SECTION A (50 Marks)

*Compulsory: Attempt **all** questions.*

Question 1.

(a) Direction: For each question, there are four alternatives A, B, C and D. Choose the correct alternative and circle it. Do not circle more than ONE alternative. If there are more than one circled, NO score will be awarded. **[25]**

i. What gives endoplasmic reticulum a 'rough appearance'?

A chromosome
B centrosome
C lysosome
D ribosome

ii. All of the following are external factors affecting photosynthesis, EXCEPT

A pollution.
B leaf anatomy.
C water content.
D light intensity.

iii. The human blood consists of

A 45% plasma.
B 55% plasma.
C 85% plasma.
D 95% plasma.

iv. Identify the natural reflexes given below.

A singing and writing
B reading and dancing
C coughing and smiling
D walking and swimming

v. The following information is about a microorganism Y.

✓ They lack true nucleus.
✓ Most abundant unicellular micro-organism.
✓ Mostly useful, but few others cause diseases.

What is microorganism Y?

A protozoa
B bacteria
C fungus
D virus

vi. Which of the following best depicts the genotypic ratio in mono-hybrid cross in F_2 generation?

A 1 : 2 : 1
B 1 : 1 : 2
C 2 : 1 : 1
D 2 : 2 : 1

vii. The association between two different organisms where one species benefits, and the other does not refers to

A symbiosis.
B parasitism.
C mutualism.
D commensalism.

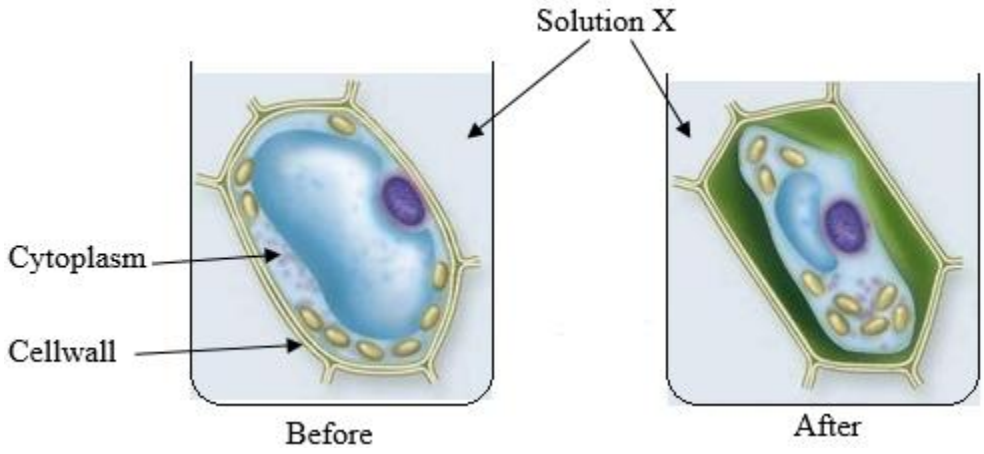
viii. Read the description given below.

✓ Each chromosome get attached to spindle fibre by centromere.
✓ All chromosome pairs lined up in the centre to form the equatorial plane.

Identify the stage in mitosis described above.

A metaphase
B anaphase
C telophase
D prophase

ix. Study the experiment given below.



The type of solution most likely represented by 'X' is

A hypertonic.
B hypotonic.
C isosmotic.
D isotonic.

x. What is the function of plant growth promoters ?

A causes stomata closure
B helps in flowering
C induces abscission
D ripening of fruits

xi. Destruction of virus and bacteria by engulfing them during phagocytises involves

A thrombocytes.
B erythrocytes.
C granulocytes.
D leucocytes.

xii. BCG vaccination for children prevents

A typhoid.
B cholera.
C tuberculosis.
D whooping cough.

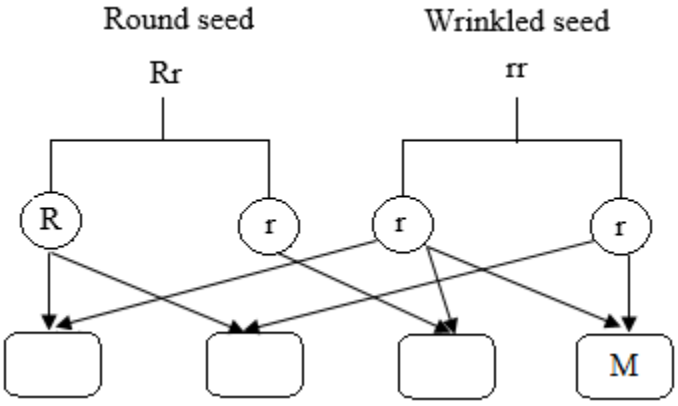
xiii. The diagram below shows the pathway of impulses for a type of action.

