Upon successfully completing this session the student will be able to:

• State the purpose of various eye examinations in the DEC Program drug influence evaluation procedure.
• Describe the administrative procedures for the eye examinations.
• Describe the clues for each eye examination.
• Conduct the eye examinations and note the clues observed.
• Prepare complete, clear and accurate records of the eye examinations.

CONTENT SEGMENTS
A. Purpose of the Examinations
B. Procedures and Clues
C. Demonstrations
D. Document Procedures
E. Practice

LEARNING ACTIVITIES
Instructor Led Presentations
Instructor Led Demonstrations
Student Led Demonstrations
Students' Hands On Practice
Reading Assignments
A. Purposes of the Eye Examinations

• The principle purpose of all of the eye examinations is to obtain articulable facts indicating the presence or absence of specific categories of drugs.

• Certain drug categories usually cause the eyes to react in specific ways. Other drug categories usually do not cause those reactions.

• The tests of Horizontal and Vertical Gaze Nystagmus provide important indicators of the drug categories that may or may not be present.

• If HGN is observed, it is likely that the subject may have ingested alcohol or another CNS Depressant, an Inhalant, a Dissociative Anesthetic, or a combination of those.

• If Vertical Gaze Nystagmus is observed, the implication may be that the subject ingested a large dose of alcohol for that individual, a Dissociative Anesthetic, such as PCP, or high doses of other Depressants or Inhalants.
By comparing the subject’s blood alcohol concentration with the angle of onset of Horizontal Gaze Nystagmus, it may be possible to determine that alcohol is or is not the sole cause of the observed Nystagmus.

Clarification: If the angle of onset is significantly inconsistent with the BAC, the implication may be that the subject has also taken a Dissociative Anesthetic, such as PCP, an inhalant, or some CNS Depressant other than alcohol.

The consistency of the angle of onset and BAC can be compared using the following formula:

\[ \text{BAC} = 50 - \text{Angle of Onset} \]

Note: Emphasize that this is not an absolute mathematical formula.

The corresponding blood alcohol concentration would be approximately 0.15.

Keep in mind that this formula is only a statistical approximation. It is not an exact relationship for all subjects at all times.

The purpose of comparing BAC and angle of onset is to obtain a gross indication of the possible presence of another CNS Depressant, a Dissociative Anesthetic, or an Inhalant.
Eye Examinations

- The purpose of comparing BAC and angle of onset is to obtain a gross indication of the possible presence of another “DID drug”
- Lack of Convergence can also provide another clue as to possible presence of “DIDC drugs”

The check for Lack of Convergence can provide another clue as to the possible presence of Depressants, Dissociative Anesthetics, or Inhalants.

Lack of Convergence is also an indicator of the possible presence of Cannabis.

- The checks of pupil size and reaction to light provide useful indicators of the possible presence of many drug categories.

- CNS Depressants, CNS Stimulants, and Inhalants will normally cause the pupils to react slowly. There will generally be little movement with Narcotic Analgesics.

- CNS Stimulants and Hallucinogens normally will cause the pupils to dilate.

- Cannabis normally causes dilation of the pupils, although this isn’t always observed.

Some specific Inhalants may cause pupil dilation.

Narcotic Analgesics will normally cause observable constriction of the pupils.

During the eye examinations you will also check for rebound dilation.
B. Procedures and Clues

Three Clues of Horizontal Gaze Nystagmus

• Lack of smooth pursuit
• Distinct and sustained nystagmus at maximum deviation
• Angle of onset of nystagmus

Horizontal Gaze Nystagmus test consists of three separate checks, administered independently to each eye.
First Clue: Lack of Smooth Pursuit

If the subject is wearing contact lenses, note that fact on the report, but don’t have the subject remove them.

If the subject is wearing eyeglasses, have him or her remove them.

• Position the stimulus approximately 12 – 15 inches in front of the subject’s nose.
• Hold the tip of the stimulus slightly above the level of the subject’s eye. Point out that this procedure ensures that the subject’s eyes will be wide open and easy to observe.
• Instruct the subject to hold the head still and follow the stimulus with their eyes.

The first check is for “lack of smooth pursuit.”

• Move the stimulus smoothly, all the way to the subject’s left side and back all the way to the right side.
• Make at least two complete passes of the stimulus: to the left side, to the right side, back to the left side, and finally back to the right side.
• When doing this, don’t pause at the center of the subject’s face; move all the way to the left, then all the way to the right, then again all the way to the left and back all the way to the right, in a smooth, continuous motion.

• While the eye is moving, examine it for evidence of a lack of smooth pursuit.

