

REGENTS Exam Topic Analysis Month/Year: _____

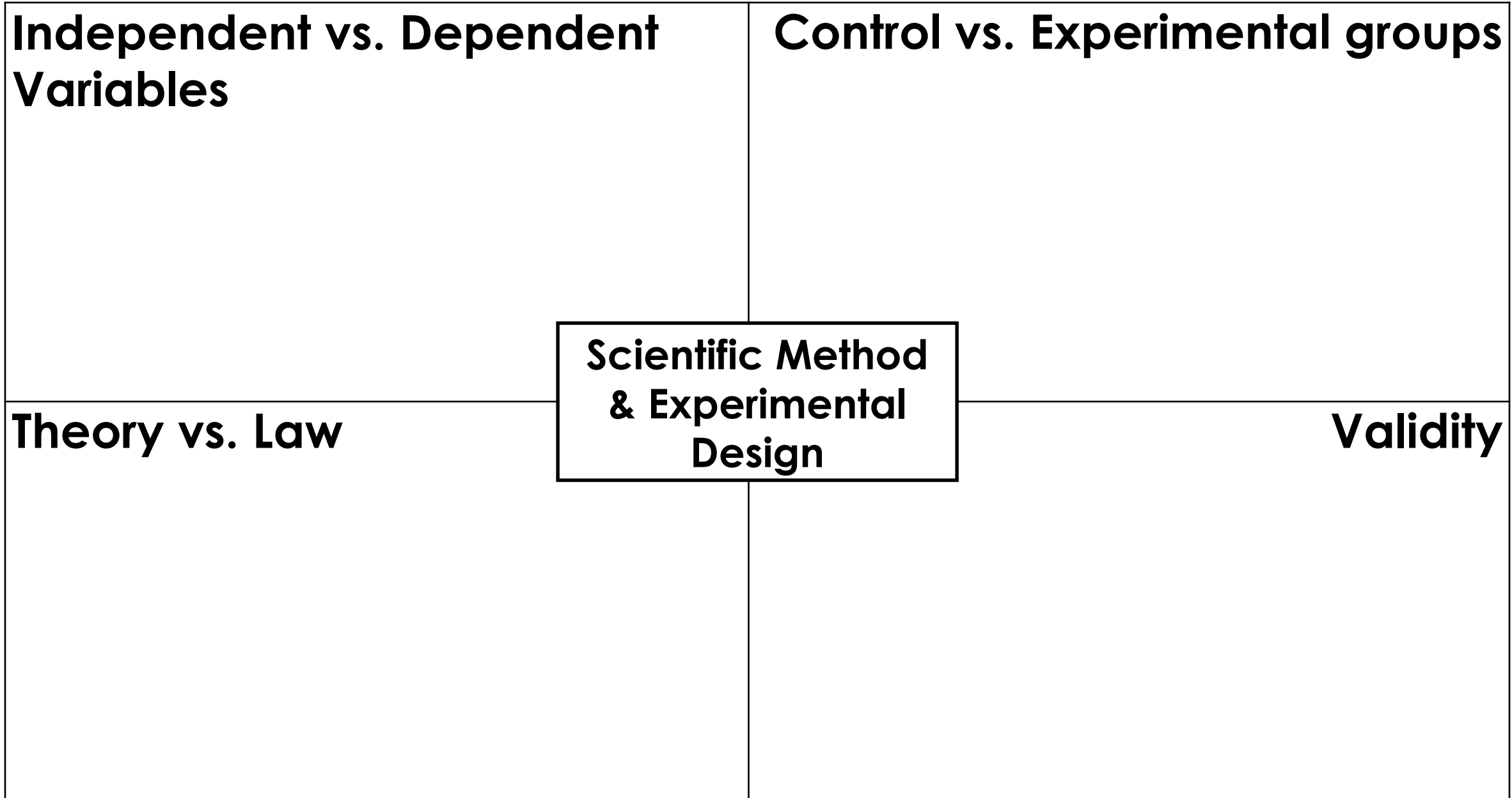
Topic	Question #s from this Exam	Total Questions
Scientific Method & Inquiry		
Lab (Skills, Tools, Technology, Safety)		
Life Processes & Cells		
Biochemistry		
Body Systems / Homeostasis		
Reproduction, Development Cell Division		
Genetics & Biotechnology		
Evolution		
Ecology		
Human Impact on the Environment		

Topic Review 1

Scientific Method

Tools of the Biologist

Copy this 4 box organizer into your notes. Use a full page!



Independent vs. Dependent Variable

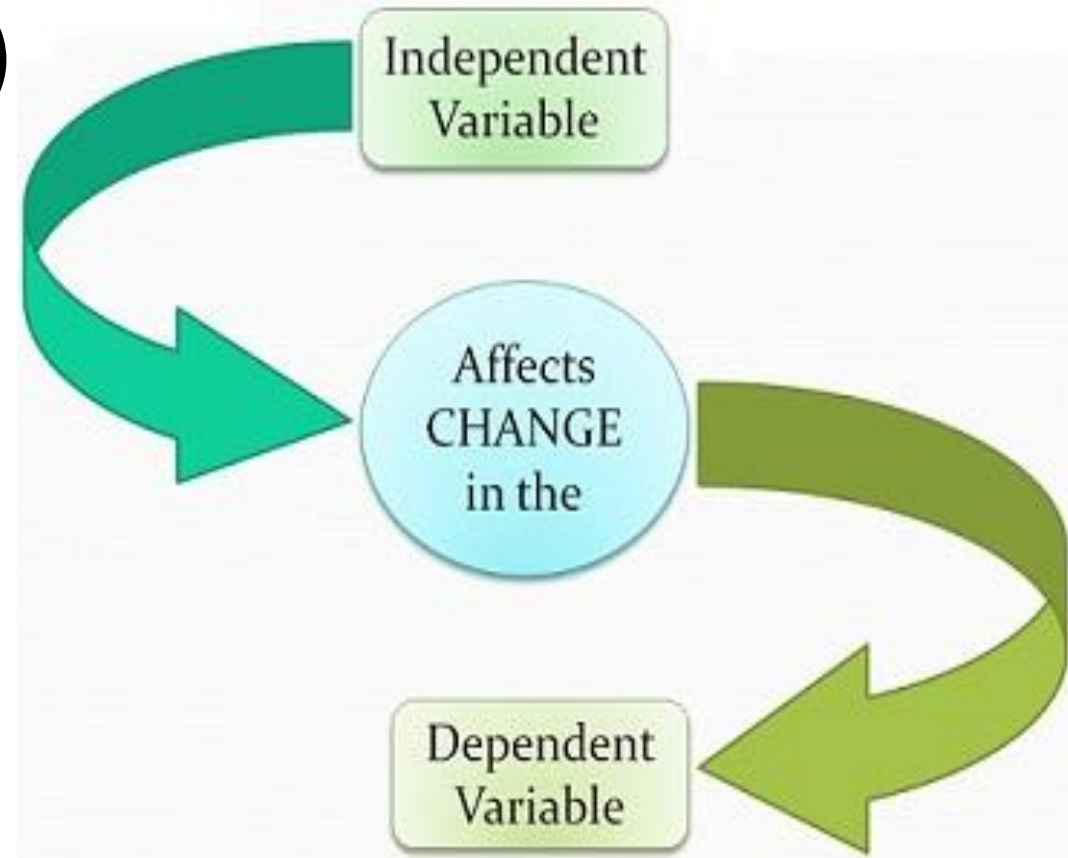
The Effect of INDEPENDENT on DEPENDENT

IV: factor intentionally changed by the researcher (Think “I” as in yourself)

- only test 1 at a time
- x axis on graph
- Ex. Amount of water

DV: data measured / observed (“depends” on first variable)

- y axis on graph
- Ex. Height of plants



Control vs. Experimental Groups

- Control:
 - remains in the original (normal) condition
 - DOES NOT receive the treatment
- Experimental:
 - DOES receive the treatment
 - may have more than one



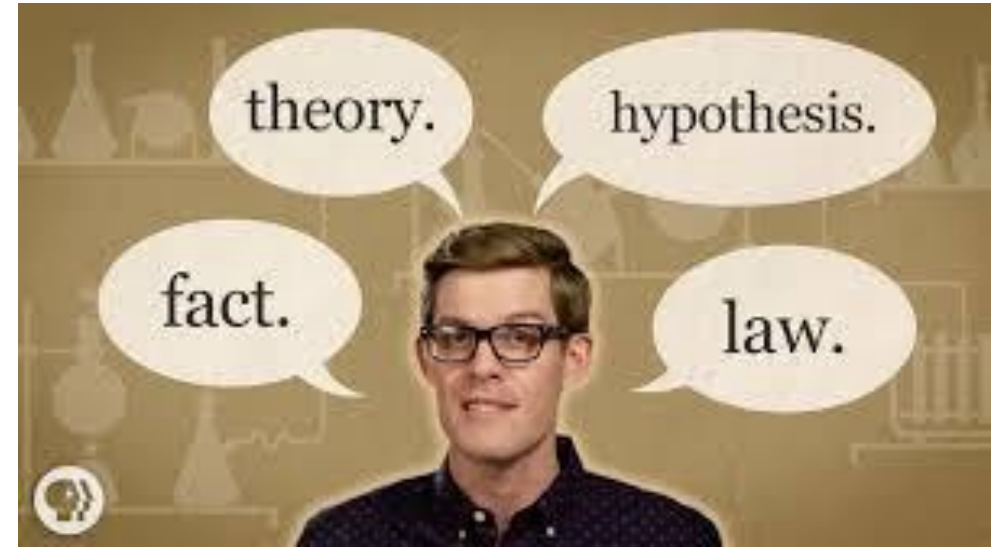
Theory vs. Law

- Theory:

- summarizes a hypothesis/hypotheses
- well supported with repeated testing
- can be disproven with new research

- Law:

- generalizes a body of observations
- cannot be disproven

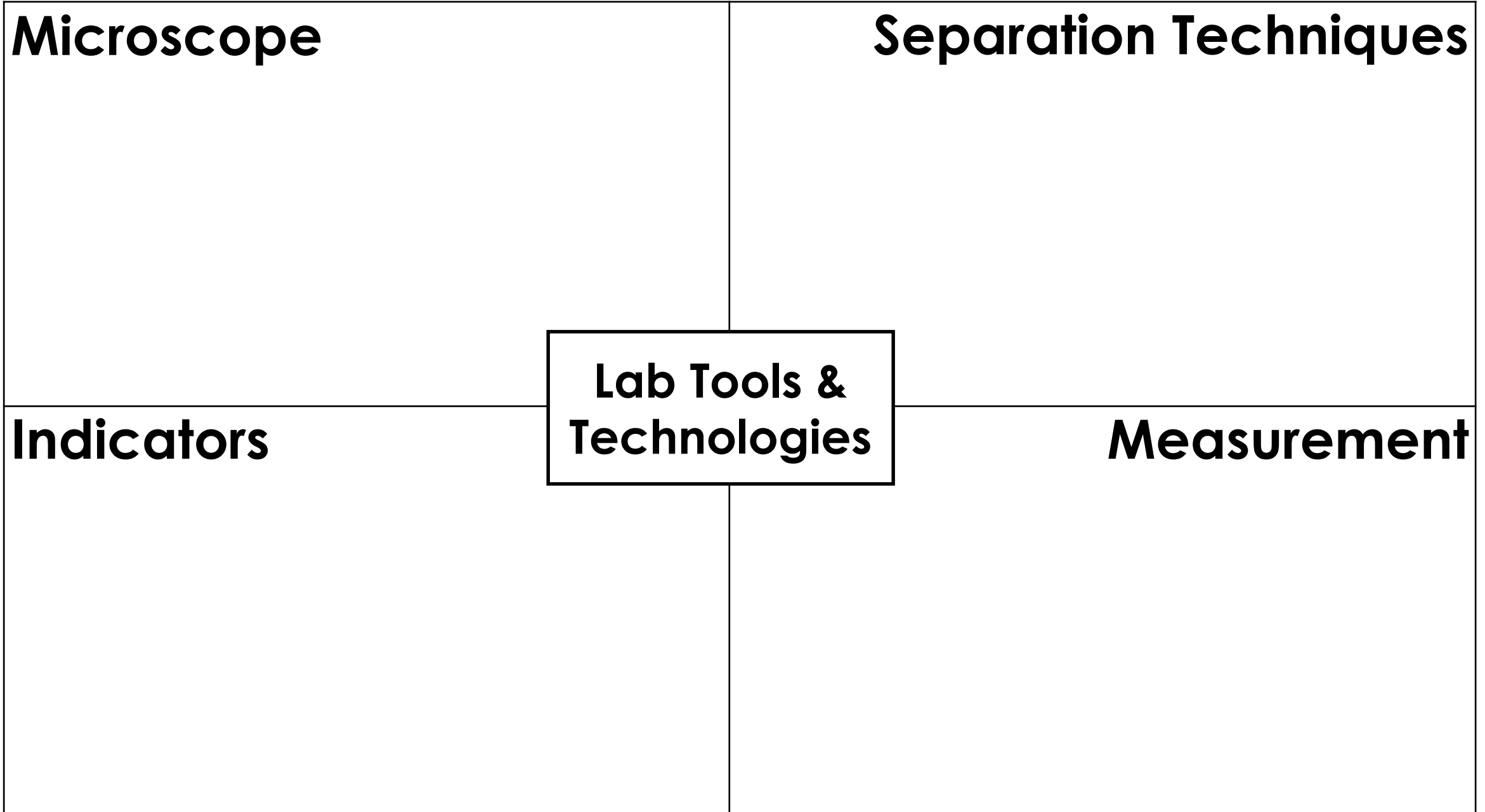


Validity

- Large Sample size, multiple trials → more data
- Only one independent variable is tested at a time
- Other experimenters can repeat, yielding the same results!

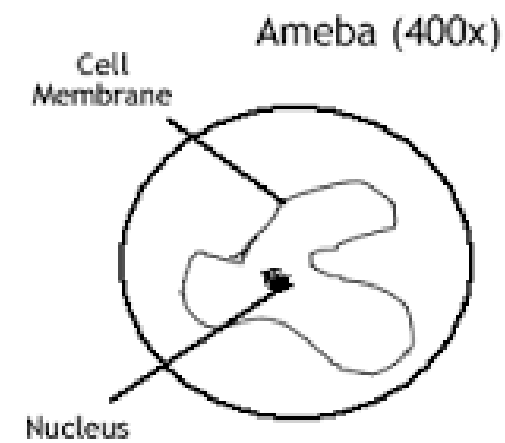
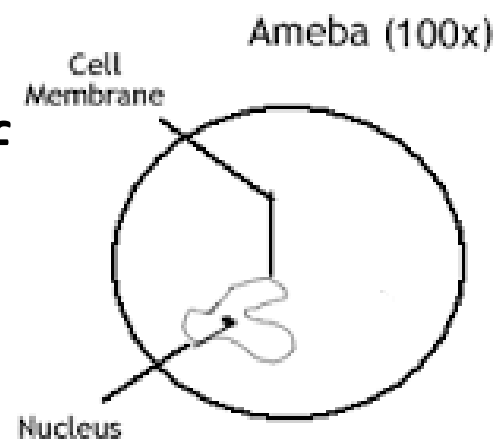


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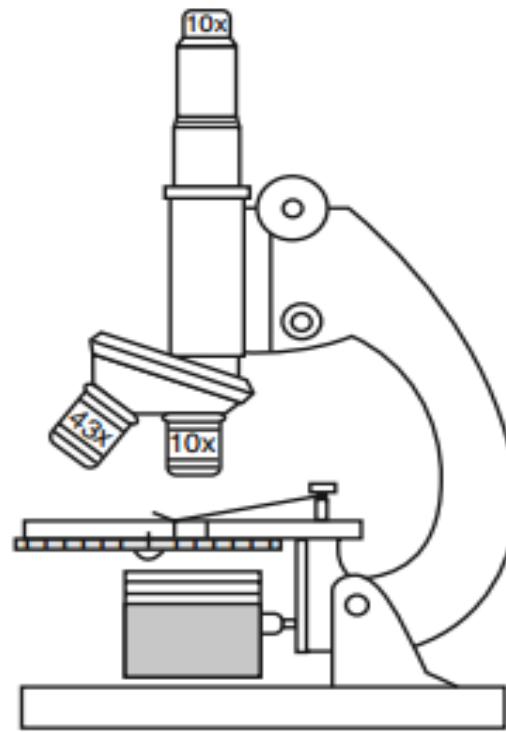


Microscope

- High power – dark, narrowest field of view
- Low power – bright, wider field of view
- Total Magnification = ocular x objective
- Image is inverted & reversed (upside down & backwards)
- Moving a slide to the right makes specimen appear to move left under the scope!
- Diaphragm – adjusts amount of light
- Course Adjustment – never on high power!



Microscope



- 48 The image of the specimen viewed using high power with this microscope will appear larger than when viewed using low power. State *one* other way the image of the specimen as seen using high power would differ from the image as seen using low power. [1]

Darker, less area of specimen will be viewable

Note: The answer to question 49 should be recorded on your separate answer sheet.

4

- 49 What is the total magnification of this microscope using the high-power objective lens?

