APPENDIX

Physics Achievement Selection Test Pool

TIME: 1 hour 30min

1) A note of frequency 2000Hz has a velocity of 400ms^{-1}. Calculate the wave length of the note. (a) 5.0m (b) 2.0m (c) 0.5 (d) 0.2

2) The eclipse of the moon occurs when the (a) moon comes exactly between the earth and the sun (b) earth comes exactly between the moon and the sun (c) sun comes exactly between the earth and the moon (d) moon reflects all the rays from the sun onto the earth.

3) A ray from a fixed object is incident on a plane mirror at an angle of 20^0. If the mirror is rotated through 30^0, by how many degrees would they reflect ray rotate? (a) 60^0 (b) 50^0 (c) 40^0 (d) 30^0

4) Which of the following distances is usually adjustable in the camera? The distance between the (a) lens and the film (b) diaphragm and the shutter (c) shutter and the film (d) diaphragm and the film

5) A travelling microscope is focused on a mark on a table. If a block of thickness 18.0cm is placed on the mark, by how many metres will the microscope be moved upwards so as to focus once again? [Refractive index of glass = 1.5m]. (a) 27cm (b) 24 cm (c) 9cm (d) 6cm

6) Which of the following observations cannot be explained using the rectilinear propagation of light? (a) production of images by a pinhole camera (b) production of real images of objects by lenses (c) formation of an annular eclipse (d) Diffraction patterns of light

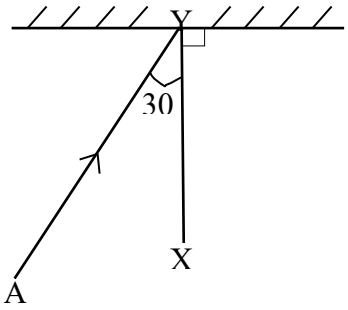
7) In the diagram below, an incident ray Ay makes an angle of 30^0 with the normal XY. If the mirror is rotated anticlockwise about Y through an angle of 200 while AY is fixed, what will the reflected ray now make with the incident ray?

(a) 70^0

(b) 80^0

(c) 100^0

(d) 120^0



8) A concave mirror can be used to produce a parallel beam of light, if a lighted bulb is placed (a) between its focus and the pole (b) at its focus (c) at its centre of curvature (d) between its focus as centre of curvature

9) When white light passes through a triangular glass prism, there is dispersion because of (a) diffraction of light (b) polarization of light (c) the difference in speed of the component of light (d) the interference of light waves in glass

10) Surface waves travelling in deep water at 15m/s are incident at a shallow water boundary. If the angle of incidence and refraction are 45^0 and 30^0 respectively, calculate the speed of the waves in shallow water. (a) $8.1ms^{-1}$ (b) $10.0ms^{-1}$ (c) $10.6ms^{-1}$ (d) $22.5ms^{-1}$

11) An incident ray is reflected normally by a plane mirror on to a screen where it forms a bright spot. The mirror and screen are parallel and 1m apart. If the mirror is rotated through 5^0, calculate the displacement of the spot. (a) 8.7cm (b) 10.0 cm (c) 15.4 cm (d) 17.6 cm

12) Convex spherical mirrors are preferred to plane as driving mirrors because (a) The image produced is upright and clearly visible (b) it provides a wider field of view (c) The image produced is erect and diminished (d) the image produced is not laterally inverted.

13) A piece of cloth appears green in sunlight. When heated in red light, it will appear (a) green (b) blue (c) red (d) black

14) Dispersion of white light by a glass occurs because (a) white light consists of a mixture of seven different colours (b) the refractive index of glass is different for each constituent colour of white light (c) the speed of each colour of light in the glass is proportional to the refractive index of glass for each colour (d) the speed of each colour of light in the glass is proportional to the angle of refraction in the prism.

15) An object is placed 20cm from a lens, if an image is formed on a screen 260cm away from the lens, calculate the magnification of the image (a) 28 (b) 26 (c) 24 (d) 13

16) The size of the hole of a pin hole camera is increased. The resultant image formed becomes (a) sharper (b) reduced in size (c) enlarged (d) blurred

17) The refractive index of a medium relative to air is 1.8. Calculate, to the nearest degree, the critical angle for the medium. (a) 68^0 (b) 56^0 (c) 34^0 (d) 18^0

18) A converging lens of focal length 15cm forms a virtual image at a point 10cm from the lens. Calculate the distance of the object from the lens. (a) 10.00cm (b) 6.00cm (c) 5.00cm (d) 1.50cm

19) In a compound microscope, the image formed by the objective lens is at a distance of 3.0cm from the eye lens. If the final image is at 28.0cmfrom the eye lens, calculate the focal length of the eye lens (a) 0.3cm (b) 2.7cm (c) 3.4cm (d) 8.3cm

20) The image which cannot be formed on a screen is said to be (a) inverted (b) erect (c) real (d) virtual

21) Which of the following conditions is necessary for the occurrence of total internal reflection of light? (a) light must travel from an optically less dense to a denser medium (b) the angle of incidence must be equal to the critical angle (c) the angle of incidence must be greater than the critical angle (d) the angle of refraction must be 90^0

22) An object is placed in the principal axis and at the centre of curvature of a concave mirror, the image of the object formed by the mirror is (a) real and magnified (b) real and inverted (c) erect and magnified (d) erect and virtual

23) A converging lens produces an image four times as large as an object placed 25cm from the lens. Calculate its focal length. (a) 100cm (b) 33cm (c) 29cm (d) 20cm

24) The horizontal floor of a water reservoir appears to be 1.0m deep when viewed vertically from above. If the refractive index of water is 1.35, calculate the real depth of the reservoir. (a) 2.35m (b) 1.35m (c) 1.00m (d) 0.35m

25) Which of the following statements about the image formed by a plane mirror is not correct? (a) It is laterally inverted (b) It has unit magnification (c) it is framed by actual intersection of rays (d) Its distance from the mirror is equal to that of the object from the mirror.

