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

MARKING SCHEME

GRADE 10: ELECTRICAL TECHNOLOGY – TERM 1 – JANUARY 2026

SECTION A: 60 Marks

1. Contribution of electrical technology to society (6 marks)

(a) Ways it contributes to societal development (2 marks)
i) Provides modern energy solutions for homes and industries
ii) Improves efficiency in production and industrial processes
iii) Enhances communication through electrical devices
iv) Improves healthcare through medical electrical equipment
v) Supports education through electrical learning aids

(b) Ways it improves employment (2 marks)
i) Creation of jobs for electricians and electrical engineers
ii) Opens opportunities for technical training and apprenticeships
iii) Promotes entrepreneurship in electrical services
iv) Increases demand for skilled labor in industries

(c) Social benefits for youth (2 marks)
i) Development of technical skills and employability
ii) Encourages innovation and creativity
iii) Builds confidence and independence
iv) Promotes teamwork and responsibility

2. Career pathways in electrical technology (6 marks)

(a) Technical careers (2 marks)
i) Electrician
ii) Electrical engineer
iii) Electrical technician
iv) Electronics technician
v) Renewable energy technician

(b) Non-technical/support careers (2 marks)
i) Electrical project manager
ii) Electrical sales representative
iii) Safety officer
iv) Technical writer/documentation officer
v) Electrical procurement officer

(c) Benefit of pursuing electrical careers (2 marks)

- ✓ Provides stable employment and good income
- ✓ Enhances problem-solving and analytical skills
- ✓ Offers opportunities for innovation and entrepreneurship
- ✓ Contributes to technological and societal development

3. Personal Protective Equipment (PPE) (8 marks)

(a) Four PPEs (4 marks)
i) Safety gloves
ii) Safety boots
iii) Helmet/hard hat
iv) Safety goggles
v) Ear muffs/hearing protection

(b) Reasons each PPE is important (4 marks)
i) Gloves – protect hands from electric shocks and cuts
ii) Boots – prevent electric shock and foot injuries
iii) Helmet – protects head from falling objects
iv) Goggles – protect eyes from sparks or debris
v) Ear muffs – protect ears from loud noise

4. Electrical safety at construction sites (6 marks)

(a) Safety responsibilities of workers (2 marks)
i) Wear PPE at all times
ii) Follow safety instructions and protocols
iii) Report unsafe conditions

(b) Responsibilities of employers (2 marks)
i) Provide safety training
ii) Supply necessary PPE and safety tools
iii) Maintain safe working environment

(c) Responsibilities of government agencies (EPRA) (2 marks)
i) Enforce electrical safety standards
ii) Conduct inspections and audits
iii) License and regulate electrical contractors

5. Uses of electricity (6 marks)

(a) Uses in homes (2 marks)
i) Lighting and heating
ii) Operating home appliances (fridges, TVs)
iii) Charging electronic devices

(b) Uses in schools (2 marks)
i) Lighting classrooms
ii) Powering computers and lab equipment
iii) Operation of projectors and audio systems

(c) Uses in offices (2 marks)
i) Computers, printers, and copiers
ii) Air conditioning and ventilation
iii) Lighting and security systems