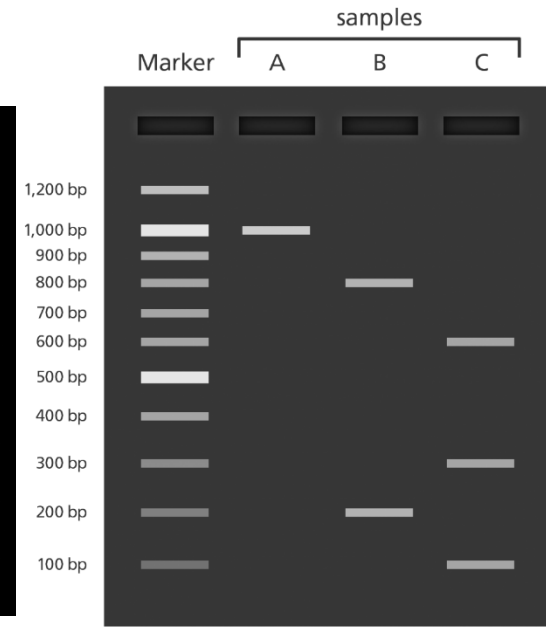
(1) 43×
(2) 53×

(3) 100×
(4) 430×

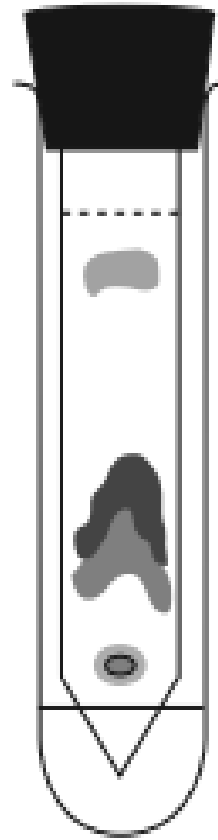
10x x 43x = 430x

Separation Techniques

- Chromatography
 - filter paper and pigments/inks – capillary action separates molecules by size
- Gel Electrophoresis
 - DNA fragments move through a gel based on size, due to electric current
- Ultracentrifuge
 - separates mixtures based on density
 - Ex. Separating cell organelles or blood components



74 The diagram below represents the results of a laboratory procedure.

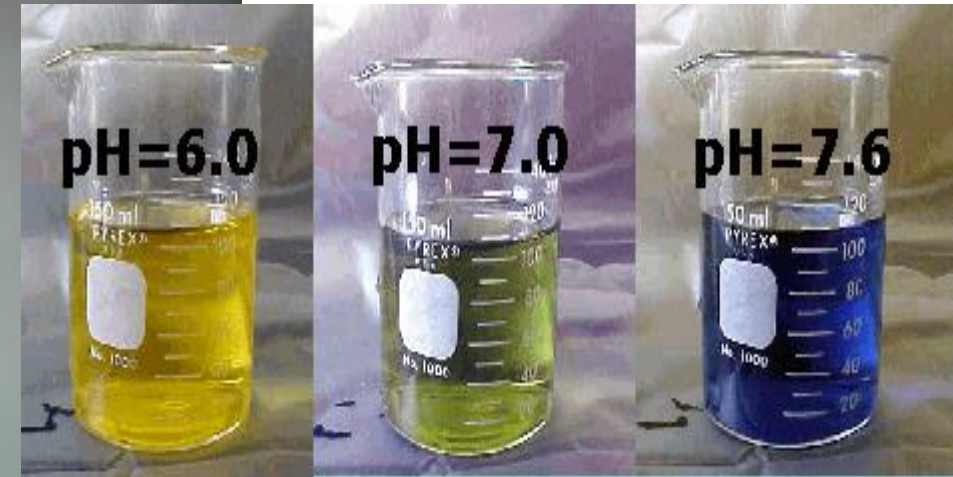


This procedure is used to

- (1) separate molecules in a liquid mixture
- (2) determine the rate of photosynthesis in plants
- (3) detect glucose in a solution
- (4) examine the gene sequences of organisms

Indicators

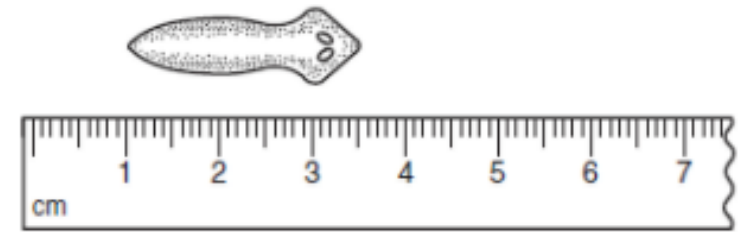
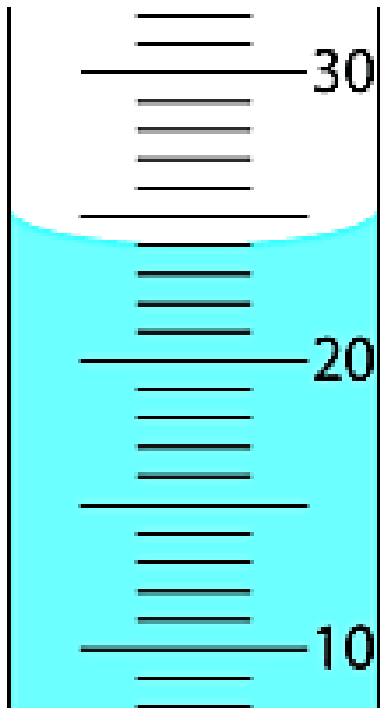
- Causes color change/bubbling if positive result
- Lugol's Iodine – starch (turns bluish-black)
- Benedict's Solution – glucose when heated (turns orange)
- Bromthymol Blue – carbon dioxide (turns yellow)



Measurement

- 1 centimeter = 10 millimeters
- 1 millimeter = 1000 micrometers
- Pay attention to scale on apparatus (1s,2s,5s,etc.)
- Volume of liquid is measured at lowest point (meniscus)

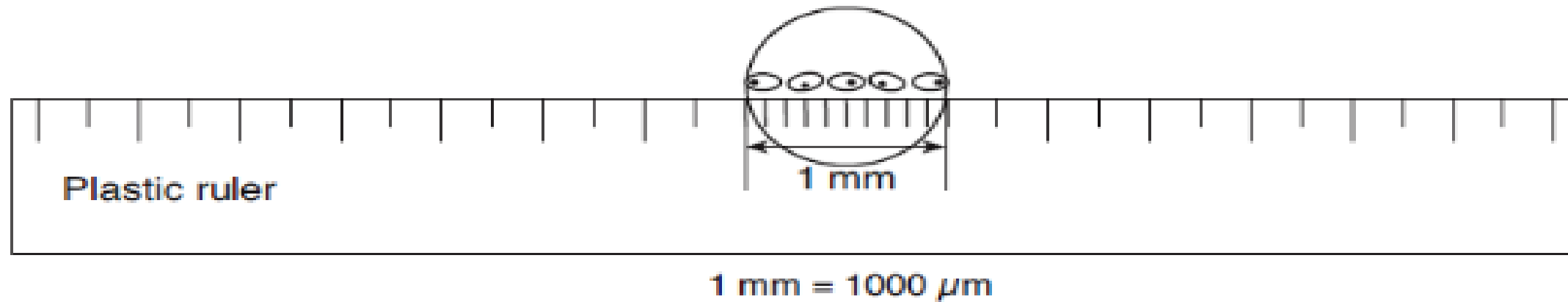
The diagram below represents the measurement of a biological specimen.



What is the approximate length of the specimen in millimeters?

- A) 25 mm
- B) 30 mm
- C) 35 mm
- D) 40 mm

A clear plastic ruler is placed across the middle of the field of view of a compound light microscope. A row of cells can be seen under low-power magnification ($100\times$).



What is the average length of a single cell in micrometers (μm)?

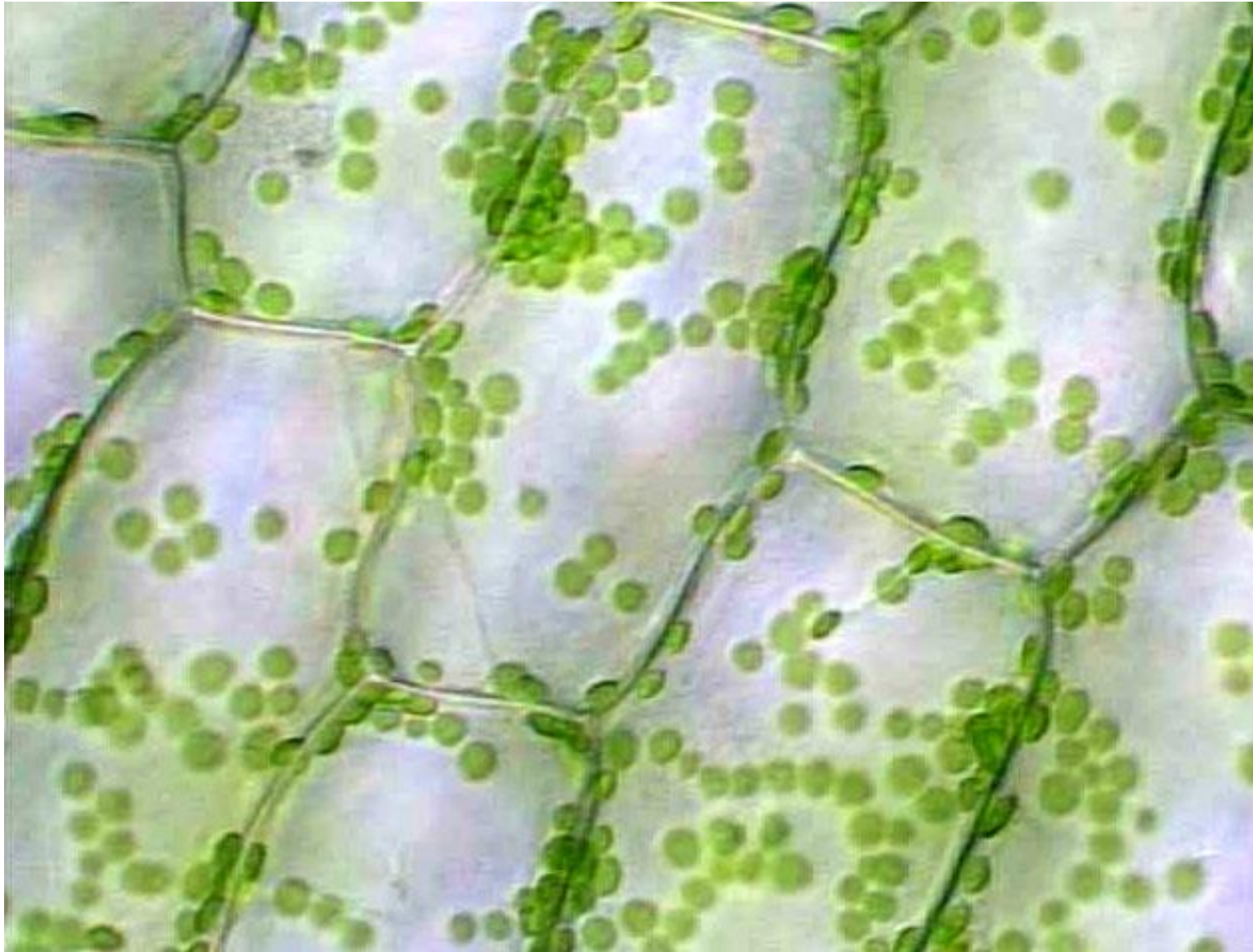
- A) $10\mu\text{m}$
- B) $100\mu\text{m}$
- C) $200\mu\text{m}$**
- D) $2000\mu\text{m}$

Topic Review 2

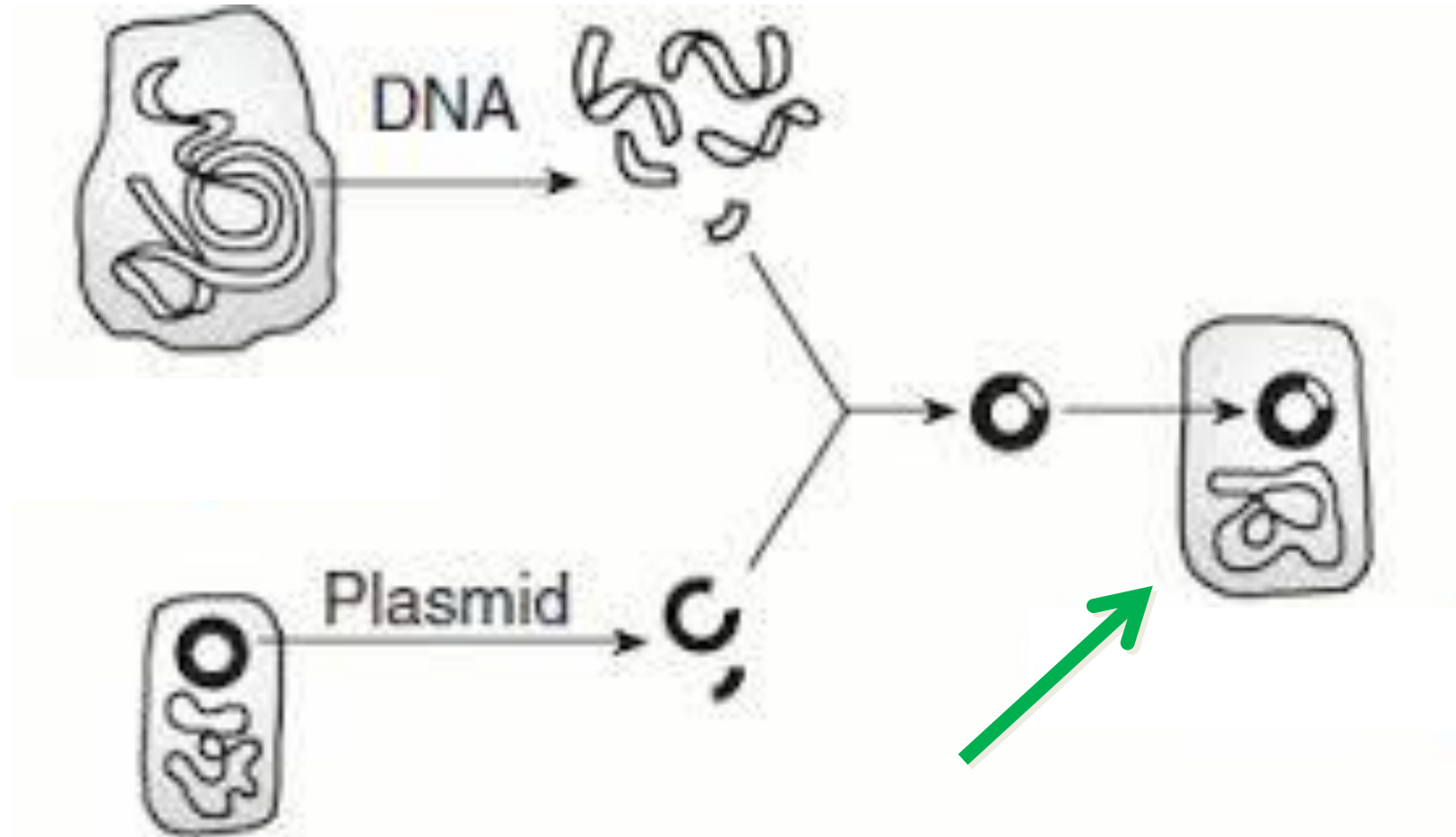
Life Processes

Cells

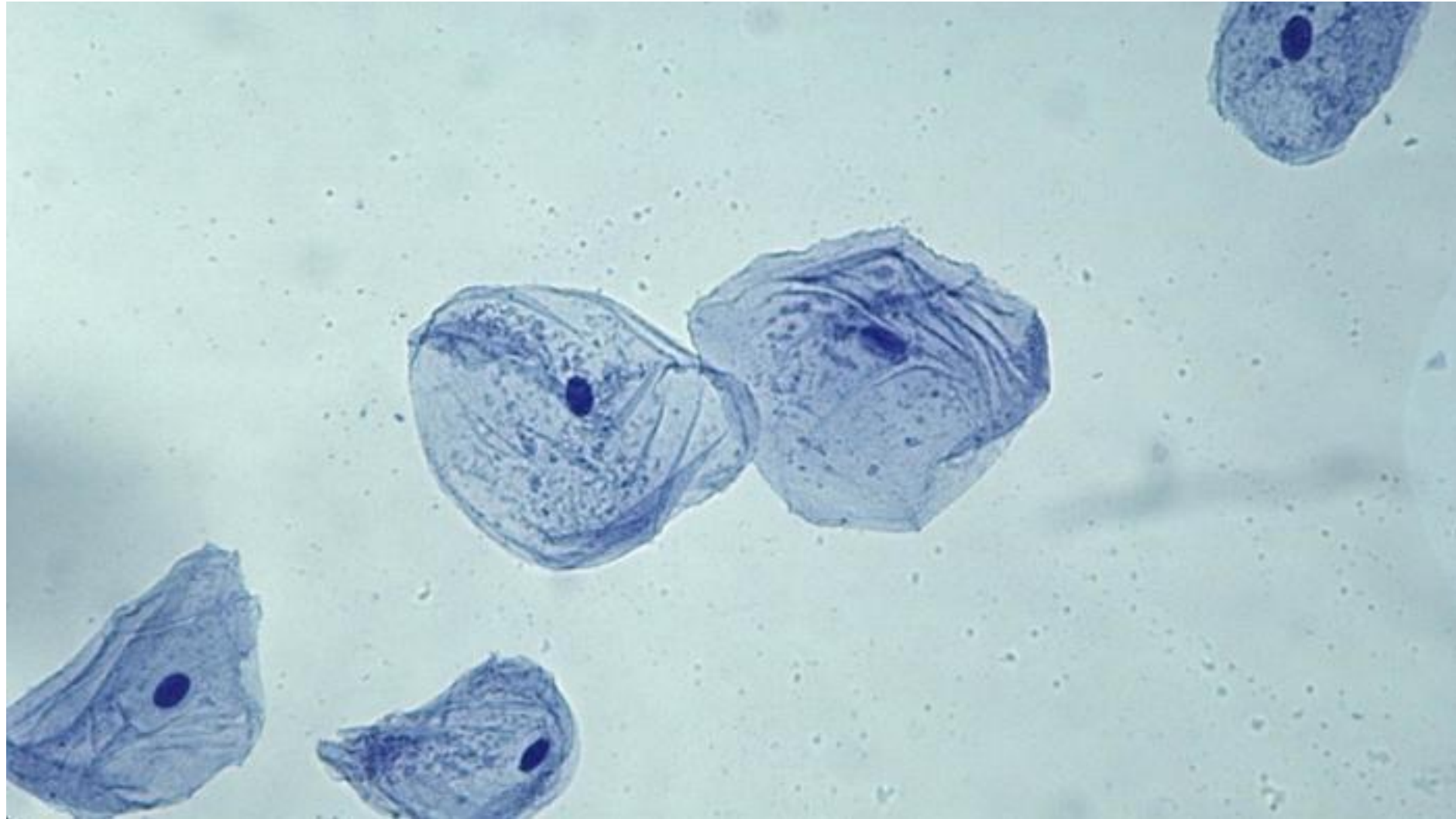
What type of cell is this? How do you know?