Receptor → CNS → Effectors

What action is illustrated in the above process?

A involuntary action
B voluntary action
C automatic action
D reflex action

xiv. Diagram below shows the monohybrid cross of seed shapes in peas.



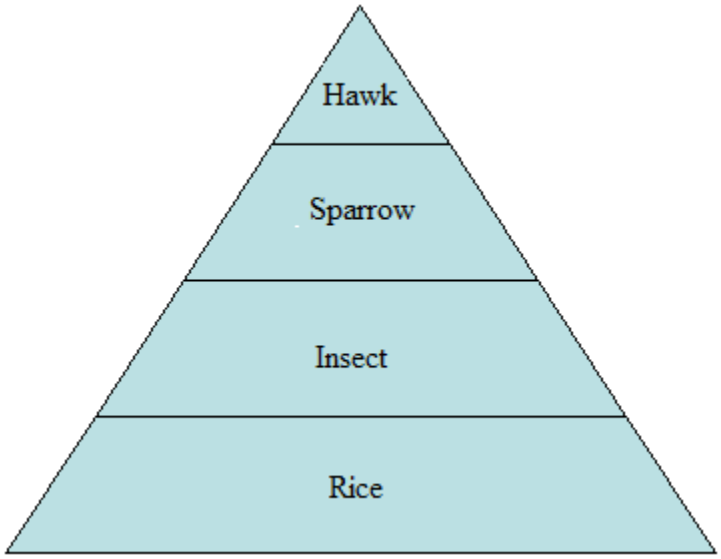
What is the phenotype of M?

A round seed
B wrinkled seed
C 50% round and 50% wrinkled seed
D 75% wrinkled and 25% round seed

xv. Which of the following best describes the function of phloem fibres?

A storage of food
B mechanical support
C provides energy to the plant
D transportation of food materials

xvi. Study the diagram given below.



What role does the hawk play in the above diagram?

A producer
B omnivore
C carnivore
D herbivore

xvii. Dema added few drops of enzyme 'X' to a fat sample. The products formed were fatty acids and glycerol. What is enzyme 'X'?

A lipase
B lactose
C maltase
D sucrose

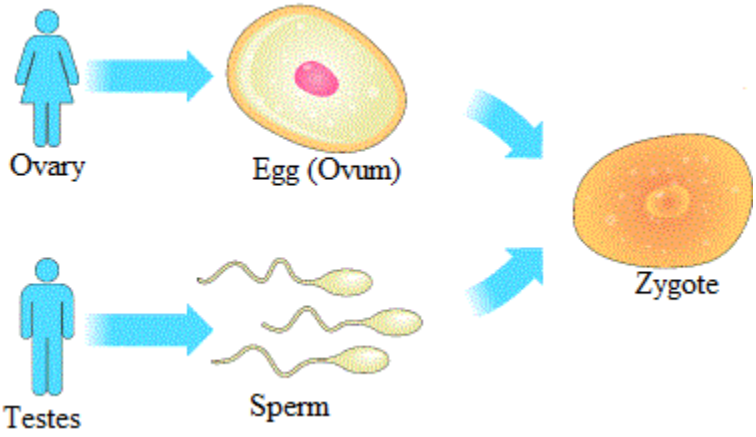
xviii. According to World Health Organization (WHO) family planning is a basic human right. Which of the following does **NOT** help in family planning?

A sex education in schools
B provision of adoption services
C providing genetic counselling
D marrying before the age of 18

xix. Common cold is caused by

A paramyxovirus.
B alphavirus.
C rhinovirus.
D flavivirus.

xx. Meiosis occurs only in the reproductive organs as given in the figure below:



Which cell will have diploid number of chromosomes?

A testes
B zygote
C sperm
D ovum

xxi. 'Bhutan is well known to the outside world as a carbon-neutral nation'. Which of the following supports the above statement?

