Modified Hackett - Mcdonald Scoring Scale

To be conducted by a veterinary ophthalmologist. Abnormal changes will be recorded according to the following scale.

Pupillary Light Reflex

Note: Using full illumination with the slit lamp, the following scale is used to score pupillary light reflex.

Score	Description
0	Normal pupillary reflex.
1	Sluggish pupillary reflex. Pupil is relatively dilated with a sluggish pupillary reflex.
2	Maximally impaired (i.e., fixed) pupillary reflex. Pupil is fully dilated with no pupillary reflex.
3	Miotic pupil.

Conjunctival Congestion (Hyperemia)

Note: The degree of pigmentation in eyes may preclude accurate scoring of this parameter.

Score	Description
0	Normal. May appear blanched to reddish pink without perilimbal injection (except at 12:00 and 6:00 positions) with vessels of the palpebral and bulbar conjunctiva easily observed.
1+	A flushed reddish color predominantly confined to the bulbar conjunctiva with some perilimbal injection. Primarily confined to the lower and upper parts of the eye from the 4:00 and 7:00 o'clock and the 11:00 and 1:00 o'clock positions.
2+	Bright red color of the bulbar and palpebral conjunctiva with accompanying perilimbal injection covering at least 75% of the circumference of the perilimbal region.
3+	Dark, beefy red color with congestion of the bulbar and the palpebral conjunctiva along with pronounced perilimbal injection. Petechia may be present on the conjunctiva. The petechiae generally predominate along the nictitating membrane and the upper palpebral conjunctiva.

Conjunctival Swelling (Chemosis)

Score	Description
0	Normal or no swelling of the conjunctival tissue.
1+	Swelling above normal without eversion of the lids (can be easily ascertained by noting that the upper and lower eyelids are positioned as in the normal eye); swelling generally starts in the lower cul-de-sac near the inner canthus, which requires slit lamp examination.
2+	Swelling with misalignment of the normal approximation of the lower and upper eyelids; primarily confined to the upper eyelid so that in the initial stages the misapproximation of the eyelids begins by partial eversion of the upper eyelid. In this stage, swelling is confined

	generally to the upper eyelid, although it exists in the lower cul-de-sac (observed best with the slit lamp).
3+	Swelling definite with partial eversion of the upper and lower eyelids essentially equivalent. This can be easily ascertained by looking at the animal head-on and noticing the positioning of the eyelids; if the eye margins do not meet, eversion has occurred.
4+	Eversion of the upper eyelid is pronounced with less pronounced eversion of the lower eyelid. It is difficult to retract the lids and observe the perilimbal region.

Conjunctival Discharge

Note: Discharge is defined as a whitish-gray, serous, purulent, mucoid, and/or bloody material. Normal discharge may include a small amount of clear or mucoid material found in the medial canthus of a substantial number of animal eyes.

Score	Description
0	No discharge (except as noted above).
1+	Discharge is above normal and present on the surface of the eye or in the medial canthus, but not on the lids or hairs of the eyelids.
2+	Discharge is abundant, easily observed, and has collected on the lids and around the hairs of the eyelids.
3+	Discharge has been flowing over the eyelids so as to wet the hairs substantially on the skin around the eyes.

Cornea

Scores for Corneal Opacity generally require two numbers; the first number indicating the severity of corneal opacity and the second number indicating the estimated area of the involvement. The severity of corneal opacity is graded as follows.

Score	Description
0	Normal cornea. Appears with the slit lamp as having a bright grey line on the epithelial surface and a bright grey line on the endothelial surface with a marble-like grey appearance of the stroma.
1+	Some loss of transparency. Only the epithelium and/or the anterior half of the stroma is involved as observed with an optical section of the slit lamp. With diffuse illumination, the underlying structures are clearly visible, although some cloudiness may be readily apparent.
2+	Some loss of transparency. The cloudiness extends past the anterior half of the stroma. The affected stroma has lost its marble-like appearance and is homogeneously white. With diffuse illumination, underlying structures are visible, although there may be some loss of

	detail.
3+	Involvement of the entire thickness of the stroma. With optical section, the endothelial surface is still visible. However, with diffuse illumination, the underlying structures are just barely visible (to the extent that the observer is still able to grade flare, iris vessel congestion, observe for pupillary response, and note lenticular changes).
4+	Involvement of the entire thickness of the stroma. With optical section, the endothelium is not clearly visualized. With diffuse illumination, the underlying structures cannot be seen so that the evaluation of aqueous flare, iris vessel congestion, pupillary response, and lenticular changes is not possible.

% Area of Corneal Opacity

Score	Description
0	Normal cornea with no area of cloudiness.
1	1 to 25% area of stromal cloudiness.
2	26 to 50% area of stromal cloudiness.
3	51 to 75% area of stromal cloudiness.
4	76 to 100% area of stromal cloudiness.