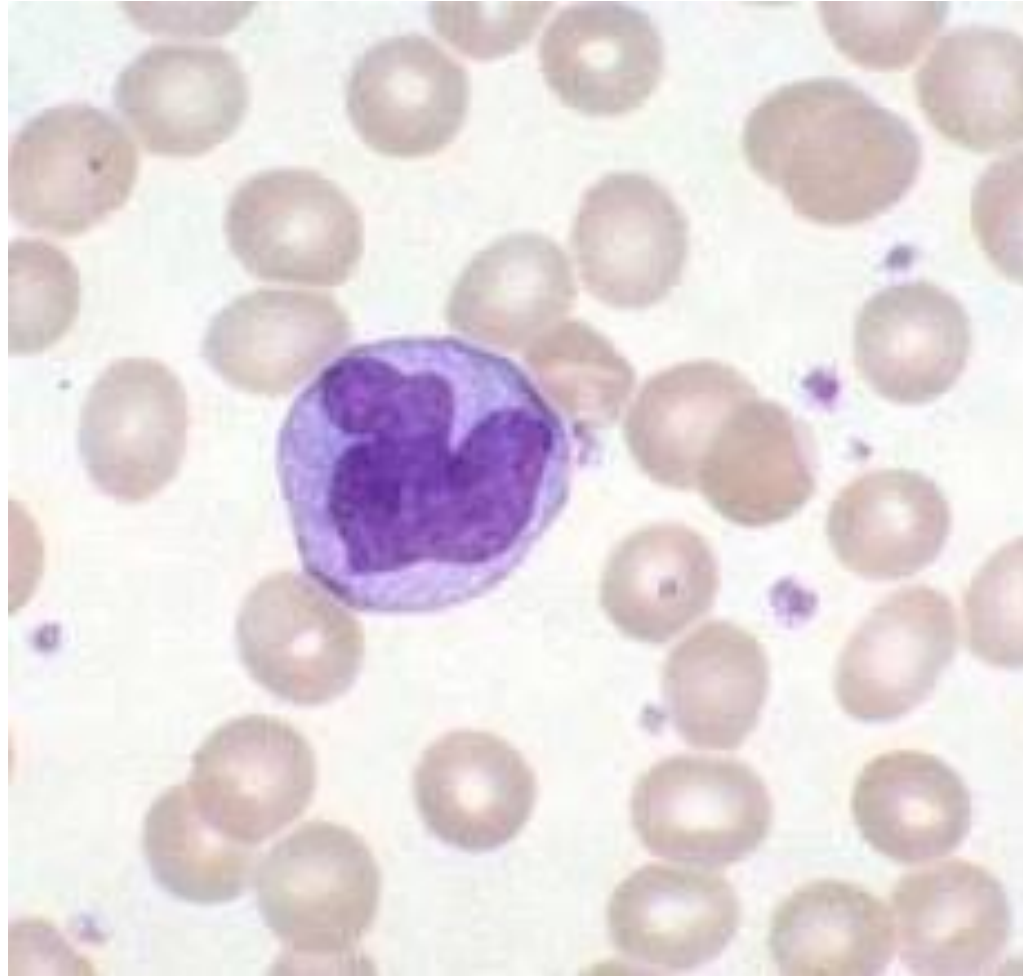
What type of cell is this?
How do you know?



What type of cell is this? How do you know?

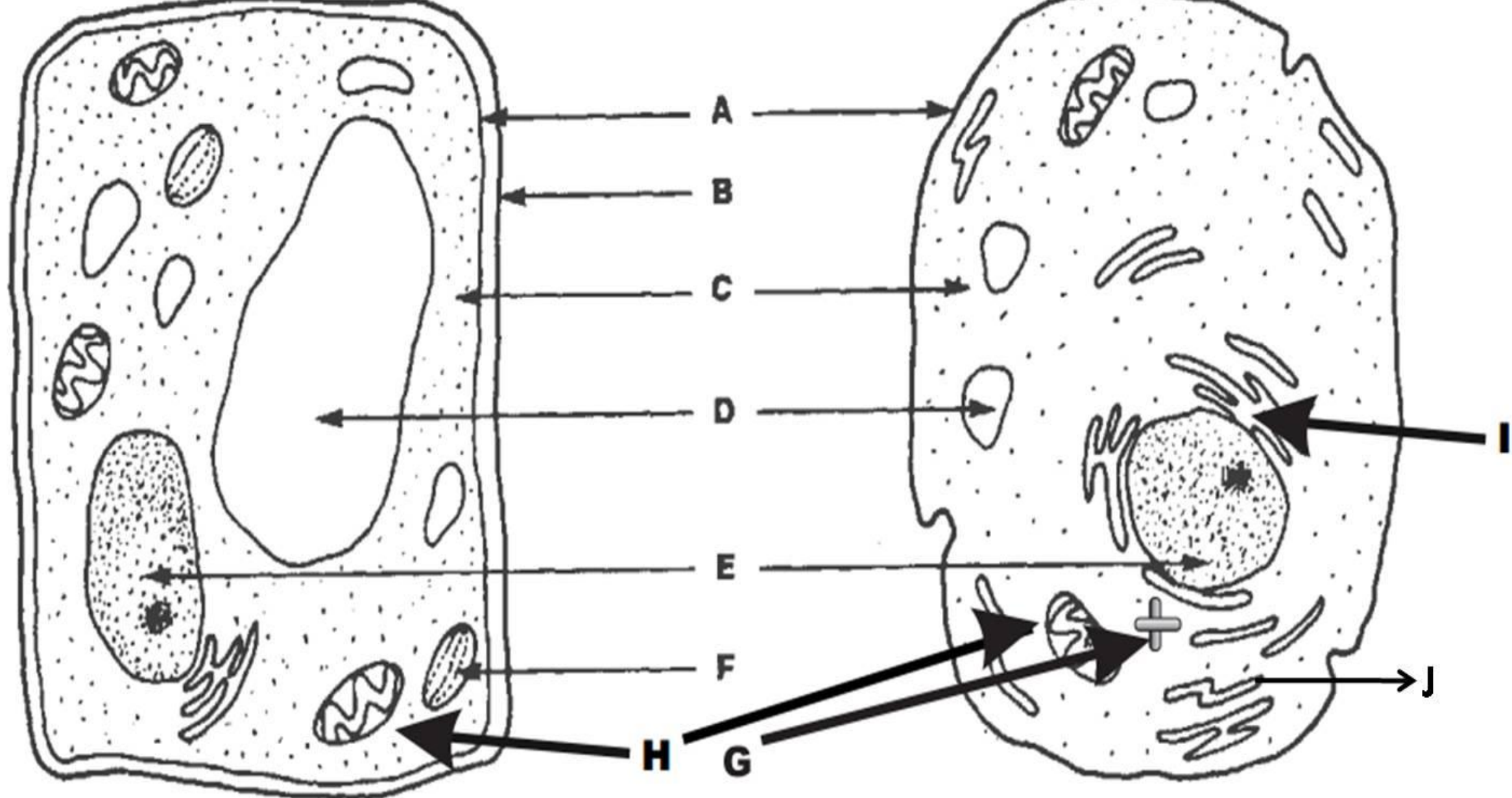


What type of cells are these? How do you know?



Life Processes & Cells

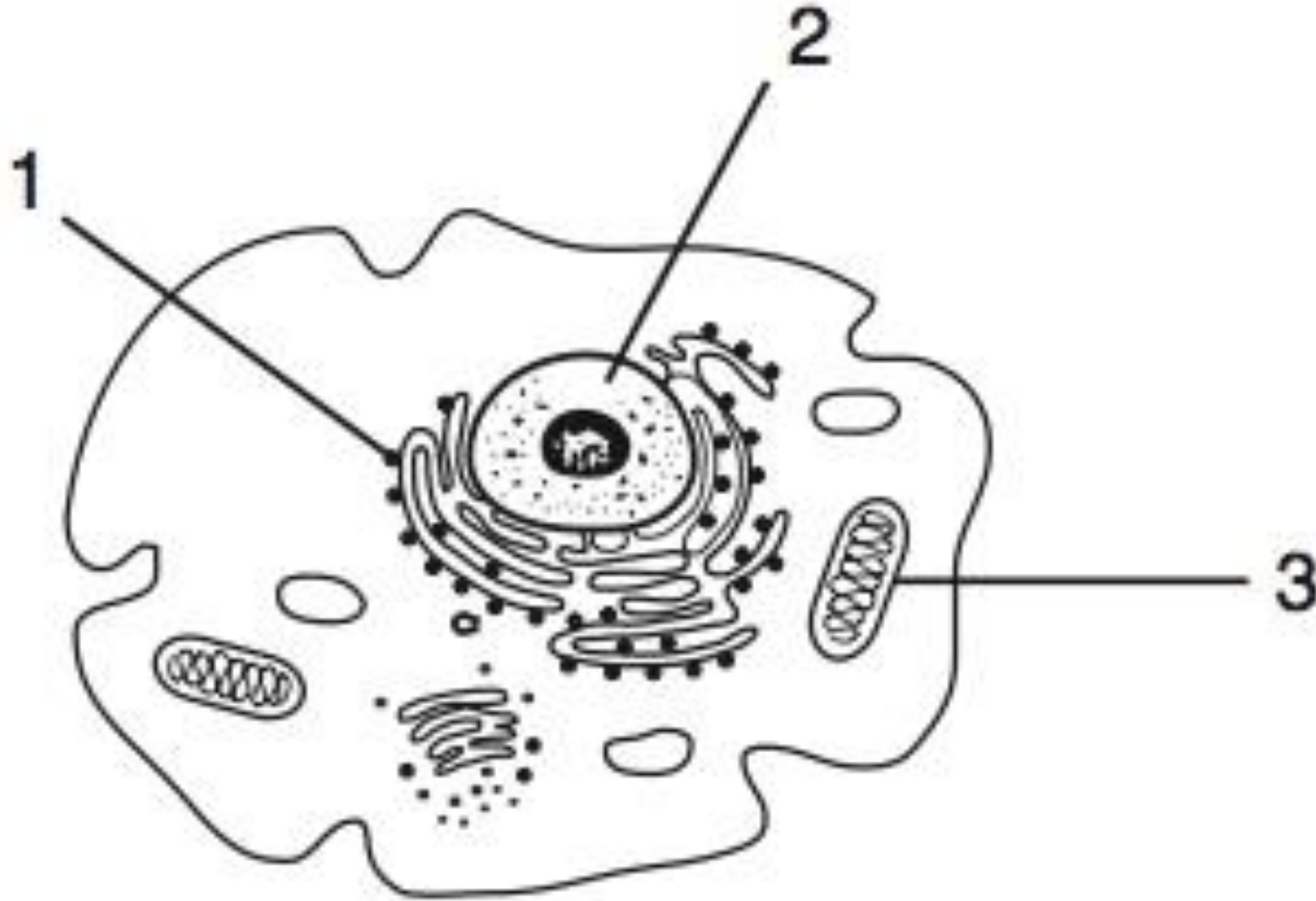
Draw a picture or write symbols in this box to summarize the topic.



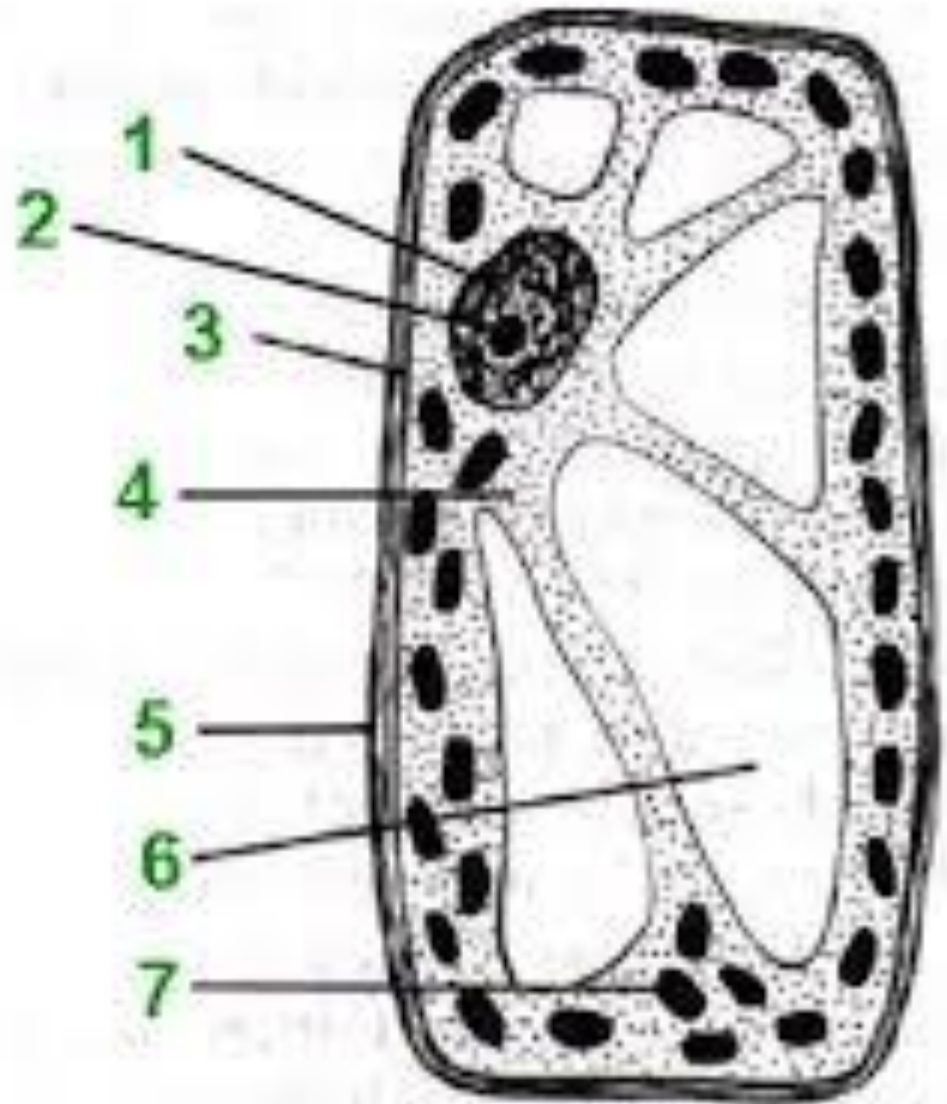
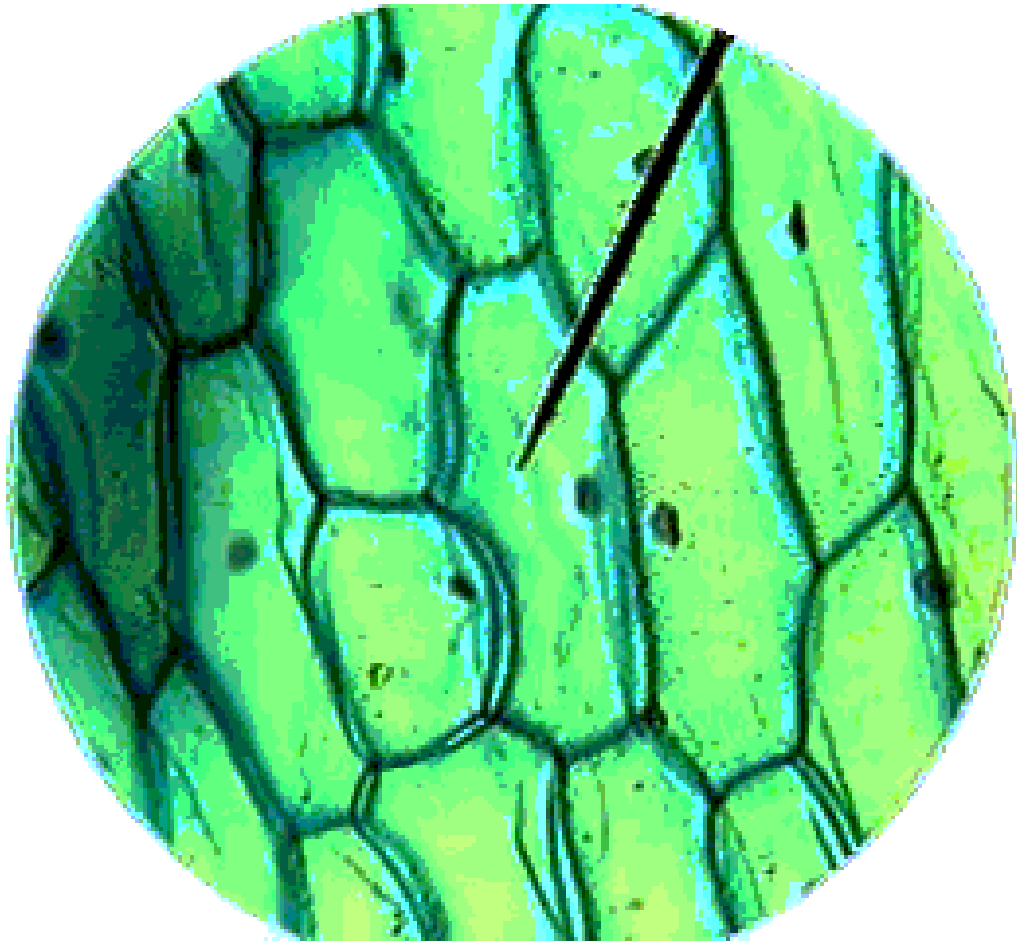
1. Plant Cell

