



SOLUTION TO F/M/20/22

QUICK ACCESS GRID

The solution to a particular question can be accessed instantly by clicking on the desired question number in the QUICK ACCESS GRID.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40



S1

B

Excretion:

All living organisms – plants as well as animals – expel waste matter by the process of excretion

All animals and plants show the following 7 characteristics:

1. **M**ovement
2. **R**espiration (is different from breathing!)
3. **S**ensitivity
4. **G**rowth
5. **R**eproduction
6. **E**xcretion
7. **N**utrition

***MRS GREN**

- breathing – seen in higher animals only
- photosynthesis – seen in plants only
- tropism – the movement of plants in response to stimuli

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**S2****B**

The binomial system uses a two-part name for an organism.

First part	Generic name*	Vulpes
Second part	Specific epithet**	lagopus

The specific name may be single or compound.

It may include the name of the discoverer in full or in abbreviation.

The name is printed in italics and underlined in a handwritten description.

*Generic = of the genus

**Specific = of the species



S3

B

Both insects and arachnids belong to phylum Arthropods.

All arthropods possess **exoskeleton** – an external skeleton that protects and supports their bodies.

Insects have 3 pairs of legs while arachnids have 4 pairs of legs.

Insects have 2 pairs of wings while arachnids lack wings.

Fly – Insect



Spider – Arachnid



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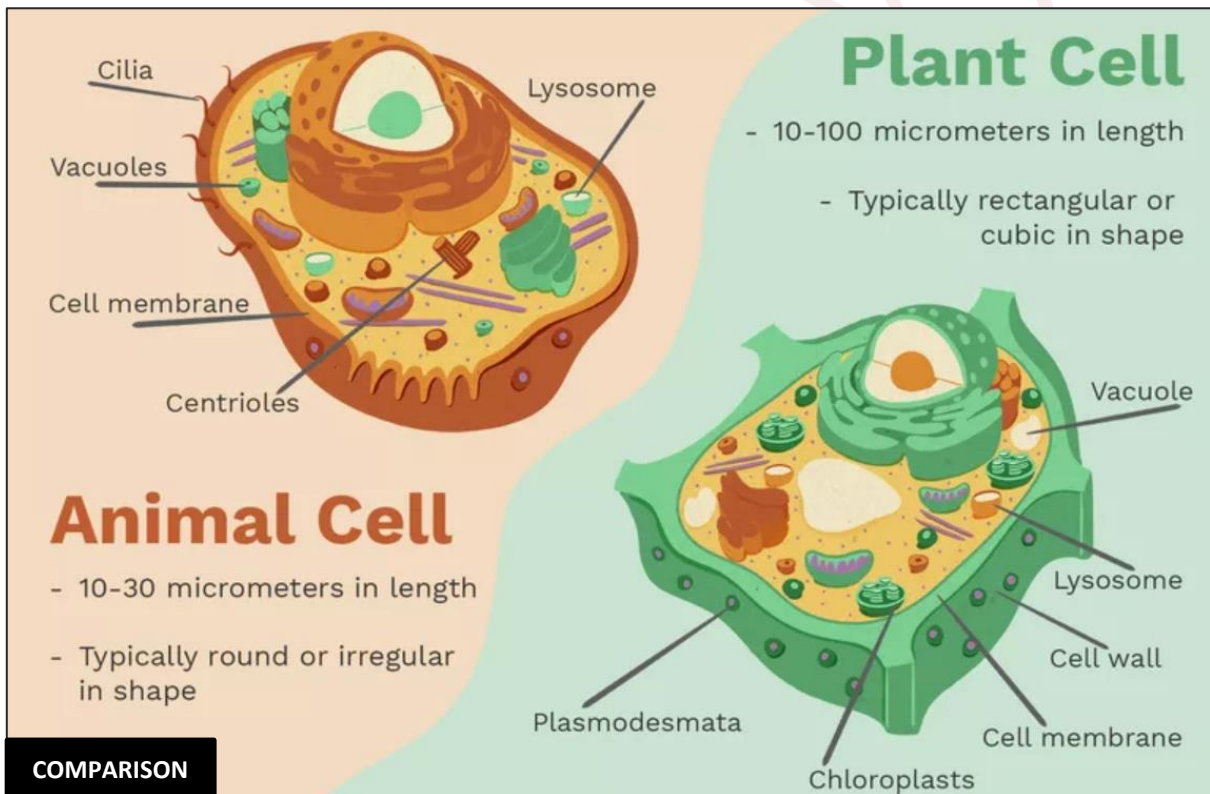
S4

D

Both animal cells and plant cells have cell membranes and nuclei.

Animal cells do not have cell walls and chloroplasts.

Plant cells have cell walls and chloroplasts.



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**S5****B**

$$\text{Magnification} = \frac{\text{size of diagram}}{\text{actual size of specimen}}$$

$$1 \text{ mm} = 1\,000 \mu\text{m}$$

$$50 \text{ mm} = 50\,000 \mu\text{m}$$

$$\text{Magnification} = \frac{50\,000}{2\,000} = 25$$

∴ magnification of the diagram = ×25

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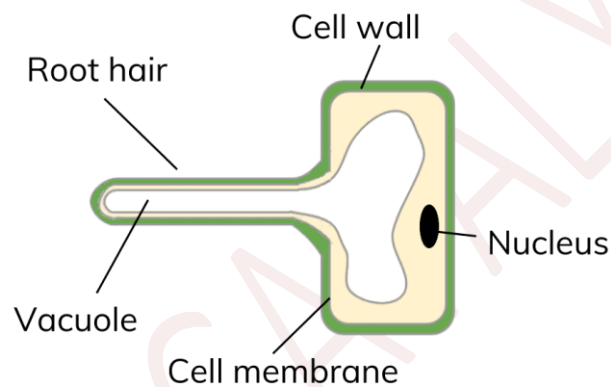


S6

A

Root hair cells are specialized to perform the function of absorption.

Root hair cells increase the surface area for absorption.
They are adapted to absorb minerals and water from the soil.