(d) Industrial applications (2 marks)
i) Operation of machines and motors
ii) Welding and fabrication
iii) Assembly lines and automation
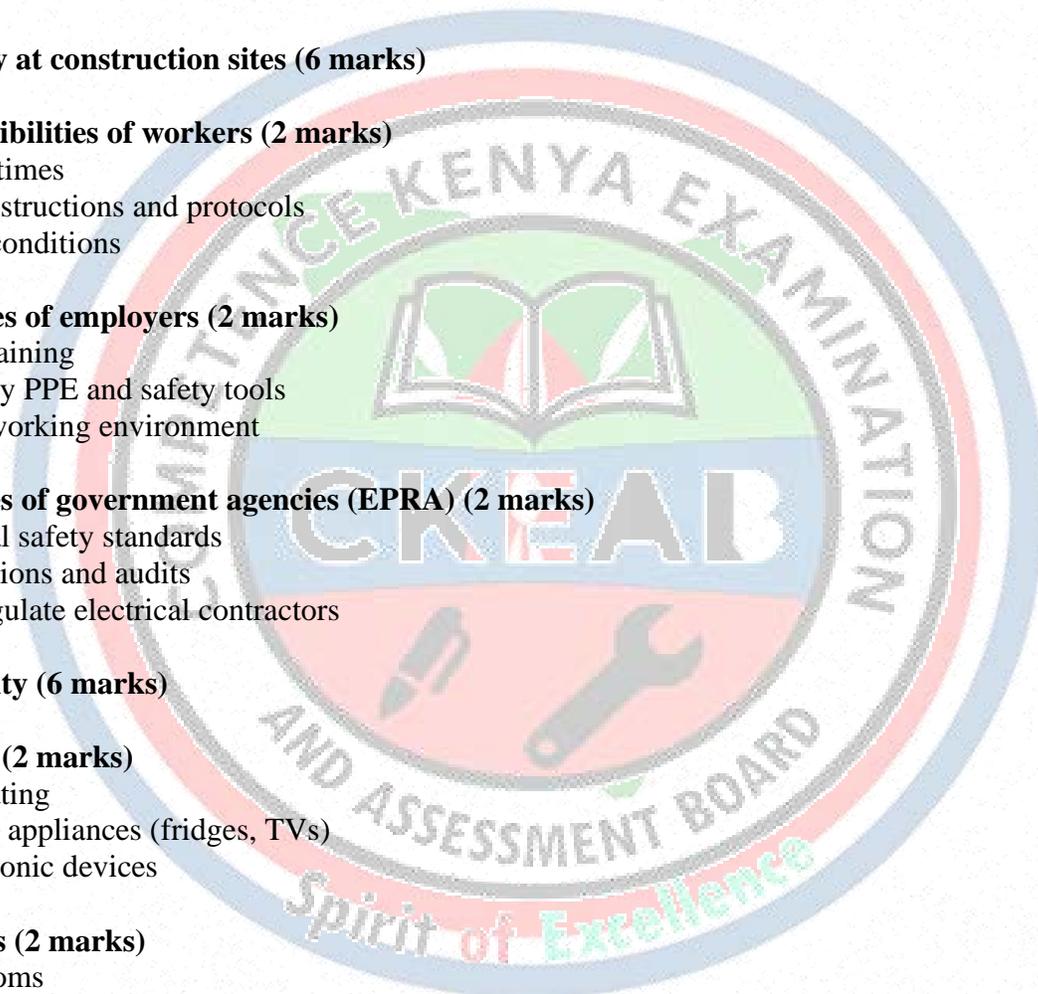
6. (6 marks)

(a) Identify components (4 marks)
U: Voltmeter
V: multimeter
W: Ohmmeter
X: Ammeter

(b) Role of parts (2 marks)
U – Measures voltage in the circuit
W – Measures resistance in the circuit

7. Electrical tools maintenance (6 marks)

(a) Reasons for cleaning tools (2 marks)
i) Prevent rust and corrosion
ii) Ensure proper function and longevity

(b) Methods of storing tools (2 marks)
i) Use toolboxes or cabinets
ii) Hang tools on racks

(c) Effects of poor tool storage (2 marks)
i) Increased risk of accidents
ii) Damage to tools and reduced efficiency

8. Basic electrical concepts (6 marks)

(a) Electrical technology definition (2 marks)

- ✓ Application of electricity in design, production, maintenance, and repair of electrical devices and systems

(b) Difference between current and voltage (2 marks)

- ✓ Current: Flow of electric charge in a conductor (Amperes)
- ✓ Voltage: Electric potential difference that drives current (Volts)
- ✓ Current is measured by ammeter; voltage by voltmeter

(c) Factors affecting resistance (2 marks)
i) Length of conductor
ii) Cross-sectional area
iii) Material type
iv) Temperature

9. Series circuit calculations (8 marks)

Circuit: R1 = 4Ω, R2 = 6Ω, V = 10 V

(a) Total resistance
R_total = R1 + R2 = 4 + 6 = 10 Ω

(b) Total current
I = V / R_total = 10 / 10 = 1 A

(c) Voltage drop across R1

V_R1 = I × R1 = 1 × 4 = 4 V

(d) Series circuit application

- ✓ Christmas lights
- ✓ Alarm circuits
- ✓ Flashlight bulbs

10. Torch DC circuit (6 marks)

(a) Components

Q: Battery/cell/power source

T: Lamp / Bulb

(b) Function of switch

- ✓ Opens/closes circuit to control flow of current

(c) Why torches use DC

- ✓ Provides constant current and voltage
- ✓ Portable (battery powered)
- ✓ Safer for handheld devices