26) The image formed by a convex mirror is always (a) real, erect and diminished (b) real, inverted and diminished (c) virtual, inverted and diminished (d) virtual, erect and diminished

27) A ray undergoes a minimum deviation at 40^0 when it is incident on an equilateral triangular glass prism. Calculate the refractive index of the prism (a) 1.48 (b) 1.50 (c) 1.53 (d) 1.67

28) Total internal reflection occurs in an optical prism when light rays (a) Travel from the prism into an optically denser medium (b) are incident in the prism at an angle greater than the critical angle (c) are incident normally in the prism (d) travel from the prism to air

29) The speed of light in a certain medium is v while its speed in a vacuum is C. the absolute refractive index of the medium is (a) C + V (b) C/V (c) V/C (d) C - V

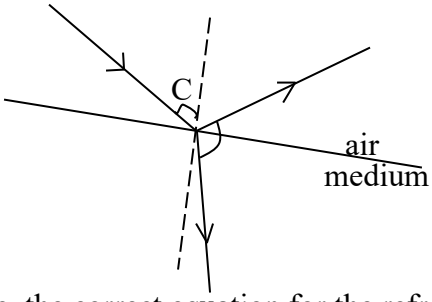
30) An object is placed 20.0cm in front of a converging lens of focal length 15.0cm. Calculate its image distance (a) 1.3cm (b) 8.6cm (c) 35.0cm (d) 60.0cm

31) Presbyopia is a defect of the eye resulting from (a) weak ciliary muscles (b) short eyeball (c) loss of sphericity of the lens (d) long eyeball

32) The focal length of the eye-piece of an astronomical telescope is f_1. While the focal length of the objective is f_2. For normal adjustment, the angular magnification is given by (a) f_0/f_1 (b) 1 - $\frac{f_2}{f_1}$ (c) $\frac{f_2}{f_1}$ – 1 (d) $\frac{f_1}{f_2}$

33) The following devices use plane mirrors in their operations, except (a) periscope (b) sextant (c) kaleidoscope (d) binoculars

34) When an object is placed at the principal focus of a concave mirror, the location of the image formed is (a) between principal focus and pole (b) between principal focus and centre of curvature (c) at infinity (d) at centre of curvature



35) From the diagram above, the correct equation for the refractive index n of the medium is (a) n = tan i (b) $n=\frac{\text{Sin } i}{\text{Sin } 90^0}$ (c) $n=\frac{\text{Sin } i}{\text{Cos } (90^0-i)}$ (d) n = Sin 90^0

36) A ray of light travels from air to water. The refractive index of water is given by the expression (a) $\frac{\text{velocity in water}}{\text{velocity in air}}$ (b) $\frac{\text{Sine of angle of refraction}}{\text{Sine of angle of incidence}}$ (c) $\frac{\text{apparent depth}}{\text{real depth}}$

(d) $\frac{\text{wavelength in air}}{\text{wavelength in water}}$

37) A lens that is thinner at the middle and thicker at the eyes is (a) diverging (b)converging (c) Plano-convex (d) converging meniscus

38) Light travelling through a small pinhole usually does not make a shadow with a distinct sharp edge because of (a) diffraction (b) interference (c) reflection (d)refraction

39) The angle of incidence of a ray of light on a plane mirror is 55^0. Determine the angle between the reflection ray and the mirror. (a) 35^0 (b) 45^0(c) 55^0 (d) 110^0

40) A concave mirror forms a magnified and erect image only when the object is placed (a) at the centre of curvature (b) at the focus (c) between the focus and the pole of the mirror (d) beyond the radius of curvature

41) A thin lens is placed 50cm from an illuminated object. The image produced has linear magnification of ¼. Calculate the power of the lens in dioptress. (a) 2.5D (b) 5.0D (c) 10.0D (d) 25.0D

42) Which of the following characteristics of light determines its colour? (a) velocity (b) wavelength (c) Amplitude (d) intensity

43) An eclipse of the sun by the moon occurs when the sun, the moon and the earth are all in straight line and the (a) earth casts a shadow on the moon (b) moon casts a shadow on the sun (c) moon is between the sun and the earth (d) sun is between the moon and the earth

44) The phenomenon which occurs when light changes direction as it passes from one medium to another is called (a) reflection (b) polarization (c) diffraction (d)refraction

45) A ray of light is incident on a plane mirror on an angle of 20^0C. This mirror is rotated through twice this angle. In this new position, the angle between the incident ray and the reflected ray is (a) 20^0 (b) 40^0 (c) 80^0 (d) 120^0

46) The image of an object is located 6cm behind a convex mirror. If its magnification is 0.6, calculate the focal length of the mirror. (a) 3.75cm (b)6.60cm (c) 10.00cm (d) 15.00cm

47) The refractive index of glass for yellow light is greater than that for red light because yellow light (a) has a greater amplitude than red light (b) is more intense than red light (c) travels more slowly than red light (d) deviates less than red light

48) Which of the following remain(s) unchanged as light travels from one medium to the other?

I speed II wavelength III frequency (a) I only (b) II only (c) III only (d) II and III only.

Which of the following optical instruments does not depend on the use of plane mirrors? (a) Kaleidoscope a(b) simple microscope (c) sextant (d) simple periscope

49) Which of the following optical instruments does not depend on the use of plane mirrors? (a) kaleidoscope (b) simple microscope (c) sextant (d) simple periscope

50) A concave mirror of radius of curvature 20cm has a pin placed 15cm from its pole. What will the magnification of the image formed? (a)4.00 (b) 2.00 (c)1.33 (d) 1.50 (e) 0.25

51) A parallel beam of light is to be obtained from the headlamp of a car. At which of the following positions should the source of light be placed from the pole of its spherical mirror? (a) at the focal point (b) at the centre of curvature (c) beyond centre of curvature (d) between the focal point and the pole (e) between the focal point and the centre of curvature

52) The image a pin formed by a diverging lens of focal length 10cm is 5cm from the lens. (a) -3.3cm (b) 3.3cm (c) 10.0cm (d) 15.0cm (e) 20.0cm

53) A real image of an object formed in a converging lens of focal length 15cm is three times the size of the object. What is the distance of the object from the lens? (a) 30cm (b) 25cm (c) 20 cm (d) 15cm (e) 10cm.

54) Which of the following is used for controlling the amount of light entering into eye? (a) cornea (b) pupil (c) iris (d) optic nerve (e)ciliary muscle.

55) The angle of deviation of light of various colours passing through a glass prism decreases in the order of (a) blue orange and red (b) red blue and orange (c) blue red and orange (d) red orange and blue (e) orange blue and red

56) The images formed by a diverging lens are always (a) diminished, virtual and inverted (b) diminished, inverted and real (c) diminished , virtual and erect (d) magnified, virtual and erect (e) magnified ,real and inverted.

57) In the normal use of a simple microscope, a person sees an (a) inverted, virtual and magnified image (b) erect ,virtual and magnified image (c) erect, real and magnified image (d) inverted, real and magnified (e) inverted and real image the same size as the object.

58) A lens of focal length 15.0cm forms an upright image four times the size of an object. Calculate the distance of the image from the lens. (a) 11.3cm (b) 18.8cm (c) 37.5cm (d) 45.0cm (e) 75.0cm.

59) An object is placed between two mirrors which are inclined at an angle of 120 and facing each other. Determine the number of images observed in the two mirrors. (a) 1 (b) 2 (c) 3 (d) 4 (e) 5.

60) In a ripple tank experiment, a vibrating plate is used to generate ripples in the water. If the distance between two successive troughs is 3.5cm and the wave travels a distance of 31.5cm 1.5s, calculate the frequency of the vibrator. (a) 3.0Hz (b) 6.0Hz (c) 12.0Hz (d) 27.0Hz (e) 73.5Hz.

61) If the critical angle of a glass-air boundary is c and refractive index of the glass is n, which of the following relationships is correct? (a) n = 90/sin c (b) n = sin c/90 (c) sin 90 sin c = n (d) sin c = 1/n (e) n = sin c/sin 45.