Corneal Vascularization

Score	Description
0	No corneal vascularization (pannus).
1	Vascularization is present but vessels have not invaded the entire corneal circumference. Where localized vessel invasion has occurred, they have not penetrated beyond 2 mm.
2	Vessel invasion is greater than 2 mm in one or more areas, or involves the entire corneal circumference.

Aqueous Flare

Note: The intensity of the Tyndall phenomenon (aqueous flare) is scored by comparing the normal Tyndall effect observed when the slit lamp beam passes through the lens with that seen in the anterior chamber. The presence of aqueous flare is presumptive evidence of breakdown of the blood-aqueous barrier.

Score	Description
0	No protein is visible in the anterior chamber when viewed by an experienced observer using slit lamp biomicroscopy; a small, bright, focal slit beam of white light; and high magnification.
Trace	Trace amount of protein is detectable in the anterior chamber. This protein is only visible with careful scrutiny by an experienced observer using slit lamp biomicroscopy; a small, bright, focal slit beam of white light; and high magnification.
1+	Mild amount of protein is detectable in the anterior chamber. The presence of protein in the anterior chamber is immediately apparent to an experienced observer using slit lamp biomicroscopy and high magnification, but such protein is detected only with careful observation with the naked eye and a small, bright, focal slit beam of white light.
2+	Moderate amount of protein is detectable in the anterior chamber. These grades are similar to 1+ but the opacity would be readily visible to the naked eye of an observer using any source of a focused beam of white light. This is a continuum of moderate opacification with 2+ being less apparent than 3+.
3+	Moderate amount of protein is detectable in the anterior chamber. These grades are similar to 1+ but the opacity would be readily visible to the naked eye of an observer using any source of a focused beam of white light. This is a continuum of moderate opacification with 3+ being more apparent than 2+.
4+	Large (severe) amount of protein is detectable in the anterior chamber. Similar to 3+ but the density of the protein approaches that of the lens. Additionally, frank fibrin deposition is frequently seen in acute circumstances. It needs to be noted that because fibrin may persist for a period of time after partial or complete restoration of the blood-aqueous barrier, it is possible to have resorbing fibrin present with lower numeric assignations for flare (e.g., 1+ flare with fibrin).

Aqueous Cell

Note: The aqueous or vitreous cell scoring is recorded as two determinations: The first to determine the number of cells visible, the second to describe the coloration of the cells observed (as applicable). The same scoring system used will be used when scoring both aqueous and vitreous cells.

Score	Description
0	No cells are seen in a single field of the focused slit lamp beam. No cells are visualized as the slit lamp beam is swept across the anterior chamber.
Trace	Rare (1-5) cells are seen in a single field of the focused slit lamp beam. When the instrument is held stationary, not every optical section contains circulating cells.
1+	6-25 cells are seen in a single field of the focused slit lamp beam. When the instrument is held stationary, each optical section of the anterior chamber contains circulating cells.

2+	26-50 cells are seen in a single field of the focused slit lamp beam. When the instrument is held stationary, each optical section of the anterior chamber contains circulating cells.
3+	51-100 cells are seen in a single field of the focused slit lamp beam. When the instrument is held stationary, each optical section of the anterior chamber contains circulating cells. Keratic precipitates or cellular deposits on the anterior lens capsule may be present.
4+	Greater than 100 cells are seen in a single field of the focused slit lamp beam. When the instrument is held stationary, each optical section of the anterior chamber contains circulating cells. Keratic precipitates or cellular deposits on the anterior lens capsule may be present. As for fibrin deposition, hypopyon or clumps of cells may persist for some period of time after the active exudation of cells into the anterior chamber has diminished or ceased entirely. Thus, it is possible to have resorbing hypopyon present with lower numeric assignations for cell (e.g., 1+ cell with hypopyon).

Aqueous or Vitreous Cell Color

Aqueous or vitreous cell may be observed as white or brown, and will be recorded as one of three categories as follows. Predominantly brown (≥75% brown), predominantly white (≥75% white), or mixed (other ratios of brown and white). Cell color types will not be counted. Rather the ophthalmologist will subjectively categorize the observation.

Iris Congestion (Hyperemia)

Note: In the following definitions the primary, secondary, and tertiary vessels are utilized as an aid to determining a subjective ocular score for iris congestion. The assumption is made that the greater the hyperemia of the vessels and the more the secondary and tertiary vessels are involved, the greater the intensity of iris involvement. Also, the degree of pigmentation in eyes may preclude accurate scoring of this parameter.