A constructing farm roads
B establishing industries
C adopting conservation policies
D encouraging rapid urbanisation

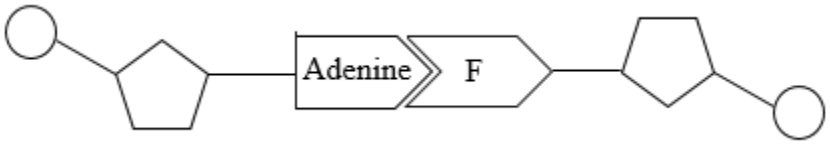
xxii. Study the table and select the correct matching pair.

A	Light reaction	stoma
B	Dark reaction	stroma
C	Glycolysis	mitochondria
D	Kerb's cycle	cytoplasm

xxiii. Dorji's mother is a carrier of colour-blindness and his father is normal. What is the possibility of Dorji being colour blind?

A 25%
B 50%
C 75%
D 100%

xxiv. The diagram below shows a portion of a DNA molecule.



The nitrogenous base F is

A guanine.
B cytosine.
C thymine.
D uracil.

xxv. Study the characteristics of the blood cell mentioned below.

✓ Nucleus large, indistinctly lobed. ✓ Cytoplasm contain large granules.

Identify the blood cell.

A basophils
B neutrophils
C eosinophils
D lymphocytes

b) Fill in the blanks by using a suitable word. [5]

i. Splitting of a single molecule of glucose into two molecules of pyruvic acid is called _____

ii. During light reaction, the light splits into hydrogen and oxygen ions. This process is called _____

iii. The rate of photosynthesis is maximum at an optimum temperature of _____

iv. Radiations, X-rays and UV rays from the sun and toxic chemicals causes change in DNA molecules which results in _____

v. The negative interaction between two organisms trying to utilize the same resource is called _____

c) Match each item under Column A with the item in Column B. Rewrite the correct pairs by writing the alphabet against the number in the space provided. [5]

Column A	Column B
i. Maintaining correct balance of water and solutes in the body ii. Transports urine from kidneys to the urinary bladder iii. Transports urine from urinary bladder to outside iv. Movement of water molecules across the semi-permeable membrane v. Movement of particles of any substances from higher concentration to lower concentration	a. osmosis b. diffusion c. active transport d. ureter e. urethra f. osmoregulation g. urinary bladder h. urethral sphincter

i.
ii.
iii.
iv.
v.

d) Correct the following statement by changing the <u>underlined</u> word only. Rewrite the correct answer only. [5]

i. Motor neurons carry impulses from CNS to the <u>receptor</u> organs such as muscles.

_____

ii. The body of a fungus is made up of long, slender thread-like structures called <u>mycelium.</u>

_____

iii. The point at which the chromosomes actually cross over in meiosis are called <u>centromere.</u>

_____

iv. Interaction between two species in which one organism derives nutrition from the other living organism is called <u>mutualism.</u>

_____

v. The only plant growth regulator in gaseous form is auxins.

_____

e) Answer the following questions:

i. How is active transport different from other types of absorption? **[1]**

ii. Write **one** difference between natural reflex and conditioned reflex. Give an example each. **[2]**

Natural reflex	Conditioned reflex

iii. Would you consider bacteria as harmful or helpful micro-organisms? Explain with any **two** justifications choosing either the helpful OR harmful column. **[2]**

Helpful bacteria	Harmful bacteria

iv. Give **two** reasons why Mendel's experiments with pea plants were successful. **[2]**

v. Write **two** advantages and **two** disadvantages of conserving forest. **[2]**

vi. Study and complete the table. **[1]**

Cell structure	**Prokaryotic cell**	**Eukaryotic cell**
1. Mitochondria	i. _____	Present
2. Nucleus	Absent	ii. _____

SECTION B (50 Marks)

*Attempt any **FIVE** questions*

Question 2.