62) A simple magnifying glass is used to view an object. At what distance from the lens must the object be placed so that an image 5 times the size of the object is produced 20cm from the lens? (a) 2cm (b) 4cm (c) 15cm (d) 25cm (e) 100cm.

63) The inability of the to focus near objects is known as (a) long sight (b) astigmatism (c) presbyopia (d) glaucoma (e) short sight.

64) Which of the following is not self-luminous? (a) incandescent electric bulb (b) incandescent fluorescent tube (c) lighted candle (d) the moon (e) the sun.

65) An object is placed on the principal axis at the center of curvature of a concave mirror. The image of the object formed by the mirror is (a) real, inverted and magnified (b) at the principal focus (c) real and diminished (d) erect and virtual (e) at the center of curvature.

66) The refractive index of a medium relative to air is 1.8. Calculate the critical angle for the medium to the nearest degree. (a) 18 (b) 34 (c) 45 (d) 68 (e) 90

67) A converging lens of focal length 5cm forms a virtual image which is 10cm from the lens. How far from the lens is the object? (a) 2.0cm (b) 3.3cm (c) 5.0cm (d) 10.0cm (e) 15.0cm

68) When white light is incident on a glass prism the spectrum produced on a screen placed beyond the prism is due to (a) diffraction (b) reflection (c) refraction (d) polarization (e) interference

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70) Whenever light waves are restricted to a specific plane, they are said to be (a) diffracted (b) refracted (c) diffused (d) regularly reflected (e) plane-polarized.

71) The magnification produced with a converging lens is 5. If the object is a square wire gauze of side 2cm, calculate the area of the image (a) 100cm (b) 40cm (c) 20cm (d) 10cm (e) 4cm

72) Which of the following is not true of the similarities between a camera and the human eye? (a) both the camera and the eye have light-proof interior (b) both the camera and the eye have light-sensitive screens (c) inverted images are formed on the screen in both (d) the distance between the lens and the screen is fixed in both (e) the amount of light entering the both the eye and the camera can be adjusted.

73) A ray of light is incident on a plane mirror at an angle of 20. This mirror is rotated through, twice this angle. In this new position the angle between the incident ray and the reflected ray is (a) 20 (b) 40 (c) 80 (d) 120

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75) The refractive index of glass for yellow light is greater than that for red light because yellow light (a) has a greater amplitude than red light (b) is more intense than red light (c) travels more slowly than red light (d) deviates less than red light

76) The real image of an object formed by a converging lens of focal length 15cm, is three times the size of the object. Calculate the object distance (a) 60cm (b) 30cm (c) 20cm (d) 15cm

77) Which of the following statements is not correct about long sight? (a) a long-sighted person can see distant objects clearly (b) light from a nearby object is focused behind the retina (c) the eyeball is too short (d) the defect is corrected by using a diverging lens.

78) An object is placed 36cm from a converging lens of focal length 24cm. If a real image which is 4cm high is formed, calculate the height of the object. (a) 2.0cm (b) 4.0cm (c) 6.0cm (d)8.0cm (e) 10.0cm

Physics Achievement Test

Time: 1hour

Instruction: Answer all questions

1. The eclipse of the moon occurs when the (a) moon comes exactly between the earth and the sun (b) earth comes exactly between the moon and the sun (c) sun comes exactly between the earth and the moon (d) moon reflects all the rays from the sun onto the earth.

2. Which of the following observations cannot be explained using the rectilinear propagation of light? (a) production of images by a pinhole camera (b) production of real images of objects by lenses (c) formation of an annular eclipse (d) diffraction pattern of light.

3. When white light passes through a triangular glass prism, there is dispersion because of (a) diffraction of light (b) polarization of light (c) the difference in speed of the component of light (d) the interference of light waves in glass

4. Surface waves travelling in deep water at 15m/s are incident at a shallow water boundary. If the angle of incidence and refraction are 45^0 and 30^0 respectively, calculate the speed of the waves in shallow water. (a) $8.1ms^{-1}$ (b) $10.0ms^{-1}$ (c) $10.6ms^{-1}$ (d) $22.5ms^{-1}$

5. Convex spherical mirrors are preferred to plane as driving mirrors because (a) The image produced is upright and clearly visible (b) it provides a wider field of view (c) The image produced is erect and diminished (d) the image produced is not laterally inverted.

6. A piece of cloth appears green in sunlight. When heated in red light, it will appear (a) green (b) blue (c) red (d) black

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8. The size of the hole of a pin hole camera is increased. The resultant image formed becomes (a) sharper (b) reduced in size (c) enlarged (d) blurred

9. The refractive index of a medium relative to air is 1.8. Calculate, to the nearest degree, the critical angle for the medium. (a) 68^0 (b) 56^0 (c) 34^0 (d) 18^0

10. A converging lens of focal length 15cm forms a virtual image at a point 10cm from the lens. Calculate the distance of the object from the lens. (a) 10.00cm (b) 6.00cm (c) 5.00cm (d) 1.50cm

11. Which of the following conditions is necessary for the occurrence of total internal reflection of light? (a) light must travel from an optically less dense to a denser medium (b) the angle of incidence must be equal to the critical angle (c) the angle of incidence must be greater than the critical angle (d) the angle of refraction must be 90^0

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18. The speed of light in a certain medium is v while its speed in a vacuum is C. the absolute refractive index of the medium is (a) C + V (b) C/V (c) V/C (d) C - V

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36. The angle of deviation of light of various colours passing through a glass prism decreases in the order of (a) blue orange and red (b) red blue and orange (c) blue red and orange (d) red orange and blue (e) orange blue and red

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42. The refractive index of a medium relative to air is 1.8. Calculate the critical angle for the medium to the nearest degree. (a) 18 (b) 34 (c) 45 (d) 68 (e) 90

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45. At what distance from a simple microscope must an object be placed so that in image 5 times the size of the object is produced 20cm from the lens? (a) 2.0cm (b) 3.3cm (c) 4.0cm (d) 5.0cm (e)15.0cm

46. Whenever light waves are restricted to a specific plane, they are said to be (a) diffracted (b) refracted (c) diffused (d) regularly reflected (e) plane-polarized.

47. The image of an object is located 6cm behind a convex mirror. If its magnification is 0.6, calculate the focal length of the mirror (a) 3.75cm (b) 6.60cm (c) 10.00cm (d) 15.00cm

48. The refractive index of glass for yellow light is greater than that for red light because yellow light (a) has a greater amplitude than red light (b) is more intense than red light (c) travels more slowly than red light (d) deviates less than red light

49. Which of the following statements is not correct about long sight? (a) a long-sighted person can see distant objects clearly (b) light from a nearby object is focused behind the retina (c) the eyeball is too short (d) the defect is corrected by using a diverging lens.