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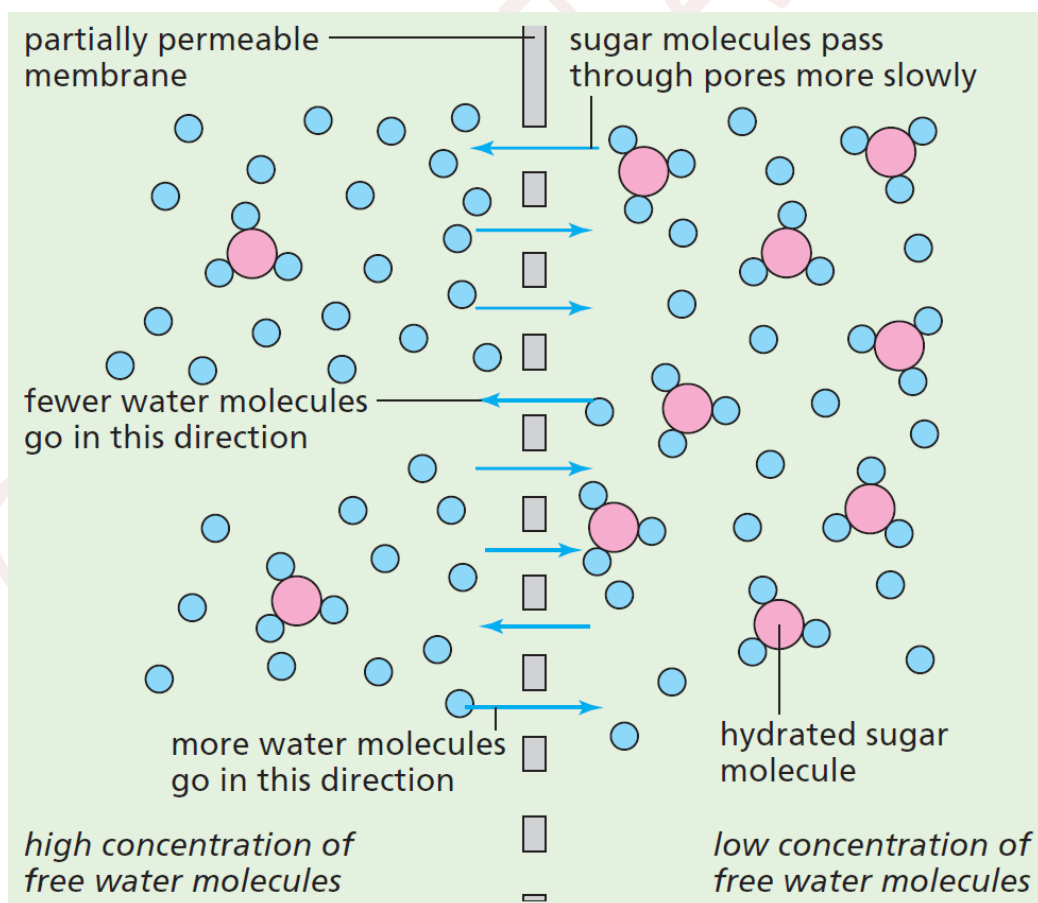
S7

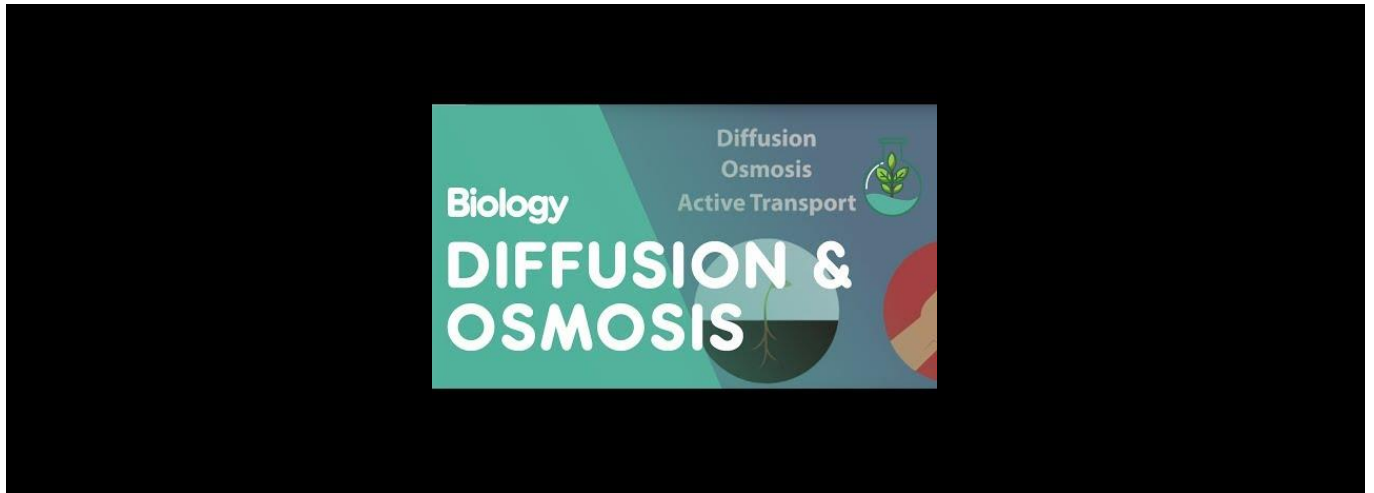
B

Osmosis can be defined as:

- the spontaneous diffusion of water molecules
- from a region of higher concentration of water molecules to a region of lower concentration of water molecules
- down a water potential gradient
- through a partially permeable membrane.

The process is spontaneous; energy is not required.





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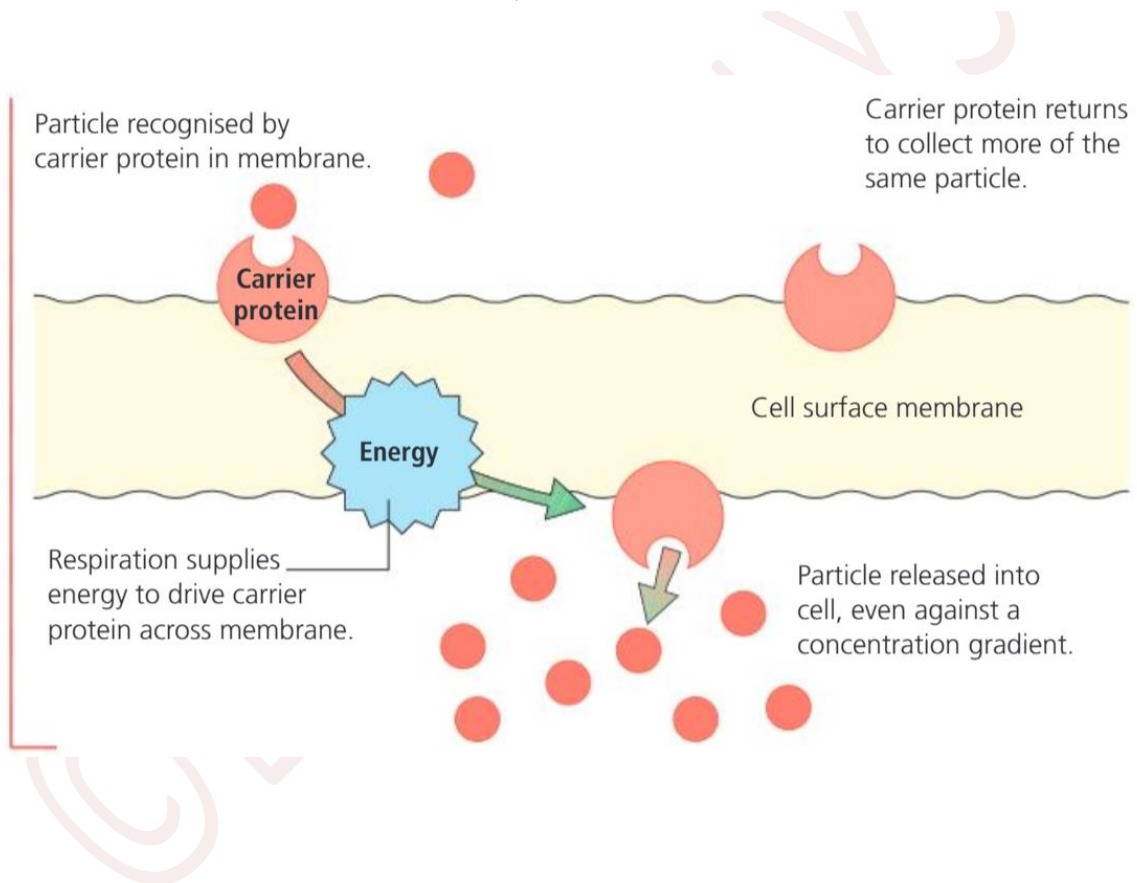
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S8

