Practical 3 Reflexes

- Henneman size principle: smaller nerves recruited before big nerves
- Reverse recruitment: artificial stimulation activate large diameter fibres first due to larger surface area

Practical 5 vision

- Accoodation: change in optical power (level of refraction of light in the lens), to focus on objects with different distances.
    - Further objects where the light is parallel does not require increase in optical power
    - Closer objects need an increase in refraction, contraction of ciliary muscle relaxes the , thickens the lens, allow focusing of closer objects.
- 70% of the accomodating power (refraction) is from the cornea (via air-cornea interface, changes in the refractive index) while 30% of adjustable accomodating power comes from the lens
    - Lens power calculated by Lens power (dioptre) = 1/focal length (distance of light ray convergence from the lens)
    - Accomodation power of the eye is calculated via D = 1/near point (m) - 1/ far point (m)
    - Spherical aberration: focal point of light through different parts of the lens do not converge on the same point
    - Chromatic aberration: different wavelengths of light through the lens have different focal lengths

Far sightedness (hyperopia) : Unable to see closer images

- The lens can not produce enough accomodating power, focal length is too long behind the retina, a convex lens is required.

Near sightedness (myopia) : Unable to see further images

- The lens can not become completely flat, (decrease in tension of zonular fibres), accomodating power does not decrease when ciliary muscle relaxes, focal point is in front of the retina, a concave lens is required.
- Conversely, may due to eyeballs being too long.

Presbyopia: As aging occurs, there will be an increase in the hardness of the lens, less accomofating power due to reduced ability to change shape. And reduced efficacy of ciliary muscles.

Visual acuity test: Snellen chart: row numbering (e.g. 6/5) indicates 6m viewing distance / distance for normal people to see. (I.e. 6/5 indicates the person standing at 6m is able to read the row where normal people would have to stand at 5m)

Astigmatism: unequal optical power in two axies of the cornea.

Binocular vision / singleness vision:

- when focusing on the near point, far image project on the nasal side of the fovea
- When focusing on the far point, the near image project on the temporal side of the fovea
- Different projection of light onto the fovea - perceived as in different visual fields
    - E.g. focus on near object, far object project on the nasal retina, when closing left eye, far object will project to the left retinal space, to the left visual cortex, appear as on the right visual field of the near object.

Colour blindness:

- Colour vision is achieved by comparing different activation levels of cone types
    - Protanopia: lacking L-cones, can’t preceive red
    - Deutanopia: lacking M-cones, can’t distinguish red/green
    - Tritanopia: lacking S-cones, can’t preceive blue

Neuroanatomy + histology practical

- Different thickness and ratio of white matter:grey matter
  - Cervical: Swelling due to brachial plexus, facec and hands. White matter also comes from lower segments.
  - Thoracic: less innervation, less processing needed, less grey matter
  - Lumbar: higher proportion of grey matter, due to increased processing required from the lower limbs
  - Sacral: grey matter responsible for processing of posterior side of the limbs.
- Cerebellar peduncles:
  - Superior cerebellar peduncles connect to the midbrain
  - Intermediate cerebellar peduncles connect to the pons
  - Inferior cerebellar peduncles connect to the medulla

Hearing practical

- Interaural time difference (ITD):
  - Interaural time difference threshold is the amount of time difference that need to change to allow detection of L/R from random guessing. (ITD at 75% - ITD at 50%)
  - Spatial threshold: increase in angle of sound source from 0° to 90° will increase ITD. Threshold angle is 75% angle - 50% angle.
  - Maximum ITD when sound source is at 90°, calculated by πr. Bigger head will lead to larger ITD, smaller animals and children are worse at detecting sounds.
  - ITD are preferentially used to detect low freqeuncy sounds, as phase locking can be used to detect time difference
- Interaural level difference (ILD)
  - ILD are preferentially used to detect high frequency sounds, shorter wavelength leads to more deflection by the head, greater level differences.
  - Low frequency sounds have longer wavelength, easier to diffract around the head
- Spectral notch: the unique construct of the auricular process deflect sounds and cancel certain frequencies, alters the sound spectrum, lead to lower sound energy at a specific frequency, allow locate the source of the sound

Cockroach experiment:

- Biphasic action potential:
  - At resting membrane potential, extracellular space is more positive than the inside (higher Na+ concentration)
  - During depolarisation, if Na+ influx depolarisation happen at the RECORDING electrode first, recording electrode position will become more negative than the reference electrode, showing a negative deflection.
  - As action potential travels, depolarisation occurs at REFERENCE electrode, while recording electrode segment undergoes hyperpolarisation, a positive deflection will be shown.
  - Opposite direction will lead to opposite recordings.
- Difference in amplitude of recording:
  - Electrode distance from the axon, further - smaller amplitude
  - Size of the axon, larger axon - higher amplitude
  - Number of activated axons - one axon lead to uniform peaks, simultaneous activation lead to multiple peaks
  - Angle of deflection
- Time difference between two recording peaks:
  - Resistance in the axon, higher resistance - slower conduction velocity, greater time difference

        - Size of the axon determines resistance: larger diameter - lower velocity.
    - Distance of electrode from the axon - further the distance, greater the time difference
    - Sensory adaptation rovides dynamic information about the rate of deflection