50. The ability of the eye to focus objects at different distances is called (a) power (b)accommodation (c) normal vision (d) persistence vision (e) long sight

INTERVENTIONS FOR EXPERIMENTAL AND CONTROL GROUPS

Lesson Plans for Experimental Group

Week 1 Lesson Plan 1

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Reflection of Light wave I

Objective: By the end of the lesson, the students should be able to:

(i) List some light sources they come across in everyday life

(ii) Explain the concept of shadow and eclipse.

Instructional Material: Candles, Pipes, three cardboard papers with hole at their center**.**

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

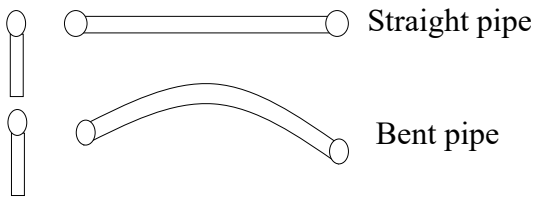
Procedure:

Engagement: What do you observe if there is a tiny hole in your house on a sunny day? What if they are more than one hole?

Exploration: (1) Teachers shares them into groups

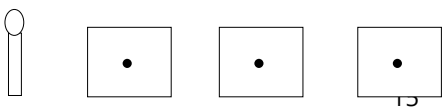
(2) The teacher provides the students with a candle, two pipes (one straight, one bent)

(3) Light up the candle and place the two papers one after the other as shown.



(4) Observe if you can view the light from the other source

Exploration: (1) Replace the pipe with three cardboard papers as shown below.



(2) Make sure they are well arranged and that the holes are uniform.

(3) Observe what happens when any of the cardboard papers are altered and its holes are not in line with the others.

Explanation: (1) Each group provides a speaker to explain their observations/findings;

(2) Each group interacts with the other group members on difficulties and successes.

(3) How many groups could not carry out the exercise and why?

(4) How many groups were able to succeed with the exercise?

(5) Teacher explains how it affects a pin hole camera.

(6) Ask students to form a note and submit the following day.

Extension:

(1) How does this lead to the formation of shadows and eclipses?

(2) Relate your observation replacing the candle cardboard and eyes with sun, moon and earth.

(3) What happens if there is a stone placed on the pipe total first and partially?

(4) Are all shadows of equal degrees?

(5) Discuss

Evaluation: (1) Students explains the rectilinear propagation of life.

(2) Students explain the concepts of eclipse and shadow

(3) Students explain the concept of rectilinear propagation of light.

Week 1 Lesson Plan 2

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Reflection of Light waves II

Objective: By the end of the lesson, the students should be able to:

(i) Determine the angle of reflection for a given angle of incidence.

(ii) Show that the path of light ray is reversible

(iii) Show the number of images formed at different position of a mirror

Instructional Material: 2 plane mirrors, tracing pins, drawing board and drawing sheet.

Reference Material:

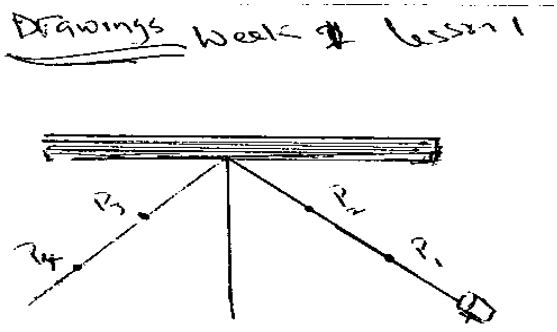
I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Engagement: Hey, let us consider what we can do with the mirror. List the uses of the mirror you know other than looking at your ugly face.

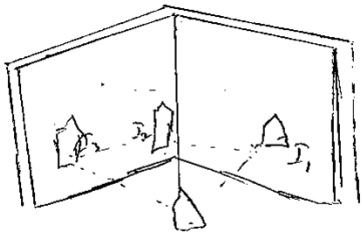
Exploration: (1) The students are to set up the activity as drawn below.



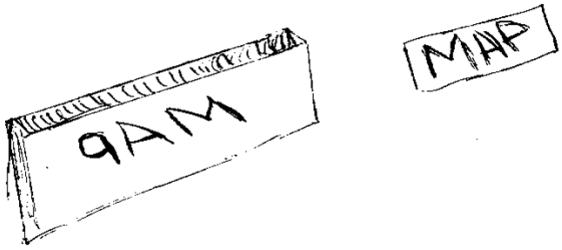
(2) Engage group takes a different value of i ranging from $10^0 – 60^{0.}$

(3) Remove the pins P_1&P_2 and place them in P_3 and P_4 and examine what happens.

(4) Place the two mirrors as shown and find out how many images you have got.



(5) Write your name on a piece of paper and place as shown below by a mirror.



(6) Students attempt to fix 2 mirrors at 45^0 opposite each other and explain their observation.

Explanation: (1) Students explain their observations in the exercises to the class

(2) Students who had no problems explain to the other groups with problems the areas of difficulties.

(3) Students were allowed to have interactions with members of other groups.

Elaboration: (1) Teacher explains the concept of reversibility of light

(2) Teacher corrects languages used by students

Evaluation: The teacher asks questions based on the lesson.

Week 2 Lesson 1

Date

Class: SS II **Age:** 15^+

Duration: 45 mins

Mental Ability: Mixed

Topic: Reflection of Light Waves III

Behavioural Objectiv: By the end of the lesson, the students should be able to:

(i) Differentiate between image formed by concave and convex mirror.

(ii) Draw ray diagram to show images formed by plane and curved mirrors.

Instructional Material: Concave mirror, convex mirror, ray box, screen.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Engagement: (1) Students are given a piece of concave and convex mirrors to examine their shapes and view their own faces.

Exploration: (1) Students are given some materials to examine and read up briefly.

(2) Students are divided into six groups

(3) Students are to work with their groups to verify the positions of images shown in the material.

(4) The students are also to verify as shown in the material at least a method of determining the focal length of curved mirrors.

Explanation: (1) Students explain their findings to the teacher.

(2) Teacher asks necessary questions to help students' understanding.

(3) Students who are successful put students who are not through.

(3) Students share their difficulty and success individually with members of other groups.

Evaluation: The teacher asks the students to:

(1) Describe the image formed by a concave mirror.

(2) Describe the image formed by a convex mirror.

Week 2 Lesson 2

Date

Class: SS II **Age:** 15^{+}

Duration: 40mins

Subject: Physics

Mental Ability: Mixed

Topic: Reflection of Light waves IV

Behavioural Objective: By the end of the lesson, the students should be able to:

(i) Solve simple equations relating to mirror formula.

(ii) Explain some practical application of curved mirrors.

Instructional Materials: A write up on sign convention, problem solved based on sign conventions

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Engagement: (1) Students are asked to list and explain ways of finding the focal length of a curved mirror.

Exploration: (1) Read the materials given to you carefully.

(2) Discuss with their group what sign conversions are.

(3) Solve the problems given with their group.

(4) Find out the practical application to:

(a) Sharing

(b) Driving

(c) Car head lamp

(5) Explain the disadvantage of concave mirror as driving mirror.

