Nervous and Endocrine Systems→
Communication and coordination

Nervous and endocrine systems

- Both help maintain Homeostasis
- Both use Chemical Messengers

Differences between nervous and endocrine systems

	Nervous System	Endocrine System
Chemical messengers	Neurotransmitters	Hormones
Message travels	Along nerve cells	In bloodstream
Speed and duration	Rapid short lived	Slower longer lasting

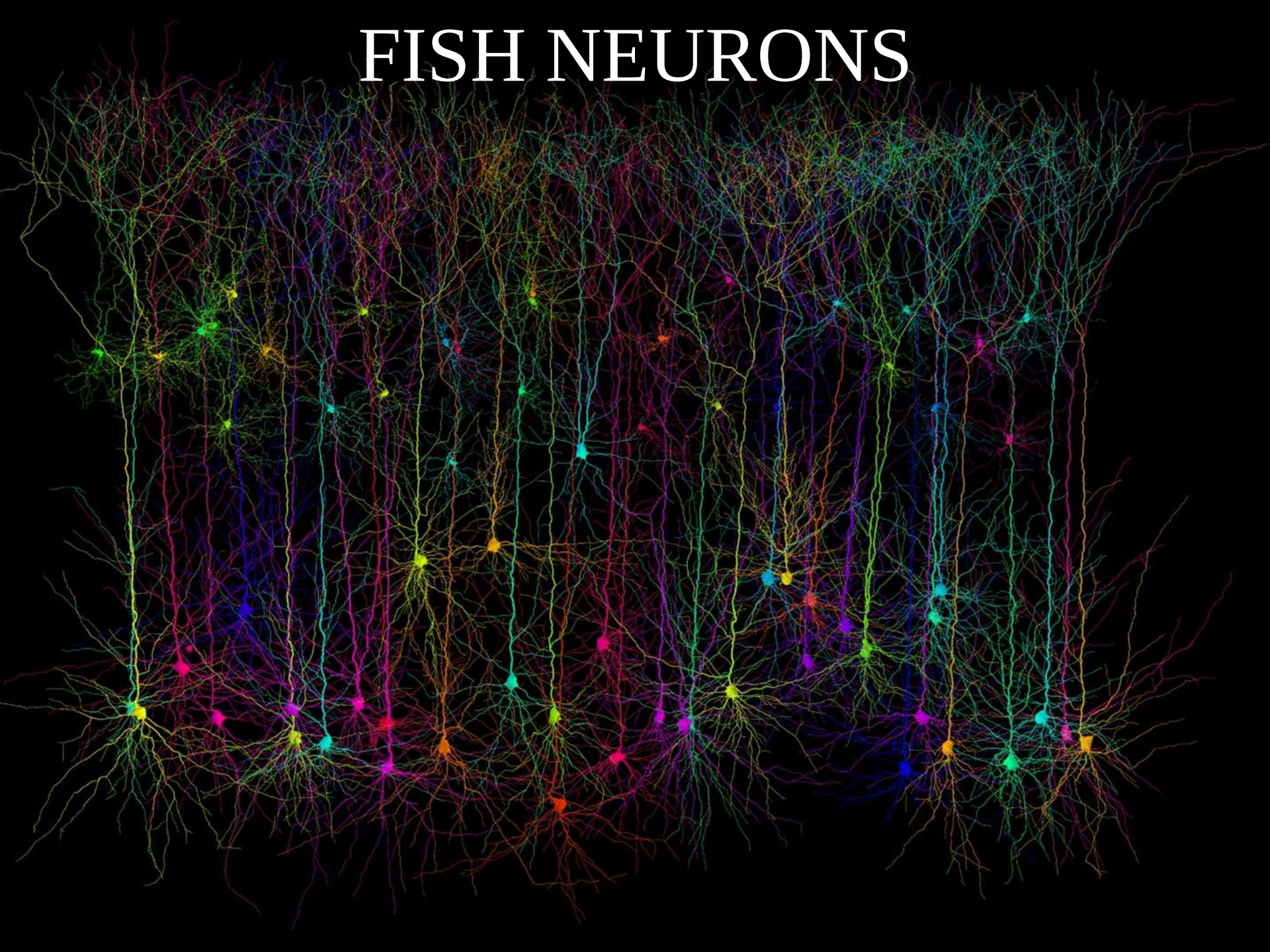
After looking at the following images and video clip you will:

1. Make a **CLAIM** about how nerve cells function
2. Provide **EVIDENCE** in the form of a drawing of a nerve cell
3. Provide **REASONING** for how a nerve cell works, supported by evidence you have gathered

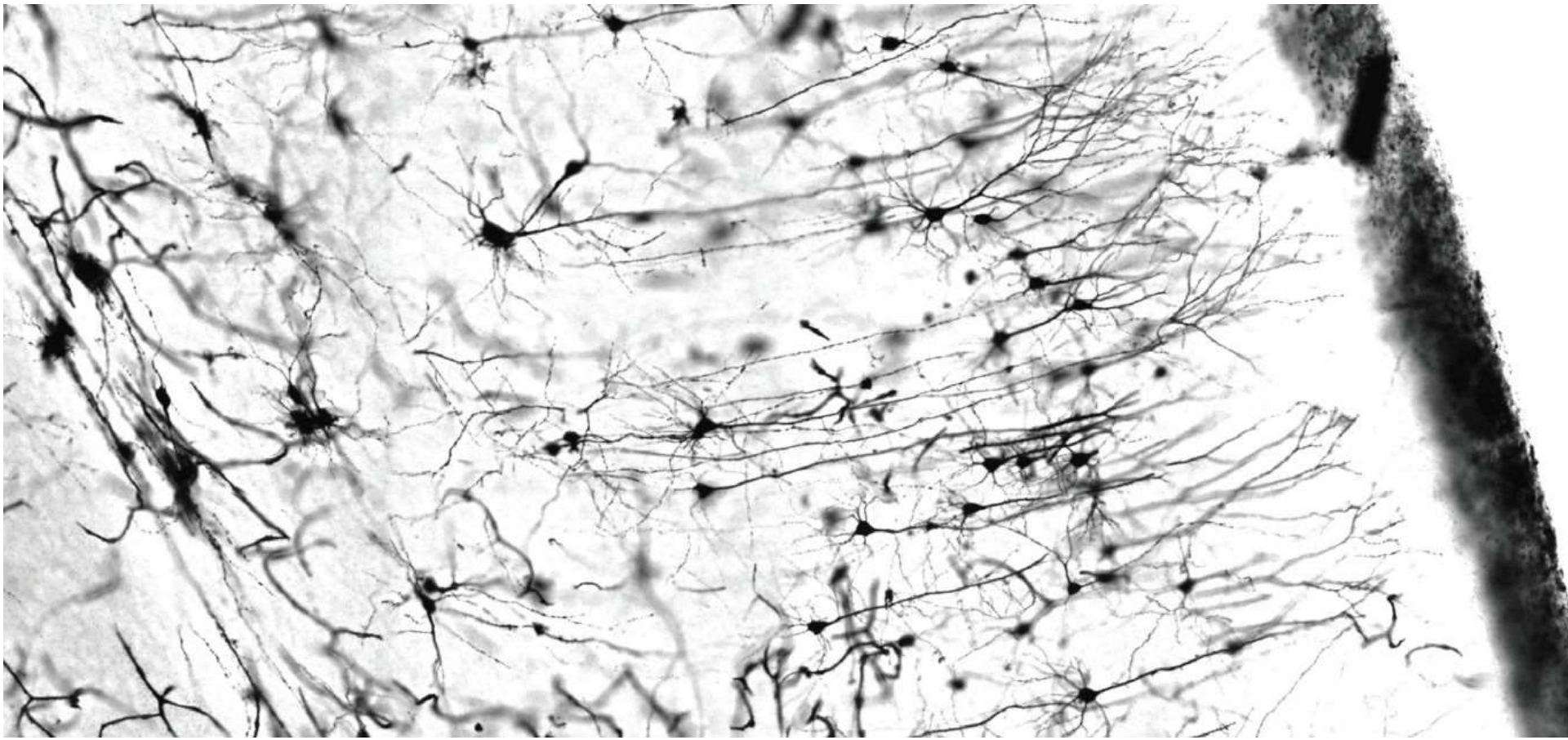
Make a claim about nerve cells

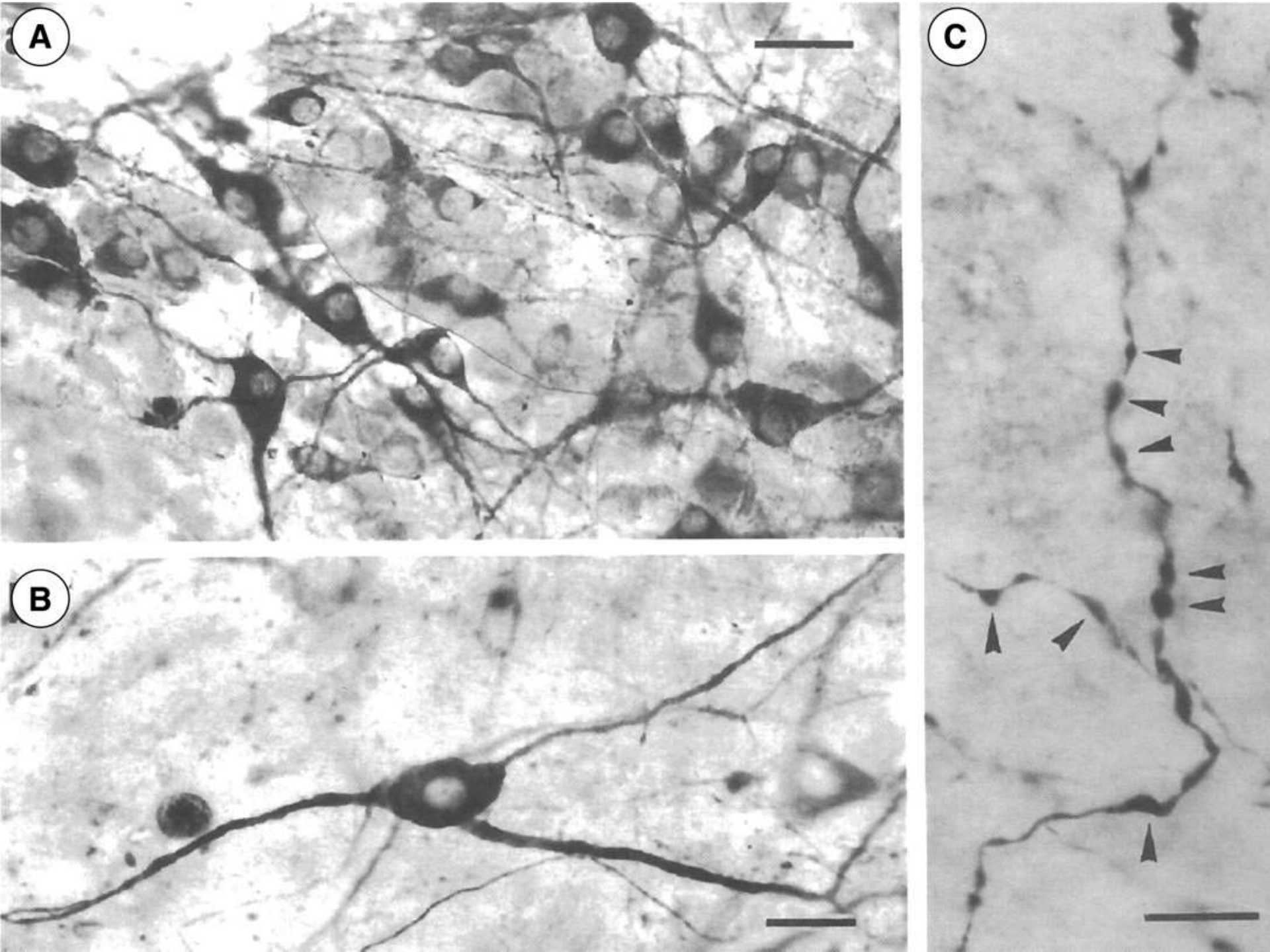
Evidence = draw a picture of a nerve cell and describe how it works based on the video

FISH NEURONS



Brain section from a 23 day old rat displays the organization and structure of neurons in the perirhinal cortex. Photos courtesy of Thomas Brown.