Score	Description
0	Normal iris without any hyperemia of the iris vessels. Occasionally around the 12:00 to 1:00 position near the pupillary border and the 6:00 and 7:00 position near the pupillary border there is a small area, about 1 to 3 mm in diameter, in which the secondary and tertiary vessels are slightly hyperemic.
1+	Minimal injection of secondary vessels but not tertiary. Generally, it is uniform, but may be of greater intensity at the 12:00 or 6:00 position. If it is confined to the 12:00 or 6:00 position, the tertiary vessels must be substantially hyperemic.
2+	Minimal injection of the tertiary vessels and minimal to moderate injection of the secondary vessels.
3+	Moderate injection of the secondary and tertiary vessels with a slight swelling of the iris stroma (this gives the iris surface a slightly rugose appearance, which is usually most prominent near the 3:00 and 9:00 positions).

4+	Marked injection of the secondary and tertiary vessels with marked swelling of the iris stroma. The iris appears rugose; may be accompanied by hemorrhage (hyphema) in the anterior chamber.

Fluorescein Staining

Note: Fluorescein staining is an indication of corneal epithelial damage and will be done at the discretion of the ophthalmologist. Scores for fluorescein staining are recorded as two scores: the first number indicating the intensity of the staining and the second indicating the estimated area of the involvement.

Score	Description
0	Absence of fluorescein staining.
1+	Slight multifocal punctate fluorescein staining. With diffuse illumination the underlying structures are easily visible. (The outline of the pupillary margin is as if there were no fluorescein staining.)
2+	Moderate fluorescein staining confined to a small focus. With diffuse illumination, the underlying structures are clearly visible, although there is some loss of detail.
3+	Marked fluorescein staining. Staining may involve a larger portion of the cornea. With diffuse illumination underlying structures are barely visible but are not completely obliterated.
4+	Extreme fluorescein staining. With diffuse illumination the underlying structures cannot be observed.

% Area of Fluorescein Staining

Score	Description
0	No area of fluorescein staining.
1	1 to 25% area of fluorescein staining.
2	26 to 50% area of fluorescein staining.
3	51 to 75% area of fluorescein staining.
4	76 to 100% area of fluorescein staining.

Note: The entire area of the cornea that contains stain is scored, regardless of the varying intensities that may be present.

Note: Kikkawa (1972) - reported that 10 to 20% of rabbits examined exhibited focal, punctate fluorescein staining normally. There may be involvement of the whole cornea, or the foci may be limited to one area.

Kikkawa Y (1972) Normal corneal staining with fluorescein. Exp Eye Res 14**:** 13-20.

Lens

The crystalline lens is readily observed with the aid of the slit lamp biomicroscope, and the location of lenticular opacity can readily be discerned by direct and retro-illumination. The location of lenticular opacities can be arbitrarily divided into the following lenticular regions beginning with the anterior capsule:

Anterior capsule
Anterior subcapsular
Anterior cortical
Equatorial cortical
Nuclear
Posterior cortical
Posterior subcapsular
Posterior capsule

The lens should be evaluated routinely during ocular evaluations and graded as 0 (normal) or 1 (abnormal). The presence of lenticular opacities should be described and the location noted as defined below.

Incomplete: A diffuse lens opacity visible upon gross inspection of the eye with an indirect ophthalmoscope or other focal light source and retroillumination. The view of the fundus is significantly impaired but a red-reflex can still be obtained. Upon slit lamp biomicroscopy the opacity involves multiple regions of the lens.

Complete: A diffuse lens opacity visible upon gross inspection of the eye with an indirect ophthalmoscope or other focal light source. The fundus cannot be seen and a red-reflex cannot be elicited. Upon slit lamp biomicroscopy the entire lens is opaque.

Resorbing: A diffuse lens opacity visible upon gross inspection of the eye with an indirect ophthalmoscope or other focal light source. The fundus may or may not be visible and a red-reflex may or may not be elicited. The lens capsule may be wrinkled and the lens itself is dehydrated and flattened or liquid and soft in appearance. Upon slit lamp biomicroscopy the entire lens is involved in the opacity.

Punctate: A focal or multifocal, discrete, dot-like lens opacity that is visible only to a trained observer with a SL-14 slit lamp biomicroscope at high magnification.

Incipient: A focal lens opacity that is visible upon gross inspection of the eye with an indirect ophthalmoscope or other focal light source and retroillumination. The view of the fundus is minimally impaired by the opacity. Upon slit lamp biomicroscopy the opacity can be localized to a specific region of the lens and other regions of the lens appear normal.

Vitreous Cell

Vitreous cell scores are assigned by using the same estimate of cells per field (0, 1-5, 6-25, 26-50, 51-100, and greater than 100) and cell color in the vitreous as for aqueous cell scores.

Retina/Fundus

Abnormal findings or an indication of normal will be recorded as observed.