Explanation: (1) Students explain their understanding to the teacher

(2) The teacher ask necessary questions to help the students understanding

(3) The teacher gives a brief summary and clarifies areas of difficulty

Elaboration:(1) Students states their findings to the teacher;

(2) Students their difficulties and successes in solving problems based on lens formula with others;

Evaluation: The teacher asks the students to:

(1) Explain the uses of curved mirrors;

(2) Solve a simple problem based on mirror formula with two parameters given.

Week 3 Lesson I

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Refraction of Light Waves I

Performance Objective: By the end of the lesson, the students should be able to:

(i) Explain how the direction of light changes as light travels from one medicine to another.

(ii) Deduce a value of refractive index of a given material from measurements of angles of incidence and refraction.

Instructional Material:

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure

	Teacher Activities	**Students' Activities**	**Time**
Engagement:	Teacher asks students to explain their observation when they jumped into the river with respect to the expected depth of the water in a sunny day.	Students explains what they have observed with respect to the teacher's question of experiences in a beach party	3 mins
Exploration	The teacher provides the following apparatus: 6 rectangular glass blocks for six groups in the class, retort stands, search pins and corks, letters written on white papers and direct the students to observe the concept of real depth and apparent depth.	The students set up the experiment as will be directed by the teacher. They move the search pins to where they observe the image when viewed from the top	8 mins
	The teacher replaces the rectangular with a measuring cylinder with water and a pin placed inside	Students also replace in the set up the rectangular glass block with the measuring cylinder with	8 mins

		water and pin at the bottom and repeat their observation	
	Teachers rectify language used	Students explain their observations, identify real depths, apparent depth and establishes the relationship between real depth and apparent depth.	6 mins
Extension	Teacher asks students to explain the effect of diffraction by ray diagrams	Students explains the apparent depth of a swimming pool, apparent bending of a stick when partially immersed in water and bringing object to view using ray diagrams	12 mins
Evaluation	Teacher asks students to write down a report based on their observations and discussion. Also, teacher gives an equation		3 mins

Week 3 Lesson II

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Refraction of Light Waves II

Performance Objective: By the end of the lesson, the students should be able to:

(i) Explain the relationship between critical angle and total internal reflection, stating the conditions under which they occur.

(ii) Establish the relationship between critical angle and refraction index and apply it to the solution of simple problems.

Instructional Material:A write up on critical angle, a chart on critical angle

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure

	Teacher Activities	**Students' Activities**	**Time**
Engagement	The teacher asks the students to explain the concept density of materials. Which is denser?	Students offer explanations	
Exploration	Teacher divides students for group discussions. Each group having a leader who moderates their sharing with equal time interval	Students share based on (1) light travelling from circular glass (denser medium) to air (2) the angle of incidence, reflected ray and angle of refraction (3) when the angle of incidence increases and the effect on angle of refraction and reflected ray (4) Critical angle and its conditions of occurrence (5) total internal reflections and the condition.	

Explanation	Teachers call for each group leader's explanation/ listens to explanation and definition of students. Teacher corrects wrong languages, wrong definitions of concepts. Teacher unifies findings from all groups.	Each group leader explains their group resolution on the concept of their groups. Students take a common stand based on each group leaders explanation	
Extension	Teacher asks students to relate their findings to natural phenomenon like (1) mirage (2) fish view under water		
Evaluation	Students make up their notes and submit to the teacher a simple calculation on critical angle.	Students explain their understanding of mirage, fish view and relate it to critical angle.	

Week 4 Lesson I

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Refraction of Light through Triangular Prisms

Objective: By the end of the lesson, the students should be able to:

(1) Find the angle of minimum deviation from a given incident and refracted angle in a triangular glass prism..

(2) Calculate simple problems based on the angle of deviation.

(3) Explain the dispassion of white light.

Instructional Material: You are provided with a white light, a triangular glass prism, and a screen.

Reference Material:

I) New School Physics by Anyakoha, M.W.

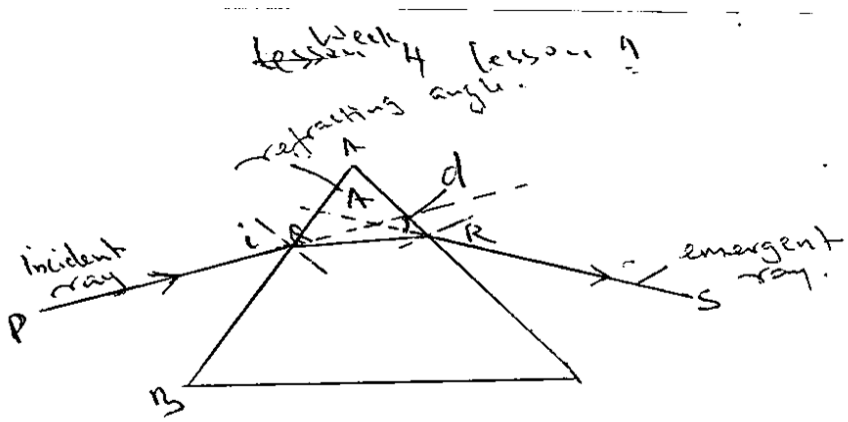
II) Senior school physics by P.N. Okeke

Procedures:

Engagement: Recall your work on rectangular glass block. You can find the lateral displacement by drawing a broken line from the normal to the point where you have the emergent ray. The distance between both is **d**

Exploration: Replacing the rectangular block with a triangular prism, we will continue our investigation or refraction.

- Consider the diagram below.



- Place two optical Pins P_1&P_2 along line PQ
- Draw an imaginary line from PQ to cut the surface AC
- Also draw the imaginary line from SR to meet the surface at AB.
- Measure D d as shown in the diagram

NB: Each group with different angle of incidence (i).

Exploration:

(1) Discuss your success and failures

(2) Discuss similarities/differences of your d.

(3) From different values of c given and different values of D gotten, explain what determines the amount of deviation.

Elaboration:

(1) From your experimentation, measure the angles A, D.

