✓ Recommended **quantity for safety and efficacy.**

(d) Consumer rights (1mk)

- ✓ Right to **safe and effective medicine.**
- ✓ Right to **correct labeling and instructions.**
- ✓ Right to **refuse harmful substances.**
- ✓ Right to **information and guidance** from pharmacist.

3. Effects of abusing drugs**(a) Cigarettes (1mk)**

- ✓ Lung cancer
- ✓ Heart disease
- ✓ Bronchitis or emphysema
- ✓ Nicotine addiction
- ✓ Stained teeth and bad breath
- ✓ Reduced fertility

(b) Khat (miraa) (1mk)

- ✓ Insomnia or sleep disorders
- ✓ Anxiety and nervousness
- ✓ Loss of appetite
- ✓ Tooth decay
- ✓ Elevated heart rate
- ✓ Digestive problems

4. Roles of chemistry in agriculture (3mks)

- ✓ Fertilizer production (NPK, urea, ammonium nitrate)
- ✓ Pesticide and herbicide production
- ✓ Soil testing and improvement
- ✓ Plant growth hormones and vitamins
- ✓ Animal feed enhancement and additives
- ✓ Controlling plant diseases chemically

5. First 20 elements**(a) Atomic number 1 → Hydrogen (H)****(b) Atomic number 8 → Oxygen (O)****(c) Atomic number 12 → Magnesium (Mg)**

- First 20 Elements: Helium (2), Lithium (3), Beryllium (4), Boron (5), Carbon (6), Nitrogen (7), Fluorine (9), Neon (10), Sodium (11), Aluminum (13), Silicon (14), Phosphorus (15), Sulfur (16), Chlorine (17), Argon (18), Potassium (19), Calcium (20)

6. Differences between atomic and mass numbers (2mks)

Atomic Number	Mass Number
Number of protons	Sum of protons + neutrons
Determines element identity	Determines isotope
Symbol Z Mass number (# protons + # neutrons) — A X — Symbol of element Atomic number (# protons) — Z	Symbol A Mass number (# protons + # neutrons) — A X — Symbol of element Atomic number (# protons) — Z

7. Learners' responsibilities in lab safety (3mks)

- ✓ Follow all **laboratory safety rules**
- ✓ Use **protective equipment** (gloves, goggles)
- ✓ Handle chemicals and equipment **responsibly**
- ✓ Report **spills or accidents**
- ✓ Keep **workspace clean**
- ✓ Avoid eating or drinking in the lab

8. Medicine side effects

(a) Substance (1mk)

- ✓ Matter with **definite composition and properties**
- ✓ Can be **element or compound**
- ✓ Example: Water (H₂O), Salt (NaCl)

(b) Routes of drug intake (2mks)

- ✓ Oral (swallowing)
- ✓ Injection (intravenous, intramuscular, subcutaneous)
- ✓ Inhalation (lungs)
- ✓ Topical (skin)
- ✓ Sublingual (under the tongue)

(c) Side effect of heroin (1mk)

- ✓ Addiction and dependency
- ✓ Respiratory depression
- ✓ Drowsiness
- ✓ Nausea and vomiting

9. Chemistry in entertainment (3mks)

- ✓ Special effects (smoke, fire, explosions)
- ✓ Lighting chemicals (phosphors, LEDs)
- ✓ Paints, dyes, stage props
- ✓ Cosmetics and makeup
- ✓ Production of polymers for costumes
- ✓ Audio-visual equipment components

10. Electronic configuration

- (a) Nitrogen ($Z=7$) $\rightarrow 1s^2 2s^2 2p^3$
 (b) Magnesium ($Z=12$) $\rightarrow 1s^2 2s^2 2p^6 3s^2$
 (c) Argon ($Z=18$) $\rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6$

SECTION B (60 MARKS)

11. Herbal drinks causing dizziness

(a) Three roles of chemistry in ensuring safety of herbal products (6mks)

- Chemical analysis** to determine the composition of herbal products.
- Detection of toxic substances or contaminants** such as heavy metals, pesticides, or microbes.
- Standardization of dosage** to ensure safe consumption.
- Shelf-life determination** through stability testing.
- Label verification** to confirm ingredients match contents.
- Quality control testing** for purity, pH, and microbial contamination.

(b) Two responsibilities of consumers when buying herbal substances (2mks)

- ✓ Check the **expiry date and label information**.
- ✓ Follow the **recommended dosage** instructions.
- ✓ Buy from **licensed or reputable sources**.
- ✓ Report **adverse reactions** to authorities.