• Use the following analogy:

  A smoothly pursing eye will move without friction, much the way that a windshield wiper glides across the windshield when it is raining steadily. An eye showing lack of smooth pursuit will move in a fashion similar to a wiper across a dry windshield.

• Also, check to be sure that both eyes are tracking in the same way: if one eye is moving smoothly but the other moves hesitantly or not at all, an illness or injury may be present.
Second Clue: Distinct and Sustained Nystagmus

The second check is for “distinct and sustained nystagmus at maximum deviation.”

- Again position the stimulus as before.
- Move the stimulus all the way to the subject’s left side and hold it there so that the subject’s eye is turned as far to the side as possible.
- Hold the eye at that position for a minimum of 4 seconds, to check carefully for jerking that may be present, and that is distinct.

When you have completed this check for the left eye, repeat the process for the right eye. Then, do it once again for the left eye, and again for the right, to verify that distinct and sustained nystagmus is or is not present.

With this cue, the examiner looks for a very distinct, unmistakable jerking.
Second Clue: Distinct and Sustained Nystagmus at Maximum Deviation (Cont.)

A slight or barely visible tremor is not sufficient to consider this clue present. A definite, sustained jerking must be seen.

Third Clue: Angle of Onset of Nystagmus

Third Clue: Angle of Onset
The final check is for the “angle of onset.”

• Position the stimulus as before.
• Slowly move the stimulus to the subject’s left side, carefully watching the eye for the first sign of jerking.

Note: Stimulus should be moved at a speed that requires approximately four seconds to travel from center to approximately 45 degrees.

• When you think that you see the eye jerk, stop moving the stimulus and hold it still.
• Verify that the eye is, in fact, jerking.
• Once you have established that you have located the point of onset, estimate the angle.
• Then, repeat the process for the right eye.
• Then, again check onset for the left eye, and again for the right.
Third Clue: Angle of Onset of Nystagmus (Cont.)

Participants’ Initial Practice of Angle Estimation

- 30 degrees
- 35 degrees
- 40 degrees

Participants will check their accuracy using a template (if available).

Vertical Gaze Nystagmus

The Vertical Gaze Nystagmus test is very simple check of the eyes.

- Position the stimulus horizontally, approximately 12 – 15 inches in front of the subject’s nose.
- Instruct the subject to hold the head still and follow the stimulus with the eyes only.
- Raise the stimulus until the subject’s eyes are elevated as far as possible.
- Watch closely for evidence of jerking.
Lack of Convergence

The test for Lack of Convergence (LOC) is also very simple. But it should be noted that this test is the least reliable of any of the eye tests due to the fact that a significant portion of the population may have an inability to cross their eyes.

- Lack of Convergence means an inability to cross the eyes.
- Prior to conducting the check for Lack of Convergence the DRE should determine if the subject to be tested routinely wears eyeglasses during reading and near visual tasks and if so, are they readily available for the test.
- If the subject wears glasses during reading and near visual tasks and they are readily available, ensure that the eyeglasses are worn for the check for Lack of Convergence.

Note: In testing for Lack of Convergence (LOC), the role of clear vision and focusing can have significant effect on the convergence of the eyes. In the clinical setting, the LOC check is routinely conducted with the eyeglasses on if normally worn by the subject during reading and near visual tasks. If the subject’s eyeglasses are not readily available, the DRE should still conduct the test.
Lack of Convergence (Cont.)

Note: Citations for clinical use of testing with subject wearing eyeglasses for LOC:
“A Recognized Clinical Trial of Treatments for Convergence Insufficiency in Children”: Scheiman, Cotter, Cooper, etc.; Arch Ophthalmol, Jan 2005.

• Position the stimulus approximately 12-15 inches in front of the subject’s face.

• Instruct the person to hold their head still and follow the stimulus with the eyes only.

• Keep the object 12-15 inches away from the person’s nose, and start to move the stimulus slowly in a circle, approximately the same size as the subject’s face.

• Once you have verified that the subject is tracking the stimulus, move it slowly and steadily toward the bridge of the nose.

• Hold the stimulus near the bridge of the nose for approximately one (1) second. The stimulus should not come any closer than approximately two (2) inches from the bridge of the nose.

• Carefully observe the subject’s eyes to determine whether both eyes converge.
**Participants’ Initial Practice of the Check for the Lack of Convergence**

**Estimating Pupil Size**

The pupils of our eyes continually adjust in size to accommodate different lighting conditions.

The pupillometer is held alongside the subject’s eye, moved up and down until the circle or semi-circle closest in size to the pupil is located.