A

- 1 It is the net movement of particles from a low concentration to a high concentration. ✓
- 2 It is the net movement of particles from a ~~high~~ ^{low} concentration to a ~~low~~ ^{high} concentration.
- 3 It requires the use of energy from respiration. ✓
- 4 It can only take place in living cells. ✓



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**S9****C**

Solution	Test for	Positive result
Biuret	Proteins	Purple colour
DCPIP	Vitamin C	Blue to colourless
Iodine	Starch	Blue-black
Benedict's	Reducing sugars	Orange / brick-red

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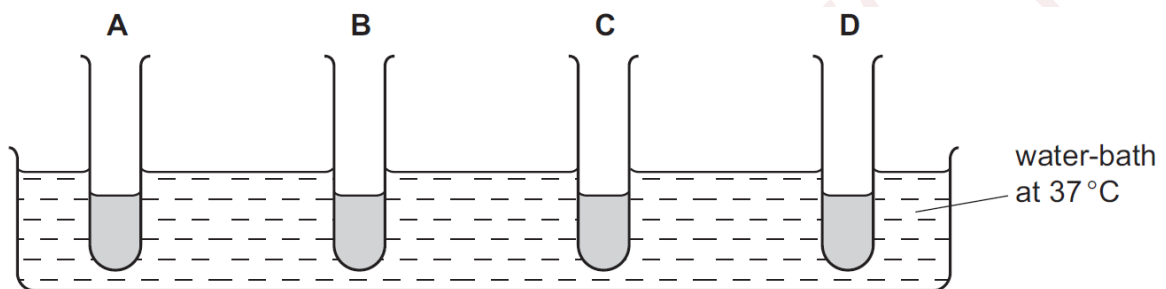


S10

C

Proteases are enzymes that breakdown (digest) proteins.

The stomach protease works best at very low pH values (highly acidic).



egg albumen
+
protease
no acid

egg albumen
+
dilute
hydrochloric
acid
no protease

egg albumen
+
dilute
hydrochloric
acid
+
protease
✓

egg albumen
+
dilute
hydrochloric
acid
+
boiled protease
boiling denatures the protease

BACK TO QUICK ACCESS GRID

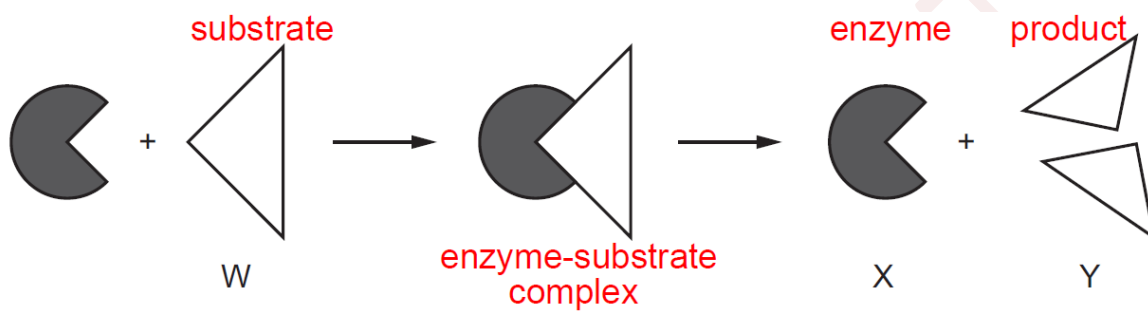
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S11

C

The diagram illustrates the lock and key model of enzyme action.



Substrate molecule W fits exactly into the active site of the enzyme to form an enzyme-substrate complex.

Reaction occurs to form product molecules, which leave the active site, making it free for further reaction.



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S12

B

Photosynthesis reaction

Carbon dioxide + Water → Glucose + Oxygen

	1	2	3	4
A	carbon dioxide	glucose	oxygen	water
B	water	carbon dioxide	glucose	oxygen ✓
C	oxygen	water	carbon dioxide	glucose
D	glucose	oxygen	water	carbon dioxide

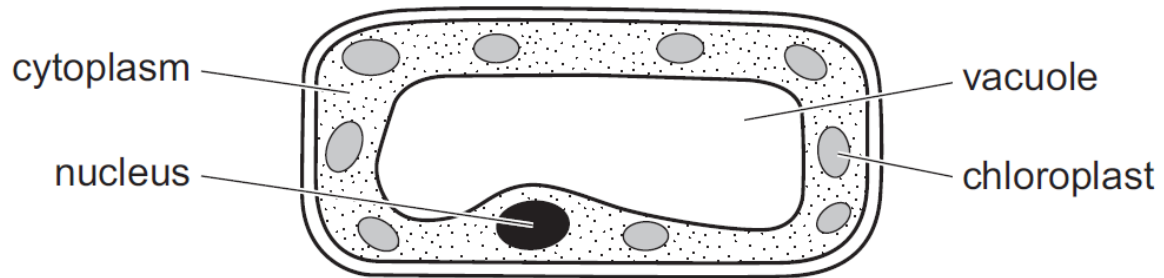
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S13

B



The plant cell shown in the diagram is found in palisade mesophyll tissue.

Indication: Cells contain many chloroplasts.

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S14

C

If the diet of a person does not provide the required nutrients in the correct proportions, the person may suffer from malnutrition.

Constipation – caused by deficiency of fibres in the diet

Coronary heart disease – caused by high intake of fatty foods

Obesity – caused by excessive consumption of fats and carbohydrates

chronic obstructive pulmonary disease – caused by long-term exposure to lung irritants, not by malnutrition

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S15

B

2 → 1 → 3 → 5 → 4

How cholera causes diarrhoea

When the *Vibrio cholera* bacteria are ingested, they multiply in the small intestine and invade its epithelial cells.

As the bacteria become embedded, they release toxins (poisons) which irritate the intestinal lining and lead to the secretion of large amounts of water and salts, including chloride ions.

The salts decrease the osmotic potential of the gut contents, drawing more water from surrounding tissues and blood by osmosis.

This makes the undigested food much more watery, leading to acute diarrhoea, and the loss of body fluids and salt leads to dehydration and kidney failure.

BACK TO QUICK ACCESS GRID

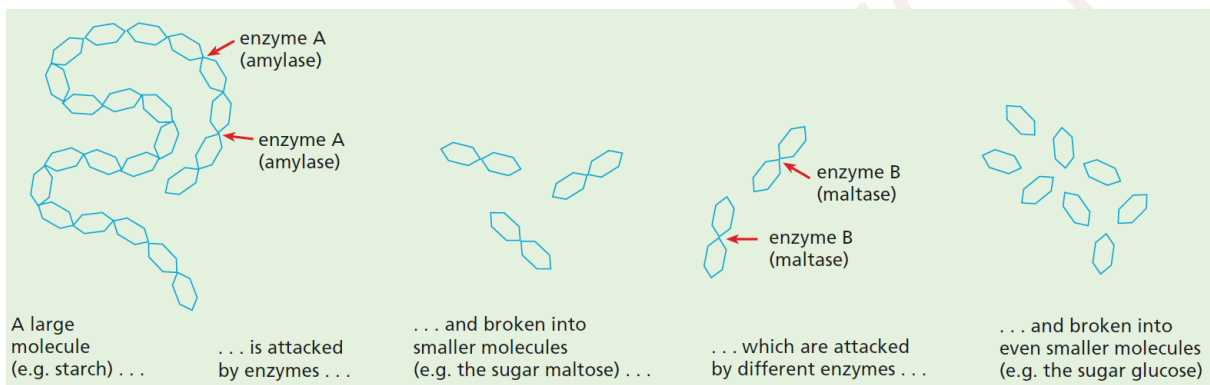
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S16

A

The digestion of carbohydrates (Starch) begins in the mouth by the salivary Amylase – enzyme which breaks down carbohydrates to maltose.