2. Animal Cell

Animal Cell



Plant Cell



Levels of cellular organization



Cells

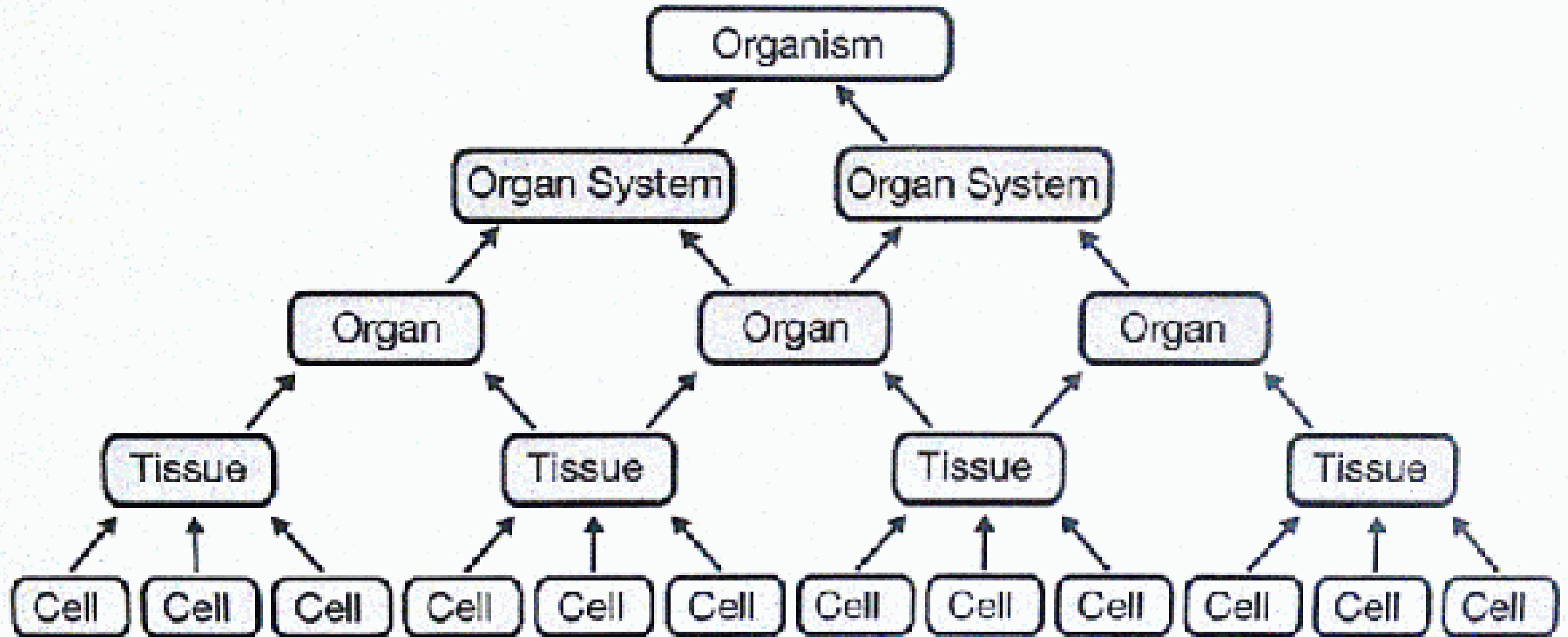
Tissues

Organ

Organ System

Organism

Levels of Organization



List Key Words about the topic

8 essential life functions and associated processes

- R** Regulation – ex. osmosis
- R** Respiration – ex. aerobic cellular respiration, fermentation
- R** Reproduction – ex. mitosis, meiosis, asexual, sexual
- E** Excretion – ex. exhalation, sweating, urination
- G** Growth – ex. zygote cleavages, insect metamorphosis
- N** Nutrition – ex. digestion (heterotrophic), photosynthesis (auto)
- T** Transport – ex. absorption and circulation
- S** Synthesis – ex. protein synthesis, photosynthesis

Paragraph: Summarize your understanding by using the key words you listed above to write a concise paragraph. **Check off** terms on the list as you use them. **Circle** the terms in your writing below.

EX. Try describing how these life processes interact in a cell maintaining homeostasis. Or, make a connection between life processes and cell organelles.

Nutrition provides the glucose needed for respiration to break down food and release energy needed by cells.

Cell membranes are selectively permeable in order to be able to regulate which materials can enter a cell on the basis of their size.

Mitochondria release ATP for use by the cell membrane to actively transport molecules in and out of the cell.

Others?

Topic Review 3

Biochemistry

Elements

**Inorganic vs. Organic
Compounds**

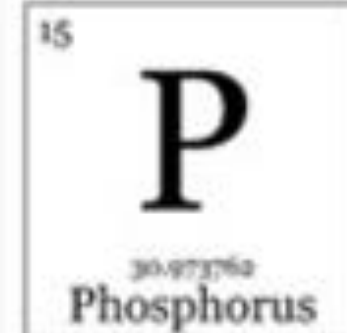
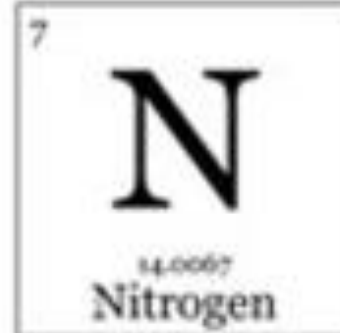
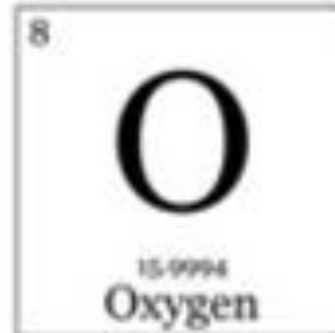
Building Blocks

**Basic
Biochemistry**

Enzymes

Elements

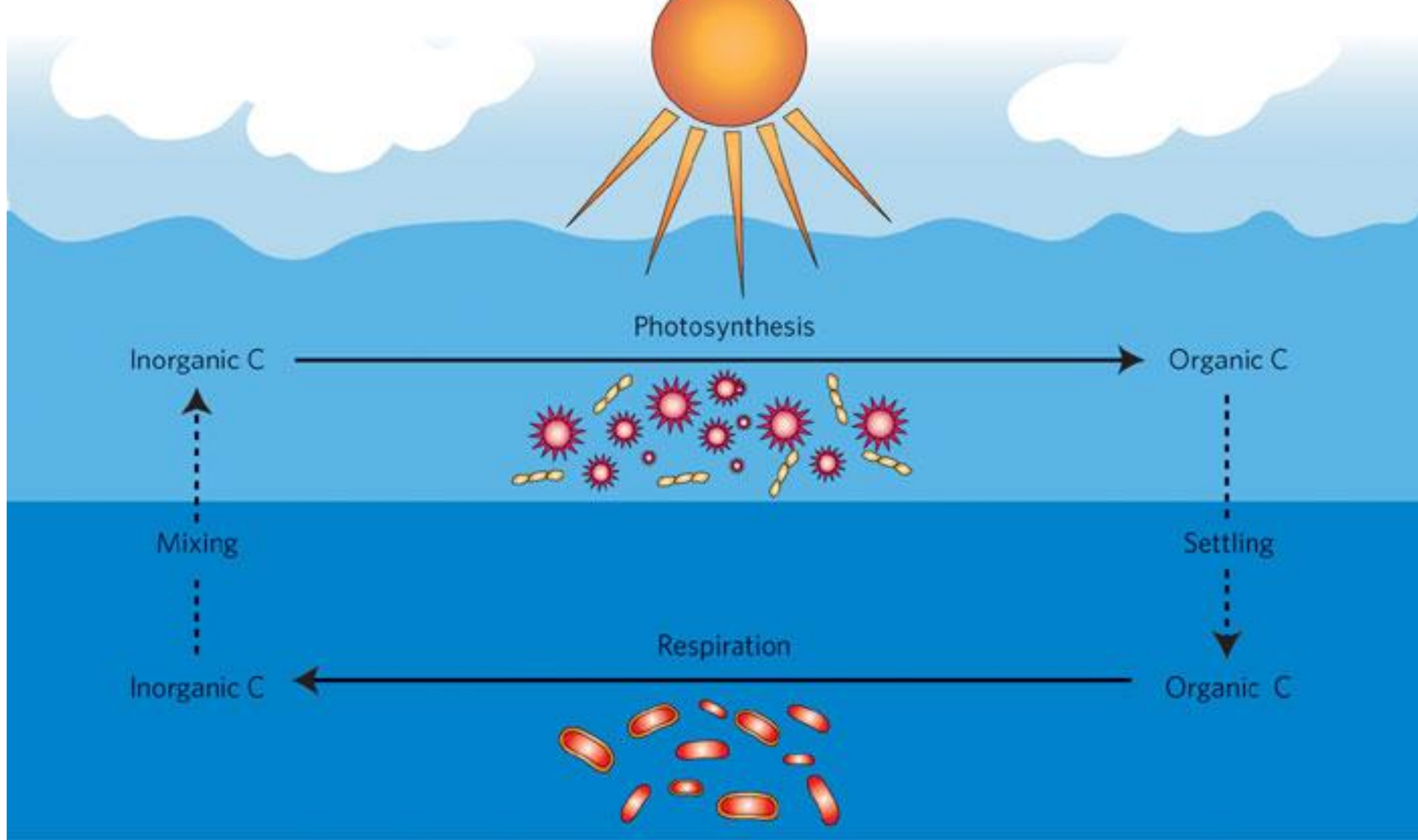
- CHONPS (order of abundance in living things)
- Smaller amounts of others including:
 - Calcium, Iodine, Sodium, Potassium, Iron, Magnesium, etc.
- Nitrogen – important for building amino acids/proteins
- Cycle between living things and the environment through material cycles



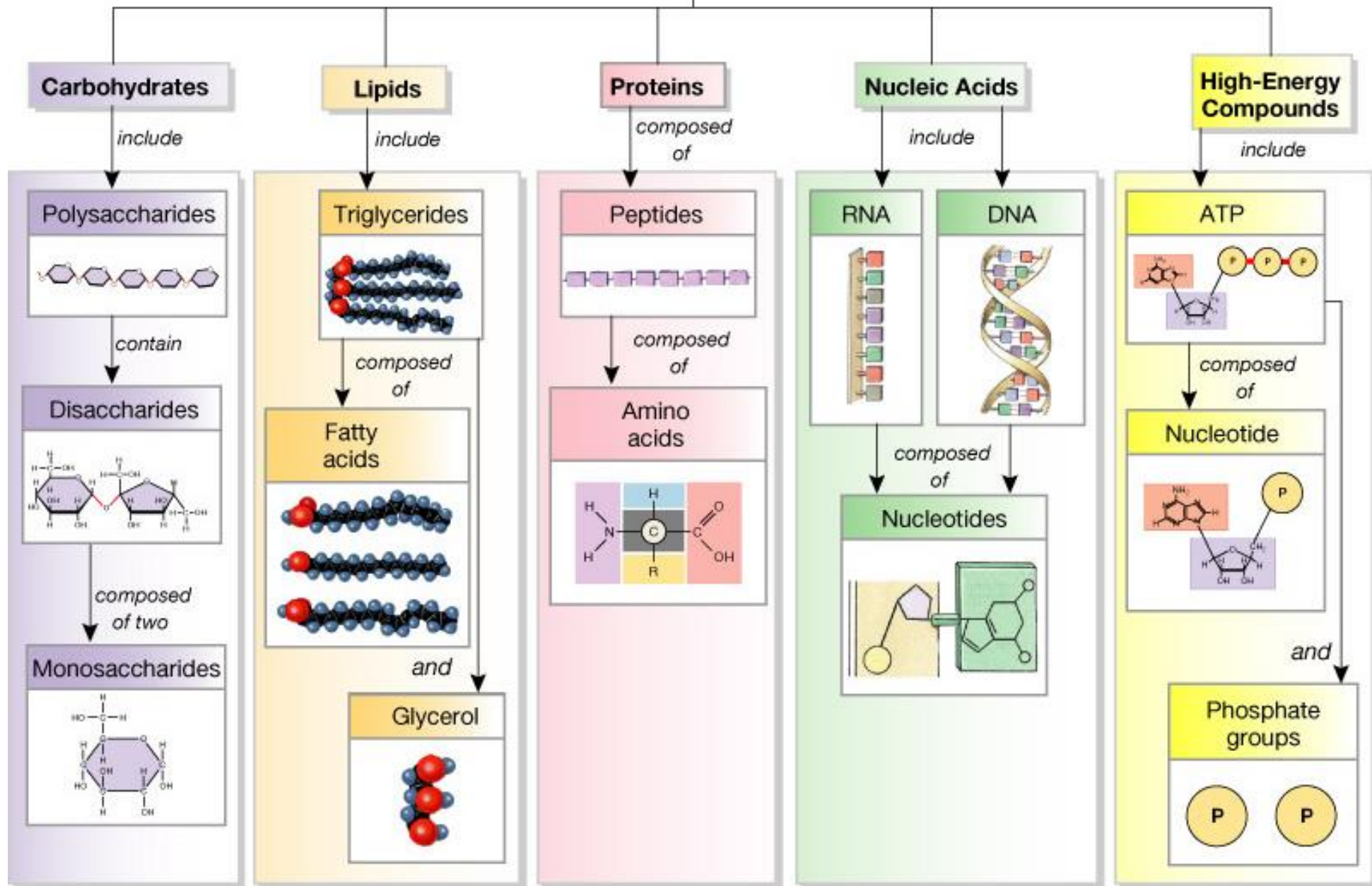
Inorganic vs. Organic - cycle in an ecosystem

- Inorganic: lacks combination of C & H (ex. salt, CO₂)
 - H₂O is most important inorganic compound
 - Salt (NaCl) is also important for chemical reactions
- Organic: has both C & H (ex. Glucose, starch, amino acids)
 - Have energy rich bonds
 - Energy is released when bonds are broken





ORGANIC COMPOUNDS



Building Blocks

Small (building blocks)

Amino acid

Simple sugar (glucose)

Nucleotide

Glycerol & fatty acids

CAN diffuse

Large

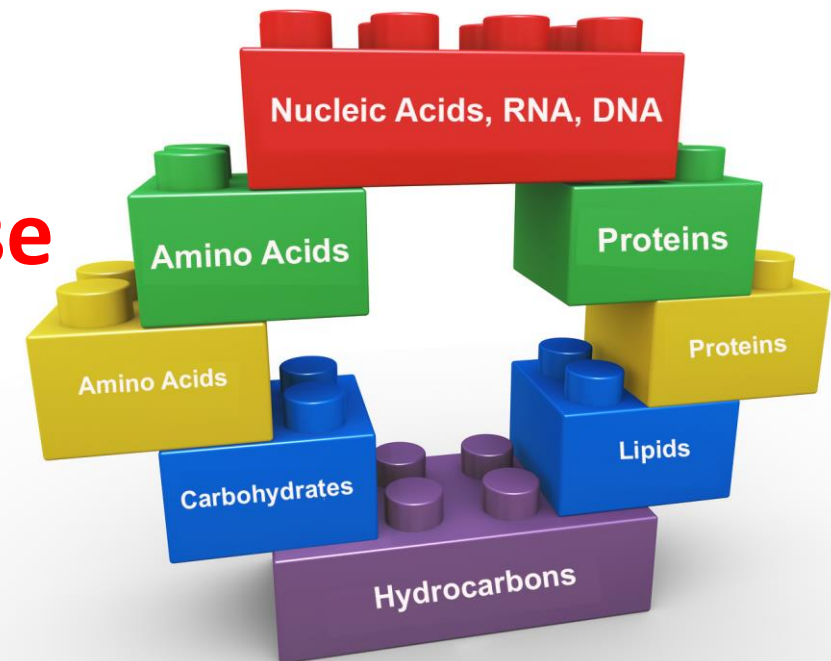
Protein

Starch

Nucleic Acid (DNA, RNA)

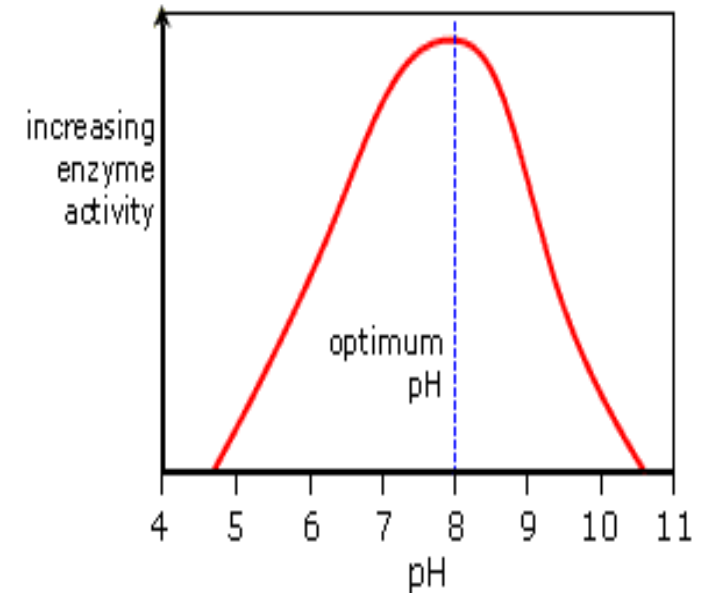
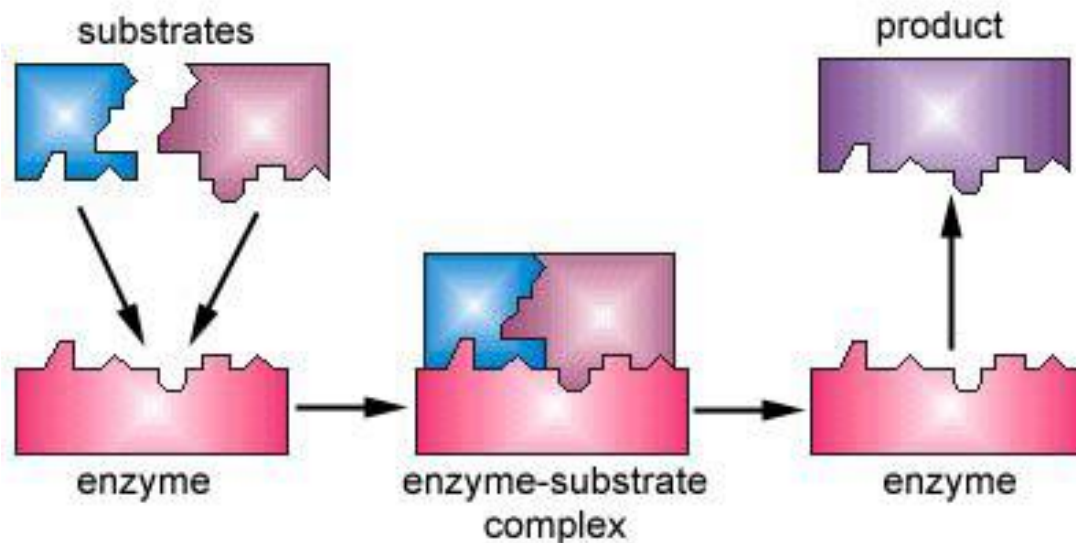
Lipid