We use a device called a pupillometer to estimate the size of the subject’s pupils.

Pupil size estimations are recorded as the numeric value that corresponds to the diameter of the circle or semi-circle that is closest in size to the subject’s pupil in each lighting condition.
This should not be confused with pupillary unrest, the continuous, irregular change in the size of the pupils that may be observed under room or steady light conditions or with pupillary light reflex, which is the pupil’s normal reaction to the changes in light.

_The Three Lighting Conditions_

Pupil sizes are estimated under three different lighting conditions:

- Room Light
- Near Total Darkness
- Direct Light
Estimation of Pupil Size under Room Light

• The pupils are examined in room light prior to darkening the room.

Participant’s Initial Practice of Pupil Size Estimation — Room Light

Estimation of Pupil Size in the Dark Room

• After you have completed the pupil size estimations in room light, you must darken the room, wait 90 seconds, and then proceed with the dark room exam

Participant’s Initial Practice of Pupil Size Estimation — Dark Room

• After you have completed the pupil size estimations in room light, you must darken the room, wait approximately 90 seconds (for the officers eyes to adjust to the light), and then proceed with the dark room exam.
Estimation of Pupil Size under Near Total Darkness

• For the check under near total darkness completely cover the tip of the penlight with your finger or thumb, so that only a reddish glow and no white light emerges.

• Bring the glowing tip up toward the subject’s left eye until you can just distinguish the pupil from the colored portion of the eye (iris).

• Continue to hold the glowing red tip in that position and bring the pupillometer up alongside the subject’s left eye and locate the circle or semi-circle that is closest in size to the pupil.

• Repeat this procedure for the subject’s right eye.
Estimation of Pupil Size under Direct Light

- Bring the penlight from the side of the subject’s face and shine it directly into their left eye.
- Position the penlight so that it illuminates and approximately fills the subject’s eye socket.
- Hold the penlight in that position for 15 seconds, and bring the pupillometer up alongside the left eye.
- Find the circle or semi-circle that is closest in size to the pupil.
- Repeat this procedure for the subject’s right eye.
Another eye sign that may be observed by the DRE is Pupillary Unrest. Pupillary Unrest is defined as the continuous, irregular change in the size of the pupils that may be observed under room or steady light conditions.

The unique indicators of Pupillary Unrest are the unevenness and fluctuations in the rate and size of the pupils under lighted conditions and its disappearance in darkness.

Pupillary Unrest may be similar to “Hippus” which is defined as a rhythmic change in the pupil size of the eyes, as they dilate and constrict when observed in darkness independent of changes in light intensity, accommodation (focusing), or other forms of sensory stimulation.

*Note: Research has shown that Hippus is primarily observed in total darkness conditions and is therefore difficult to detect under the current DRE protocol.*
Rebound Dilation

Rebound dilation is defined as a period of pupillary constriction followed by a period of pupillary dilation where the pupil steadily increases in size and does not return to its original constricted size.

Example: The pupil is estimated at 8.5mm in near total darkness. Once the penlight is shined into the pupil it constricts to 4.0 mm then steadily dilates to 6.0 mm and remains that diameter while the direct light is shined into the eye.

Rebound dilation has been reported with persons impaired by drugs that cause pupillary dilation. Cannabis is most common.

Pupil Ranges

For most people, even under very bright light the pupils will not constrict much below a diameter of 2.0 millimeters (mm) or dilate to a diameter of not more than 8.5 mm in near total dark conditions.

Consequently, the use of three distinct pupil size ranges for each of the different testing conditions may be considered more useful in the evaluation to determine impairment vs. non-impairment.
Pupil Size Technical Terms

Two key technical terms regarding pupil sizes are: Miosis – abnormally small pupil, i.e., constricted, and Mydriasis – an abnormally large pupil, i.e., dilated.

Non-Impaired Pupil Sizes

With pupil size and range:

Room light
• Approximately 4.0 mm with pupil sizes ranging from 2.5 to 5.0 mm

Near total darkness
• Approximately 6.5 mm with pupil sizes ranging from 5.0 to 8.5 mm

Direct light
• Approximately 3.0 mm with pupil sizes ranging from 2.0 to 4.5 mm

Non-Impaired Pupil Sizes

Room Light
• For a non-impaired person, the average pupil size and range for room light is approximately 4.0 mm, with pupil sizes ranging from 2.5 to 5.0 mm.

Near Total Darkness
• For a non-impaired person, the average pupil size and range for near total darkness is approximately 6.5 mm with pupil sizes ranging from 5.0 to 8.5 mm.