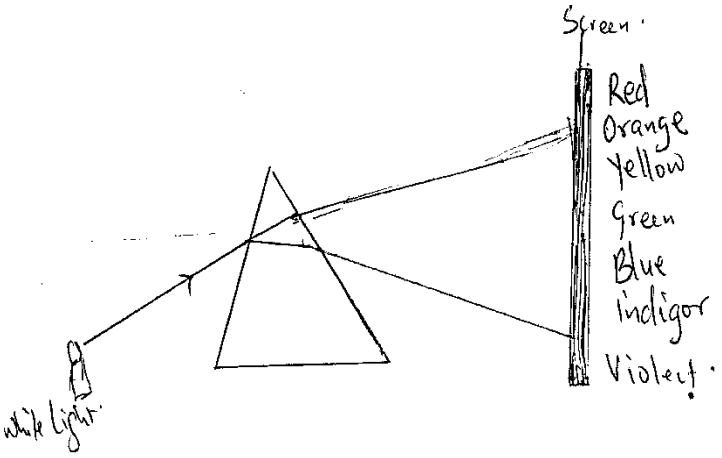
(2) Compute your answers into the following equation

$$n = \frac{\text{Sin } {}^{1}/_{2}\,(A+D)}{\text{Sin } {}^{1}/_{2}\,A}$$

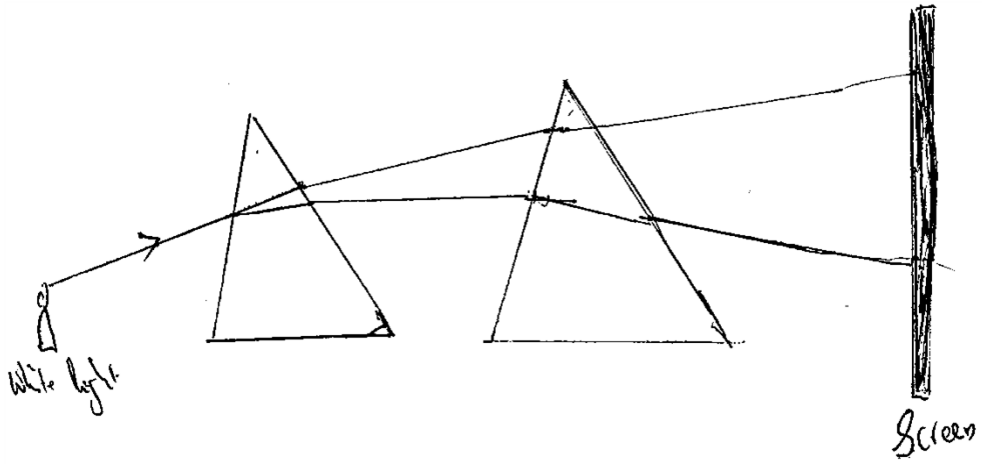
(3) Compare the value of n in this exercise to the value of n in rectangular glass.

Exploration 2:

Point the white light on the prism as shown below.

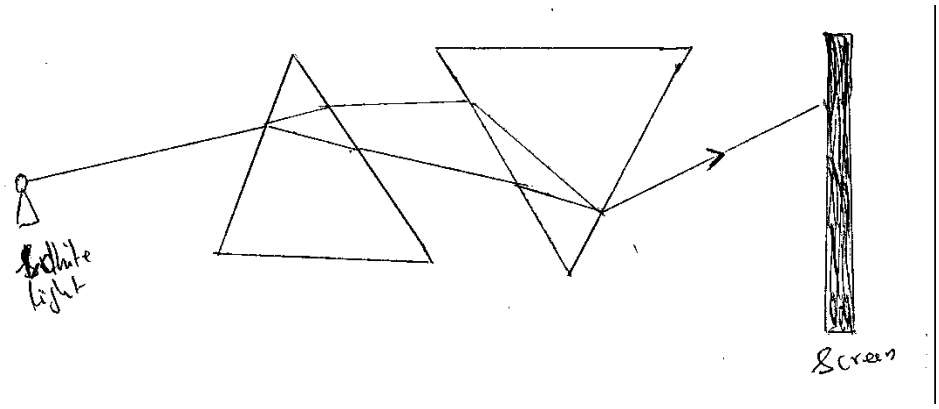


Take a second prism and place in front of first prism as shown below.



What are your observations?

Change the second prism upside down as shown below.



Explanation 2: Explain your observation in A

Explain your observation in B

Explain your observation in C

Examine other groups work and compare with your work.

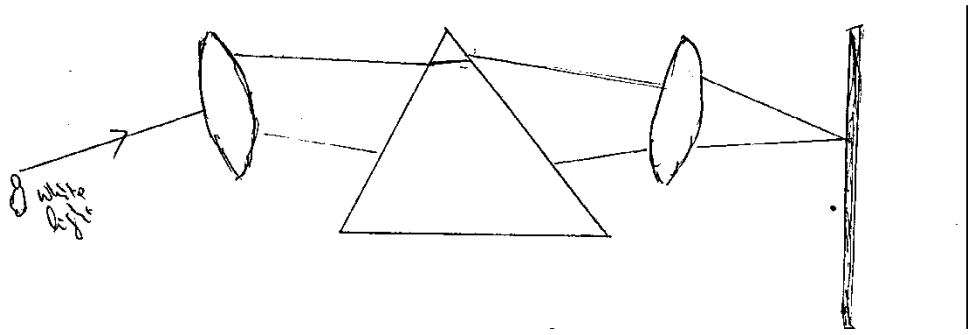
Elaboration 2: Each group should select a spokesperson to explain their observation.

Identify group that could not carry out the activity effectively

Helps should be given to any group with difficulty from any member of a successful group.

To diagram a, fix two converging lens in front and back of the prism as shown below.

What are the findings?



Evaluation:

(1) Students should write a report of the observations and submit the following day.

(2) Teachers should find out areas of difficulties from each group.

(3) Students will solve the following problems independently.

(4) Student should tell the teacher the area of difficulty.

Week 4 Lesson 2

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Colours of objects

Previous Knowledge: The teacher asks the students to

Behavioural Objective: By the end of the lesson, the students should be able to:

(1) Explain and list the types of primary colours.

(2) Explain and list the types of secondary colours.

Instructional Materials: Different colours, water and containers to mix colours.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

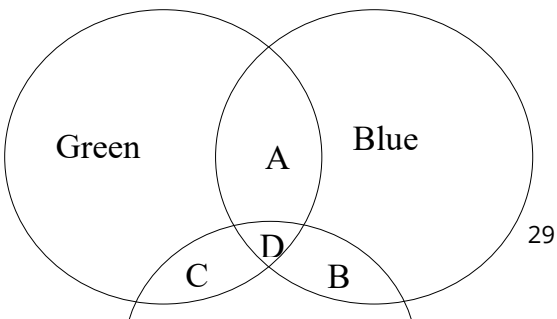
Procedure:

Engagement: Students are expected to discuss their observation when selecting wears in a boutique.

Does the colour of your clothes in the boutique when exposed to a certain light differ from when you bring the clothes out of the boutique?

How does this affect your choice of clothes?

Exploration: Provided with different colours, find out what happens when the following colours are mixed together.



A - Green + Blue =?

B - Blue + Red =?

C - Green + Red =?

Also mix the following colour with Blue and fill in your observation

Green	A	Blue
Yellow	B	
Red	C	

A = Green + Blue =?

B = Yellow + Blue =?

C = Red + Blue =?

Evaluation: The teacher asks questions based on the lesson.

Week 5 Lesson 1

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Refraction of Light through lenses

Performance Objective: By the end of the lesson, the students should be able to:

(1) Students are given material to examine the position of images on different positions of the concave lens.

(2) Derive and use lens formula to solve simple numerical problems on lenses.

Instructional Materials: Concave lens, convex lens, ray box screen.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Engagement: Students are given a piece of concave and convex lenses to examine their shapes and view object with.