Can NOT diffuse



ENZYMES (proteins)

- Organic/biological catalysts, control rate of chem. reactions
- Fit only with specific shape substrate
- Activity altered by pH level, temperature, or concentration
 - Cold - activity slows but not denatured
 - Too hot - activity slows and may be denatured



Aerobic Cellular Respiration

**Anaerobic Respiration /
Fermentation**

**Biochemical
Processes**

Photosynthesis

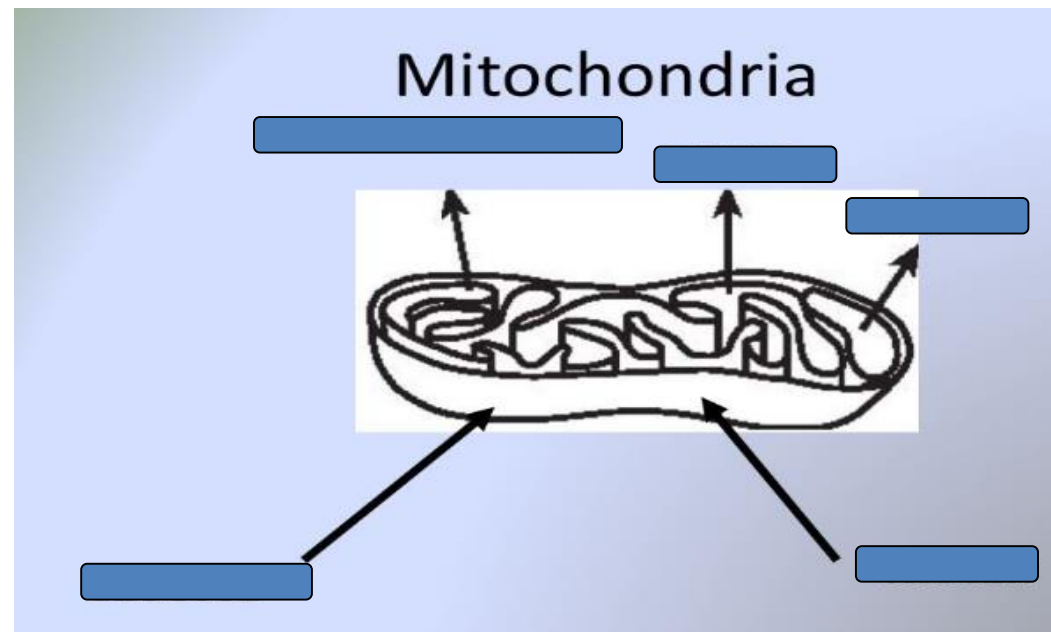
Plant Adaptations

Aerobic Cell Respiration

- uses oxygen to break down glucose
- High energy yield



- Occurs in all animals, plants, algae and some bacteria



Anaerobic Cell Respiration / Fermentation

- lower energy yield than aerobic

Lactic Acid Fermentation

- Animals (as a last resort) and some bacteria



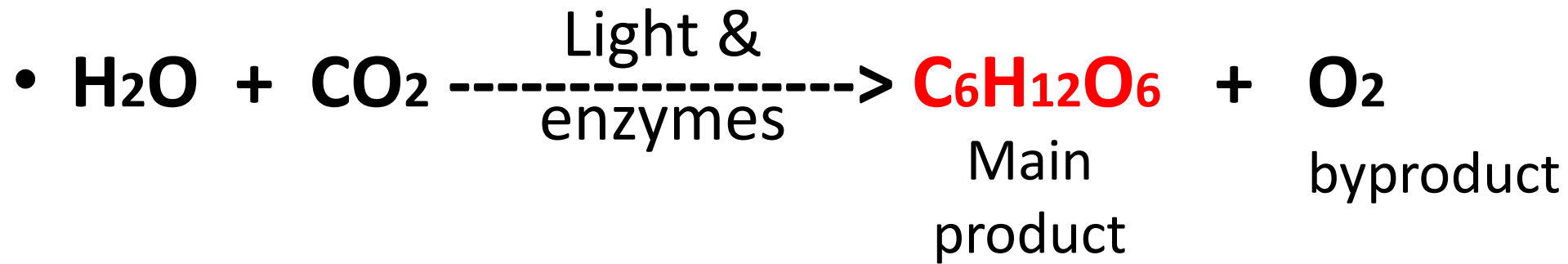
Alcoholic Fermentation

- Yeast and some bacteria



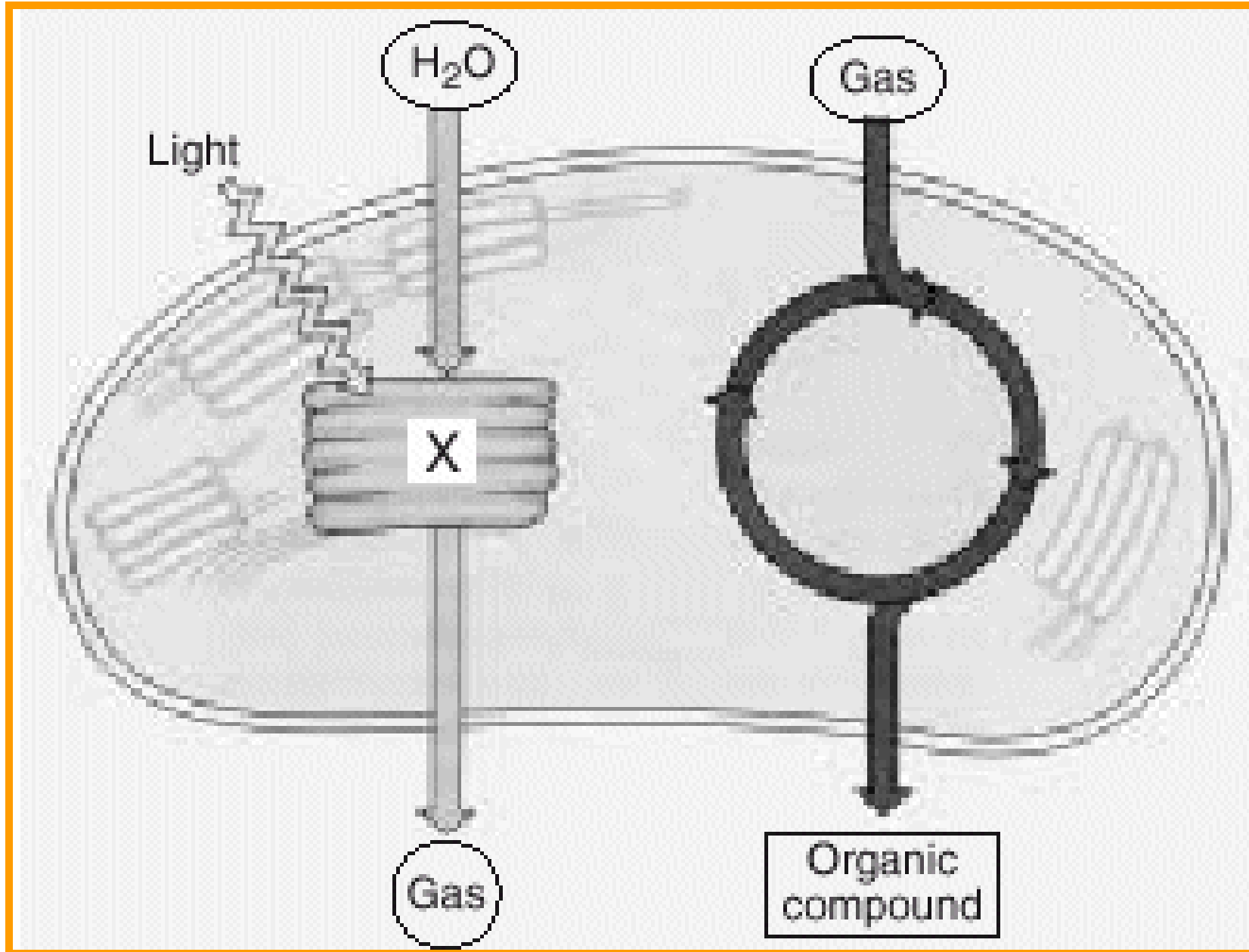
Photosynthesis

- Performed by autotrophs / producers (ex. plants & algae)
- Uses energy from the sun to convert inorganic compounds into energy rich organic compounds (food – glucose)