Direct Light
• For a non-impaired person, the average pupil size and range for direct light is approximately 3.0 mm with pupil sizes ranging from 2.0 to 4.5 mm.
Reaction to Light

Assessment of the pupil’s reaction to light takes place during the check of pupil size under direct light when the uncovered light is brought from the side of the subject’s face and the light beam is moved directly into his or her left eye.

- As you bring the beam of light directly into the subject’s eye, note how the pupil reacts.

- Under ordinary conditions, the pupil should react very quickly, and constrict noticeably when the light beam strikes the eye.

- Under the influence of certain categories of drugs, the pupil’s reaction may be slow, or there may be no visible reaction at all.

- Hold the direct light on the subject’s eye for 15 seconds to assess pupil reaction.

- Also check for Rebound Dilation during this 15 second period.

- Caution should be used by the officer so as not to move the light beam or allow the bulb to change in light intensity.

- When you have completed this process for the left eye, repeat it for the right eye.
C. Demonstrations

- Check for Lack of Smooth Pursuit
- Check for Distinct and Sustained Nystagmus at Maximum Deviation
- Check for an Onset of Nystagmus prior to 45 degrees

**Estimation of Angle of Onset**

**Demonstration of Vertical Gaze Nystagmus and Lack of Convergence**

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**Demonstration of Pupil Size and Reaction to Light Checks**

- Room Light
  - Dark Room Checks of Pupil Size
    - Near Total Darkness
    - Direct Light
    - Reaction to Light

**Demonstration of Pupil Size and Reaction to Light Checks**

- Room Light
- Dark room checks of pupil size
- Near total darkness
- Direct light
- Reaction to light
D. Documentation Procedures

A brief examination of the eyes is made during the Preliminary Examination.

- Check for equal pupil size.
- Check for resting nystagmus.
- Assessment of tracking ability.
- Initial assessment of Nystagmus angle of onset.

Notes:_______________________________________________
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### Sample Eye Examination

A brief examination of the eyes is made during the Preliminary Examination.

- Check for equal pupil size.
- Check for resting nystagmus.
- Assessment of tracking ability.
- Initial assessment of Nystagmus angle of onset.

#### Horizontal Gaze Nystagmus

<table>
<thead>
<tr>
<th>Room Light</th>
<th>Left Eye</th>
<th>Right Eye</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 - 5.0</td>
<td>Rebound Dilation: Yes</td>
<td>No</td>
</tr>
<tr>
<td>5.0 - 8.5</td>
<td>Reaction to Light:</td>
<td></td>
</tr>
<tr>
<td>2.0 - 4.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Vertical Gaze Nystagmus

Lack of Convergence

The dark room eye examinations are documented in a subsequent section of the form.

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Notes:

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**Sample Eye Examination (Cont.)**

<table>
<thead>
<tr>
<th>Pupil Size</th>
<th>Room Light</th>
<th>Near Total Darkness</th>
<th>Direct Light</th>
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</thead>
<tbody>
<tr>
<td>Left Eye</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Right Eye</td>
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</tbody>
</table>

**Notes:**

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**Preliminary Eye Exams**

- Check for equal pupil size.
- Check for resting nystagmus.
- Assessment of tracking ability.
- Initial estimation of nystagmus angle of onset.

**Eye Exams**

**Pupil Size Estimations**

- Room Light
- Near Total Darkness
- Direct Light

**Reporting out of Pupil Size Estimations**
Tabulations:

Room Light
Repeat this process for each of the other two lighting conditions.

Near Total Darkness Tabulation:

Direct Light Tabulation:

E. Practice

Preliminary Eye Exams

- Check for equal pupil size.
- Check for resting nystagmus.
- Assessment of tracking ability.
- Initial estimation of nystagmus angle of onset.

Eye Exams

- Horizontal Gaze Nystagmus.
- Vertical Gaze Nystagmus.
- Lack of Convergence.
# Pupil Size Chart

<table>
<thead>
<tr>
<th>Pupil Size</th>
<th>Room Light</th>
<th>Near Total Darkness</th>
<th>Direct Light</th>
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</thead>
<tbody>
<tr>
<td>2.0 mm</td>
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<tr>
<td>2.5 mm</td>
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<td>3.0 mm</td>
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<td>3.5 mm</td>
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<td>4.0 mm</td>
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<td>4.5 mm</td>
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<td>6.5 mm</td>
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<td>7.0 mm</td>
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<td>7.5 mm</td>
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<tr>
<td>8.0 mm and above</td>
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</table>