



REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARD

FOR

ANALYTICAL CHEMISTRY TECHNICIAN

KNQF LEVEL 6

OCCUPATION STANDARD ISCED CODE: 0531 554A

APPLY PHYSICS PRINCIPLES.

ISCED UNIT CODE: 0531 551 06A

TVET CDACC UNIT CODE: ASC/OS/ACHEM/CC/02/6/MA

UNIT DESCRIPTION

This unit specifies the competencies required to apply physics principles. It involves applying: dynamics principles; principles of thermodynamics; principles of optics; friction principles; work, energy and power principles; pressure principles.; principles of electromagnetism; electrostatic and electrical principles.; semiconductor device principles, and principles of nuclear physics.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace functions	These are assessable statements which specify the required level of performance for each of the elements <i>(Bold and italicized terms are elaborated in the range)</i>
1. Apply dynamics principles.	1.1 Static forces are applied as per physics principles. 1.2 Linear motion is applied as per the <i>laws of motion</i> . 1.3 Circular motion is applied as per laws of motion.
2. Apply principles. of thermodynamics	2.1 <i>Heat energy</i> is measured as per physics laboratory manual. 2.2 Heat energy is calculated as per <i>thermodynamic principles</i> . 2.3 <i>Thermodynamic processes</i> are determined as per physics laboratory manual. 2.4 <i>Thermodynamic quantities</i> are calculated as per physics laboratory manual.

<p>3. Apply principles. of optics</p>	<p>3.1 Light properties are applied as per optic principles.</p> <p>3.2 Distances and sizes of object and images are determined as per the geometrical optics and mirror and lens formula rules.</p> <p>3.3 Magnification power of optical device is determined as per optic principles.</p>
<p>4. Apply friction principles.</p>	<p>4.1 Source of friction in an equipment is identified as per manufacturer's manual.</p> <p>4.2 Resultant forces are applied as per friction principles.</p> <p>4.3 Coefficient of friction is calculated as per friction principles.</p>
<p>5. Apply pressure principles</p>	<p>5.1 Pressure concepts are applied as per pressure laws.</p> <p>5.2 Pressure problems are solved according to pressure laws.</p> <p>5.3 Pressure applications are identified as per job specification.</p>
<p>6. Apply principles of electromagnetism.</p>	<p>6.1 Magnets are identified as per the physics laboratory manual.</p> <p>6.2 Magnetic properties are determined based on the magnetic principles.</p> <p>6.3 Electromagnetism is applied based on the principle of electromagnetism.</p>
<p>7. Apply electrostatic and electrical principles.</p>	<p>7.1 Electrostatic devices are identified as per job specification</p> <p>7.2 Circuits are connected as per electrical principles.</p> <p>7.3 Ohm's law is applied as per electrical principles.</p> <p>7.4 Electrical energy sources are identified as per electrical principles.</p>

	7.5 Principle of operation of induction is applied as per job specification.
8. Apply semiconductor device principles.	<p>8.1 Semiconductor device is identified as per job specification.</p> <p>8.2 Rectification is carried out as per the electronic principles.</p> <p>8.3 Characteristic of semi-conductor diodes are verified as per the manufacturer's manual.</p>
9. Apply principles of nuclear physics	<p>9.1 X-rays are produced and utilized as per the manufacturer's manual.</p> <p>9.2 Radioactive element is detected based on the detection systems.</p> <p>9.3 Safety precautions on radioactive elements are observed based on safety regulations.</p> <p>9.4 Radioactive radiations are applied based on nuclear principles.</p>

RANGE

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

Variable	Range
1. Laws of motion may include but not limited to:	<ul style="list-style-type: none"> ● Law of inertia ● Law of momentum ● Law of interaction
2. Heat energy includes but is not limited to:	<ul style="list-style-type: none"> ● Heat capacity ● Specific heat capacity