A
B
C

Science rule: Nerve messages only travel in one direction

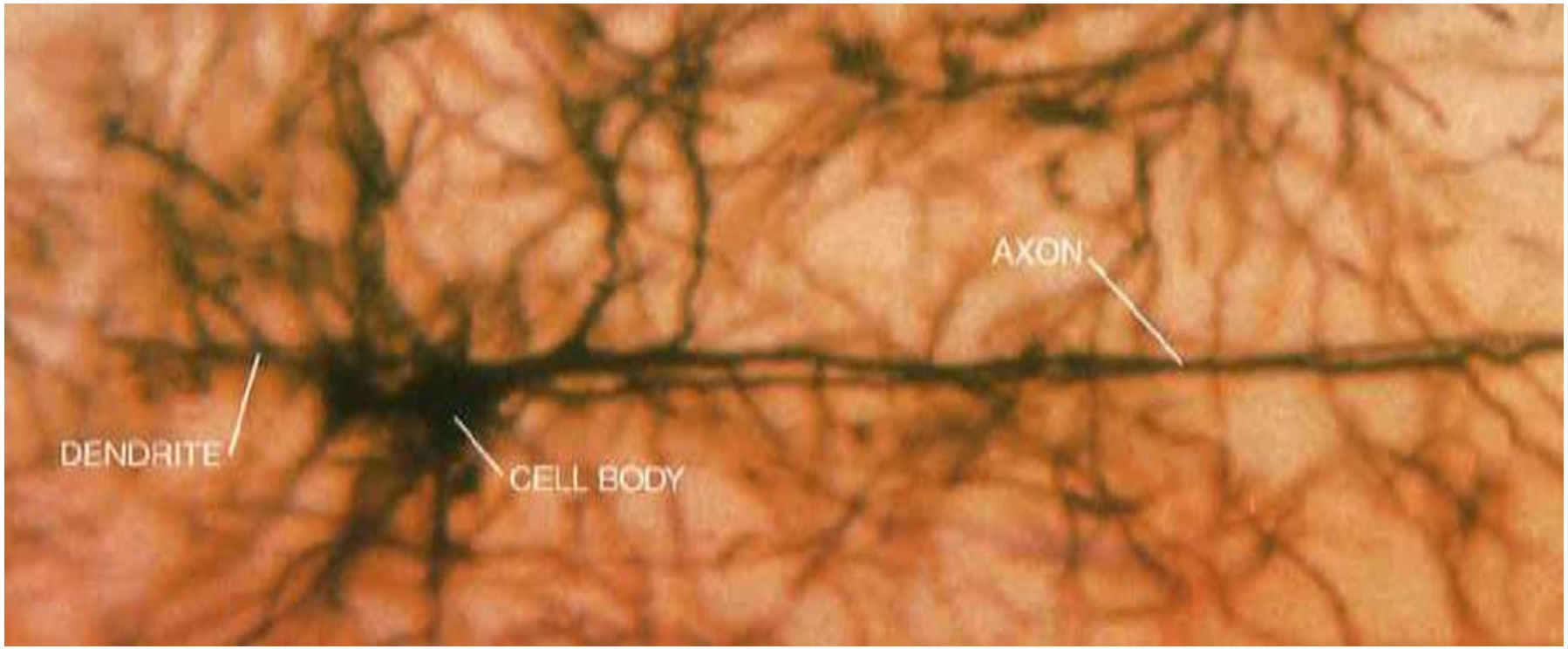
- Stimulus = <u>any change in the environment</u>

TASK:

- **Give an example of a stimulus and describe (**using pictures and or words**) how the body will receive and respond to that stimulus.**
- Feel free to use the model drawing of a human body to help explain your theory about a stimulus and response

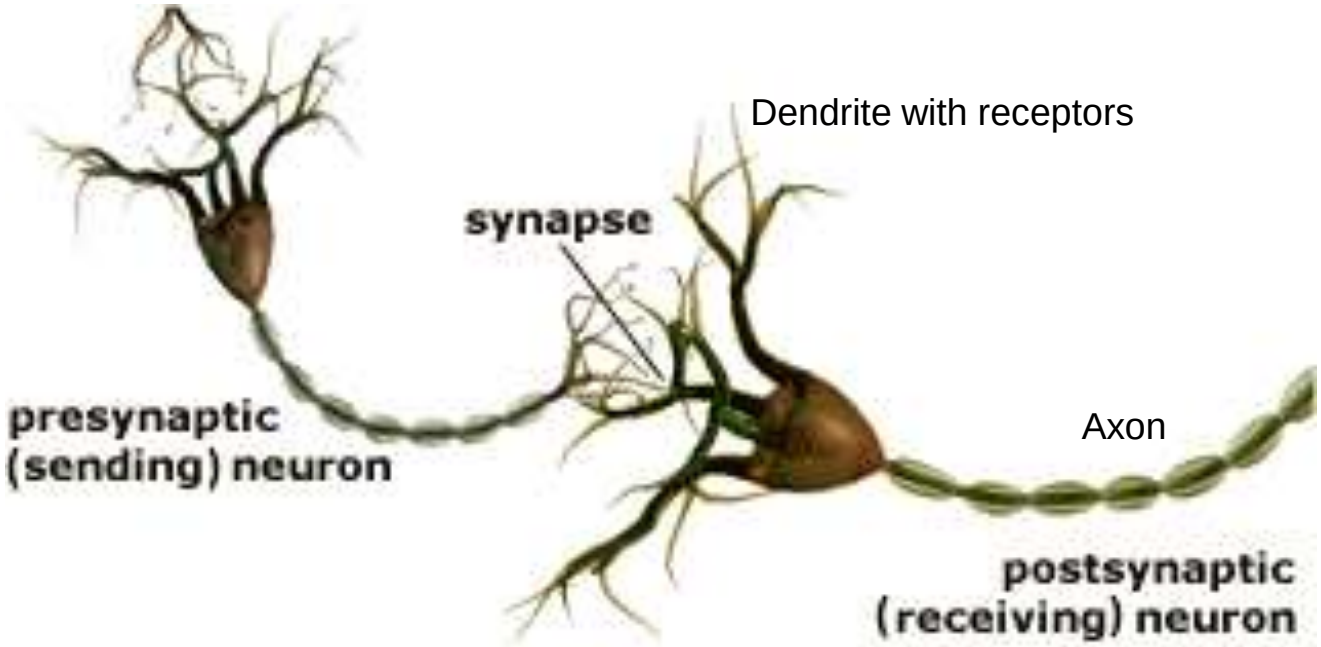
Neuron = nerve cell

Draw and label a nerve cell

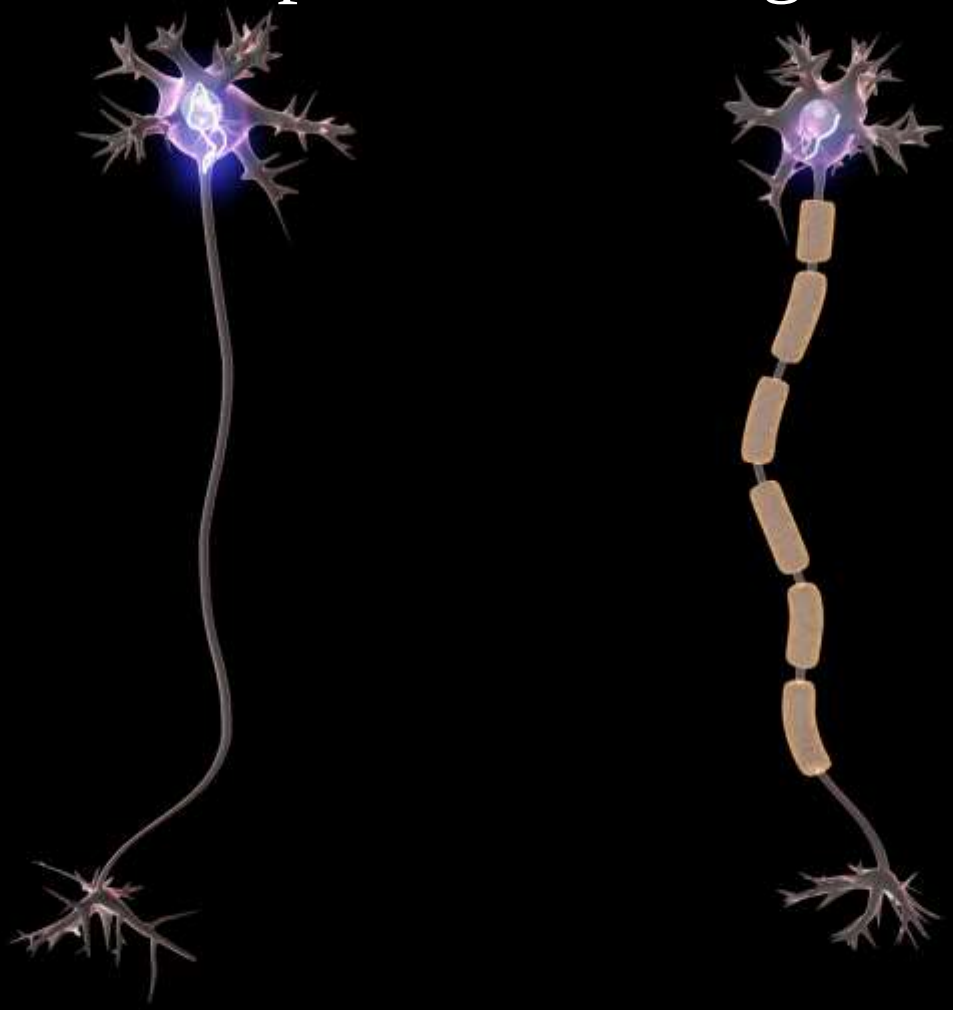


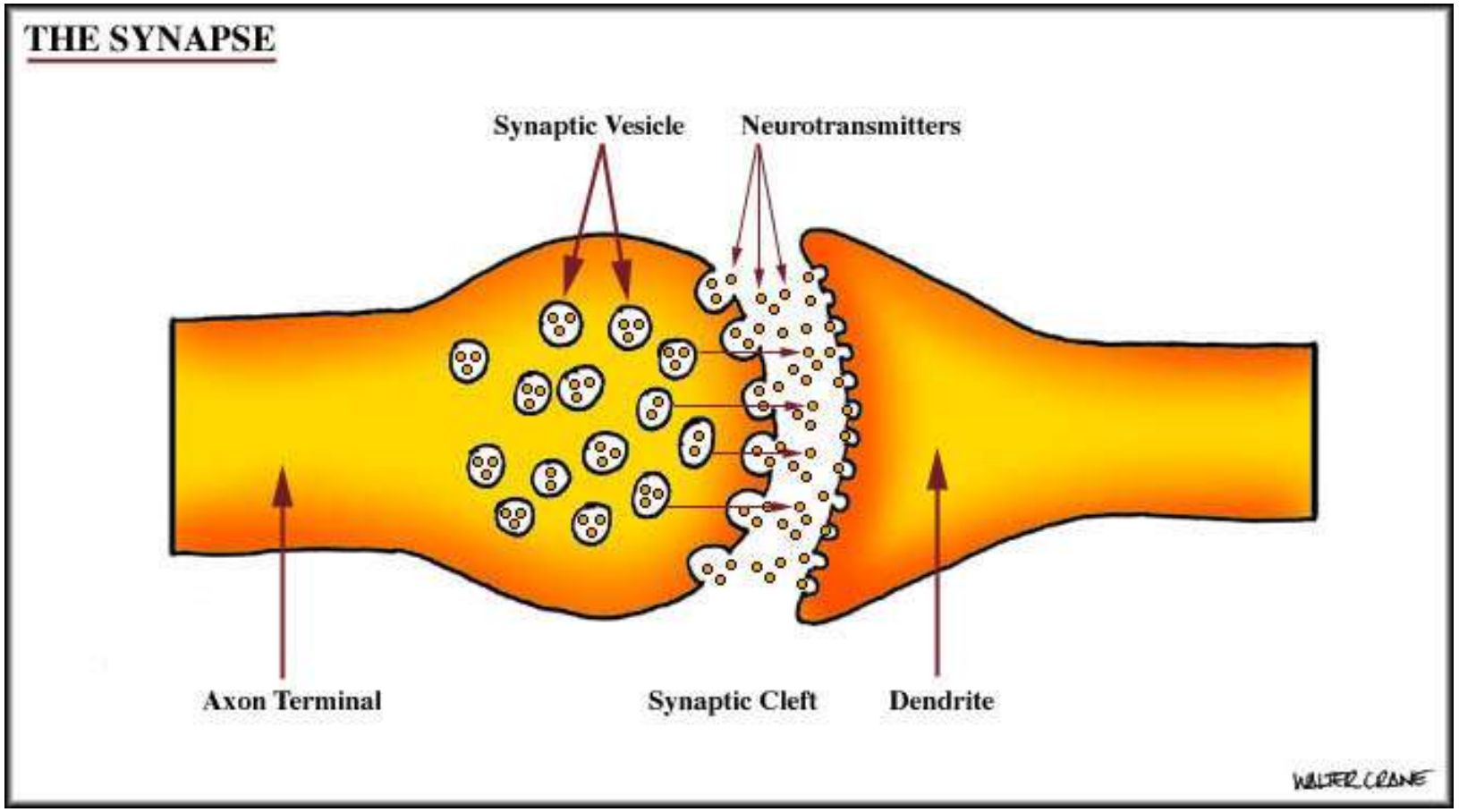
Neuron = <u>nerve cell</u>
<u>Synapse</u> = space between 2 nerve cells

- Add another nerve cell connected by a synapse



Myelin insulates nerve cells → increases speed of message

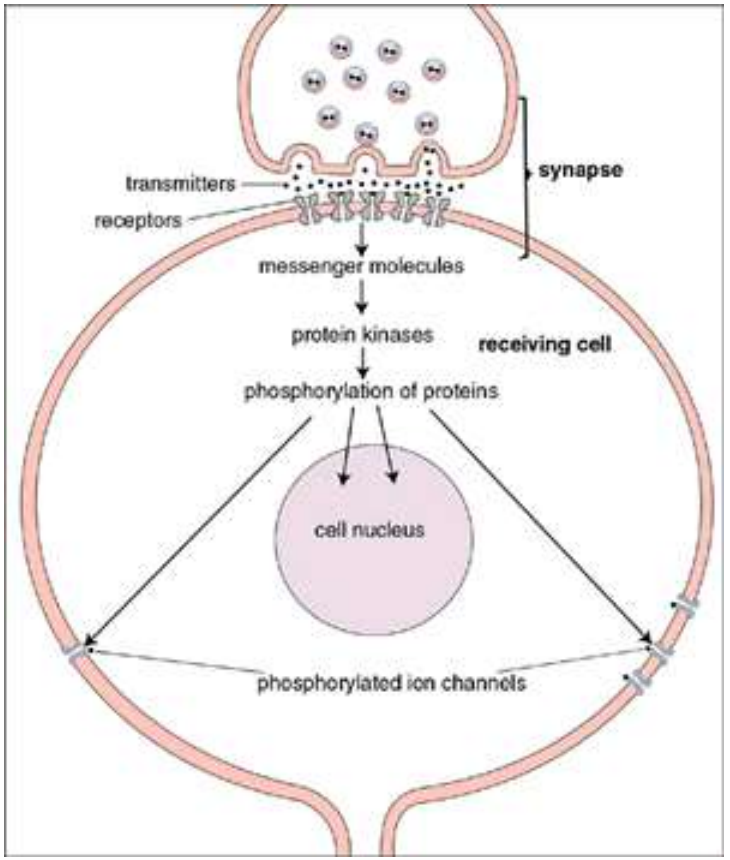




http://www.csuchico.edu/~pmccaffrey/syllabi/CMSD%20320/images/U12Synapse.JPG

Receptors (receive messages)

- Chemical messengers = Neurotransmitters
- Nerve cells have receptors
- Receptor proteins are very specific because of their shape
- Different neurotransmitters → different effects



http://www.neurological.org.nz/graphics/51-2-2.gif

Watch NIH supplemental cd


NERVOUS
SYSTEM
part 3
10 SYNAPSES!