(d) Advantage of LEDs

- ✓ Lower energy consumption
- ✓ Longer lifespan
- ✓ Less heat generated

11. Kirchhoff's Laws (6 marks)

(a) KCL

- ✓ Sum of currents entering a junction = sum of currents leaving junction
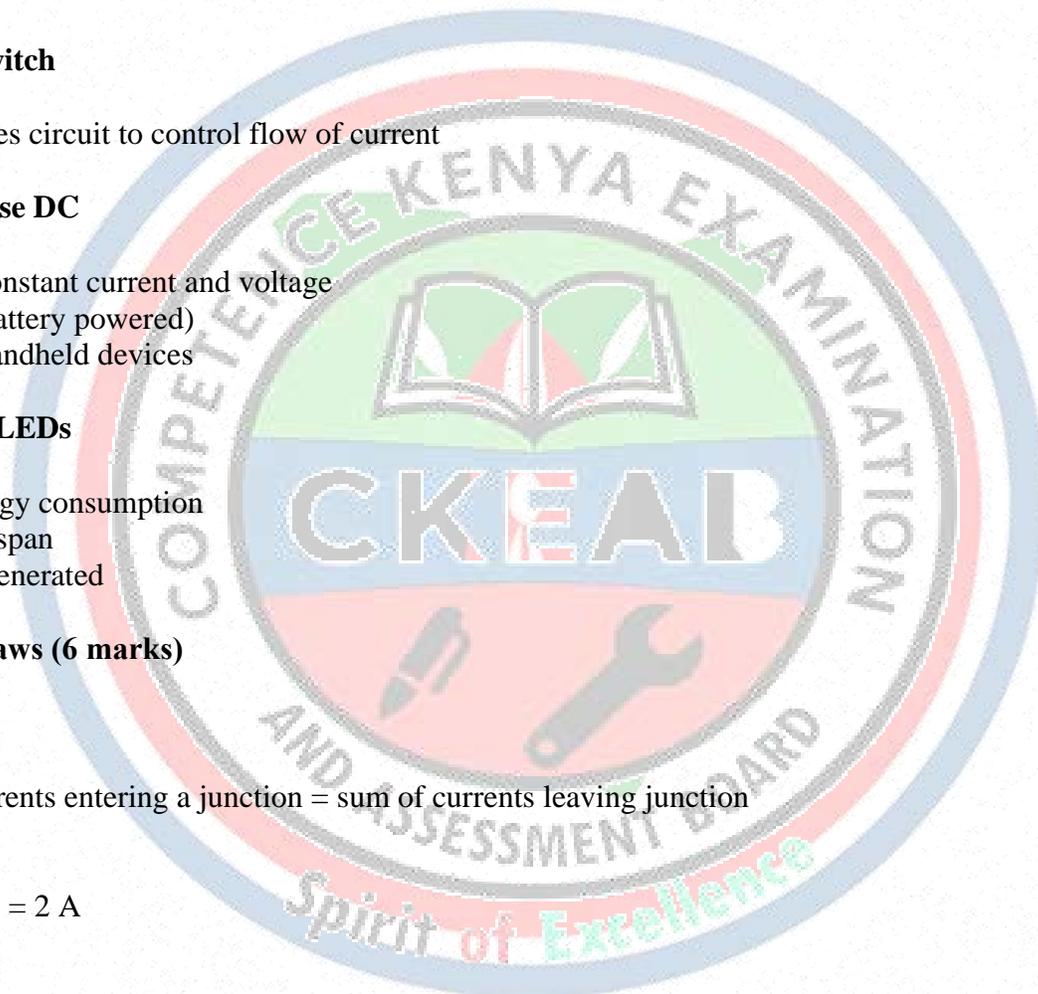
(b) I3 calculation

I3 = I1 – I2 = 6 – 4 = 2 A

(c) KVL

- ✓ Sum of voltages in a closed loop = 0

(d) Real-life applications

i) Electrical power distribution

ii) Circuit analysis in electronics

iii) Household wiring

iv) Telecommunication circuits

12. Smartphone charging issues (10 marks)

(a) Possible causes of open circuit
i) Broken wire in cable
ii) Loose connection at terminals
iii) Faulty USB port

(b) Signs of short circuit
i) Sparks or smoke
ii) Fuse blowing
iii) Circuit overheating