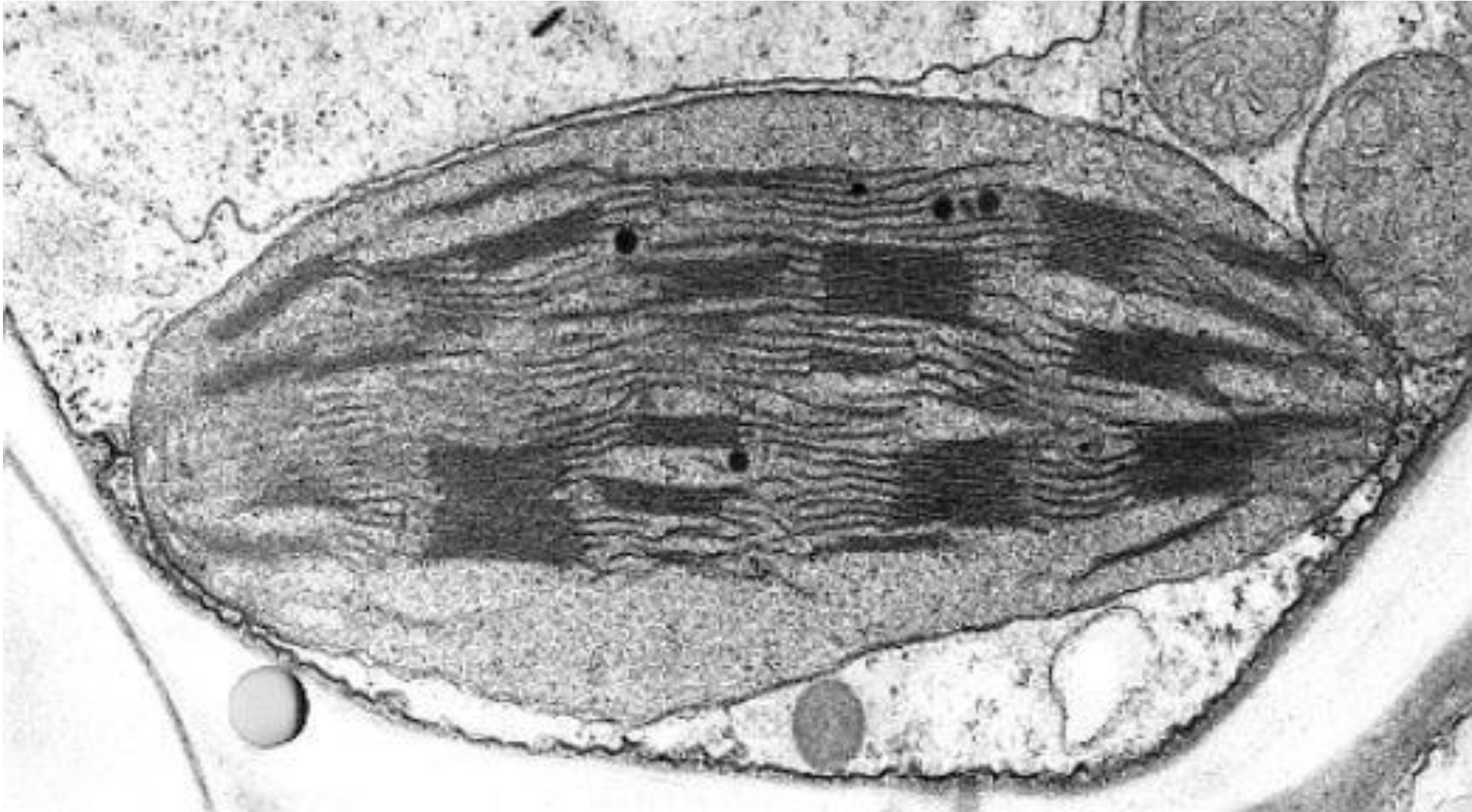


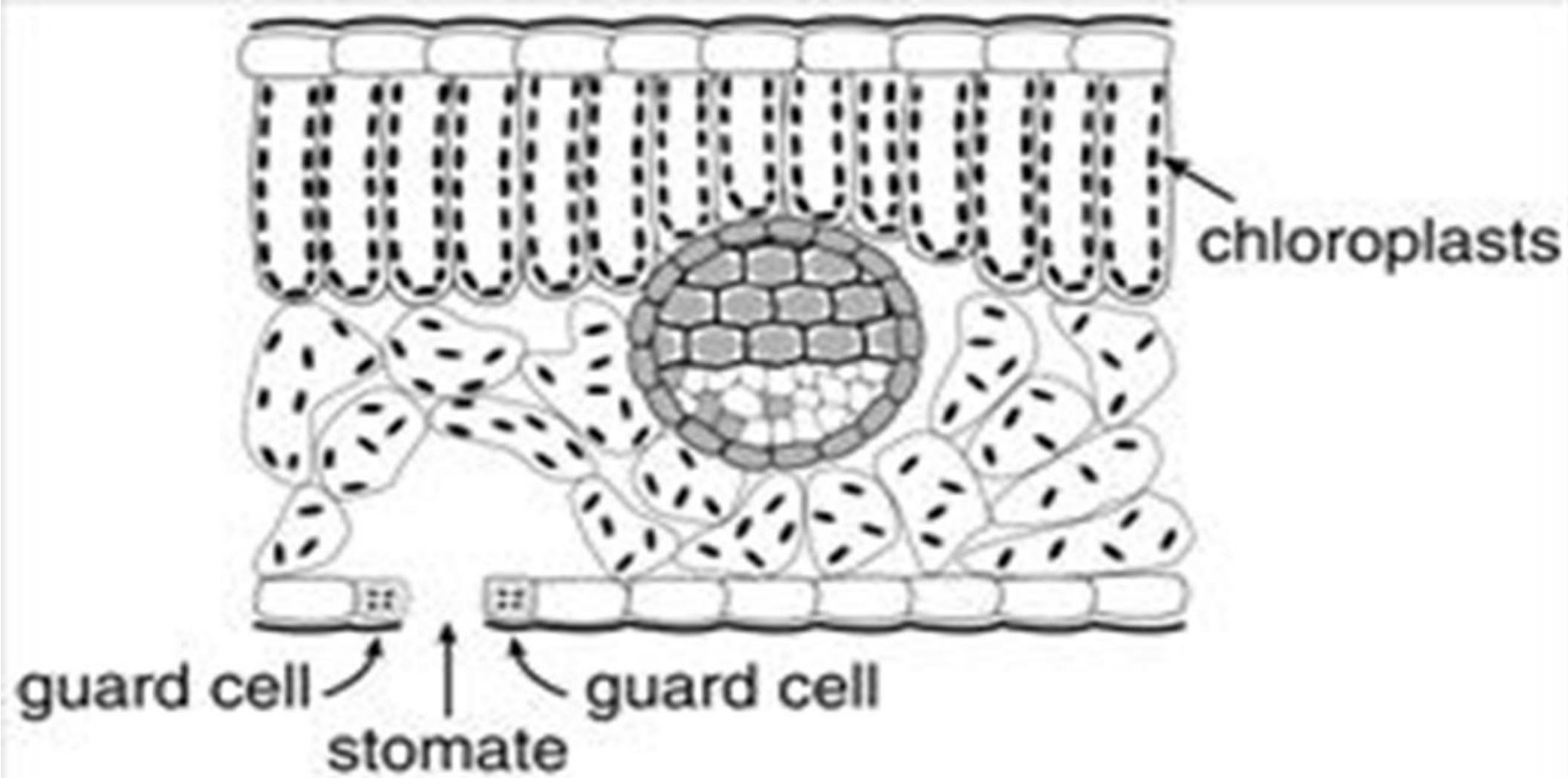
- Occurs in chloroplast

Photosynthesis



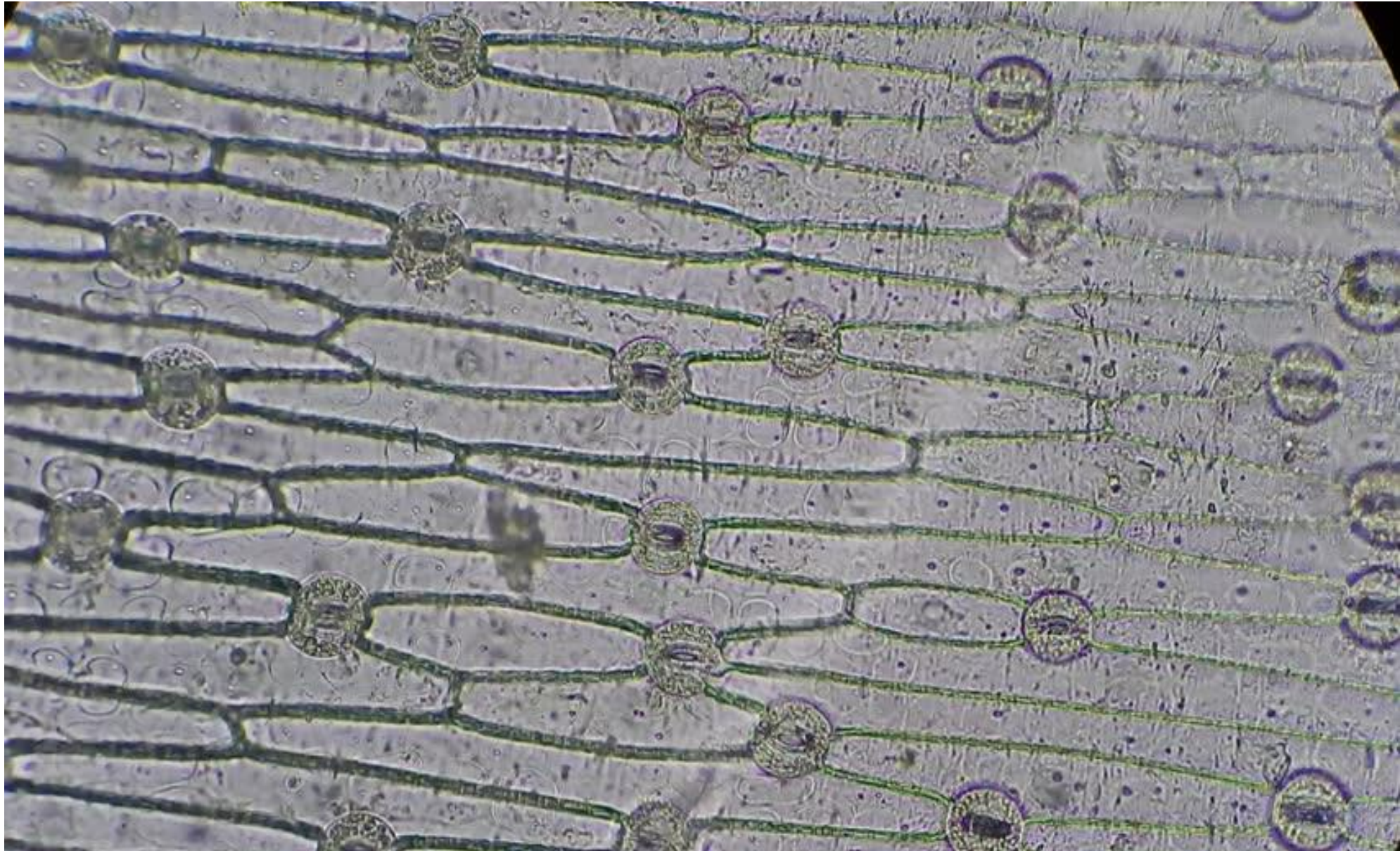
Chloroplast structure





Cross section of leaf

Lower Epidermis with Guard Cells



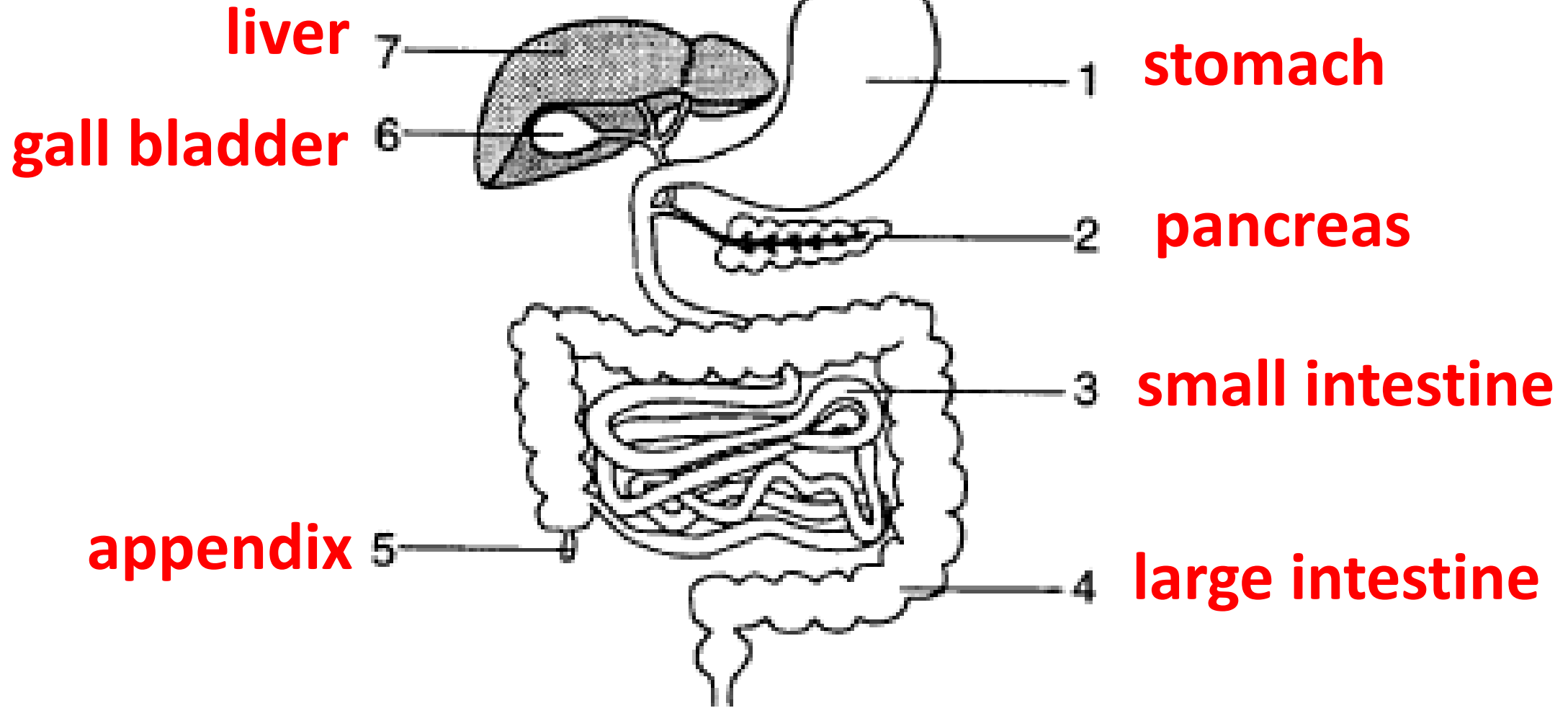
Plant Adaptations

- Leaves
 - flat & thin to absorb sunlight
 - stomates (holes in leaf) allow for gas exchange
 - guard cells open/close stomates (regulate water loss by transpiration)
- Roots/Stem
 - water enters at roots & moves up xylem by capillary action and transpiration pull
 - minerals enter by Active Transport (ATP)
- Flower
 - attracts pollinators for sexual reproduction