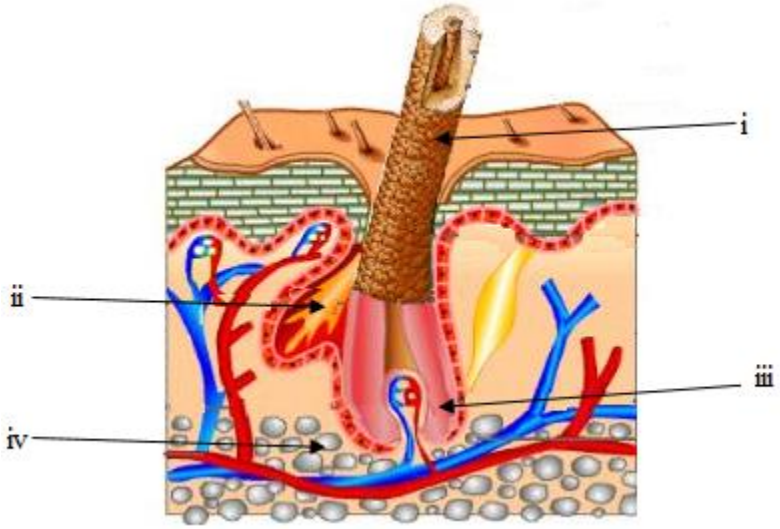
a) Define the following: **[2]**

i. Mitosis

ii. Meiosis

b) Briefly explain the Contact Exchange Theory. **[2]**

c) The given diagram shows the vertical section of the skin.



i. Label parts i, ii, iii and iv. **[2]**

i.
ii.
iii.
iv.

ii. Write **one** function of part ii. **[1]**

iii. Name **one** excretory organ other than the skin. **[1]**

d. Classify these actions under sympathetic and parasympathetic systems. **[2]**

[stimulates digestion, increases peristalsis, dilates pupils, slows heart beat]

Sympathetic system	Parasympathetic system

Question 3.

a) i. Define Blackman's law of limiting factor. **[1]**

ii. What will happen if there are less number of WBCs in the body?
List down any **two** effects. **[2]**

b) The diagram below shows an example of an involuntary action.

i. Name the action. **[1]**

ii. How is it different from tapping your feet when you hear music? **[2]**

c) Study the classification of two organisms given below.

A	B
- Occurs as spherical, rod-shape and spiral shapes - DNA found inside nucleoid	- Occurs as polyhedral, helical, spiral and cylindrical shapes - DNA or RNA is surrounded by a protein coat called capsid

i. Name A and B. **[1]**

ii. State **one** disease each caused by A and B. **[1]**

d) Which means of reproduction is better, asexual or sexual reproduction? Choose either 'Asexual' or 'Sexual' and justify with **two** reasons. **[2]**

Asexual reproduction	Sexual reproduction

Question 4.

a) Name the following :

i. A very strong digestive juice capable of digesting lipids, carbohydrate and proteins. **[½]**

ii. A hormone produced by the stomach cells which stimulates parietal cells to produce HCl. **[½]**

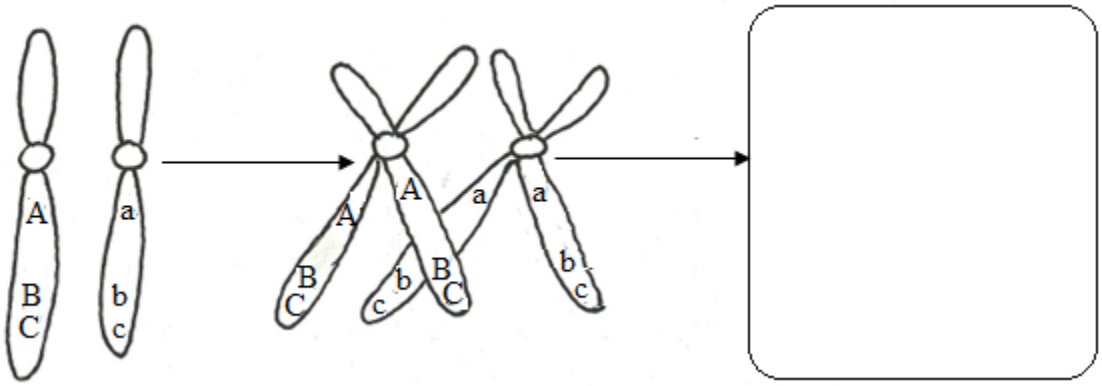
b) Mention **two** advantages of family planning. **[2]**

c) Give reasons for the following:

