A. Eye Development

1. VERTEBRATE EYE FORMATION

- In vertebrates, the eyes form from the CNS as outpockets of the neural tube, while in flies, the eyes form from imaginal discs derived from epidermal cells.

Give a brief description of how the eye forms in vertebrate species.

The development of vertebrate and squid eyes is an example of what type of evolution?
2. EYELESS/PAX6- MASTER GENE OR NOT?
   Eyeless (flies) and Pax6 (vertebrates)= TF that was originally thought to be a master gene that controls eye development

What characteristics support the claim that Eyeless/Pax6 is an eye master gene?

What characteristics contradict the claim that Eyeless/Pax6 is an eye master gene?

B. Neuronal Differentiation, Cell Movement & Migration

1. NEURONAL DIFFERENTIATION-NEURAL CREST CELLS
   Neural crest cells are migrating cells with the potential to develop into different cell types (ex. Pigment cells, neurons, bones in the face etc.)
   - Anterior cells \( \rightarrow \) Cholinergic ganglia (parasympathetic)
   - Posterior cells \( \rightarrow \) Adrenergic ganglia (sympathetic)

   Experiment:

2. CELL MIGRATION
   Neural crests cells were plated on a Petri dish covered with gold particles and allowed to divide \( \rightarrow \) had symmetrical branching
   - Cell has intrinsic characteristics (ex. Initial direction of migration)
   - A few critical choice points in navigation
   - Many of those choice points have redundant cues

   What are some examples of redundant cues involved in cell migration?
3. PROCESS EXTENSION

How does the growth cone able to detect and move towards guidance cues?

C. CNS Pathfinding in Vertebrates and Invertebrates

Cell Migration= whole cell body moves
Axon Pathfinding= cell body stays fixed while the axon travels and synapses with a target

1. PIONEER AXONS IN THE GRASSHOPPER LIMB BUD
What is a pioneer axon?

Experiment:
2. MIDLINE AXON GUIDANCE

Describe the function of the following proteins
• Netrin (Unc6)=
  • Unc40=
  • Unc5=
  • Slit=
  • Robo1/Robo2/Robo3=
  • Comm=
Describe what would happen in the following mutants.

• Netrin (Unc6)- =

• Unc40- =

• Unc5- =

• Slit- =

• Robo1- =

• Robo1-/Robo2-/Robo3- triple mutant=

• Comm- =

• Slit-/Comm- double mutant=

• Overexpression of Comm=