REGENTS PRACTICE QUESTIONS

Nerve impulses travel in 1 direction

Receptor on dendrite → axon → terminal end → Secretes neurotransmitter which travels across the synapse → Receptor on next dendrite

Messages travel in

ONE DIRECTION

Nervous System (2 parts)

1. Peripheral nervous system
    a. sensory and motor neurons
2. Central nervous system
    a. brain and spinal column


NERVOUS
SYSTEM
part 1
08 INTRO to the NERVOUS SYSTEM

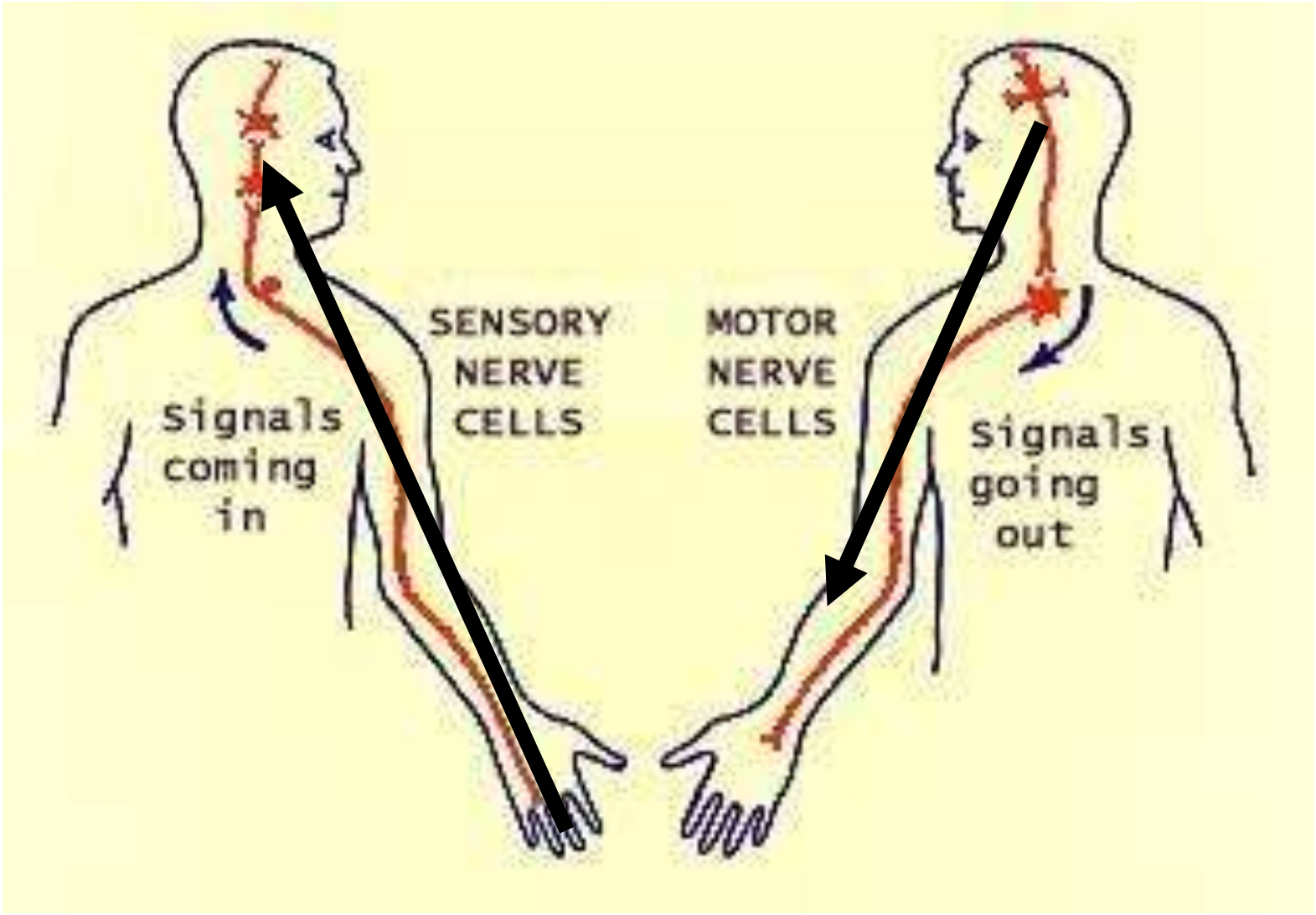
STIMULUS

- Change in environment → stimulates a reaction
- Can be physical
  - sights, sounds, vibrations or touch
- Can be chemical
  - Hormones,
  - changes in blood pH and concentration of substances

Episode 3

THE CHEMICAL MIND

Draw a model of a stimulus and response



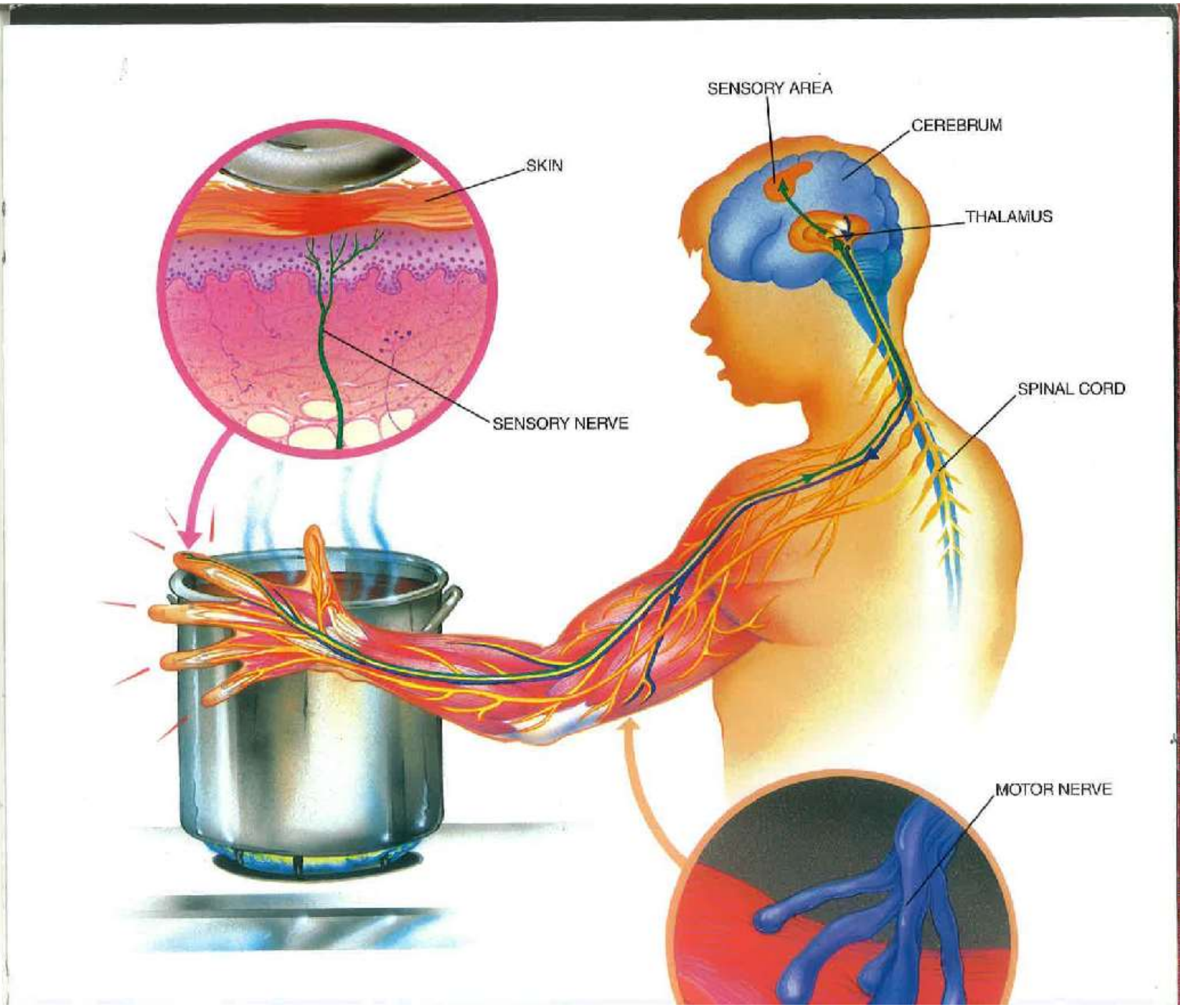
How does a reflex differ from a normal stimulus and response

- https://www.youtube.com/watch?v=jK0JS2OsvKA
- https://www.youtube.com/watch?v=PPPgTq3L6k4

Reflex

Stimulus → spinal column → motor neuron → effector cell

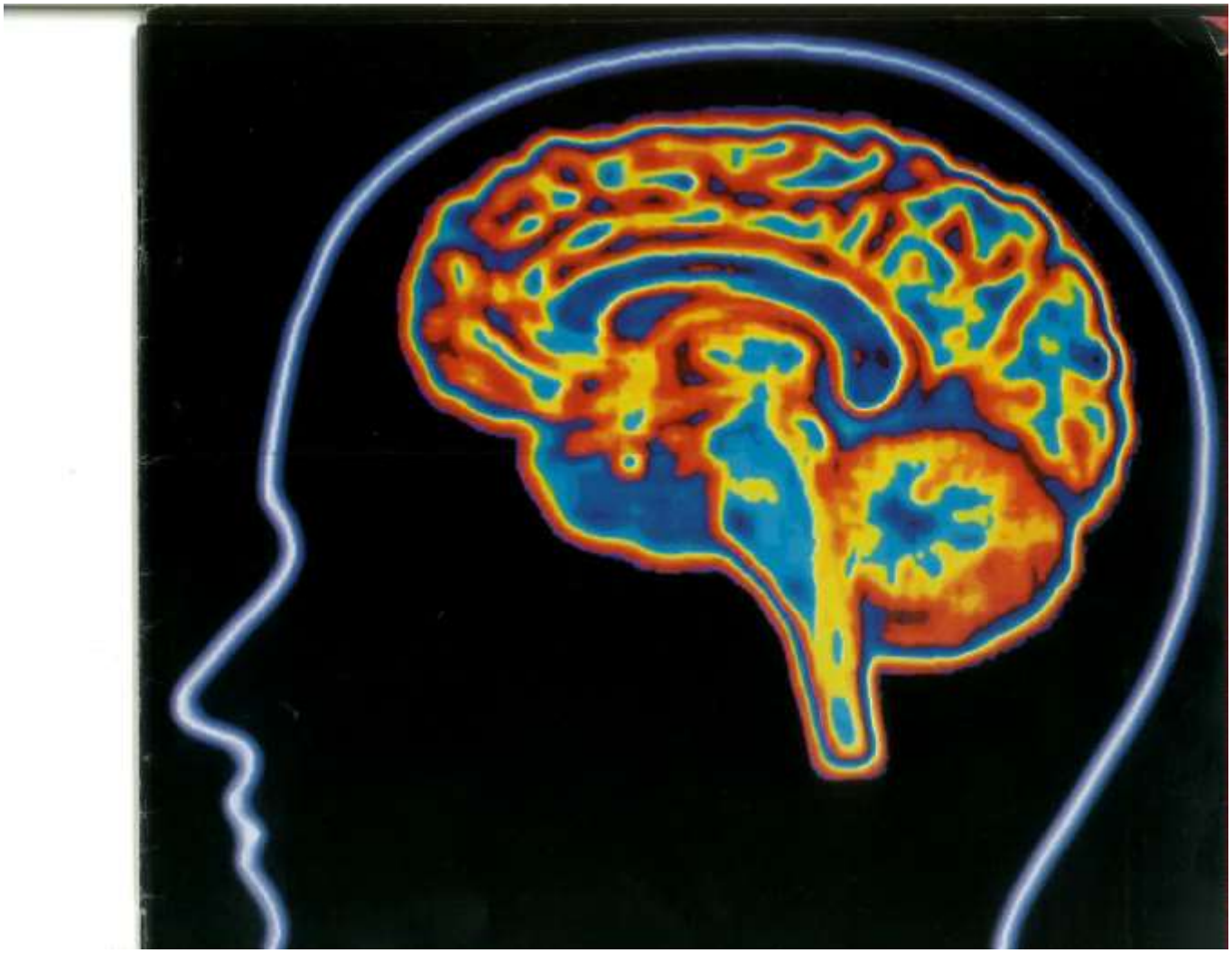
Does not need to go to brain for reaction to occur

