Subject: Physics

Form/Grade: Form 3

Official Syllabus Topic: Light

Curriculum: Zambia Competency-Based Curriculum (CBC)

SECTION 1: Topic Overview

The purpose of Light is to develop learners' understanding of the principles of geometric optics, including reflection, refraction, total internal reflection, lenses, optical instruments, and dispersion, enabling them to analyze light behaviour and apply concepts to practical optical phenomena.

SECTION 2: Scenario-Based Learning Examples (EXACTLY FIVE)

Scenario 1:

Context: In the bright sunlight of Livingstone near Victoria Falls, Zambia, learners observe rainbows forming in the perpetual mist from the falls, noting colour sequences and how light interacts with water droplets in this iconic natural spectacle.

Learner Engagement: Groups compile observations of rainbow angles and colours over several visits or photos, create mental images of refraction and dispersion paths, evaluate conditions for formation, and address visibility improvements for tourism safety in misty areas.

Competency Developed (Analytical Thinking - Compile data, create mental images and address issues): Learners compile data, create mental images and address issues.

Scenario 2:

Context: During community eye-testing camps in rural Kasama, Northern Province, learners assist opticians using simple mirrors and charts, collaborating to position patients correctly for accurate vision checks common in Zambian health outreach programmes.

Learner Engagement: Pairs practice reflection laws with plane mirrors and torches, play with angle adjustments in group setups mimicking periscope designs, solving puzzles on image locations while building relationships through shared trials.

Competency Developed (Collaboration - Play with peers to build relationships): Learners play with peers to build relationships.

Scenario 3:

Context: In Lusaka's tailoring shops like those in Kamwala Market, learners see seamstresses using magnifying glasses to thread needles, explaining how convex lenses form enlarged images for precise work in Zambia's vibrant garment industry.

Learner Engagement: Use ray diagrams and lens formulae to communicate real image formation, express focal length calculations symbolically on charts, present findings scientifically, and seek peer feedback on lens applications in daily tasks.

Competency Developed (Communication - Use mathematical/scientific language in different situations): Learners use mathematical/scientific language in different situations.

Scenario 4:

Context: Learners in Kitwe observe shimmering heat haze above hot copper mine surfaces on the Copperbelt, comparing apparent depth of objects in water pools versus mirage effects in Zambia's mining environments.

Learner Engagement: Manipulate glass blocks and water tanks to test refraction angles, arrange incident rays by attributes, compare bending differences to differentiate normal from critical angles in total internal reflection experiments.

Competency Developed (Critical Thinking - Compare similarities or differences between objects): Learners compare similarities or differences between objects.

Scenario 5:

Context: In fishing communities along Lake Bangweulu in Samfya, learners note how spears appear bent at water surface, identifying optical waste like discarded plastic that scatters light and pollutes clear views in local wetlands.

Learner Engagement: After prism dispersion activities with sunlight, identify coloured paper waste from diagrams, dispose in school recycling points, adhering to practices that maintain clean optical observation sites for sustainable fishing.

Competency Developed (Environmental Sustainability - Adhere to best practices in environmental management): Learners adhere to best practices in environmental management.

SECTION 3: Effective Teaching Approach

Light should be taught in Form 3 through inquiry-based experiments and demonstrations in Zambian classrooms with limited ICT resources, using torches, mirrors, lenses, prisms, and water containers for ray tracing and image formation. Begin with learner-centered discussions on

natural phenomena like rainbows at Victoria Falls or mirages, encourage collaborative group work with differentiated ray diagram tasks, peer feedback, and reflections linking to Zambian optical applications in health and industry to foster CBC analytical and critical thinking.

SECTION 4: Competency-Based Assessment Ideas

1. Data compilation from refraction angle measurements, evaluating Snell's law (Analytical Thinking - Evaluate solutions).

2. Group construction of simple periscopes from mirrors, promoting teamwork (Collaboration - Solving puzzle in groups).

3. Presentation using diagrams for lens defects in local spectacles (Communication - Express oneself using different media and symbols).

4. Classification of images by lens types in practical setups (Critical Thinking - Classify objects according to their attributes).

5. Reflection on waste disposal after prism experiments (Environmental Sustainability - Dispose trash in the designated place).

SECTION 5: Extension and Real-Life Application (Zambia-Focused)

Learners can safely build simple telescopes from lenses to observe birds or stars in community parks, aiding environmental monitoring in Zambian wildlife areas. At home, use mirrors for solar

cooking designs, improving energy efficiency in rural households. Participate in school health clubs testing vision with charts, supporting eye care in provinces. Join clean-ups around water bodies to reduce light-scattering pollution, preserving clear fishing views in lakes like Kariba. Construct pinhole cameras from boxes for photography projects, capturing cultural events across Zambian communities.