Exploration:

(1) Students are given some materials to examine and read up briefly some materials.

(2) Students are divided into groups of six.

(3) Students are to work with their groups to verify the positions of images shown in the material.

(4) Students solve together 2 problems using the lens formula.

(5) Each group finds out at least two methods of finding the focal length of a lens.

Explanation:

(1) Students explain their findings to the teacher.

(2) The teacher asks questions to help students' understanding.

(3) The teacher gives a brief summary and clarification on perceived area(s) of difficulty(ies).

Exploration:

(1) Students appoint a leader to explain their findings.

(2) Students who are successful put students who are not through.

(3) Students share their difficulty and success individually with members of other groups.

Evaluation: The teacher asks the students to differentiate between the image formed in a concave and convex lens.

Week 5 Lesson 2

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Application of Light Wave 1

Behavioural Objectives: By the end of the lesson, the students should be able to:

(1) Explain the principles involved in a snapshot camera.

(2) Explain the formation of images in a camera and projector.

(3) List 3 parts of a camera and projector and explain their functions.

Instructional Materials:

(1) A diagram of camera and slide projector

(2) A writeup on camera and slide projector

(3) A camera

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Engagement: Hey! Have you seen how ugly you were when you were born? How did you come to see that ugly picture of yours? Have you been to cinema to watch those big pictures on the wall? Compare your experiences with watching TV.

Exploration:

(1) you are expected to read up at home the material provided (A)

(2) Discuss with your group what you knowabout the material generally.

(3) Discuss the function of the following as it relates to the simple lens camera with your group.

(a) Diaphragm

(b) Exposure time

(c) Developing

(d) Bellows

Exploration:

(1) Also read up part B of the material.

(2) Discuss with your group what you make of the material generally.

(3) Discuss the function of the following as it relates to the projector with your group

(a) Light source

(b) The condenser

(c) Slide carrier

(d) The projection lens

(e) The screen

Explanation:

(1) What did you understand about the working of a simple camera?

(2) What did you understand about the working of the projector?

(3) Teacher corrects languages/errors from students.

(4) A brief summary is presented by the teacher.

Extension:

(1) Compare the image formed by a simple camera and the projector.

(2) Any similarity between a simple camera and a projector

Evaluation: The teacher asks questions based on the lesson

Week 6 Lesson 1

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Eyes

Performance Objective: By the end of the lesson, the students should be able to:

Instructional Materials: A mode of the human eye, a binocular, A write up.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Engagement: Hey! Look into your neighbour's eyes and explain your observations. List and name any part of your neighbour's eyes.

Exploration: You will be given a model of the human eye. Study it and write down the different part of the eye.

With the material given to you, discuss the different parts of an eye with their functions with your colleagues.

Exploration:

Does your eye accommodate? Writings will be placed in far and new places to see whose eye does not accommodate.

Exploration:

(1) An object will be placed in front of the students.

(2) Close your right eye and observe the dimensions you can see clearly.

(3) Close your left eye and observe the dimensions you can see clearly.

(4) View the object with two eyes and check how many.

Explanation:

(1) From the material studied, discuss how the eye accommodates objects irrespective of the position.

(2) Explain in general, binocular vision based on your observation with left, right and both eyes.

Evaluation: The teacher asks the students to explain accommodation.

Week 6 Lesson 2

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Application of light waves

BehaviouralObjective: By the end of the lesson, the students should be able to:

(1) Explain the similarities and differences between the human eye and the camera.

(2) Explain the concept of major fiction in telescope.

Instructional Materials:

(1) A writeup on telescope

(2) A telescope

Entry Behaviour: The teacher asks the students to explain the concept of accommodation.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Engagement: The teacher asks the students to explain the concept of accommodation.

Exploration: (1) You will be provided with a material to study the following:

(a) Similarities of the Human Eye and the camera.

(b) Differences of the Human eye and the camera

(c) The different types of microscopes and the telescopes.

Explanation:

(1) Do you agree with the similarities and the difference listed above.

(2) Discuss the magnifying power of the telescope with respect to the formula.

$$M = \frac{\text{Focal length of object}}{\text{Focal length of eye piece}} = \frac{Fo}{Fe}$$

(3) What is the role of prism Binoculars?

(4) Discuss the magnifying power of the compound microscope with respect to the formula.

$$M = M_1 \times M_2$$

Extension:

(1) Have you seen a telescope being used?

(2) What are the uses of telescope to military persons?

Evaluation: As students to define

(1) Magnification

(2) State the similarities of the human eye and the camera.

Section 2: Lesson Plan for Control Group

Week 1 Lesson 1

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Reflection of Light wave I

Objective: By the end of the lesson, the students should be able to:

(iii) List some light sources they come across in everyday life

(iv) Explain the concept of shadow and eclipse.

Instructional Material: Candles, Pipes, three cardboard papers with hole at their center**.**

Entry Behaviour: The teacher asks the students to explain the concept of waves and its characteristics.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Step 1: the teacher explains the concept of light travelling in a straight line.

Step 2: The teacher explains the sources of light.

Step 3: The teacher explains the concepts of shadow and eclipse

Step 4: The teacher explains the different types of eclipse.

Evaluation: The teacher asks the students to list examples of artificial sources of light, and also differentiate between the eclipse of the moon and that of the sun.

Week 1 Lesson Plan 2

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Reflection of Light waves II

Objective: By the end of the lesson, the students should be able to:

(i) Determine the angle of reflection for a given angle of incidence.

(ii) Show that the path of light ray is reversible

(iii) Show the number of images formed at different position of a mirror

Instructional Material: 2 plane mirrors, tracing pins, drawing board and drawing sheet.

Entry Behaviour: The teacher asks the students to explain the formation of shadow.

Reference Material:

III) New School Physics by Anyakoha, M.W.

IV) Senior school physics by P.N. Okeke

Procedure:

Step 1: The teacher explains how the angle of reflection can be determined for a given angle of incidence.

Step 2: The teacher explains the principle of reversibility of light.

Step 3: The teacher explains the number of images formed when two mirrors are combined in right angle.

Step 4: The teacher explains the nature of image formed in a plane mirror.

Evaluation: The teacher asks students questions based on the lesson.

Week 2 Lesson 1

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Reflection of Light waves III

Previous Knowledge: The teacher asks the students to differentiate between the angle of incidence and reflection.

Behavioural Objective: By the end of the lesson, the students should be able to:

(i) Differentiate between image formed by concave and convex mirror.

(ii) Draw ray diagram to show images formed by plane and curved mirrors.

Instructional Material: Concave mirror, convex mirror, ray box, screen.

Entry Behaviour: The teacher asks the students to explain the principle of reversibility of light.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Step 1: The teacher formation of image at (1) (2) (3)

All explanation will be with a diagram.

Step 2: The teacher explains the determination of focal length of a mirror using the method

(i) Lens formula.

(ii) Parallax

Evaluation: The teacher asks the students to explain the formation of image at the focal point.