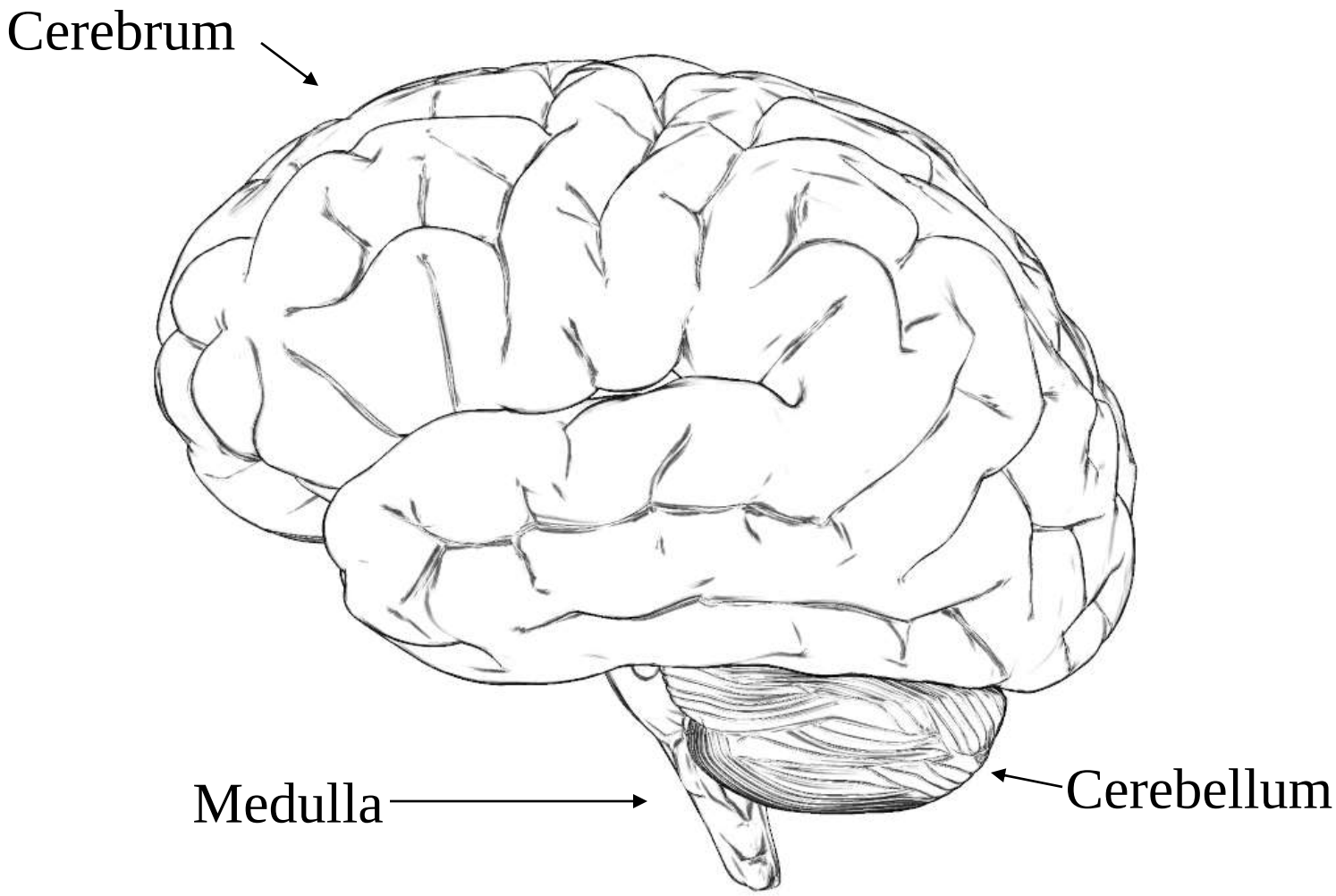

SENSORY AREA
CEREBRUM
SKIN
THALAMUS
SENSORY NERVE
SPINAL CORD
MOTOR NERVE

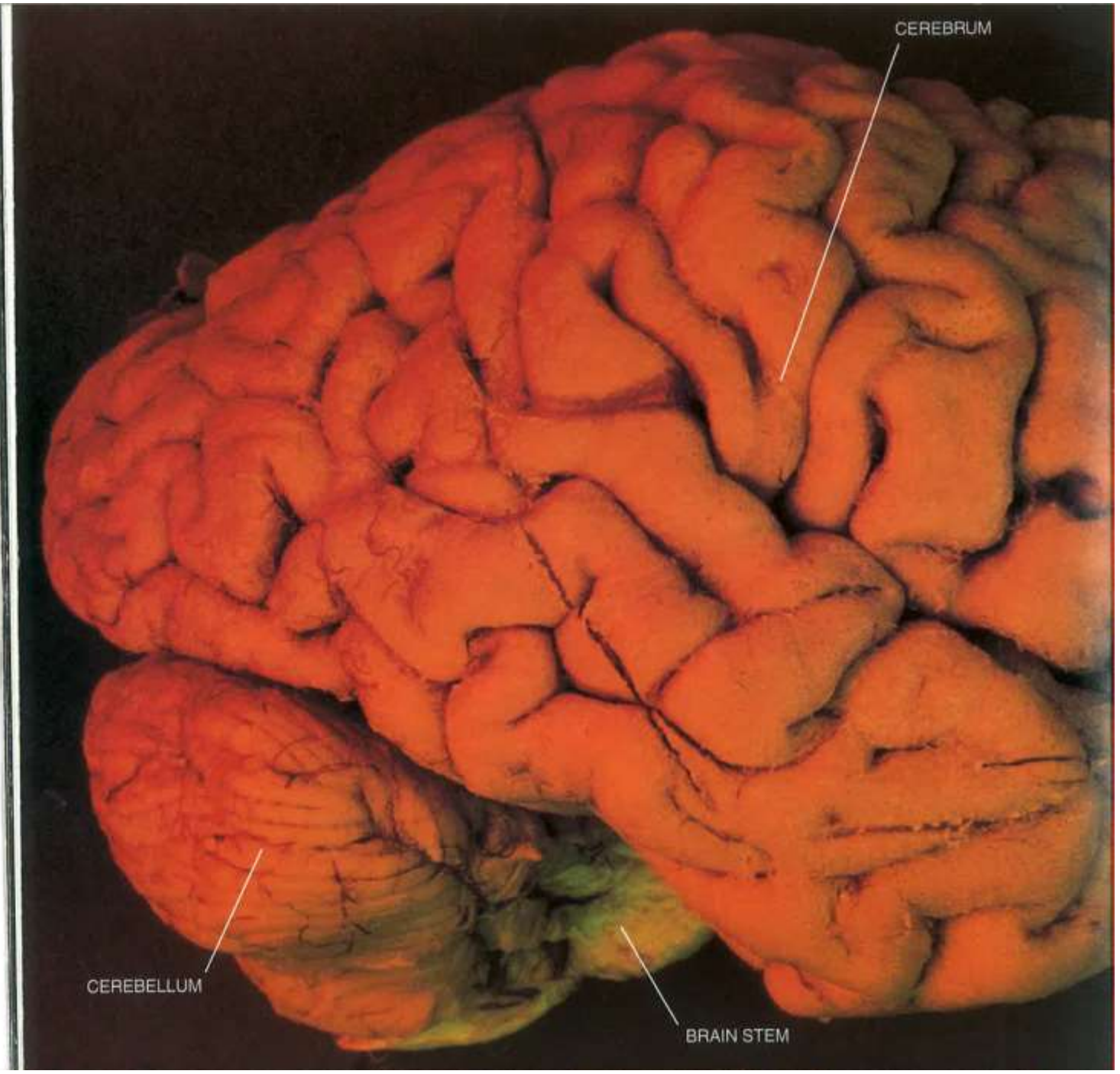
Nervous system

- Stimulus
  - (ex: sound of buzzing insect)
- Sensory nerves →
  - receive and → electrical impulse
- Impulse goes to brain or spinal column →
- Message sent to motor neuron →
- Stimulate effector cells
  - (ex: muscles of arm swat at the insect)

The Brain

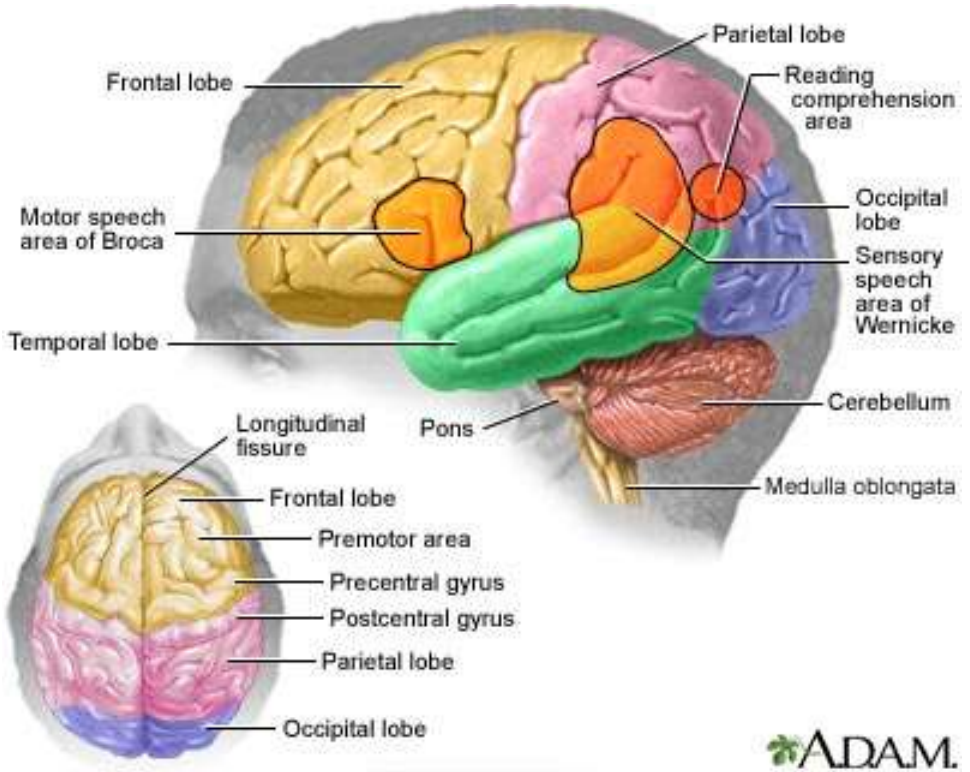



Cerebrum
Medulla
Cerebellum

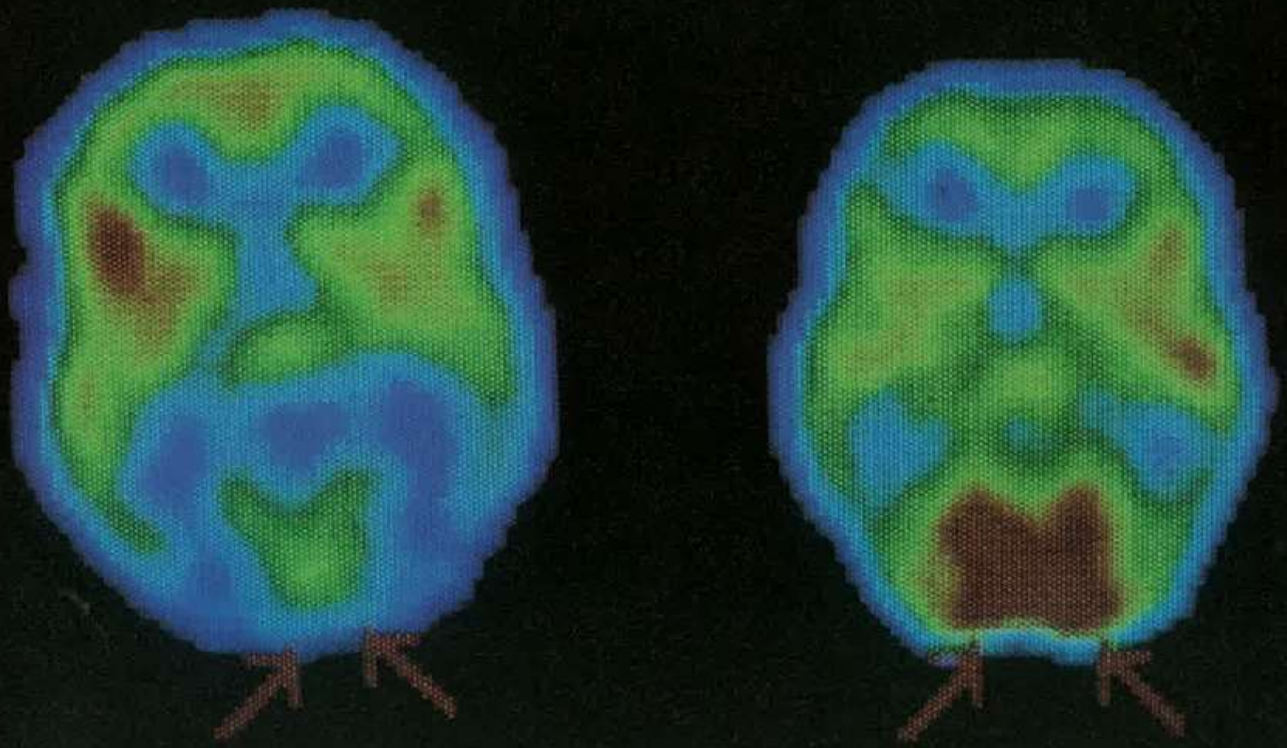

CEREBRUM
CEREBELLUM
BRAIN STEM

The Brain
3 main parts

- Cerebrum =
  - biggest part (controls thought)
- Cerebellum =
  - balance and coordination
- Medulla =
  - controls involuntary functions



VISUAL STIMULATION



EYES CLOSED

EYES OPENED

BLOOD SUGAR LAB


WHY
HIGH
BLOOD
SUGAR
IS BAD FOR YOU

INTRODUCTION:

Diabetes is a disease affecting insulin producing glands of the pancreas. If there is not enough insulin being produced by these cells, the amount of glucose in the blood will remain high. A blood glucose level above 140 for an extended period of time is not normal. This disease, if not brought under control, can lead to severe complications and even death.