(c) Multimeter usage
i) Set to continuity or resistance mode
ii) Check for breaks in the cable
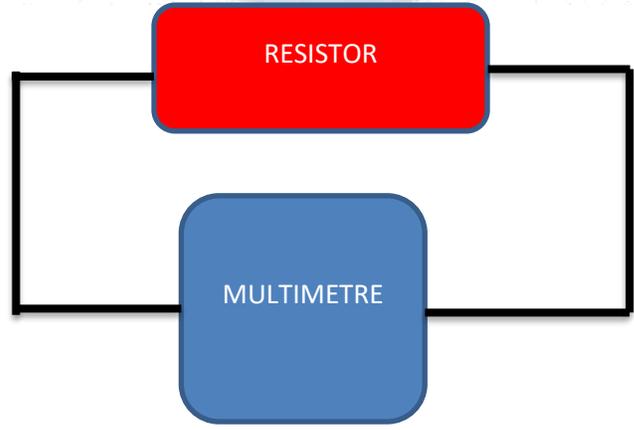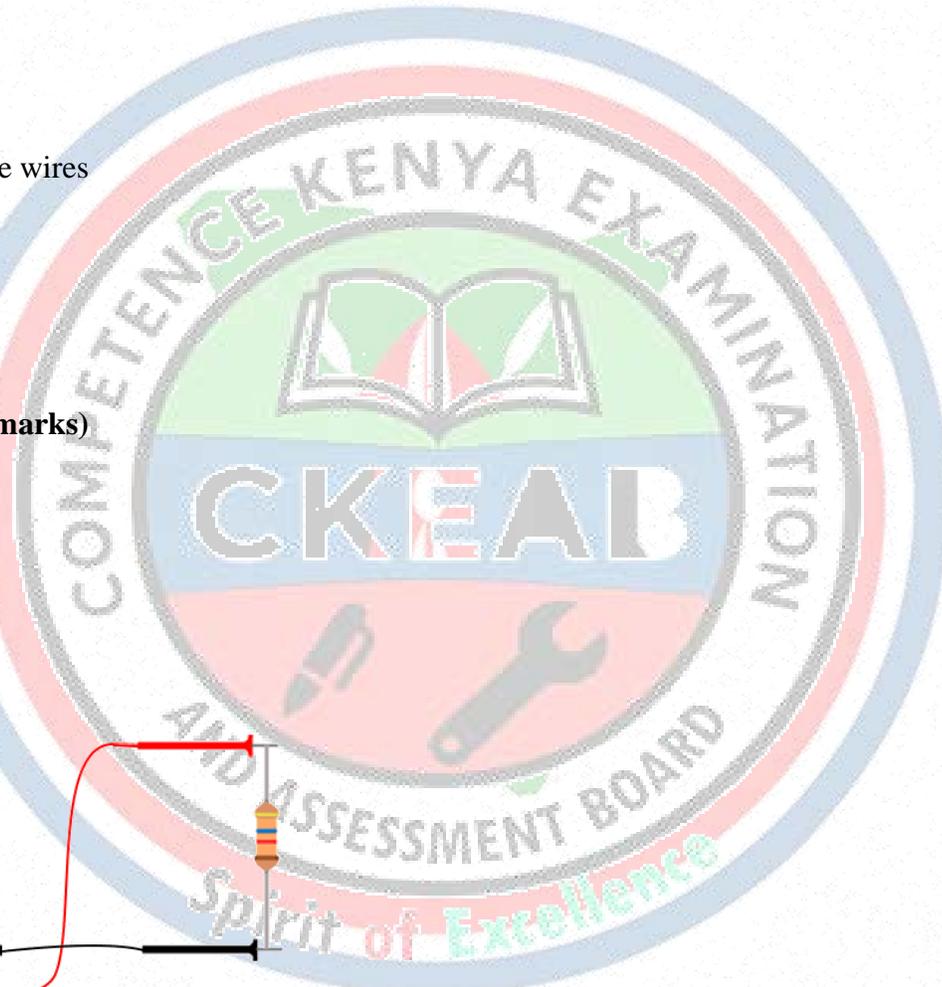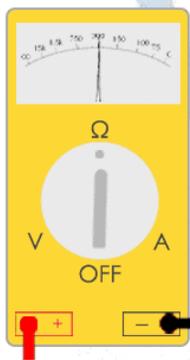iii) Test battery voltage

(d) Safety precaution

✓ Avoid touching live wires

(e) Faulty components
i) Blown fuse
ii) Burnt resistor
iii) Damaged capacitor

13. Multimeter usage (8 marks)

(a) Diagram (ASCII)

RESISTOR

OR

MULTIMETRE

 (b) Rules
i) Always turn off circuit when measuring resistance
ii) Use correct settings and range

(c) Measuring current
i) Break circuit and connect multimeter in series
ii) Observe reading

(d) Calibration reason

- ✓ Ensures accurate readings

(e) Other instruments
i) Ammeter
ii) Voltmeter
iii) Oscilloscope

14. Motorcycle DC charging (10 marks)

(a) How DC enables charging
i) Provides constant voltage to battery
ii) Charges mobile device safely
iii) Current flows in one direction