Maltose is broken down to glucose by the enzyme maltase, which is present in the membranes of the epithelial cells of the villi located in the small intestine.

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S17

D

Transportation of water from roots to the rest of the plant occurs through **xylem**.



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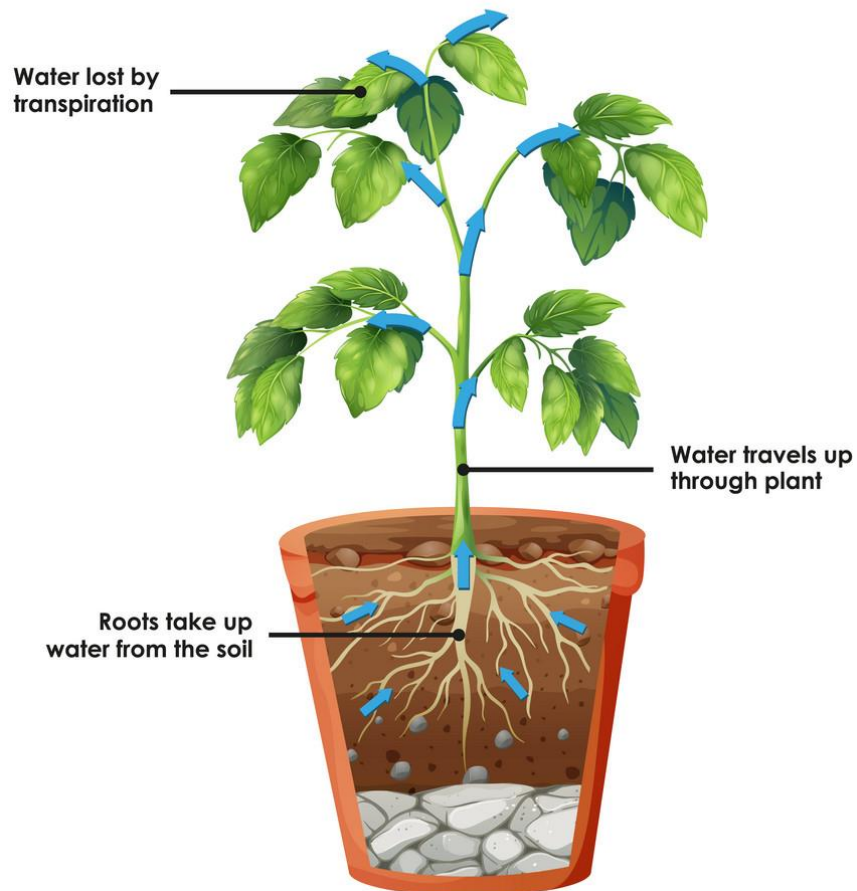
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S18

D

TRANSPIRATION



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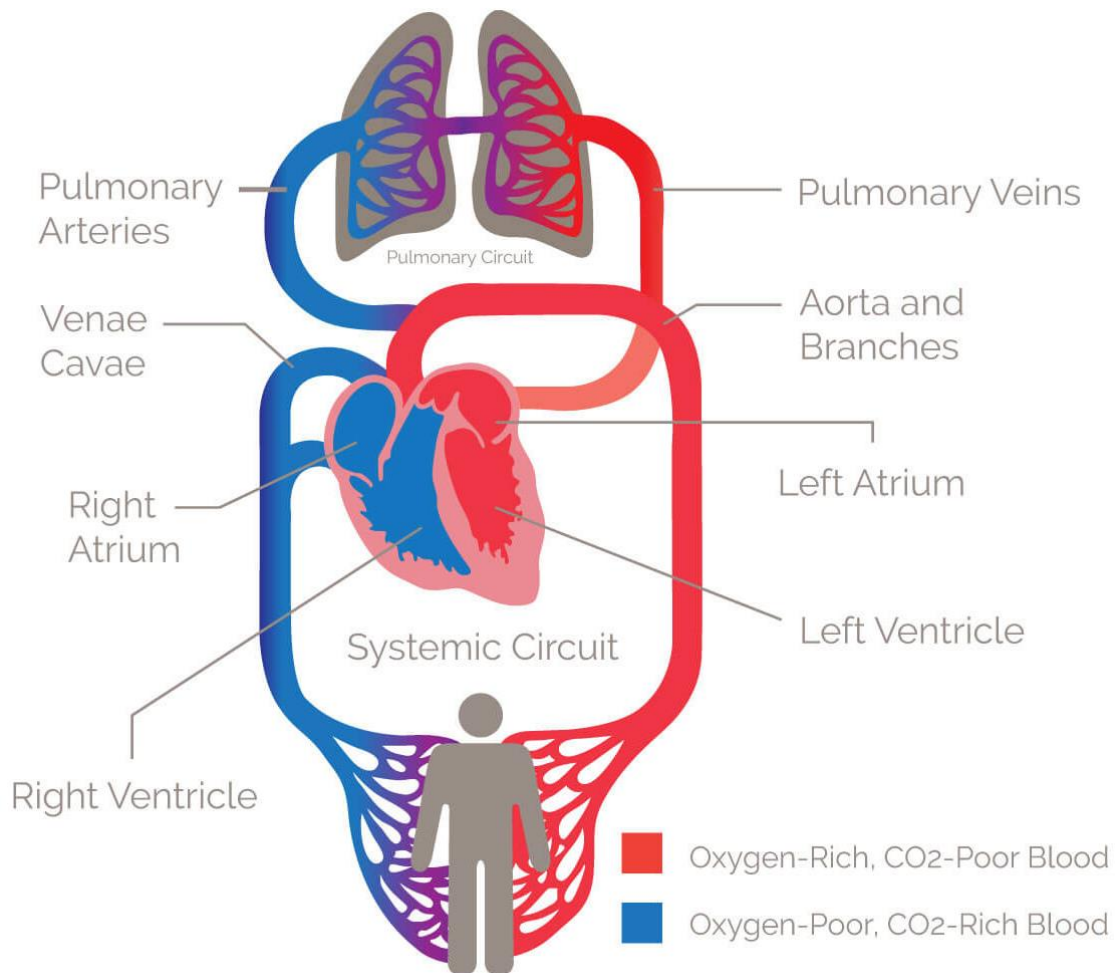


S19

A

body → heart → lungs → heart

DOUBLE CIRCULATION



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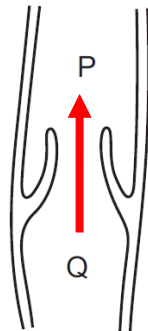


S20

D

Type of vessel = **Vein**

Direction of blood flow = **Q to P**



Open Valve
Allows blood to flow freely upwards during a muscle pump.