Topic Review 4

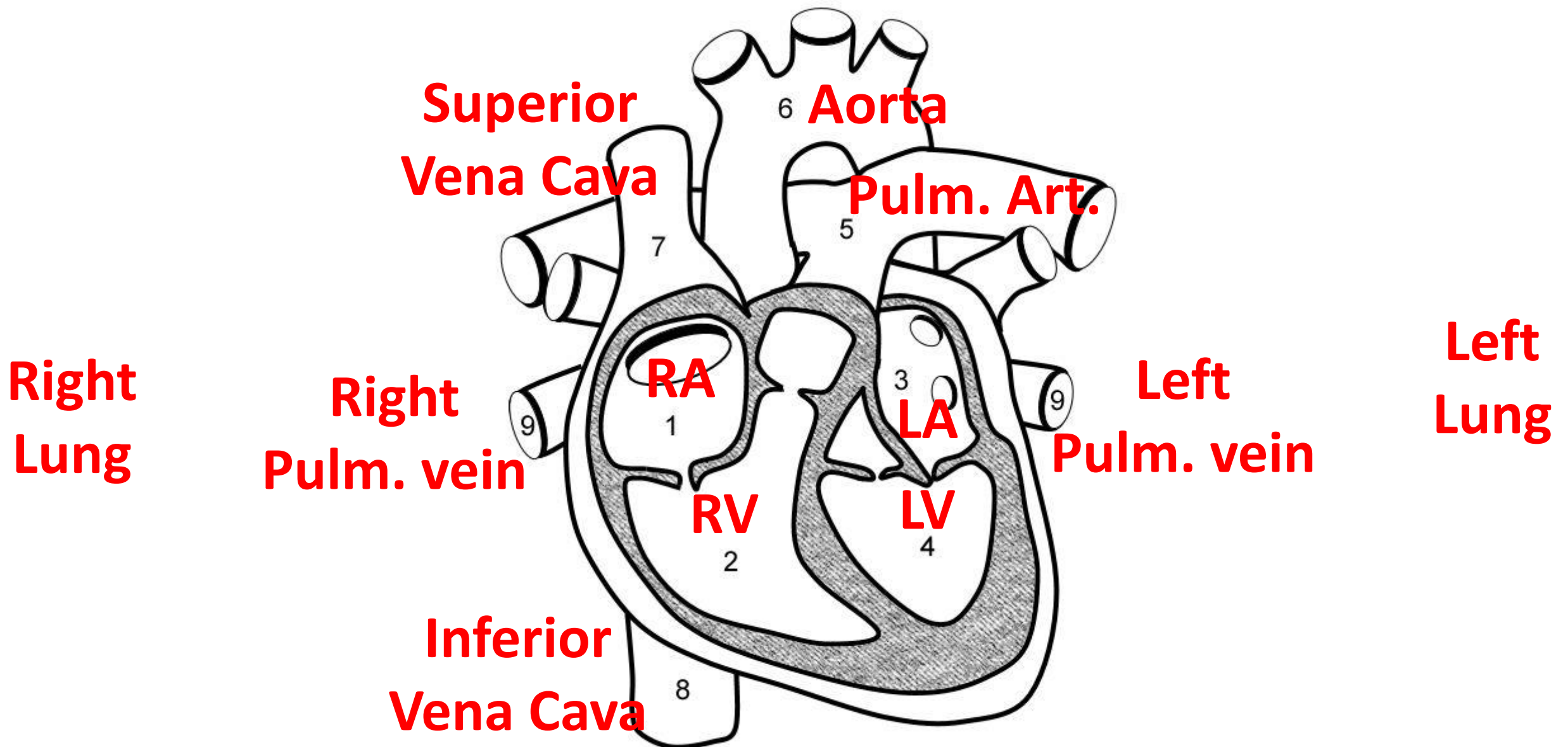
Homeostasis

Body Systems



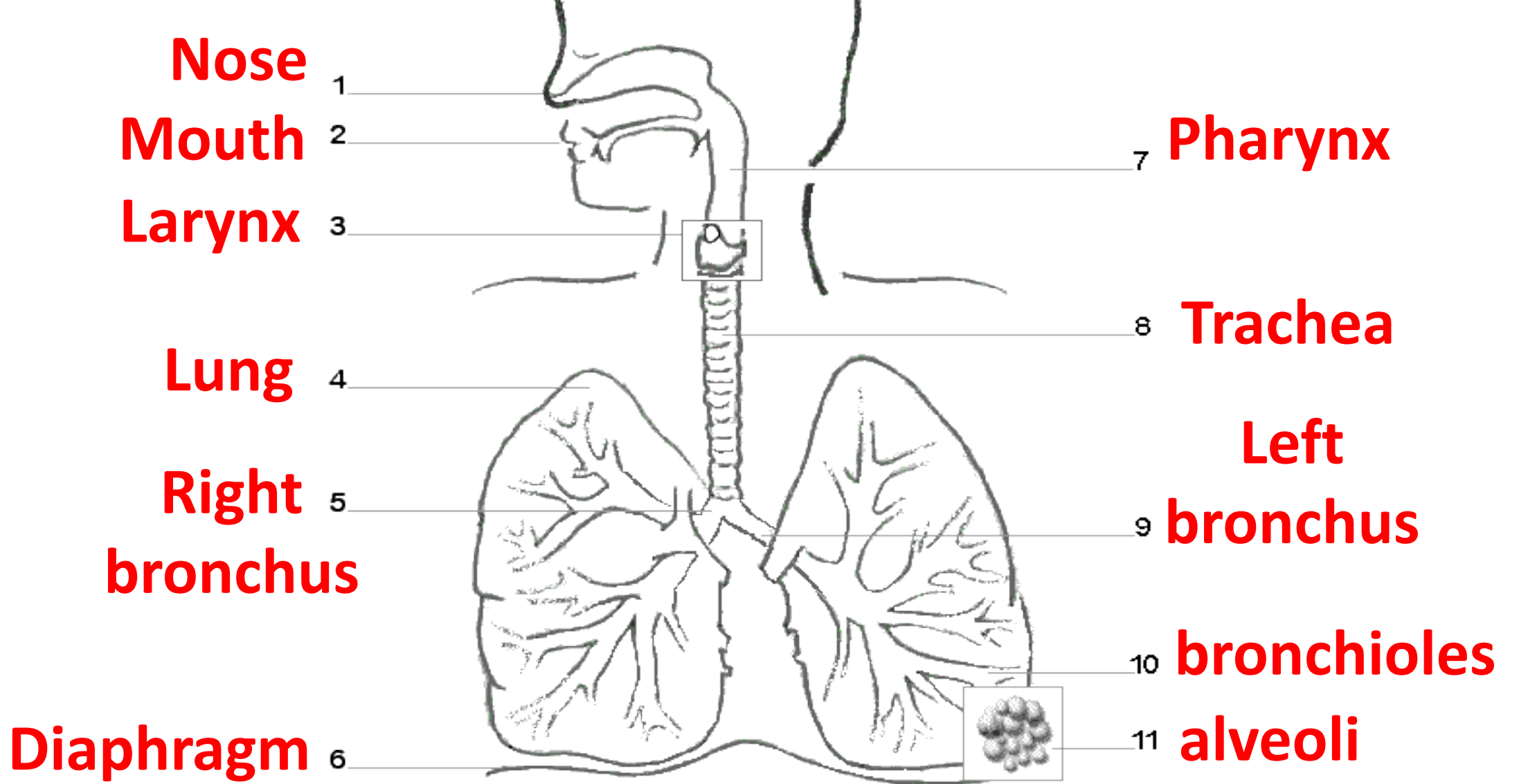
System Digestive

Life Process Nutrition



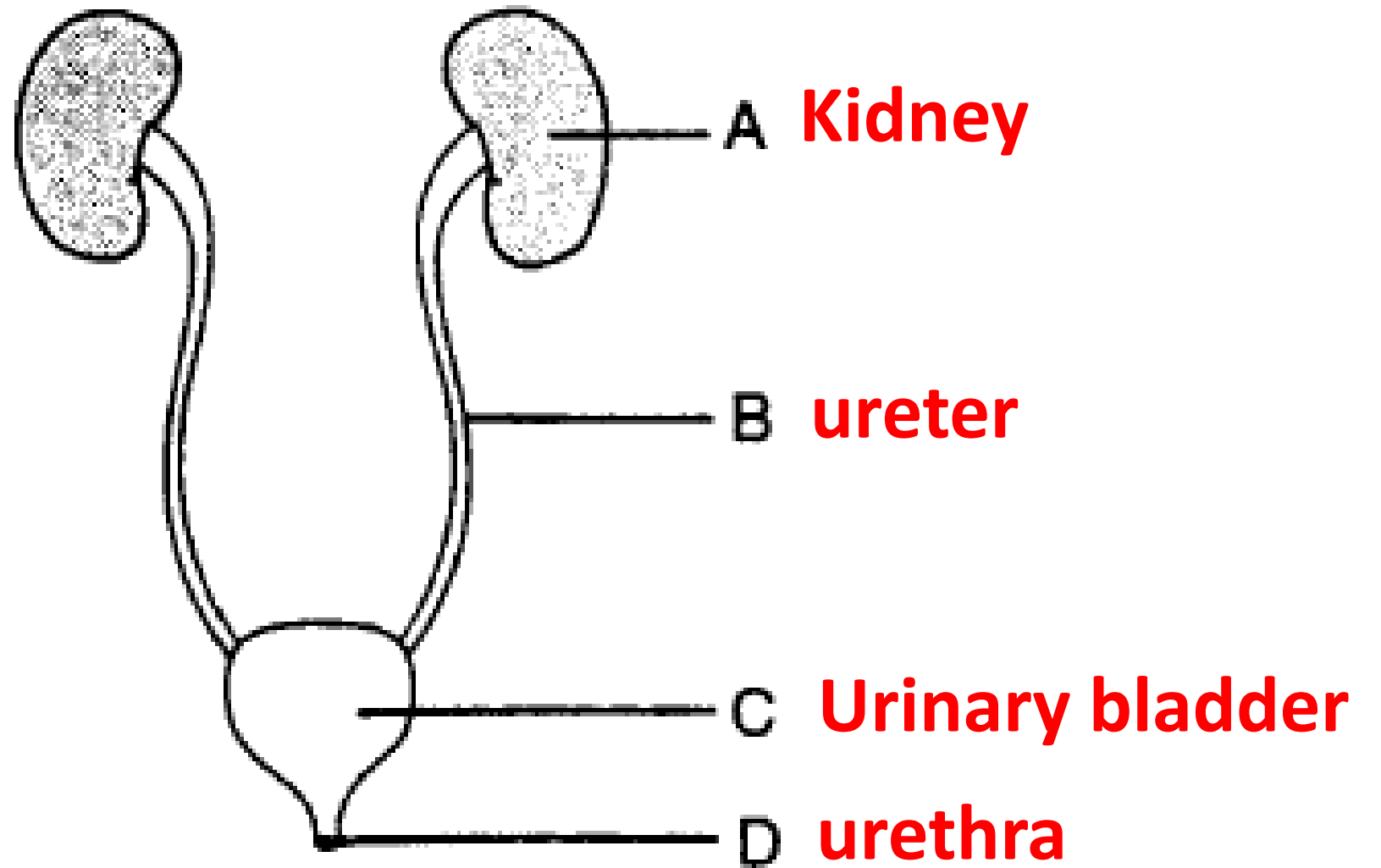
System **Circulatory / Cardiovascular**

Life Process **Transport**



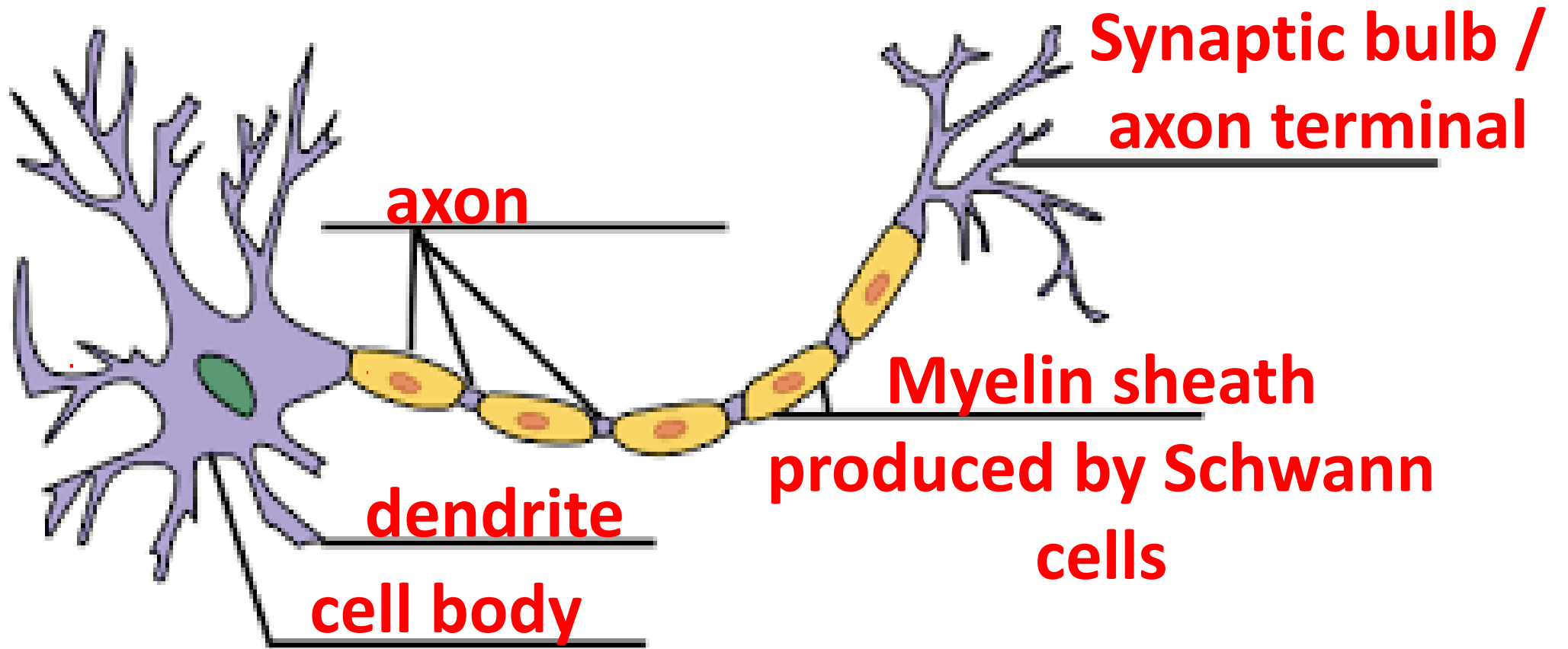
System Respiratory

Life Process Excretion, Respiration



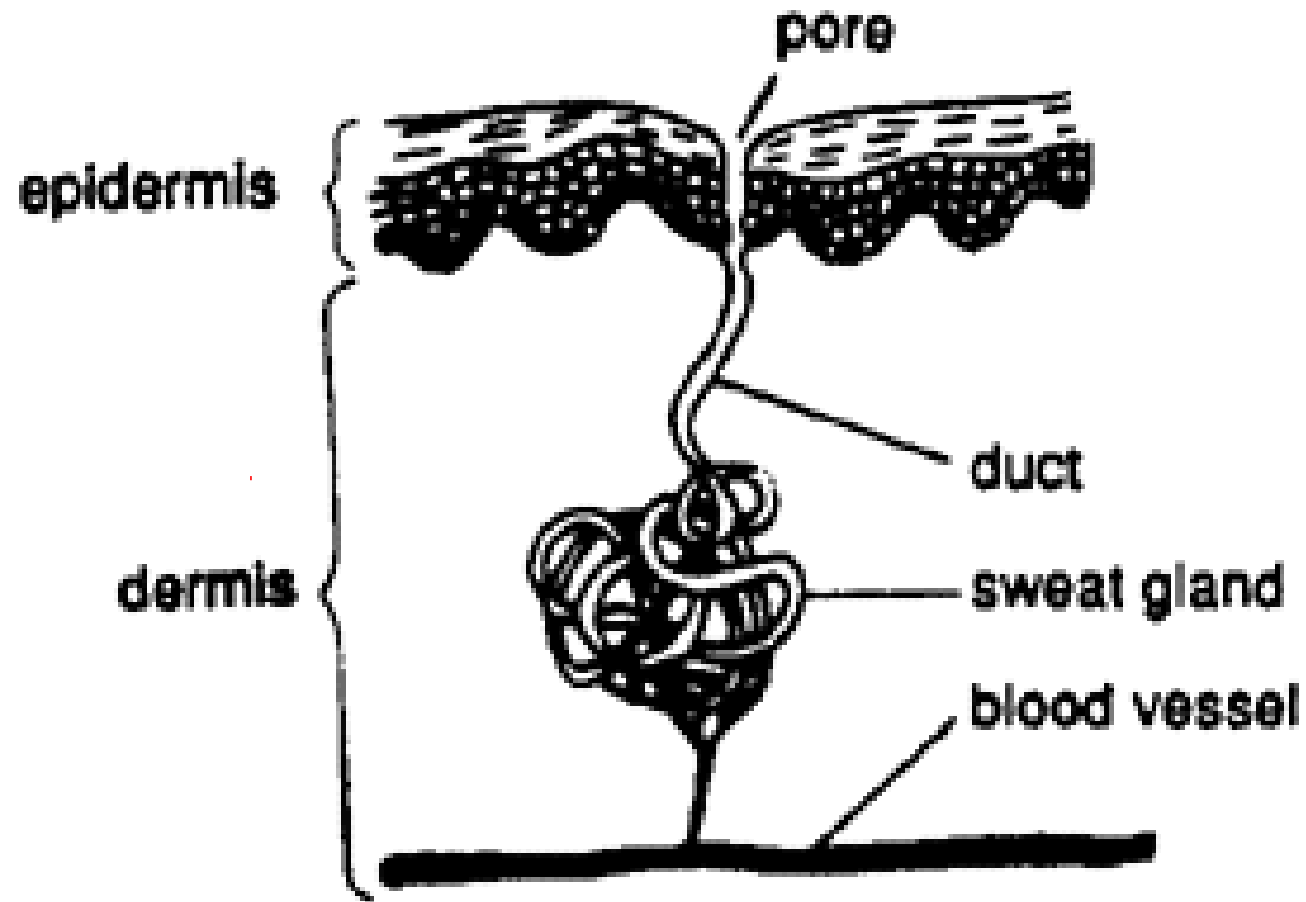
System Urinary or Excretory

Life Process Excretion



System Nervous (a neuron)

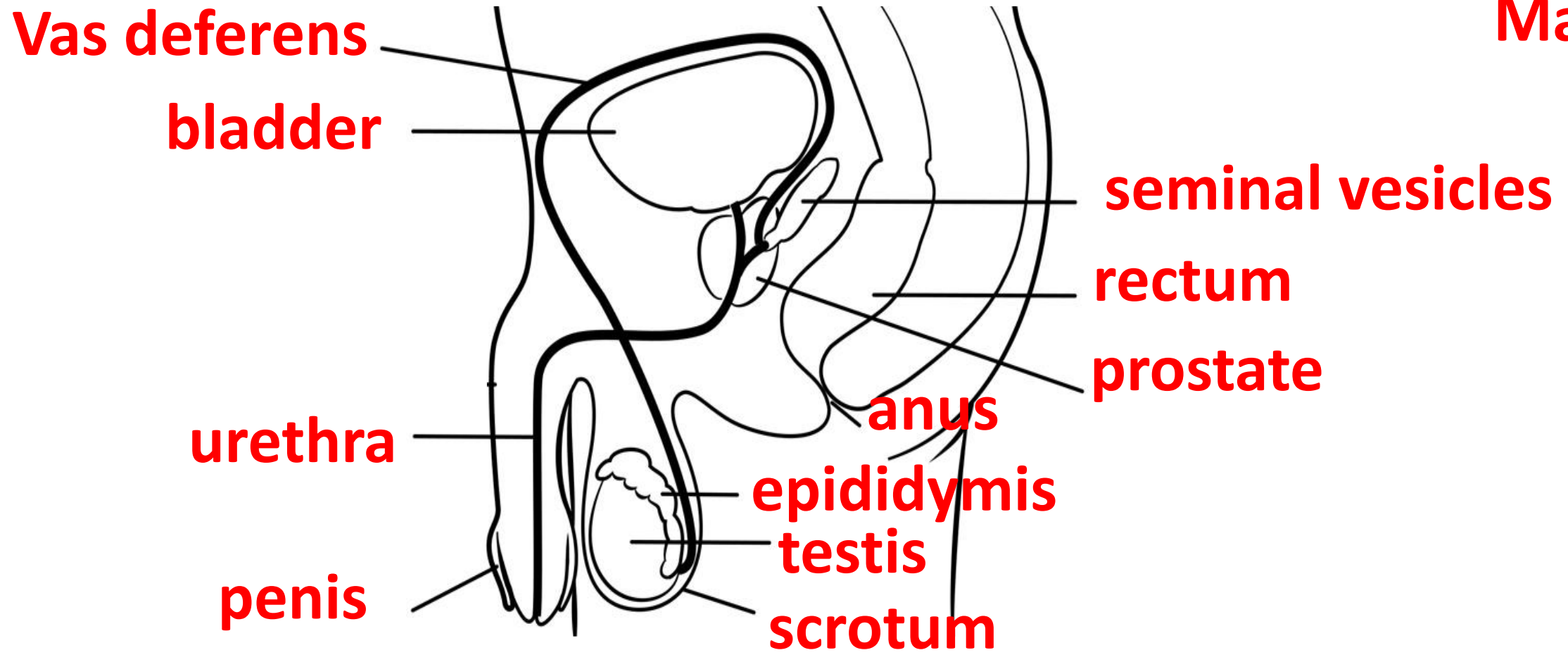
Life Process Regulation



System Excretory (skin)

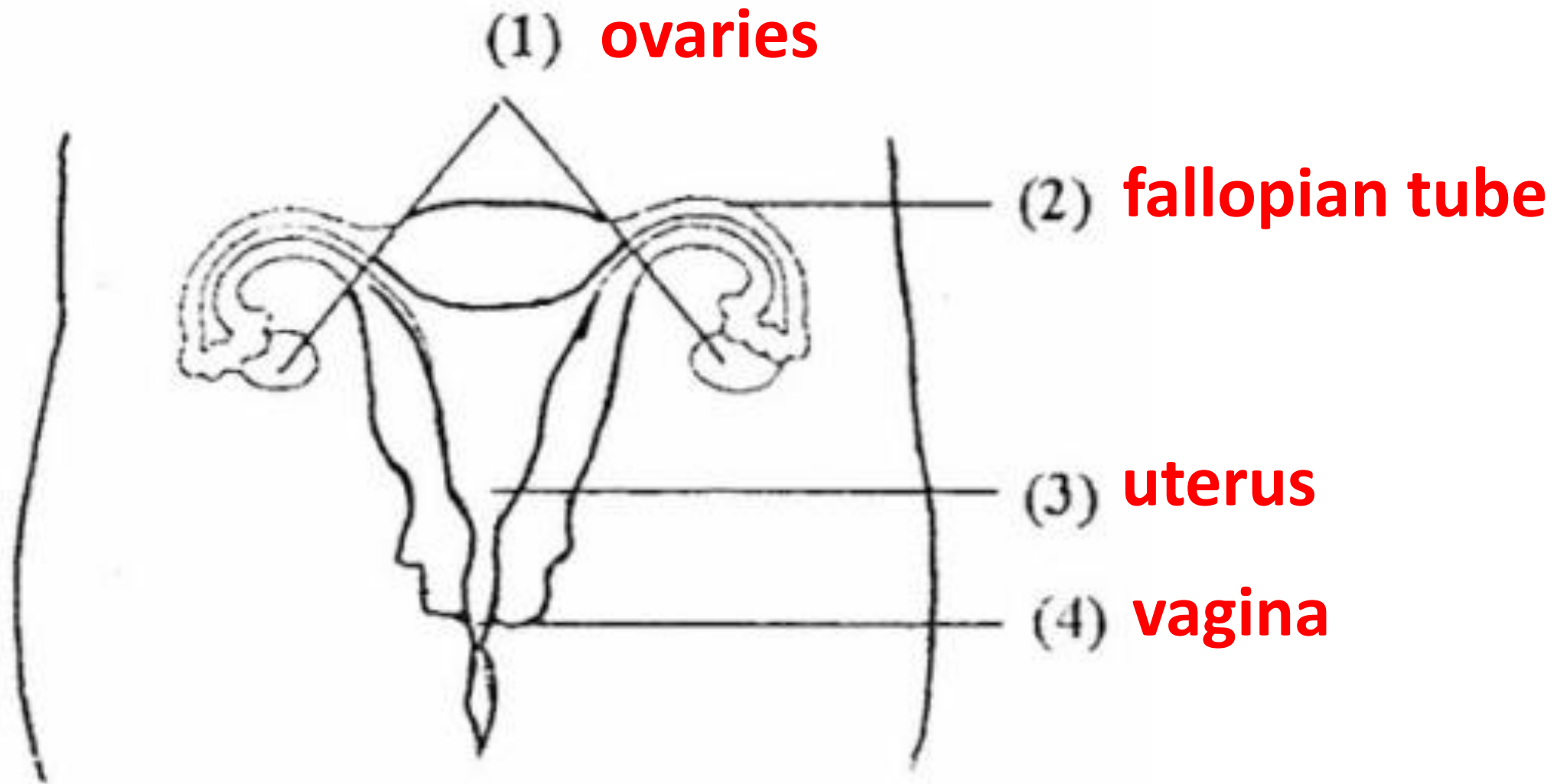
Life Process Excretion, Regulation

Male



System Reproductive

Life Process Reproduction



System Reproductive

Life Process Reproduction

pineal gland

parathyroids

3

5

hypothalamus

pituitary

1

2

thyroid

thymus

4

6

adrenal

pancreas

7

8

testes

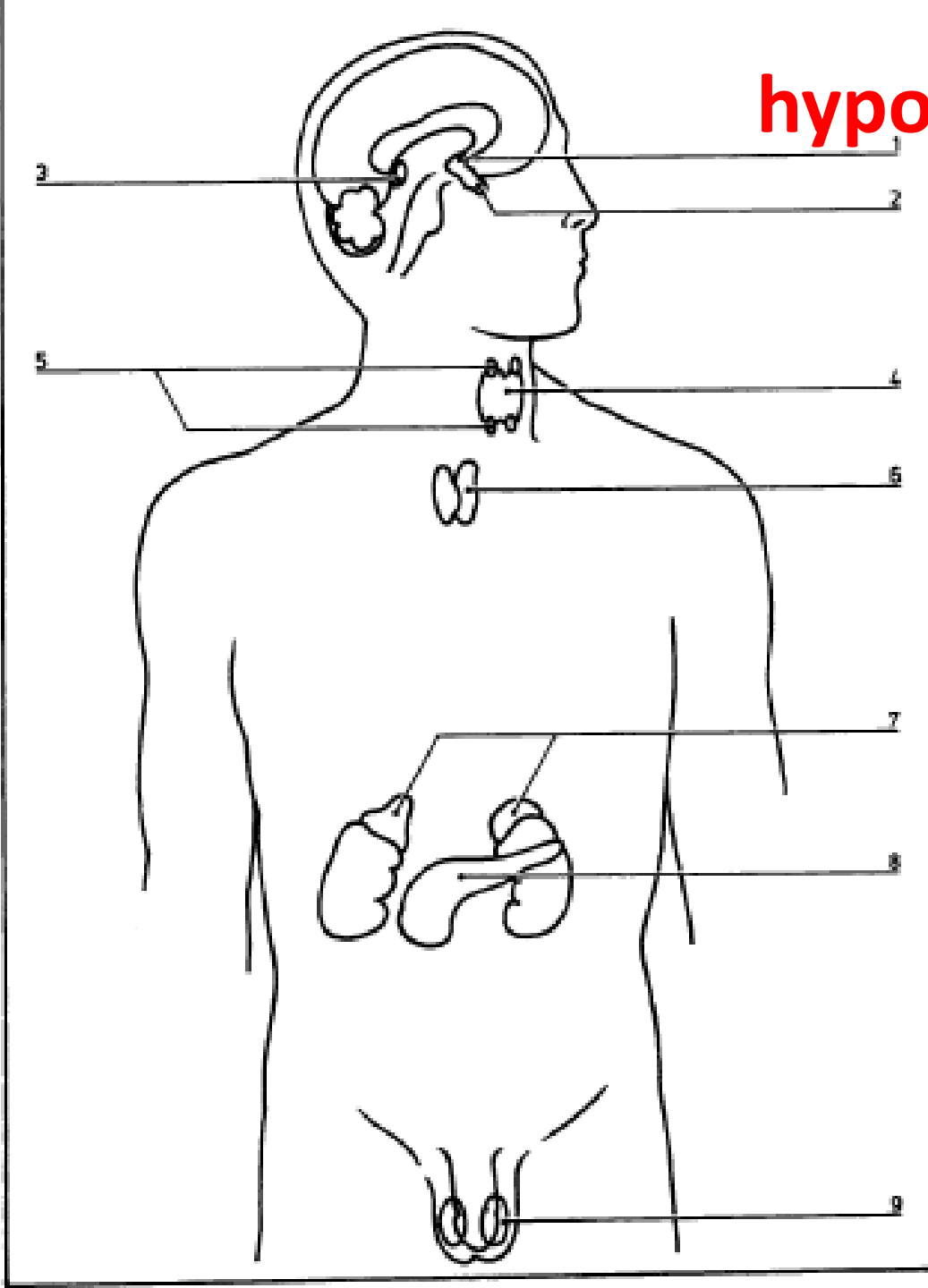
9

System **Endocrine**

Life Process **Regulation,**

Growth,

Reproduction



Body Systems BINGO Terms

AIDS	Gland	Respiration	Nervous syst
Allergy	Glucagon	Respiratory syst	Neuron
Antibodies	Growth	Response	Neurotransmitter
Antigens	HIV	Skeletal syst	Nutrition
Cancer	Homeostasis	Stimulus	Organ
Cells	Hormone	Synthesis	Organelles
Circulatory syst	Immune syst	Tissue	Pathogen
Digestive syst	Insulin	Transport	Positive feedback
Effector	Metabolism	Urinary Syst	Receptor
Endocrine syst	Muscular syst	Vaccine	Regulation
Engulf	Negative	White blood cell	Reproduction
Excretion	feedback		Reproductive syst

Topic Review 5

Cell Division

Reproduction

Mitosis

Meiosis

asexual
reproduction

ex. skin cells, zygote
divisions

2 daughter cells

diploid ($2n$)

no crossing over

genetically identical

sexual
reproduction

ex. gamete
production

4 daughter cells

haploid (n)

crossing over occurs

genetically varied

DNA must
replicate first

Needed in human
reproduction &
development

cell
division

Directions: Write a paragraph using each of the following terms. Be concise. Cross out each term on the list as you use it & circle it in your paragraph. Use as few sentences as possible!