Week 2 Lesson 2

Date

Class: SS II **Age:** 15^{+}

Duration: 40mins

Subject: Physics

Mental Ability: Mixed

Topic: Reflection of Light waves IV

Previous Knowledge: The teacher asks the students to

Behavioural Objective: By the end of the lesson, the students should be able to:

(i) Solve simple equations relating to mirror formula.

(ii) Explain some practical application of curved mirrors.

Instructional Materials: A write up on sign convention, problem solved based on sign conventions.

Entry Behaviour: The teacher asks the students to list the methods of determining the focal length of a mirror.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Step 1: The teacher solves 2 problems relating to mirror formula

Step 2: The teacher explains sign convention and solve problems based on sign convention

Step 3: The teacher explains magnification and solve little problems on magnification.

Step 4: The teacher explains the practical uses of mirror in (1) shaving (2) driving (3) car head lamp.

Evaluation: The teacher asks relevant questions based on the lesson.

Week 3 Lesson I

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Refraction of light waves I

Performance Objective: By the end of the lesson, the students should be able to:

(i) Explain how the direction of light changes as light travels from one medicine to another.

(ii) Deduce a value of refractive index of a given material from measurements of angles of incidence and refraction.

Instructional Material:

Entry Behaviour: The teacher asks the students to explain the concepts of reflection of light.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Step I: Teacher explains the concept of refraction

Step II: Teacher explains the same observable phenomenon of refraction.

Step III: The teacher explains refraction through rectangular glass block.

Step IV: The teacher explains the incident ray, refraction ray, emergent ray, incident angle and refracted angle.

Step V: The teacher states and explains the laws of reflection.

Step VI: The teacher revises the lesson.

Evaluation: The teacher asks the students to define the laws of reflections

Week 3 Lesson II

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Refraction of light waves II

Performance Objective: By the end of the lesson, the students should be able to:

(i) Explain the relationship between critical angle and total internal reflection, stating the conditions under which they occur.

(ii) Establish the relationship between critical angle and refraction index and apply it to the solution of simple problems.

Instructional Material:

Entry Behaviour: The teacher asks the student to explain the concept of real and apparent depth.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedures:

Step I: The teacher explains the concept of critical angle.

Step II: The teacher explains the total internal reflection.

Step III: The teacher solves simple problems based on refractive index.

Step IV: The teacher explains the total internal reflection of nature.

Step V: The teacher revises his lessons.

Evaluation: The teachers ask the student's relevant questions based the lesson.

Week 4 Lesson I

Date

Class: SS II **Age:** 15^{+}

Duration: 45 mins

Mental Ability: Mixed

Topic: Refraction of Light through Triangular Prisms

Objective: By the end of the lesson, the students should be able to:

Instructional Material:

Entry Behaviour: The teacher asks the student to explain the concept of total internal reflection.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Step I: The teacher explains reflection of light in triangular glass block

Step II: The teacher explains how to determine the angles of incidence, refraction and minimum deviation.

Step III: The teacher solves a problem based on the angle of deviation.

Step IV: The teacher explains what happens when a white light is incidence on a triangular block and cast on a screen.

Step V: The teacher explains what happens when light is incidence on two glass prisms and cast on a screen.

Step VI: The teacher explains what happens when one of the two prisms is inverted as in step II.

Step IV: The teacher explains what happens when a triangular when a triangular glass prism is placed in between two convex lenses and light is incident on it.

Evaluation: The teacher ask necessary question on the topic.

Week 4 Lesson 2

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Colours of Objects

Previous Knowledge: The teacher asks the students to

Behavioural Objective: By the end of the lesson, the students should be able to:

Instructional Materials:

Entry behaviour: The teacher asks the students to list the colours that will be observed when white are incident on a triangular glass prism.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedures:

Step I: Teacher explains the meaning of primary colours to students.

Step II: The teacher explains the meaning of secondary colours to students.

Step III: The teachers explain the production of necessary colours when mixed.

Step IV: The teacher explains appearance of an object.

Step V: Teacher explains the concept of complementary colours.

Step VI: The teacher explains image formation of image at different positions.

Evaluation: The teacher asks questions relating to the topic.

Week 5 Lesson 1

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Refraction of Light through lenses

Performance Objective: By the end of the lesson, the students should be able to:

(1) Students are given material to examine the position of images on different positions of the concave lens.

(2) Derive and use lens formula to solve simple numerical problems on lenses.

Instructional Materials: Concave lens, convex lens, ray box, screen.

Entry behaviour: The students were asked to differentiate between primary and secondary colours.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedures:

Step I: The students explain parameters in lens formula.

Step II: Solve problems using lens formula and explain Cartesian plane.

Step III: The teacher explains how to find the focal lens of formula using

a) Quick but approximate method

b) Lens formula

c) Parallax method.

Evaluation: The teacher asks the students necessary questions based on the topic.

Week 5 Lesson 2

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Application of Light Wave 1

Behavioural Objectives: By the end of the lesson, the students should be able to:

(1) Explain the principles involved in a snapshot camera.

(2) Explain the formation of images in a camera and projector.

(3) List 3 parts of a camera and projector and explain their functions.

Instructional Materials:

Entry behaviour: The teacher asks the student ask the students to explain any know method of finding the focal length of lens.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Step I: The teacher explains the function of simple lens camera to the students.

Step II: The teacher explains the function of the different part of a camera to the students.

Step III: The teacher explains the simple projector to the students.

Step IV: The teacher explains the function of the different part of a projector to the students.

Evaluation: The teacher asks questions of the lesson

Week 6 Lesson 1

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Eyes

Performance Objective: By the end of the lesson, the students should be able to:

Instructional Materials:

Entry behaviour: The teacher asks the students to differentiate between the working of a camera and a projector.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedures:

Step I: The teacher displays a diagram of the human eye and explains the function of the different part.

Step II: The teacher explains the concept of accommodation to students

Step III: The teacher explains binocular vision to students.

Step IV: The teacher revises the lesson.

Evaluation: The teacher asks the students to list two parts of the human eye and state their function.

Week 6 Lesson 2

Date

Class: SS II **Age:** 15^{+}

Duration: 40 mins

Subject: Physics

Mental Ability: Mixed

Topic: Application

Behavioural Objective: By the end of the lesson, the students should be able to:

(1) Explain the similarities and differences between the human eye and the camera.

(2) Explain the concept of major fiction in telescope.

Instructional Materials:

Entry behaviour: The teacher asks the students to explain the concept of accommodation.

Reference Material:

I) New School Physics by Anyakoha, M.W.

II) Senior school physics by P.N. Okeke

Procedure:

Step I: The teacher explains the differences between the human eye and the camera.

Step II: The teacher explains the types of microscopes and telescope and states their functions

Step III: The teacher explains the magnifying power of a telescope and a compound microscope.

Step IV: The teacher explains the role and advantages of prism binoculars to students.

Evaluation: The teacher asks the students questions based on the lesson.