EVIDENCE:

Use the following data to create an appropriate graph. Be sure to label each axis, include units and a key for each patient.

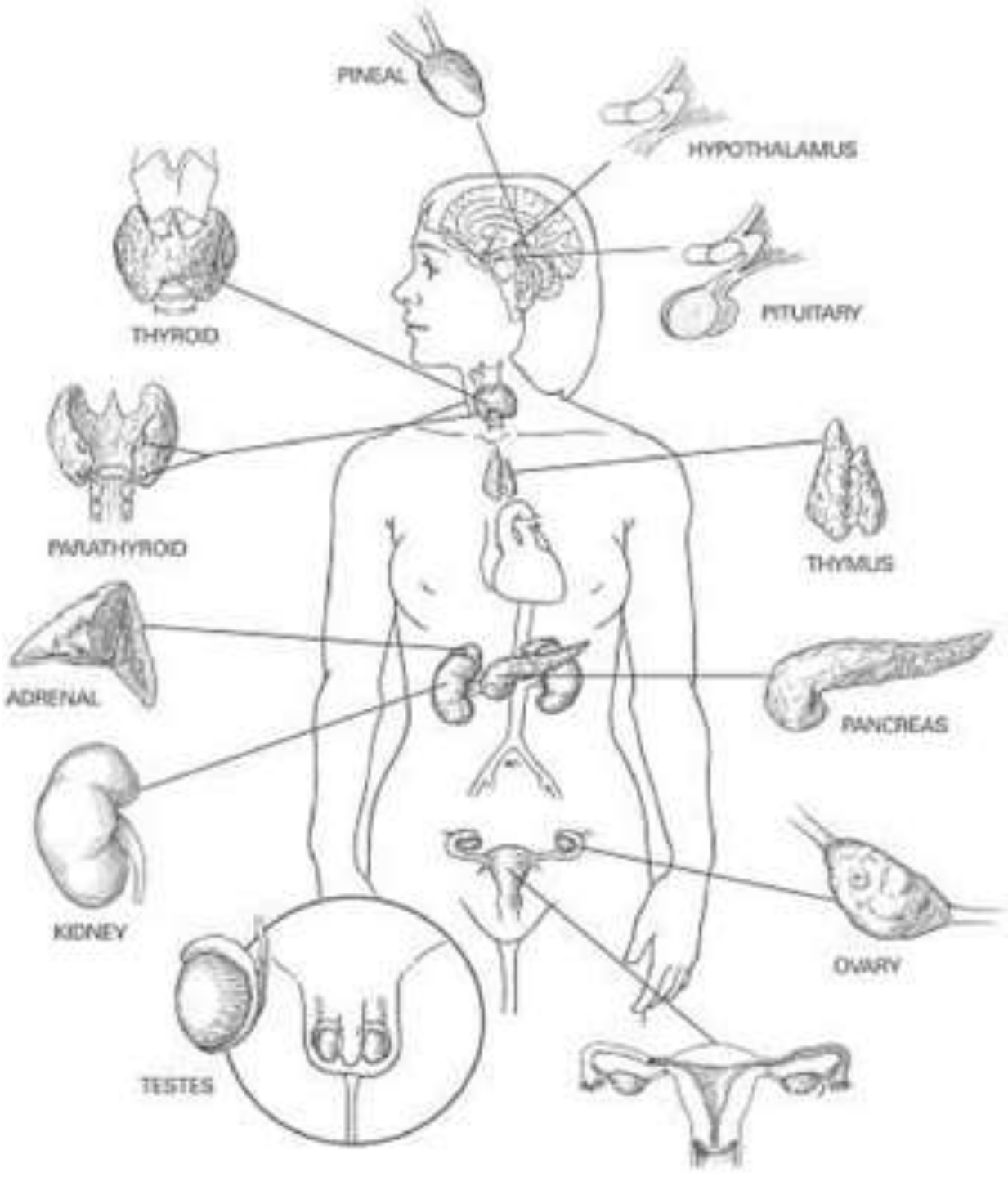
Endocrine System

Brain

➔Glands

➔Hormones

➔Regulation


PINEAL
HYPOTHALAMUS
PITUITARY
THYROID
PARATHYROID
THYMUS
ADRENAL
PANCREAS
KIDNEY
OVARY
TESTES

FILL IN THE BLANKS

The BRAIN

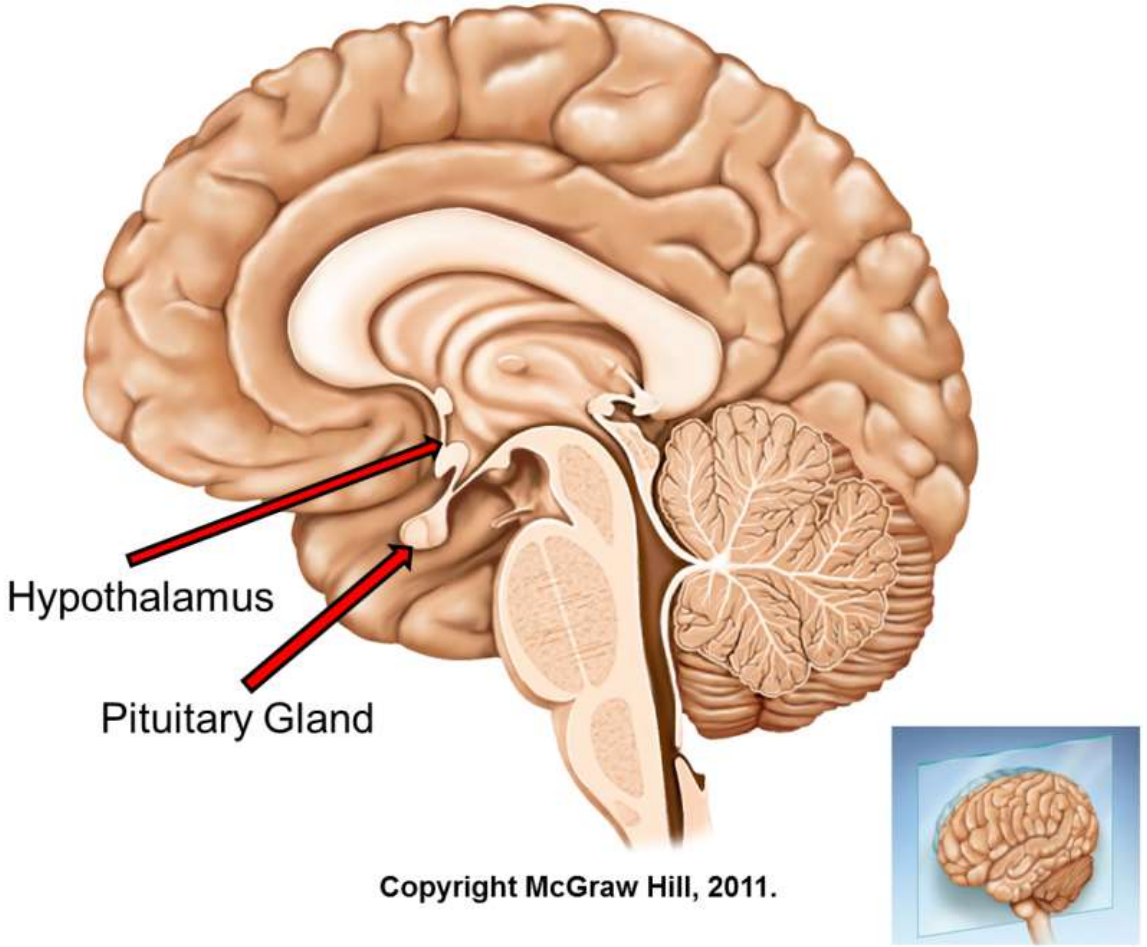
- ➔ Stimulates the GLANDS to
  - ◆ Secrete HORMONES that control
    - ● Regulation