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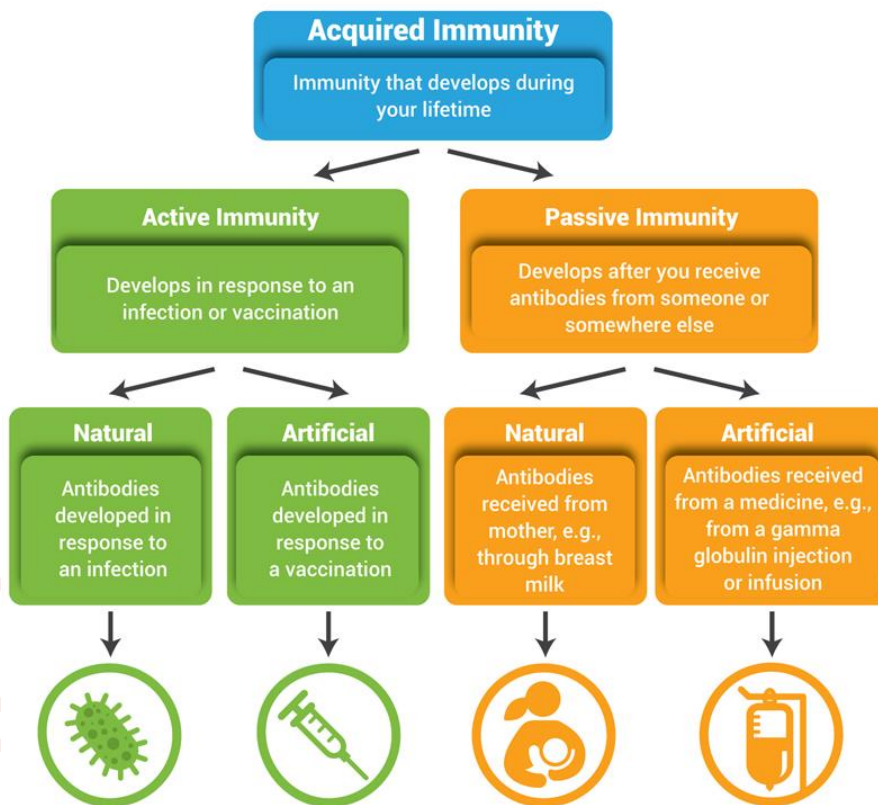


S21

C

Feeding on breast milk: antibodies present in breast milk are transferred to the individual, hence passive immunity

Infection by disease / vaccination: antibodies are produced in the individual's body, hence active immunity



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S22

C

During physical activity, the muscles work harder, use more oxygen and produce more carbon dioxide. This leads to an increased concentration of carbon dioxide in the blood which in turn makes it slightly acidic.

The breathing rate increases to meet the increased demand for Oxygen and to expel the carbon dioxide at a faster rate through exhalation.

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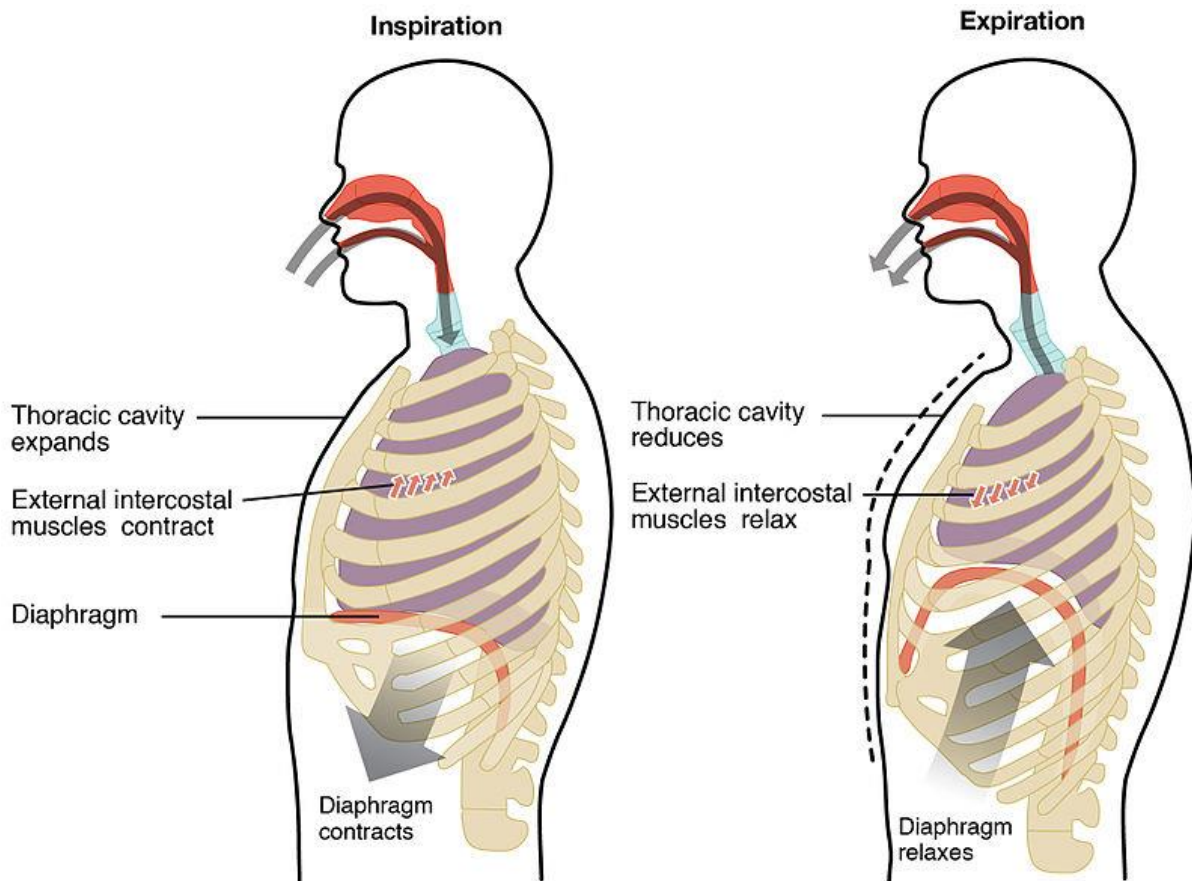


S23

C

Upon inspiration (breathing in), the diaphragm and external intercostal muscles contract; the internal intercostal muscles relax, chest cavity size increases and the ribs move up.

This lowers the air pressure in the chest cavity causing the air to flow into the lungs through the airways.



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**S24****B**

Anaerobic respiration of one molecule of glucose



2 molecules of ethanol are released.

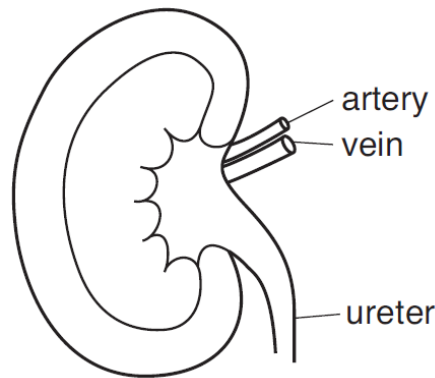
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S25

C



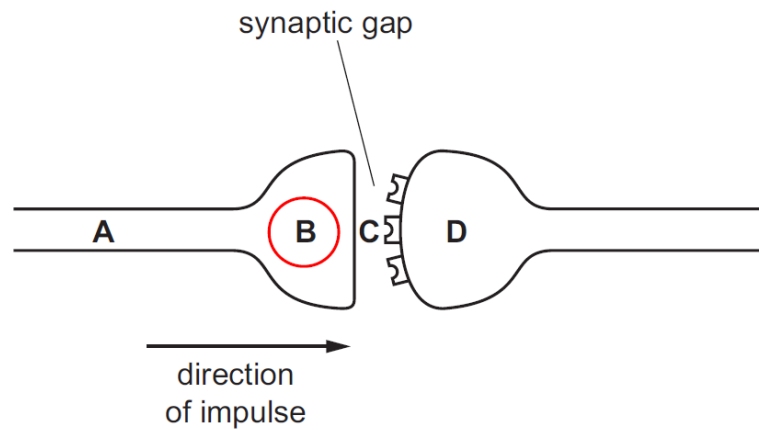
In a healthy person, the arteries and veins transport glucose.