(c) Two qualities of a safe learning/working environment in a chemistry lab (2mks)

- ✓ Proper **ventilation** to prevent inhalation of toxic fumes.
- ✓ Well-organized **chemical storage** to prevent accidents.
- ✓ Availability of **fire extinguishers, first aid, and protective gear**.
- ✓ Clean and **uncluttered workspaces**.

12. Drug abuse among youth

(a) Two reasons why young people abuse drugs like glue/cobbler's blue (4mks)

- ✓ **Peer pressure** from friends or social groups.
- ✓ **Curiosity or experimentation** to explore effects.
- ✓ **Stress or escape** from problems at home or school.
- ✓ **Influence of media or advertisement** showing drug use as "cool."
- ✓ **Easy availability and low cost** of certain drugs.

(b) Modes of intake and health effects

(i) Cocaine (2mks)

- ✓ Mode of intake: **Sniffed, inhaled, or injected**.
- ✓ Health effects: **Heart attack, high blood pressure, addiction, nasal damage**.

(ii) Illicit brew (chang'aa) (2mks)

- ✓ Mode of intake: **Oral consumption**.
- ✓ Health effects: **Liver cirrhosis, kidney damage, alcoholism, impaired judgement**.

(iii) Cannabis (bhang) (2mks)

- ✓ Mode of intake: **Smoked or eaten (edibles).**
- ✓ Health effects: **Memory loss, impaired concentration, lung problems, addiction.**

(c) Two long-term effects of Mandrax (2mks)

- ✓ Memory impairment or **cognitive decline.**
- ✓ **Liver and kidney damage.**
- ✓ Addiction and psychological dependence.
- ✓ Disturbed sleep patterns.

13. Atomic structure and Dalton's theory

(a) Two postulates of Dalton's atomic theory (2mks)

- ✓ All matter is made of **tiny indivisible atoms.**
- ✓ Atoms of the same element are **identical in mass and properties.**
- ✓ Atoms combine in **simple whole-number ratios** to form compounds.
- ✓ Atoms are **not created or destroyed** in chemical reactions.

(b) Gold foil experiment – evidence from lines A, B, C (3mks)

- ✓ **Line A (straight passage):** Atom is **mostly empty space.**
- ✓ **Line B (deflected particles):** Atom contains a **dense positive nucleus.**
- ✓ **Line C (reflected particles):** Nucleus is **very small but heavy.**

(c) Two conclusions from the gold foil experiment (2mks)

- ✓ Atom is **mostly empty space.**
- ✓ Nucleus is **dense and positively charged.**
- ✓ Electrons move around the nucleus in **empty space.**

(d) Definitions (2mks)

- ✓ **Isotope:** Atoms of the same element with **same number of protons but different number of neutrons.**
- ✓ **Orbital:** Region around the nucleus where **electrons are most likely found.**

(e) Subatomic particle varying in isotopes of the same element (1mk)