(b) Advantages
i) Portable and suitable for vehicles
ii) Provides stable voltage

(c) Dangers of poor wiring
i) Electric shock
ii) Short circuit leading to fire

(d) Safety measures
i) Use insulated wires
ii) Avoid overloading circuits
iii) Regularly inspect connections

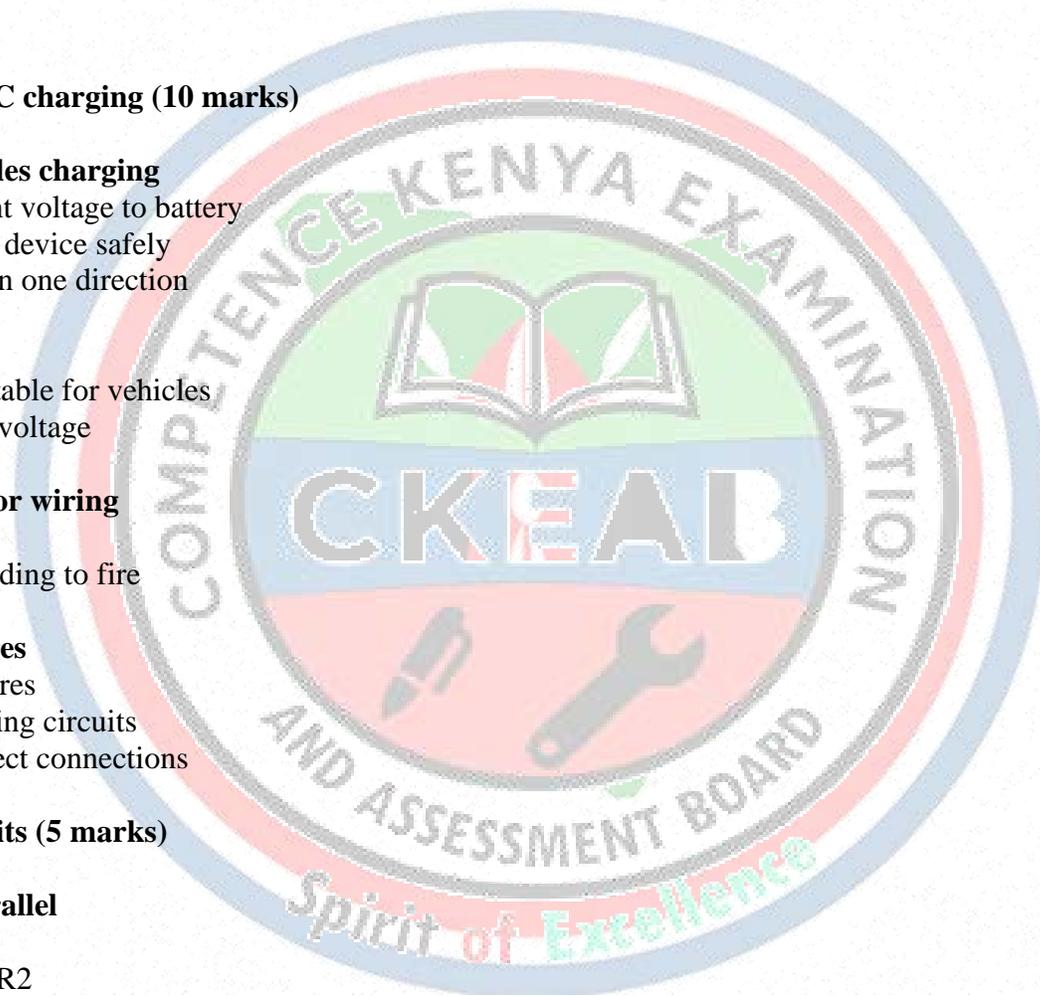## 15. Resistor circuits (5 marks)

(a) Series and parallel

- ✓ Series: R1,R2
- ✓ Parallel: R3 and R4

(b) Total resistance (example)

- ✓ If R3 || R4 = (R3×R4)/(R3+R4)
- ✓ R_total = R1 + R2 + (R3||R4)

$$R_{\text{parallel}} = \frac{R3 \times R4}{R3 + R4}$$

Step 2: Calculate parallel resistance (R3 || R4)

$$R3 \| R4 = \frac{10 \times 15}{10 + 15} = \frac{150}{25} = 6\,\Omega$$

Step 3: Add series resistances

$$R_{\text{total}} = R1 + R2 + (R3 \| R4)$$

$$R_{\text{total}} = 15 + 20 + 6 = 41\,\Omega$$

Total resistance R $_{\text{total}}$ =41 Ω

(c) Advantage of parallel

- Maintains voltage across components
- Reduces overall resistance

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.