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S26

B

B is the part (axon terminal) of pre synaptic neuron which releases the vesicles filled with neurotransmitter molecules.

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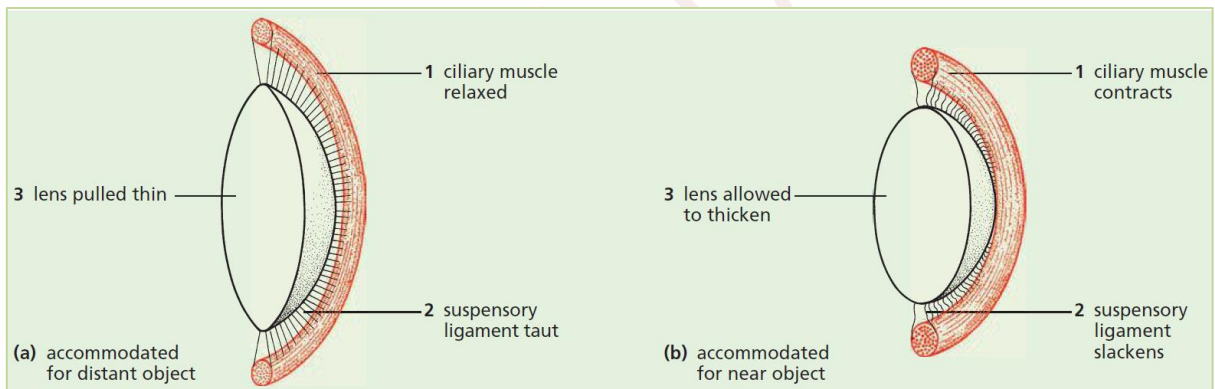
S27

A

Suspensory ligaments connect the lens at its periphery to the ciliary body.

To focus light from a distant object, the ciliary muscles relax. This increases tension on the suspensory ligaments and flattens the lens.

To accommodate for a near object, the ciliary muscles contract, thereby decreasing tension in the suspensory ligaments and allowing the lens to spring back into a more rounded shape.



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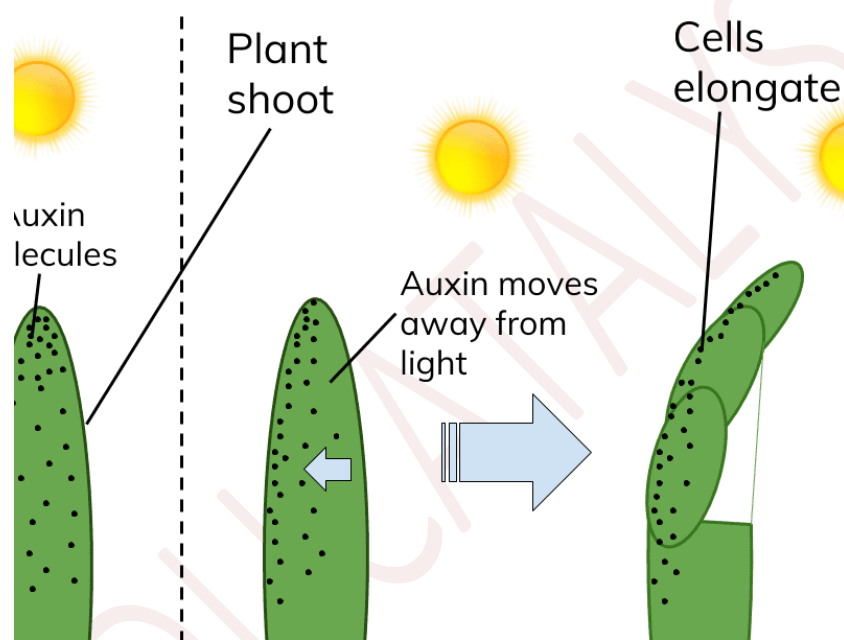
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S28

A

Auxin will move to the dark side of the shoot and cause cells to elongate.



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S29

C

Indiscriminate use of antibiotics leads to antibiotic resistance in bacteria. It is therefore important to use antibiotics only when necessary.

Antibiotics are ineffective against viruses, hence should not be used to treat viral infections.

Actions 1 and 3 are therefore correct.

Usage of antibiotics on bacteria that are already resistant will have no impact on their resistance. Action 2 is incorrect.

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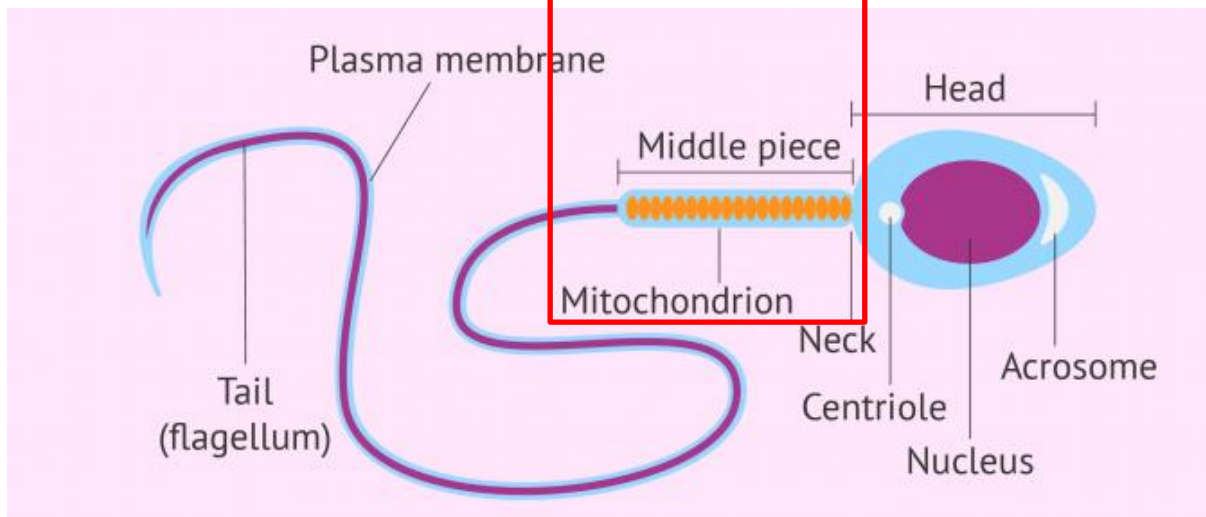
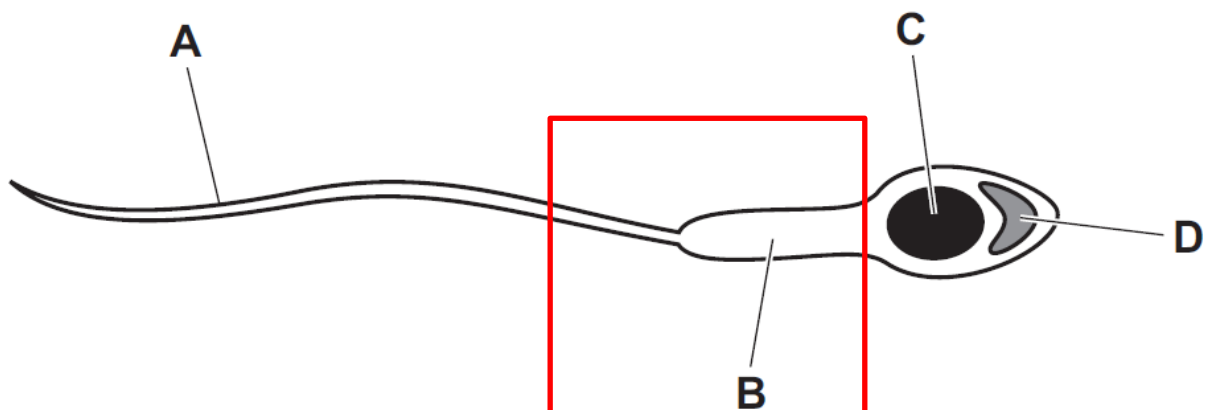
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S30