- ✓ **Neutron**

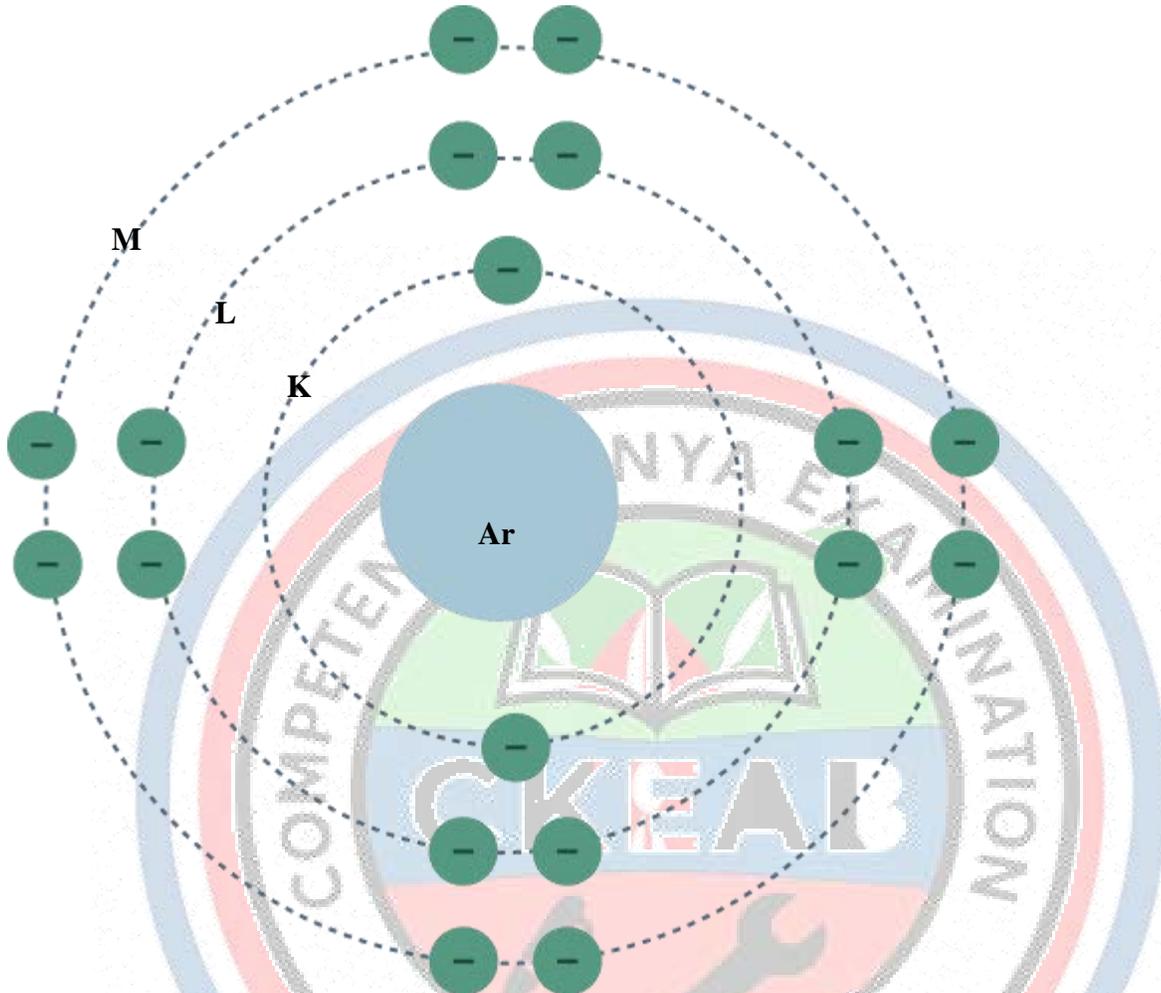
14. Element X isotopes 20 and 22 in ratio 3:1

(a) Calculate relative atomic mass (3mks)

$$\text{RAM} = \left(\frac{(3 \times 20) + (1 \times 22)}{3 + 1} \right) = \frac{60 + 22}{4} = 20.5$$

(b) Diagram showing first three energy levels (3mks)

- ✓ **1st energy level (K-shell):** 2 electrons
- ✓ **2nd energy level (L-shell):** 8 electrons
- ✓ **3rd energy level (M-shell):** 8 electrons



(Label levels as K, L, M with circles and electrons as dots)

(c) Relationship between energy levels and orbitals (3mks)

- Energy levels are **shells around nucleus**.
- Each energy level contains **sub-levels (s, p, d, f)**.
- Sub-levels contain **orbitals**, regions where electrons are likely found.
- Higher energy levels → more **sub-levels and orbitals**.

(d) Order of filling first four orbitals (2mks)

$1s \rightarrow 2s \rightarrow 2p \rightarrow 3s$

(e) Electron configuration using s and p notation

- ✓ **Phosphorus (Z=15):** $1s^2 2s^2 2p^6 3s^2 3p^3$
- ✓ **Neon (Z=10):** $1s^2 2s^2 2p^6$

15. Chemistry-related careers and industry

(a) Four branches of chemistry (4mks)

- ✓ Organic chemistry
- ✓ Inorganic chemistry
- ✓ Physical chemistry
- ✓ Analytical chemistry
- ✓ Biochemistry
- ✓ Environmental chemistry
- ✓ Industrial chemistry

(b) Career per branch (4mks)

- ✓ Pharmacist → Organic chemistry
- ✓ Petroleum engineer → Physical/inorganic chemistry
- ✓ Food technologist → Biochemistry/analytical chemistry
- ✓ Forensic scientist → Analytical chemistry
- ✓ Environmental scientist → Environmental chemistry
- ✓ Chemical engineer → Industrial chemistry

(c) Three ways chemistry is applied in manufacturing (6mks)

- ✓ **Drug and pharmaceutical production** for medicine.
- ✓ **Paints, plastics, and polymer manufacture.**
- ✓ **Food processing and preservation.**
- ✓ **Textile and detergent manufacture.**
- ✓ **Fertilizers and agrochemical production.**
- ✓ **Quality control testing** for safe and consistent products.
- ✓ **Waste management** and environmental protection in industries.

NOTE TO FACILITATORS (TEACHERS):

The marking scheme provided is not exhaustive. Facilitators are advised to use their professional judgment when awarding marks. Any correct, relevant, and scientifically or contextually acceptable answer that demonstrates understanding of the concepts should be credited. Where examples are required, learners may provide other valid examples apart from those listed in the scheme.

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