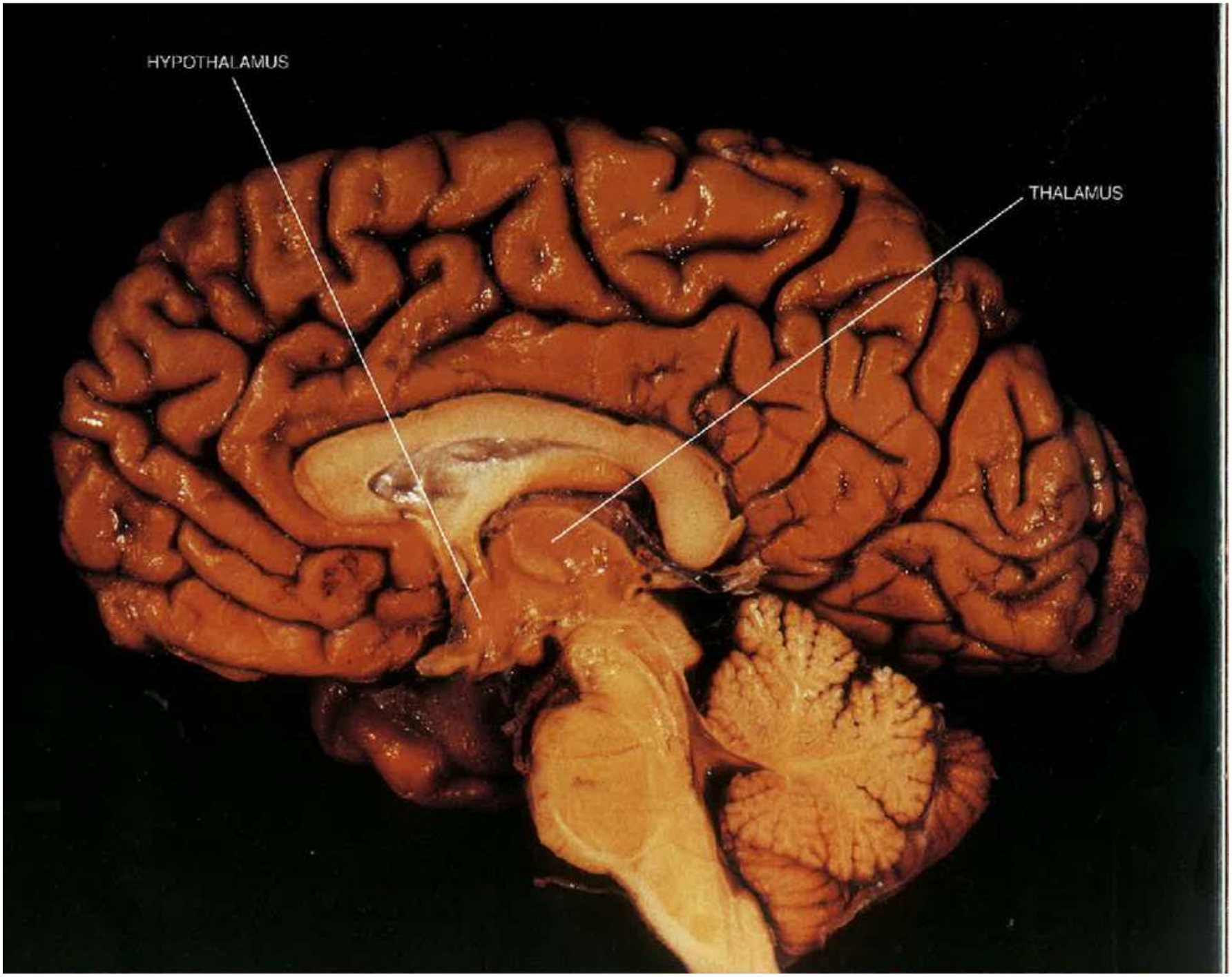
HYPOTHALAMUS =

- Part of the brain that controls _____

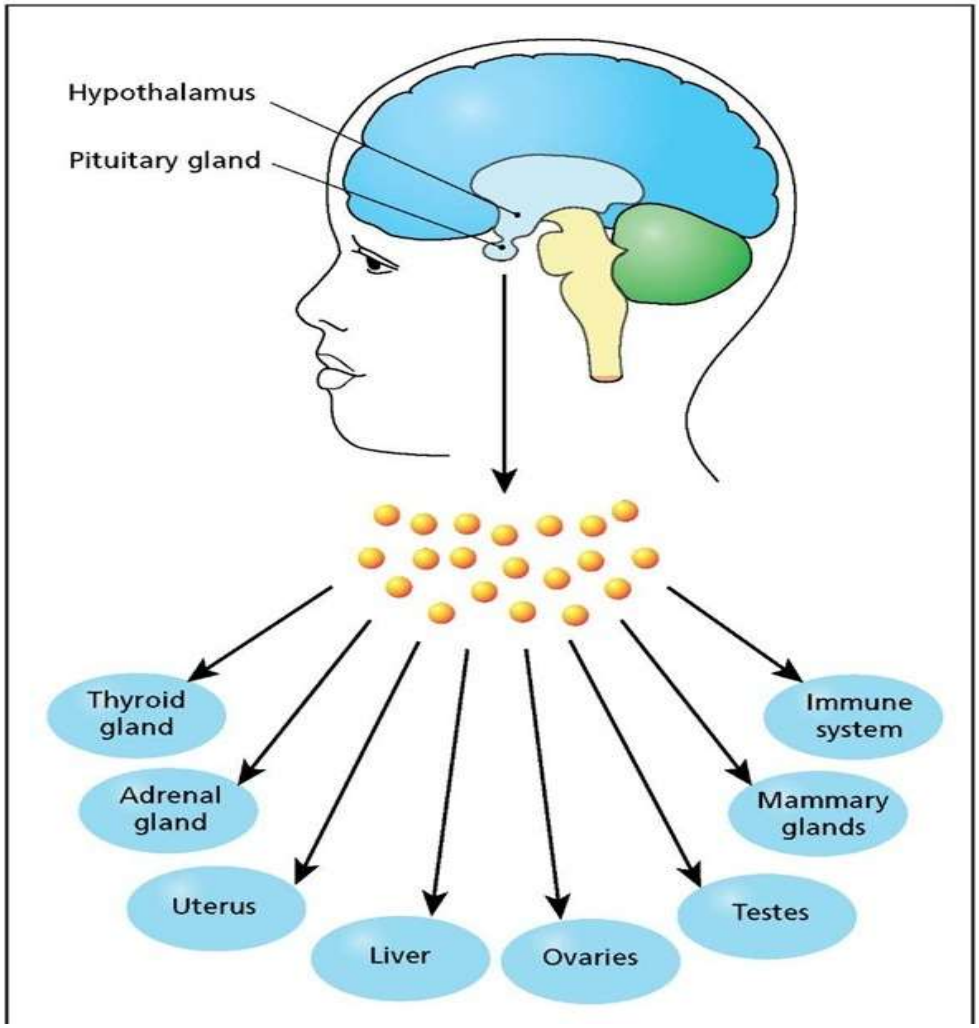
Hypothalamus =

- Part of the brain that controls the pituitary gland

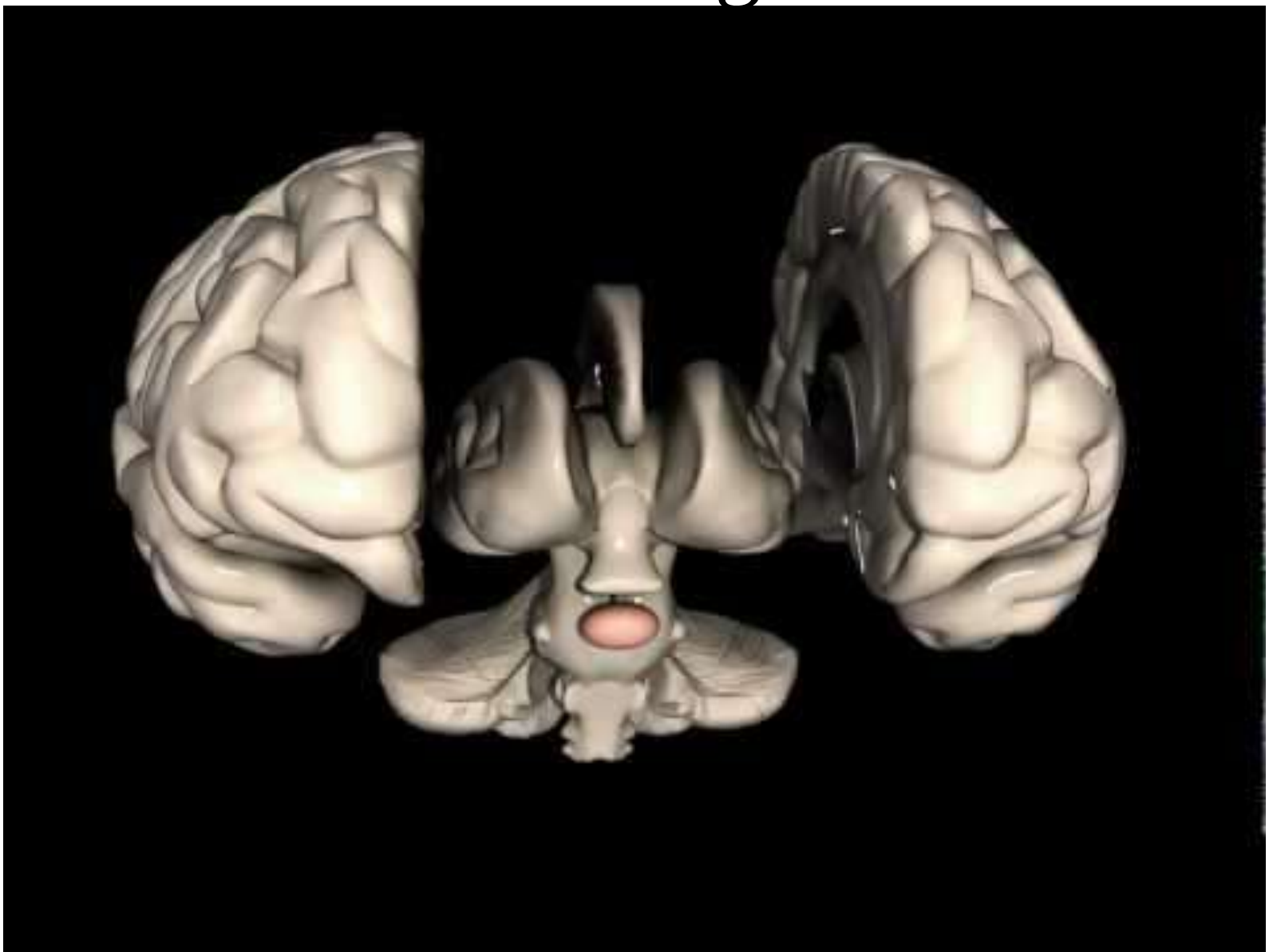



HYPOTHALAMUS
THALAMUS

Pituitary gland = the master gland

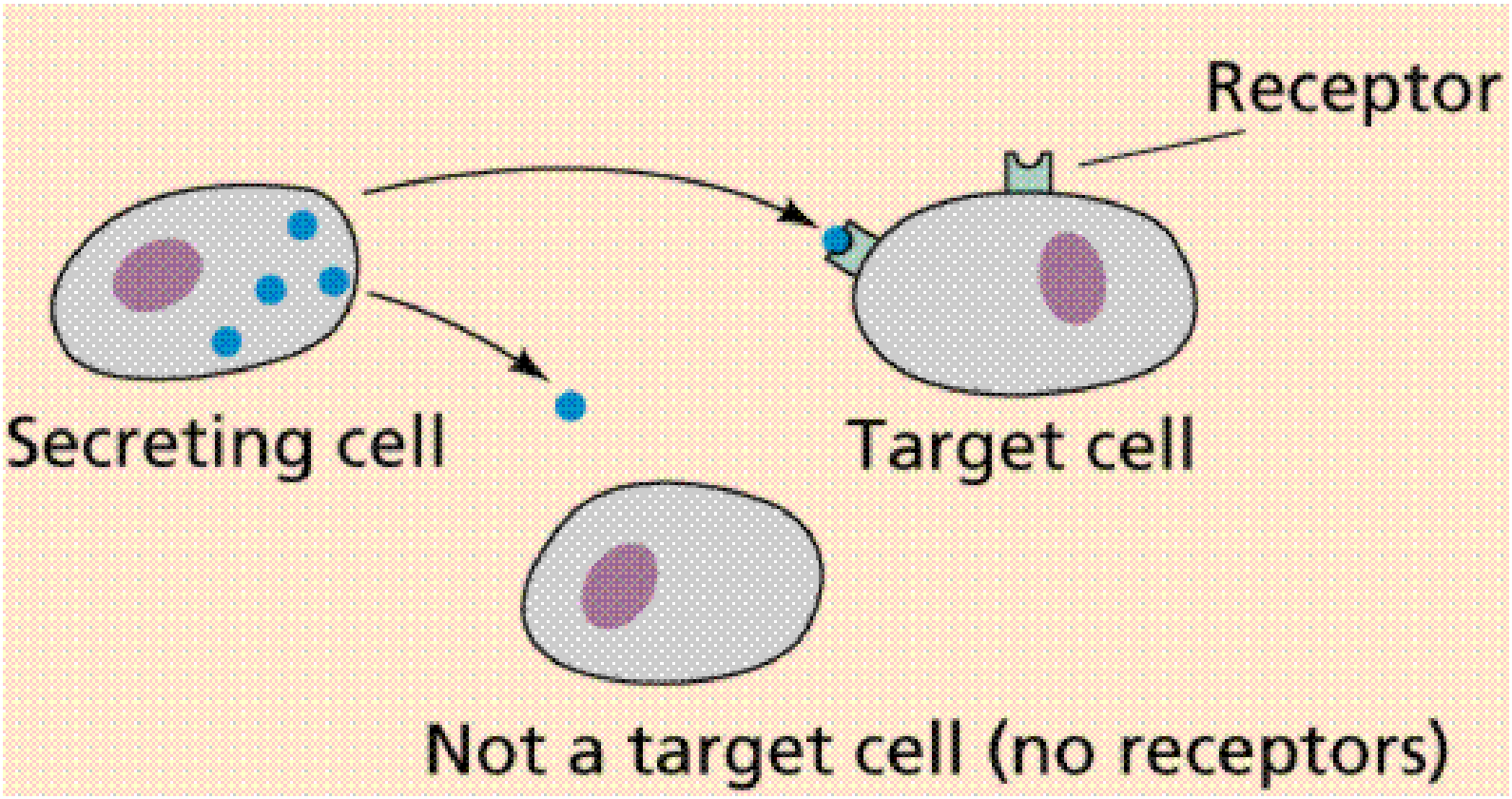


Why is the pituitary gland called the master gland?



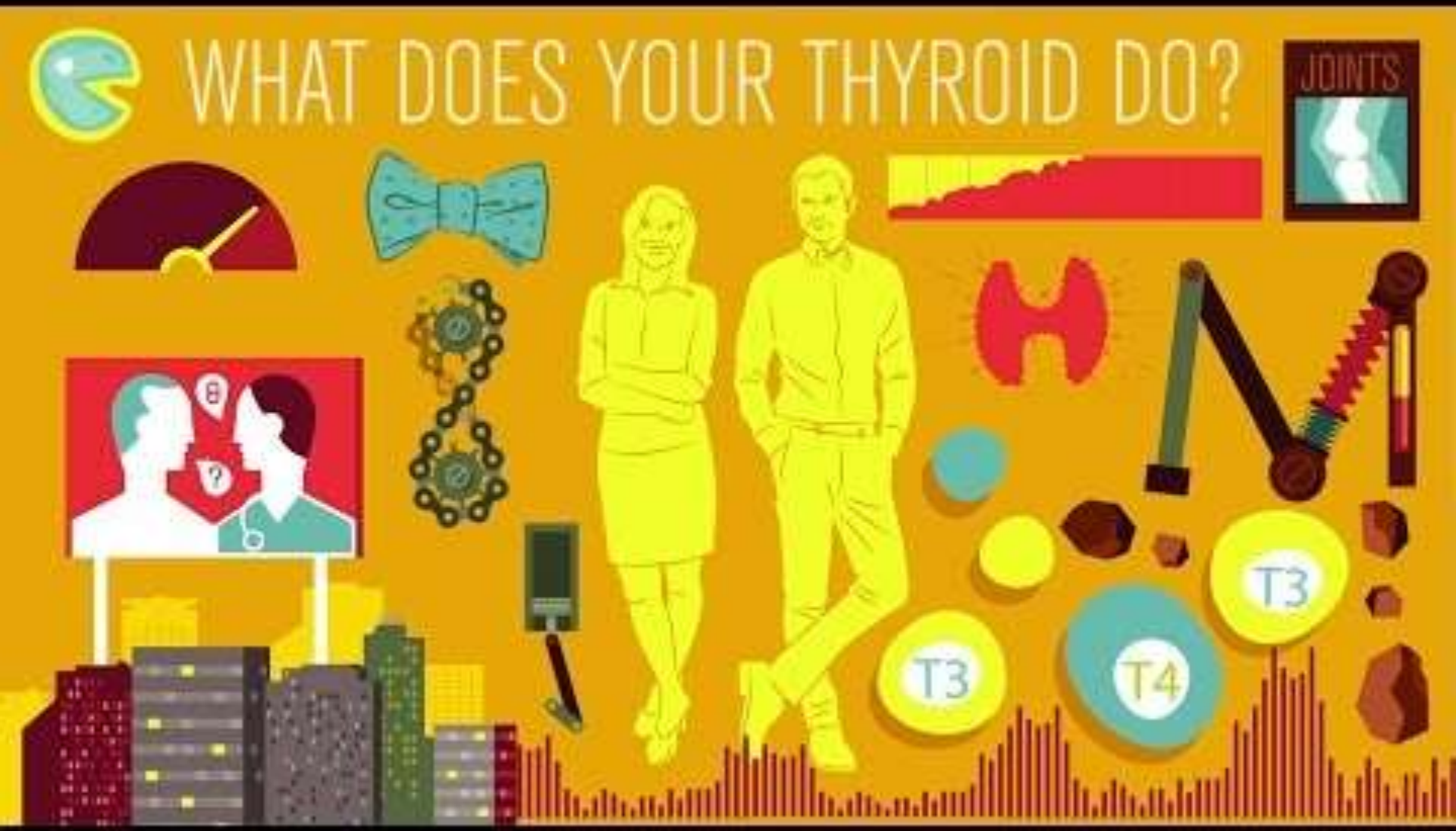
Answer questions 1 and 2 in notes packet