B

Part B contains Mitochondria



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S31

B

The immune system is a complex network of cells known as immune cells that include **lymphocytes**.

HIV causes reduction in number of lymphocytes.

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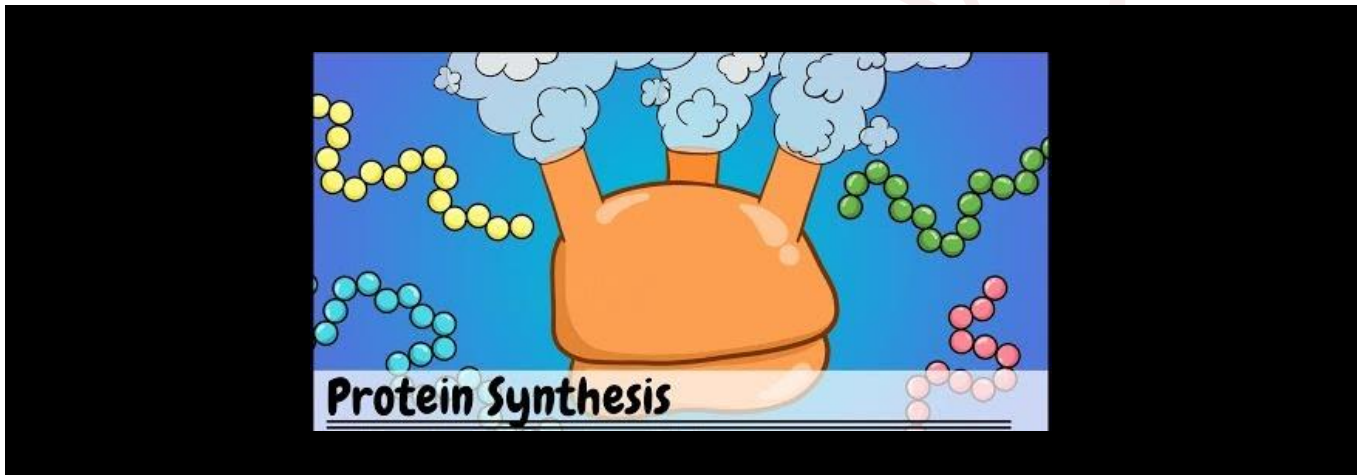
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S32

D

3 → 2 → 1 → 4



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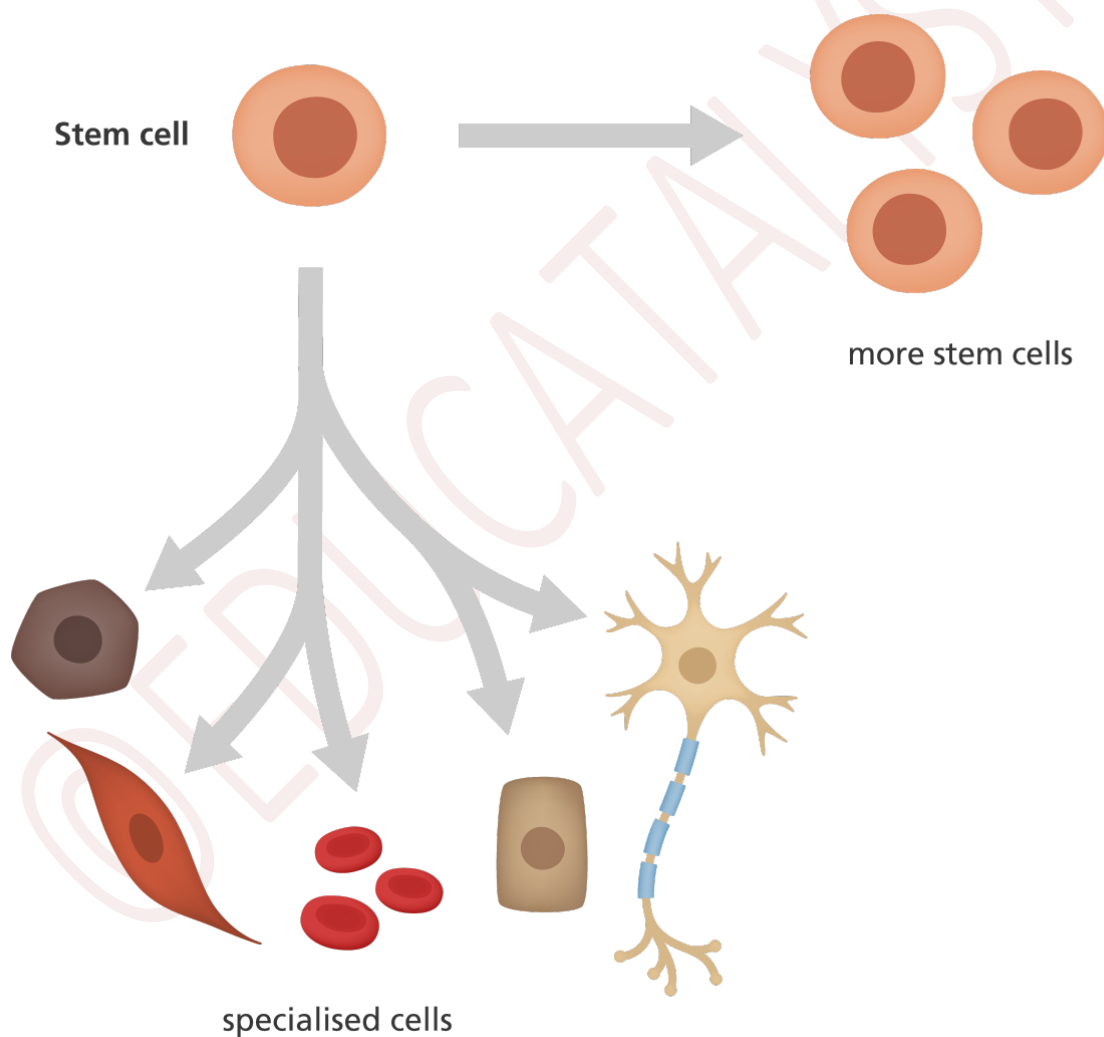
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S33

D

Stem cells are **unspecialised** and **undifferentiated** cells which divide by mitosis to give rise to specialised cells.