	<ul style="list-style-type: none"> ● Latent heat ● Latent heat of fusion ● Latent heat of vaporization ● Latent heat of sublimation
3. Thermodynamic processes include but are not limited to:	<ul style="list-style-type: none"> ● Adiabatic changes ● Isothermal processes ● Isobaric changes ● Isochoric changes
4. Thermodynamic quantities include but are not limited to:	<ul style="list-style-type: none"> ● Pressure ● Volume ● Temperature
5. Light properties include but are not limited to:	<ul style="list-style-type: none"> ● Reflection ● Total internal reflection ● Refraction
6. Mirror and lens formula include	$1/f = 1/u + 1/v$ <ul style="list-style-type: none"> ● f - Focal length ● u - Object distance ● v - Image distance $m = v/u = i/o$ <ul style="list-style-type: none"> ● i - Image height ● o - Object height
7. Types of magnets include but are not limited to:	<ul style="list-style-type: none"> ● Permanent ● Temporary ● Earth

8. Magnetic properties include but are not limited to:	<ul style="list-style-type: none"> ● Lines of force ● Magnetic flux patterns ● Flux density
9. Electromagnetism may include but is not limited to:	<ul style="list-style-type: none"> ● Quantities and units ● Stationery and moving conductor ● Fleming's right hand rule ● Faraday's and Lenz's cork screw rule ● Grip rule ● Self-inductance ● Mutual inductance ● Induction due to current change in another circuit
10. Electrostatic devices may include but is not limited to:	<ul style="list-style-type: none"> ● Capacitor ● Van de Graff generator ● Electroscope
11. Electrical energy sources may include but is not limited to:	<ul style="list-style-type: none"> ● Renewable sources ● Non-renewable sources
12. Induction may include but is not limited to:	<ul style="list-style-type: none"> ● self-induction ● mutual induction
13. Semiconductor device may include but is not limited to:	<ul style="list-style-type: none"> ● diode ● transistor ● LED
14. Rectification may include but is not limited to:	<ul style="list-style-type: none"> ● Half-wave ● Full wave

15. Radioactive element may include but is not limited to:	<ul style="list-style-type: none"> ● Thorium ● Uranium ● Carbon 14
16. Radioactive radiations may include but is not limited to:	<ul style="list-style-type: none"> ● Alpha particles ● Beta particles ● Gamma radiation ● Background radiations

REQUIRED KNOWLEDGE AND SKILLS

This section describes the knowledge and skills required for this unit of competency.

Required knowledge

The individual needs to demonstrate knowledge of:

- Technical
- Problem solving
- Critical thinking
- Reporting
- Interpretation

Required skills

The individual needs to demonstrate the following skills:

- Physics equipment and apparatus
- Physics formulas

- Physical quantities
- Thermodynamic processes
- Characteristics and behavior of waves
- Light properties and behavior

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and skills range.

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Applied circular motion as per laws of motion.</p> <p>1.2 Determined thermodynamic processes as per physics laboratory manual.</p> <p>1.3 Calculated thermodynamic quantities as per physics laboratory manual.</p> <p>1.4 Applied light properties as per physics laboratory manual.</p> <p>1.5 Determined distances and sizes of object and images as per geometrical optics and mirror and lens formula.</p> <p>1.6 Determined magnification power of an optical device as per physics laboratory manual.</p> <p>1.7 Applied resultant forces as per physics laboratory manual.</p> <p>1.8 Applied pressure concepts as per pressure laws</p>
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	<p>1.9 Applied electromagnetism based on Principle of electromagnetism.</p> <p>1.10 Applied electrostatic devices as per electrostatic principles.</p> <p>1.11 Applied principle of induction as per job specification.</p> <p>1.11 Applied semiconductor device as per electronic principles.</p> <p>1.12 Utilized X-rays produced as per manufacturer's manual.</p> <p>1.13 Applied radioactive radiations based on nuclear principles.</p>
2. Resource implications	<p>The following resources should be provided:</p> <p>2.1 Appropriately simulated environment where assessment can take place</p> <p>2.2 Access to relevant work environment</p> <p>2.3 Resources relevant to the proposed activities or tasks</p>
3. Methods of assessment	<p>Competency in this unit may be assessed through:</p> <p>3.1 Oral</p> <p>3.2 Written</p> <p>3.3 Third party report</p> <p>3.4 Case study</p>
4. Context of assessment	<p>4.2 Competency may be assessed individually in the actual workplace or simulated environment</p>
5. Guidance information for assessment	<p>5.2 Holistic assessment with other units relevant to the industry sector and workplace job role is recommended.</p>