Glands secrete hormones that bind to receptors on target cells

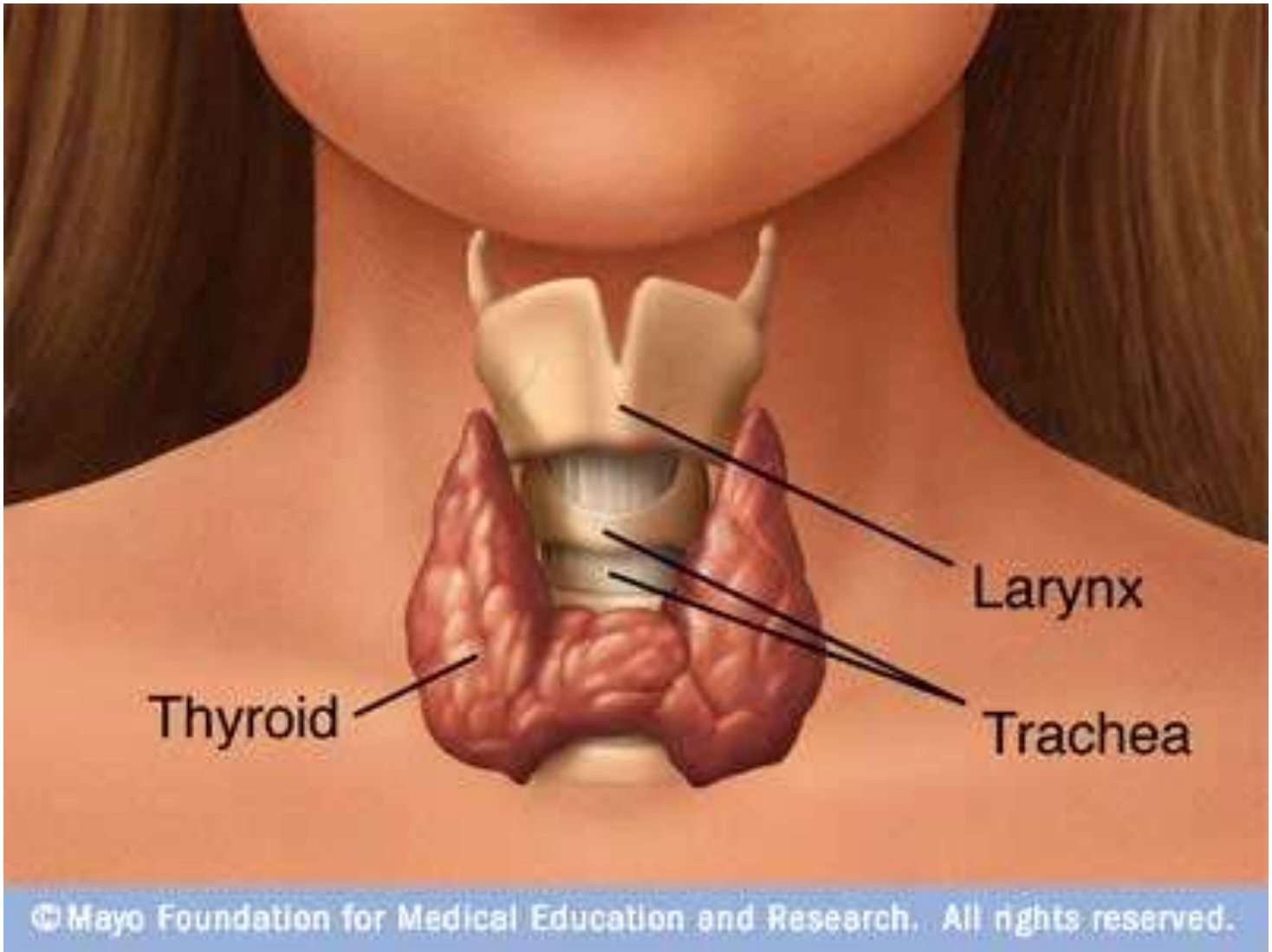


Answer questions 3-6 in notes packet

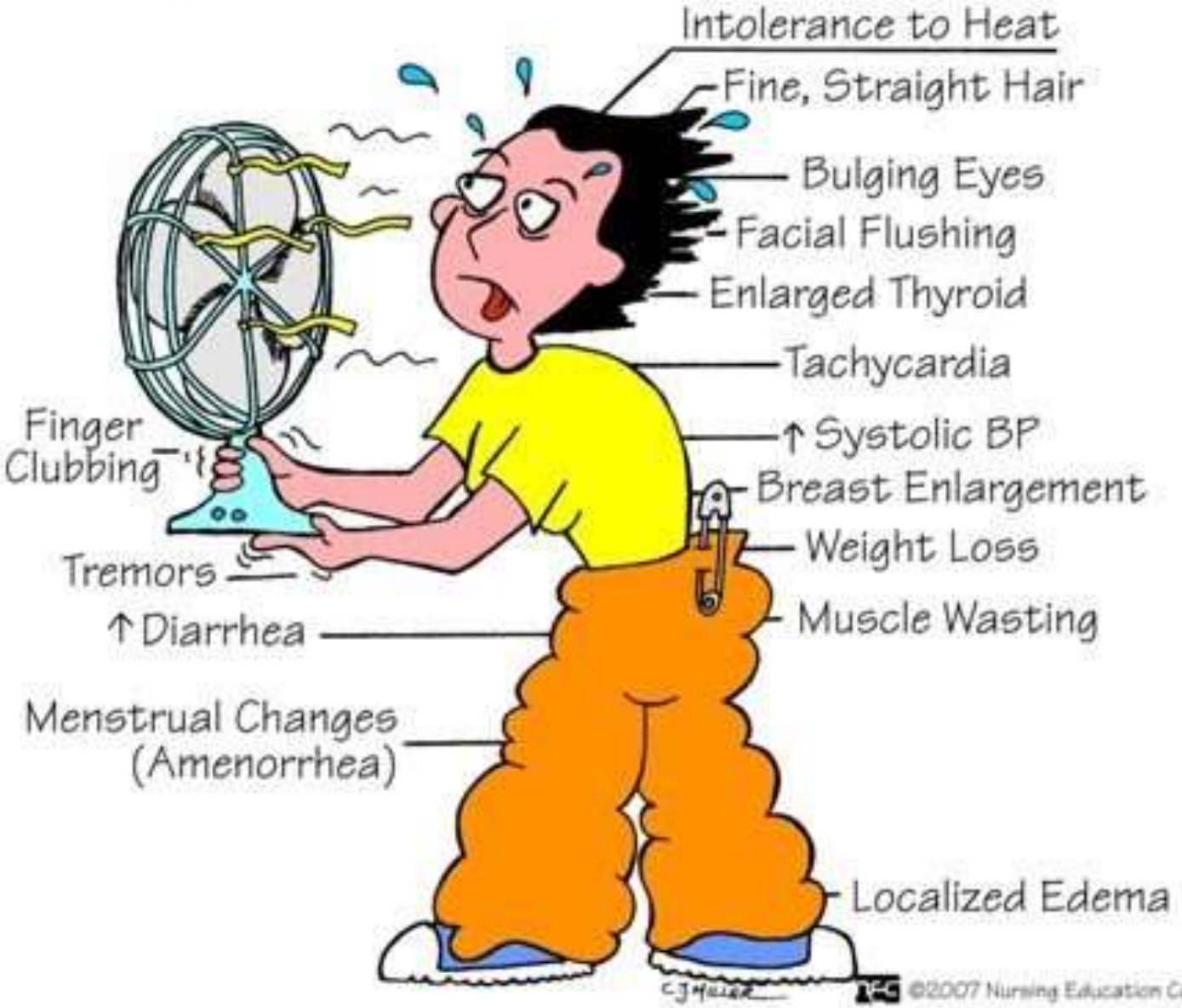
More GLANDS and what they REGULATE


WHAT DOES YOUR THYROID DO?
JOINTS
T3
T4
T3

Thyroid gland
➔Controls metabolism



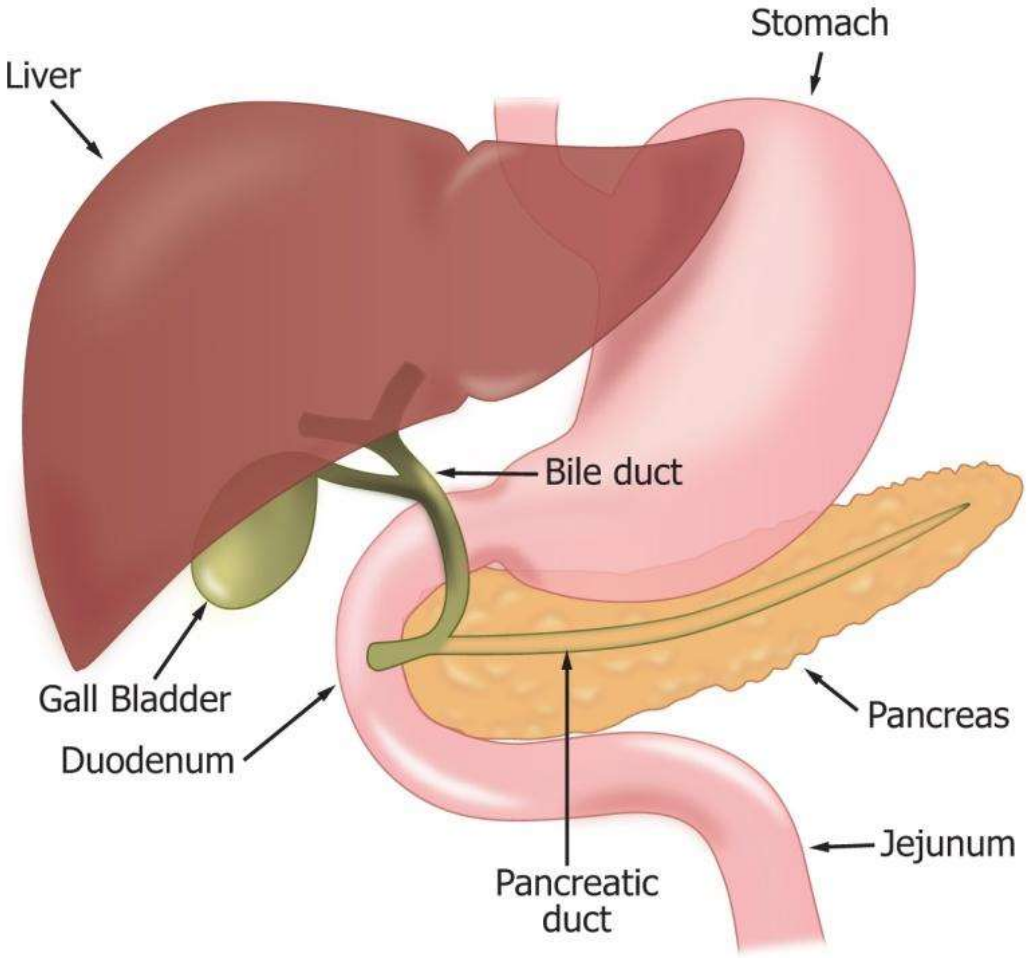
HYPERTHYROIDISM



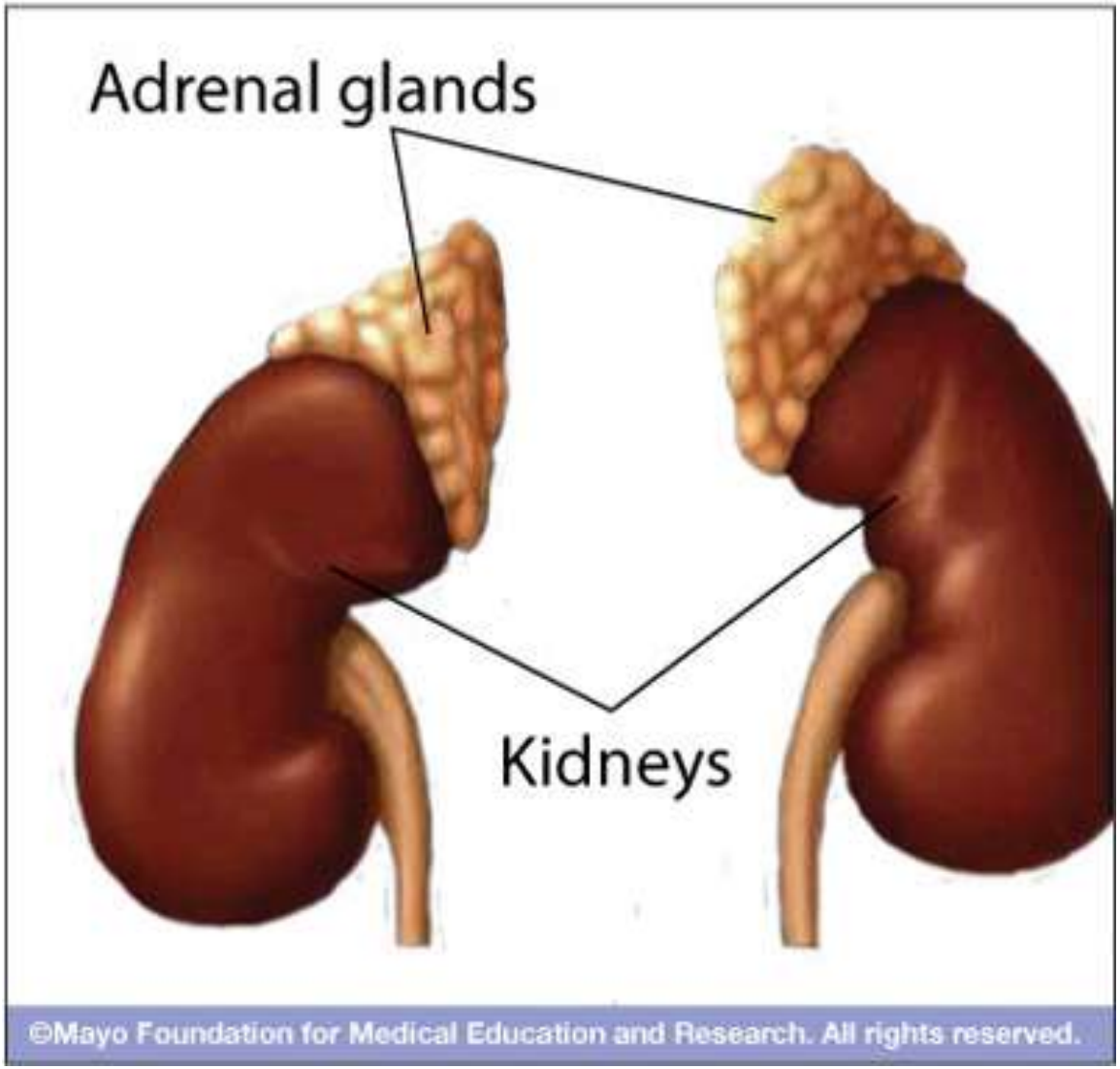
©2007 Nursing Education Consultants, Inc.