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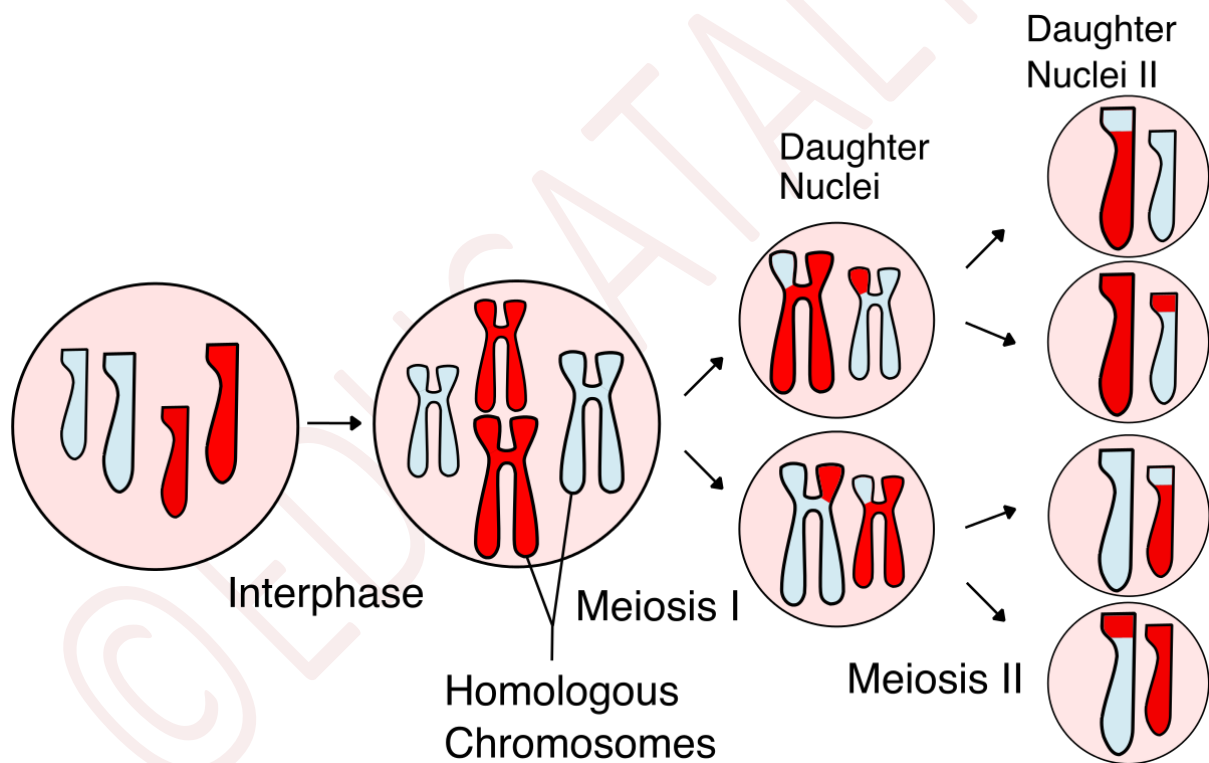


S34

B

The process of meiosis involves two divisions of the genetic material.

The first division is called the **reduction division** – or meiosis I – because it reduces the number of chromosomes from 46 chromosomes or $2n$ to 23 chromosomes or n (n describes a single chromosome set).



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**S35****A**

Possible genotype combinations of person affected with sickle-cell disease:

Hb^SHb^A or Hb^SHb^S

Genotype combinations of normal person:

Hb^AHb^A only



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**S36****B****2 → 4 → 1 → 3**

The changing environment causes variation in organisms due to mutation.

The well adapted organisms survive while those not able to adapt to the changing environment perish.

The organisms that survive pass on the genes to the future generation.

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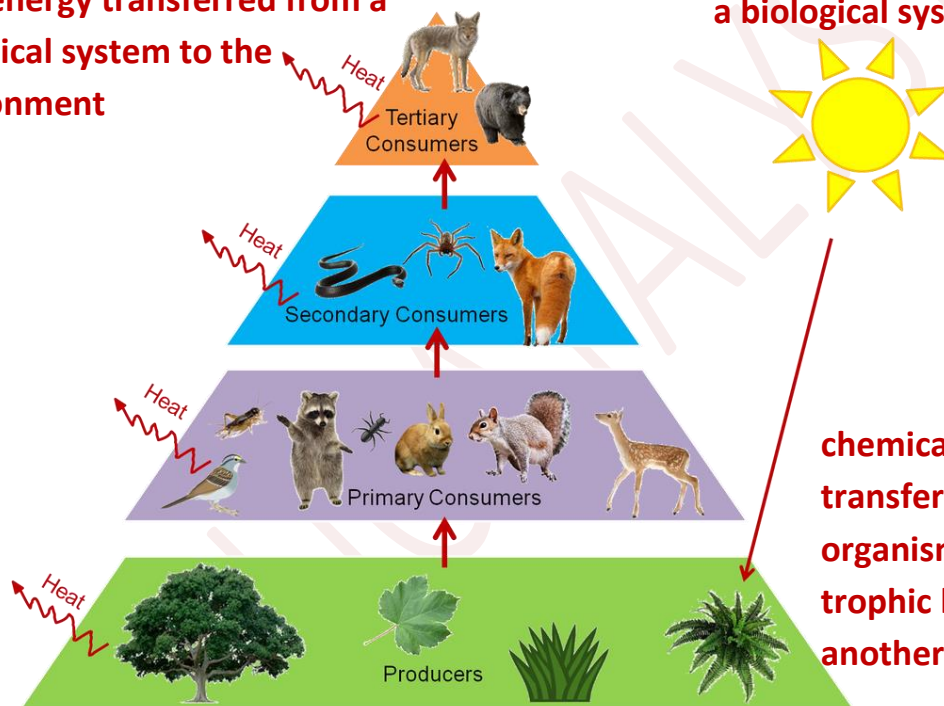


S37

C

Heat energy transferred from a biological system to the environment

Light energy entering a biological system



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S38

B

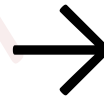
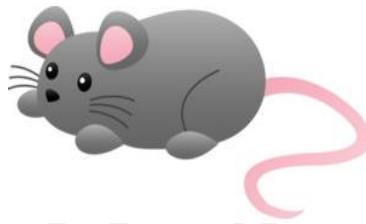
grass
Producers



mouse
Primary
consumer



owl
Secondary
consumer



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S39

C

Lactose-free milk is produced by adding lactase to milk.

Lactase is an enzyme produced by people who tolerate dairy products, which breaks down lactose in the body.

The final lactose-free milk has nearly the same taste, texture and nutrient profile as regular milk.

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**S40****A**

Nitrates are important components of fertilisers. Nitrates are highly water-soluble.

Excessive use of fertilisers results in nitrates being washed off the soil during irrigation, or when it rains as surface run-off into rivers.

Maximum concentration of nitrate is seen at the point after farm A and before farm C indicating excessive usage of fertiliser on farm A.

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