- meiosis, egg, ovary, ovulation, sperm, testes, fertilization, zygote, genetic recombination, fallopian tube, cleavage, mitosis, differentiation, implantation, uterus, embryo, fetus, placenta, diffusion, umbilical cord

Meiosis produces gametes (egg & sperm). Sperm are made in the testes of a male and eggs are made in the ovary of a female. After ovulation, when the egg is released, the egg and sperm fuse in the fallopian tube during fertilization. This newly formed zygote has undergone genetic recombination receiving half of its DNA from each parent. The first mitotic cell divisions, called cleavage, allow the zygote to grow and make more cells. The embryo embeds itself into the nutrient rich uterus lining during implantation. The cells will become specialized forming nerve cells, blood cells, etc. during differentiation. After 8 weeks of development it is called a fetus. A placenta grows attached to the uterus at one end and the umbilical cord at the other end, allowing nutrients and wastes to pass between mother and fetus by diffusion across the capillary walls.

Topic Review 6

Genetics

Biotechnology

Top TEN Facts - Genetics & Biotechnology

Directions:

- Use your previous knowledge of genetics and biotechnology **AND** the facts you need to answer the practice questions to compose a top 10 facts list for this topic.
- You must integrate vocabulary and concepts wherever possible in order to keep the list to **ONLY 10 facts!**

10. Chromosomes are long, tightly wrapped strands of DNA that contain genes, sequences of bases which determine traits by coding for building proteins.
9. DNA is a polymer made of many paired nucleotides (A-T, G-C) held together by weak hydrogen bonds that are easily broken to allow replication to occur before a cell divides.
8. The sequence of bases of DNA's code is copied into mRNA form (A pairs with U instead of T) during transcription in the nucleus, which is then translated at the ribosome as the correct sequence of amino acids are linked together in order during protein synthesis.

7. Mutations are changes in DNA that could cause the resulting protein to be misshaped and nonfunctional but also can contribute to genetic diversity which increases species survival.
6. Mutations in gametes can be passed down to offspring but not mutations in body cells.
5. All cells contain an organism's full genome but cells only express certain genes and expression of genes can be affected by environmental factors like amount of light or temperature.
4. A genotype is the combination of 2 alleles, passed from parents to offspring, that direct the phenotype (physical expression) of a trait.

3. Selective breeding involves choosing organisms to mate so that their offspring may have certain desired traits. Ex. Fastest race horses etc.
2. Genetic engineering (Recombinant DNA technology) changes genetic make up, creating new varieties of organisms for medicinal purposes (ex. bacteria that make insulin for diabetics) and agricultural purposes (ex. corn that makes its own pesticide) by using restriction enzymes to splice genes.
1. Cloning is the process of producing a genetically identical copy of an organism/cell/gene, which may occur naturally (identical twins, cutting plants) or using biotechnology (Dolly the sheep).
0. Gel electrophoresis separates DNA fragments by size, producing a unique banding pattern that can be used to compare individuals/species.

Topic Review 7

Evolution

TOPIC/TERM

GENE EXPRESSION 25

COMPARATIVE BIOCHEMISTRY (DNA, ENZYMES, etc.) 3

MUTATIONS 16

CLADOGRAM 5

HUMAN IMPACT ON NATURAL SELECTION 22

DARWIN'S THEORY OF NATURAL SELECTION

12 17 4 8 2 23

COMPARATIVE ANATOMY 21

GEL ELECTROPHORESIS 10

CLONING 9 15 17

BIOTECHNOLOGY / RECOMBINANT DNA TECHNOLOGY

6 11 20 24

SELECTIVE BREEDING 14

PROTEIN SYNTHESIS 1 19

RNA 13

DNA 18

Genetics and Evolution Regents Review Matching

Evolution Crossword

Across

1. finches on the Galapagos had different shaped **beaks**
5. when a species dies out, it becomes **extinct**
6. a bat's wing is _____ to a human's arm **homologous**
8. structures that have no use **vestigial**
9. closest living relative to humans **chimpanzee**
12. the process by which new species are formed **speciation** **common**
14. a species from which two or more species diverged (2 words) **ancestor**
16. tree diagram that shows how organisms are related **cladogram**
17. the earth is thought to be 4.5 ___ years old **billion**
18. occurs when there is only a limited amount of resources available
competition

Down

2. "survival of the fittest", natural **selection**
3. a trait that may be favorable or unfavorable for survival **adaptation**
4. causes an organism to have resistance to a pesticide or antibiotic **mutation**
7. idea that species produce more offspring than can possible survive **overproduction**
10. type of bird on the galapagos islands **finch**
11. name of the ship Darwin sailed on **Beagle**
13. preserved remains of an organism that lived long ago **fossil**
15. published "The Origin of Species" **Darwin**

Topic Review 8

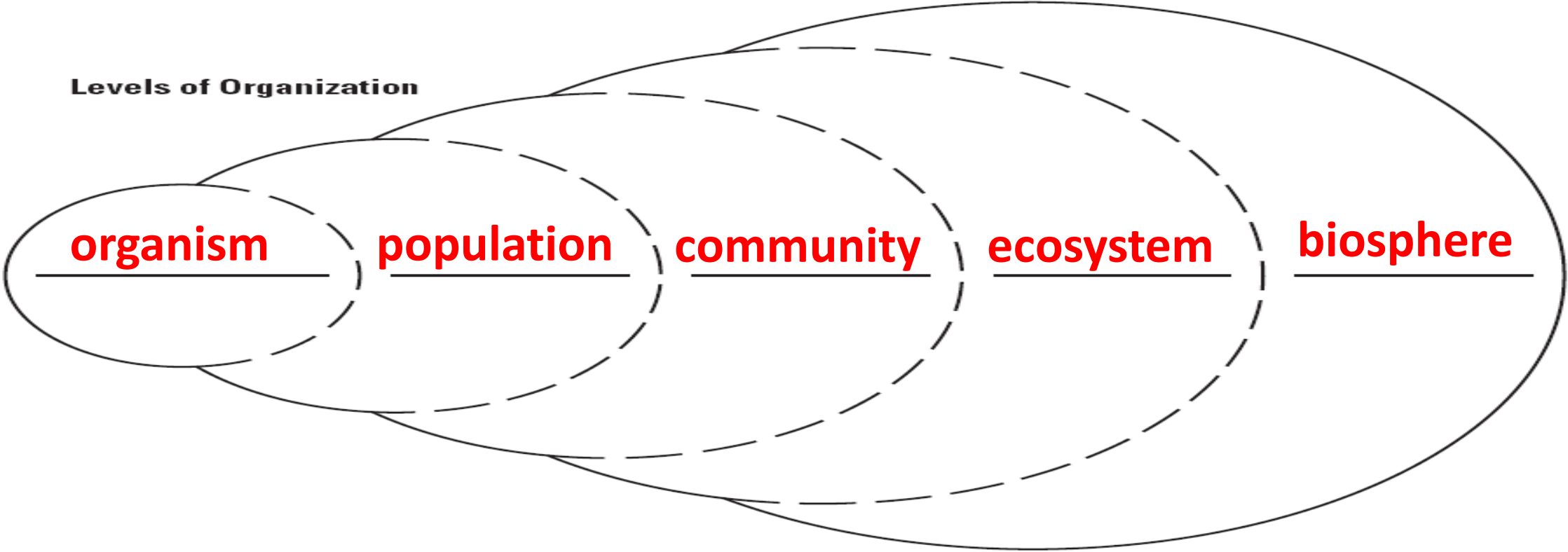
Ecology

Human Impact

Ecology Review

Level	Description	Example
1. Organism	an individual living thing	one white tailed deer
2. Population	All members of 1 species in an area	All the white tailed deer in a forest
3. Community	All living things in an area (many different species)	All the animals, plants, & microbes in the forest
4. Ecosystem	Both the living and nonliving parts of a specific habitat	the forest (including air, water, etc. & living things)
5. Biosphere	Portion of Earth where life exists	Land, sea, & air in all of Earth's biomes

Fill in the diagram below with the Levels of Organization studied in Ecology. Use the terms from the table above.



Complete the following sentences with the correct term from the list below.

autotrophs	eating	nonliving	abiotic	living	temperature	producers
moisture	plants	animals	biotic	consumers	heterotrophs	nonliving

6. All ecosystems are made up of living and nonliving components.
7. Biotic factors are living things, such as plants or animals.
8. Abiotic factors are nonliving things, such as wind, temperature, or moisture.
9. Autotrophs are organisms that get their energy from nonliving resources, meaning they make their own food. These organisms are also called producers.
10. Heterotrophs are organisms that get their energy by eating other organisms. These organisms are also called consumers.
11. Why are producers so important to an ecosystem?
They are the organisms that are able to take in energy from the sun and use it to produce organic compounds (glucose) which is a food source for other organisms.

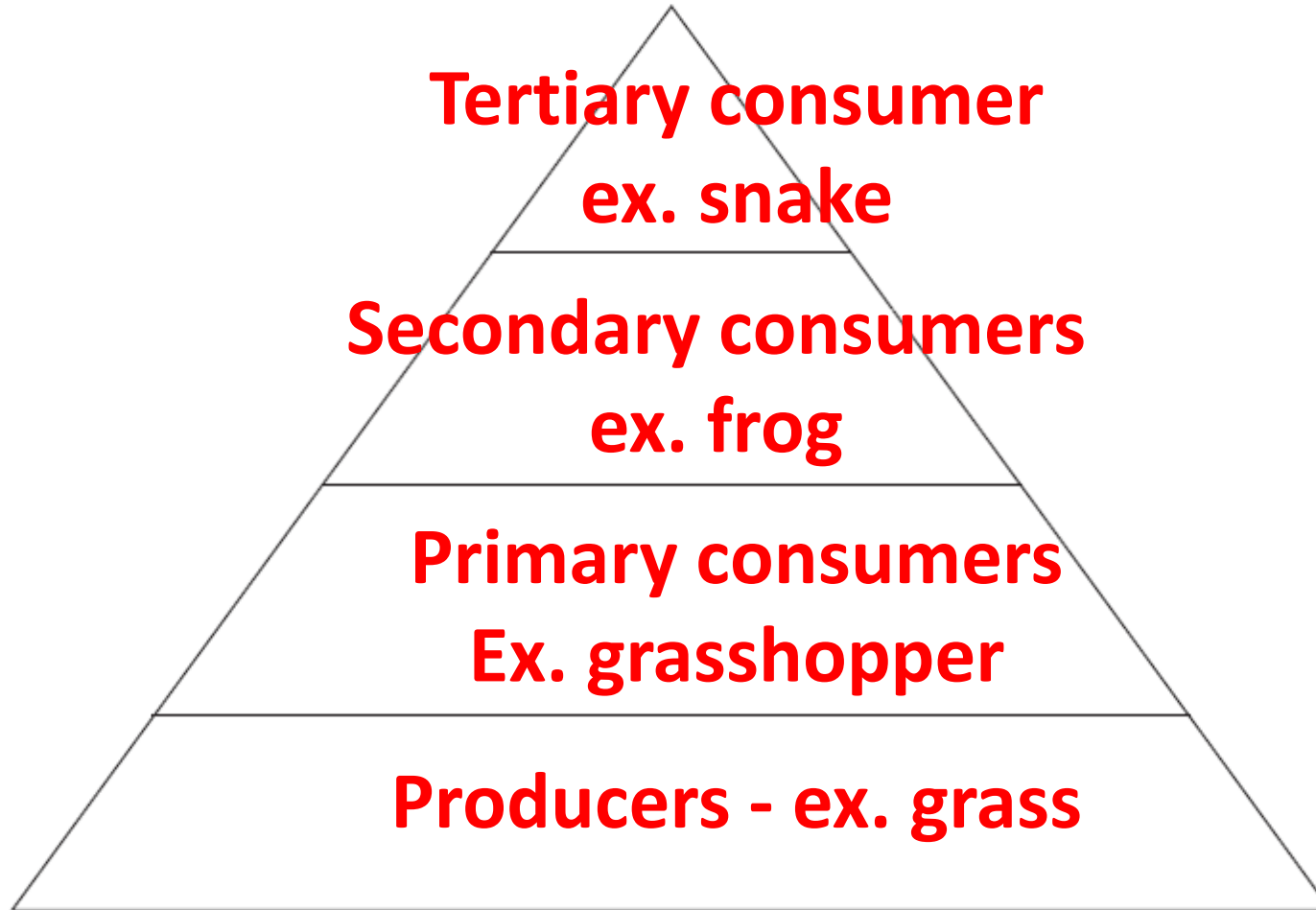
KEY CONCEPT: Food chains and food webs model the flow of energy in an ecosystem.

Choose the correct term from the box below to fit each description.

carnivore	herbivore	secondary consumer	decomposer	omnivore
primary consumer	sun	tertiary consumer	trophic levels	

12. I eat only plants. I am a(n) herbivore.
13. I eat only other animals. I am a(n) carnivore.
14. I eat both plants and animals. I am a(n) omnivore.
15. I break down and recycle organic matter. I am a(n) decomposer.
16. I am the first consumer above the producer level. I am a(n) primary consumer.
17. I am a carnivore that eats herbivores. I am a(n) secondary consumer.
18. I am a carnivore that eats other carnivores. I am a(n) tertiary consumer.
19. The levels of nourishment in a food chain are called trophic levels.
20. I am the ultimate source energy for most food chains/webs on Earth. I am the sun.
21. How is a food web different from a food chain? **Food web includes interconnected food chains**

22. Label the four tiers of the energy pyramid with the correct trophic level (producers, primary consumers, secondary consumers, and tertiary consumers). Then, choose an ecosystem and fill in the energy pyramid with specific examples of an organism at each level that might exist within that ecosystem.



23. Form a relationship between the following terms: limiting factors, carrying capacity _____

Limiting factors such as food sources available, temperature, pH level, determine which organisms can survive in a habitat, keeping populations in check maintaining the carrying capacity.

24. Describe ecological succession. Include the terms pioneer organisms and climax community.

Occurs when an ecosystem changes over time. Pioneer organisms are the 1st to appear and they modify the environment allowing for other organisms to survive and continue to modify the environment until a stable climax community is established.

Human Impact

- Describe the difference between renewable and nonrenewable resources. Give examples.

Renewable – can be replenished, ex. Trees

Nonrenewable – finite, cannot be replenished, ex. Fossil fuels

- Describe renewable energy sources.

Solar power – energy from the sun can be used for electricity

Wind power – energy from wind can be used for electricity

**- unlimited, do not require fuel, do not produce CO₂
(greenhouse gasses)**

Human Impact

- List the benefits and threats to biodiversity

<u>Benefits to Biodiversity</u>	<u>Threats to Biodiversity</u>
<ul style="list-style-type: none">• Conservation of resources• Reforestation• Shade farming/planting• Wildlife & nature preserves• Laws restricting hunting and fishing	<ul style="list-style-type: none">• Deforestation• Overhunting/overfishing• Use of biocides• Global warming• Deforestation/habitat destruction

Human Impact

- Give examples of reduce, reuse, & recycle

Reduce

- Turn off lights when leaving the room
- Turn off water when brushing teeth

Reuse

- Buy second hand goods instead of new
- Reusable shopping bags, water bottles, etc.
- Upcycle (find new a use for wastes)

Recycle

- Put paper, glass, plastic, metal wastes in recycling bins
- Purchase goods made from recycled materials (ex. notebooks)

- For the following topics, list the causes, effects, & remedies.

<u>Problem</u>	<u>Cause</u>	<u>Effect</u>	<u>Remedy</u>
Water Pollution	Chemicals, sewage, oil, pesticides, hot water	Reduces biodiversity, disrupts food chain	Use alternate energy (not oil), natural predator not biocides
Acid Rain	Sulfur dioxide & nitrogen oxide from factory emissions (burning fossil fuels)	Disrupts enzyme function in plants and aquatic life	Pass laws restricting emission levels
Global Warming	Excess CO ₂ from burning fossil fuels	Inc. temp melts ice, disrupts habitats, rising sea levels	Reduce fossil fuel use, use clean energy sources, plant more trees

Ozone Depletion	Chemicals called CFCs (chlorofluorocarbons) in refrigeration & air conditioning units	Increases UV radiation, mutations, skin cancer	Banned use of CFCs
Pesticides	Crops are destroyed by pests (insects/rodents) costing money	Decreases biodiversity, pollutes water supply, bioaccumulation of toxic chemicals up the food chain (highest conc. at top)	Use biological controls instead like a natural predator of the pest or spray hormones to attract & trap insects