HYPOTHYROIDISM

Pancreas→ insulin & glucagon →controls blood sugar

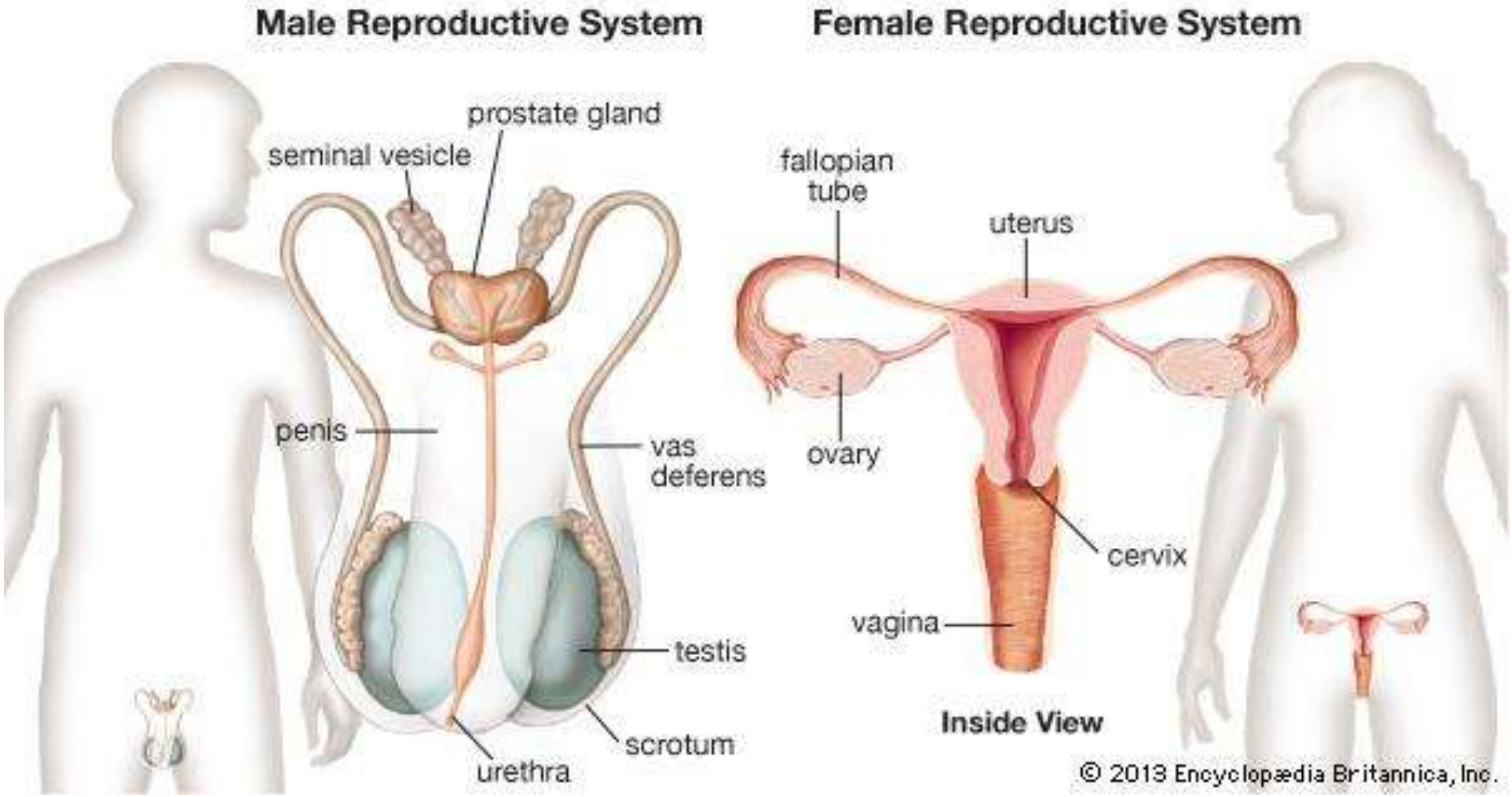


Adrenal glands → adrenaline → fight or flight response



Testes produce →
testosterone needed for →
male reproductive development

Ovaries produce →
estrogen needed for →
female reproductive development


Male Reproductive System
prostate gland
seminal vesicle
penis
vas deferens
testis
scrotum
urethra
Female Reproductive System
fallopian tube
uterus
ovary
cervix
vagina
Inside View
© 2013 Encyclopædia Britannica, Inc.

Feedback loops → maintain homeostasis

- Positive feedback
  - **Ex:** breastfeeding infant → stimulate increased milk production
- Negative feedback
  - **Ex:**
    - HIGH blood sugar → body produces insulin → which decreases blood sugar
    - LOW blood sugar → body produces glucagon → which increases blood sugar

HORMONES (Fill in the blanks in your notes as we watch the following video)

1. What are they?
2. Made by _____
3. Carried in _____
4. Very _____ because of their _____
5. Only affect _____ cells
    a. Cells with _____

ENDOCRINE SYSTEM

part 1

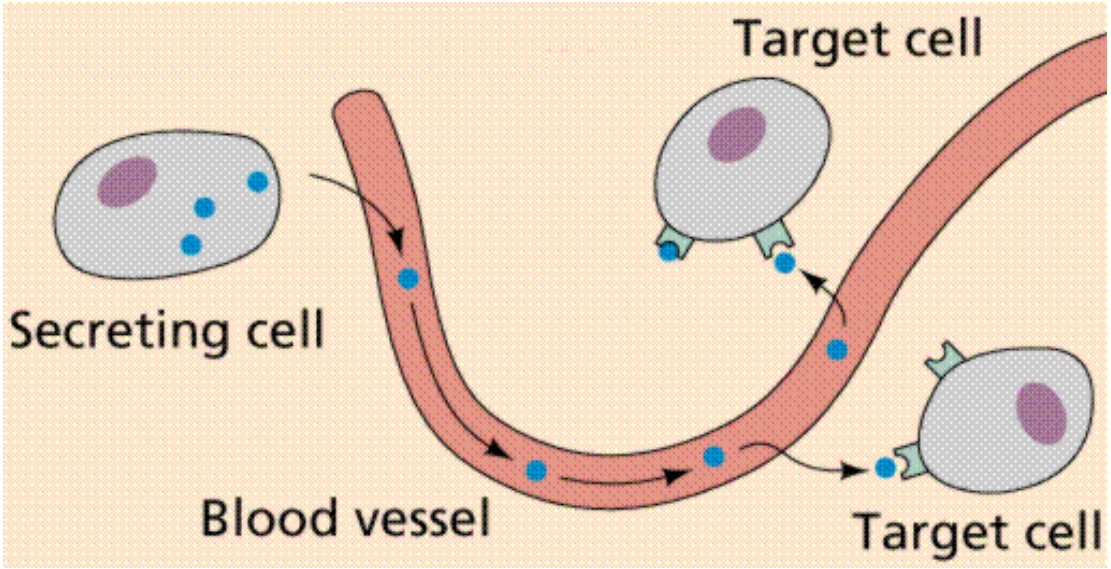
23 GLANDS & HORMONES!

HORMONES

1. Chemical messengers
2. Made by glands
3. Carried in blood
4. Very specific because of their shape
5. Only affect target cells
    a. Cells with receptor molecules

Target cells

- Receive hormones
- Have receptor molecules
- Specific because of their shape



http://www.cartage.org.lb/en/themes/Sciences/LifeScience/GeneralBiology/Physiology/EndocrineSystem/Hormones/hormone_2.gif

Describe the genetic makeup of all cells in an organism

- All cells in one organism are genetically identical

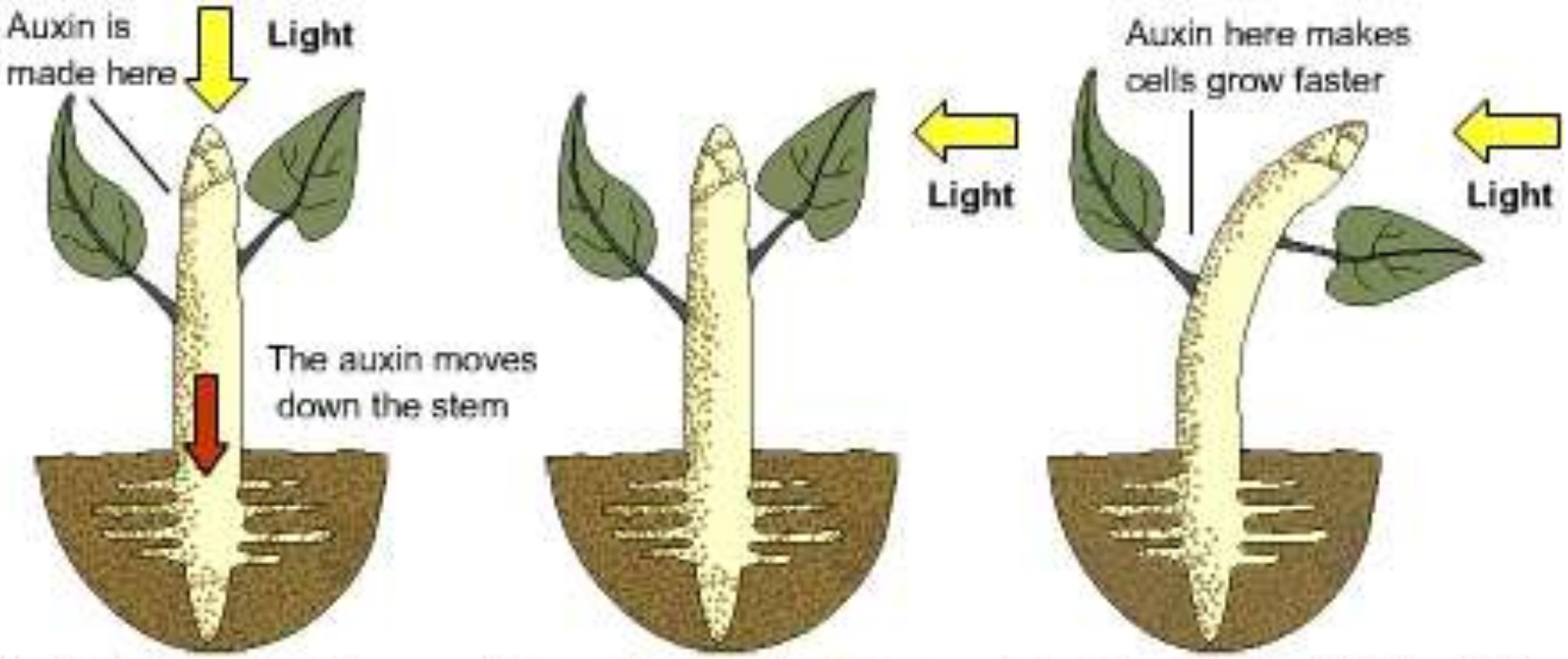
Explain how cells with the same DNA can look and function differently

- Environment controls gene expression which leads to the creation of specialized tissues

Hormones and plants

- Hormones help plants grow and develop different types of tissues (roots, stems, leaves…)
- Auxins =
  - hormones that help plants grow toward light

Auxins


Auxin is made here
Light
The auxin moves down the stem
Auxin diffuses down the shoot stimulating growth.
Light
If one side of the shoot is in the light, auxin diffuses away from the light.
Auxin here makes cells grow faster
Light
The side of the shoot in the shade has more auxin, so grows faster, causing the shoot to bend towards the light.

- Animal hormones control growth and development

- 2 processes controlled by hormones

Molting = shedding of outer covering → growth (ex: snakes, spiders, and insects)

Hormones vs Pheromones

- Hormones =
  - send messages to different parts of the body
- Pheromones =
  - send messages to other organisms
  - Examples:
    - Chemicals secreted to attract mates
    - Chemicals secreted to signal danger or mark they way to food (ex: ants)

Ant Pheromones

Pheromone traps

- https://www.youtube.com/wa
  UIQSSIF4
- Alternative to pesticides
- Problems with Pesticides =
  - Kill non-target species
  - Bio-accumulate
  - Runoff into waterways
  - Increase pesticide resistance

Feedback mechanisms → homeostasis

Nervous and Endocrine systems coordinate activities → maintain homeostasis

DRAW A FEEDBACK LOOP DIAGRAM FOR EACH EXAMPLE