i. Active immunity is better than passive immunity. **[1]**

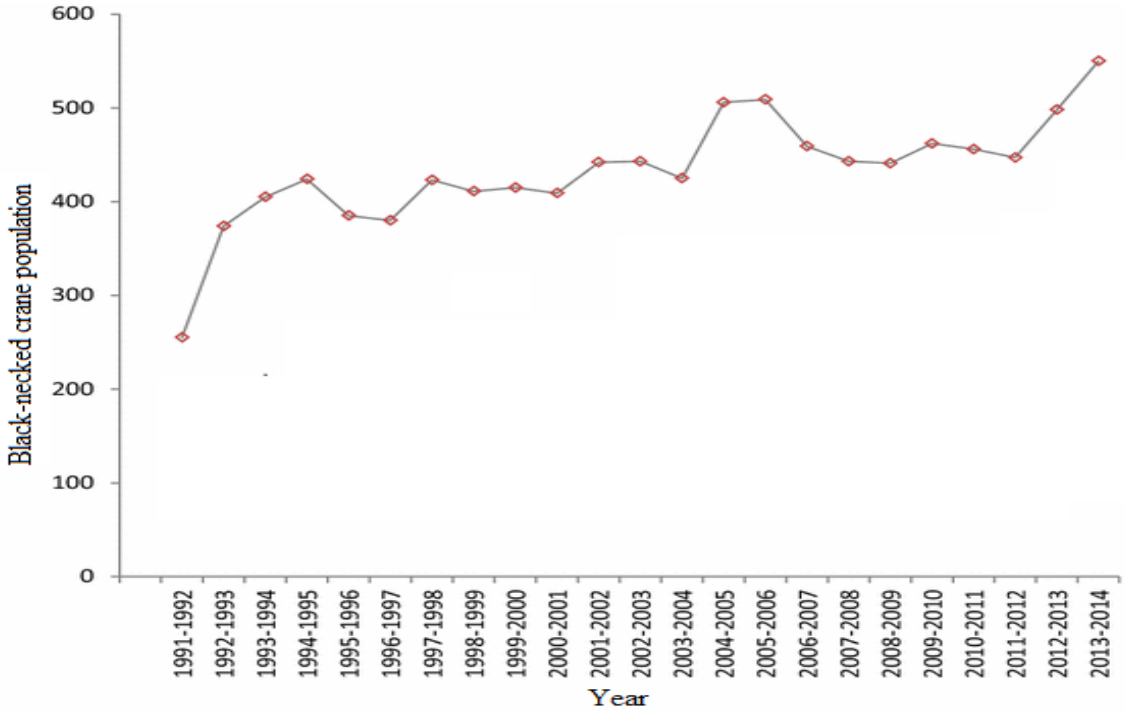
ii. Antacids are given to a person suffering from gastritis. **[1]**

d) i. Complete the diagram **[1]**



ii. Why is the process important? **[1]**

e) Graph below shows the population of black-necked cranes in Bhutan. Study and answer the questions that follow.



i. How many black-necked cranes were there in the year 2004 – 2005? **[1]**

ii. Why was there a decline in the number of black-necked cranes in the year 2006-2007? **[1]**

iii. Why is the conservation of black-necked crane important for Bhutan ? **[1]**

Question 5.

a) Give the scientific term for the following:

i. Sensory receptor that can detect temperature inside the body and are located in the dermis of skin. **[½]**

ii. Sensory receptor that can detect light to provide the sense of vision. **[½]**

b) Refer the diagram below to answer questions i. and ii.

i. Identify the disease. **[1]**

ii. Write **two** preventive measures. **[1]**

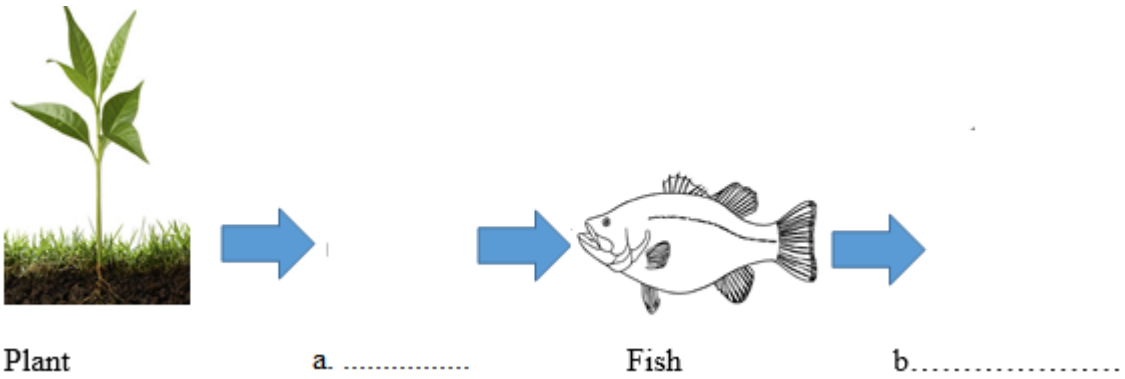
c) How do the following influence genetic variation? **[3]**

i. Random fertilization

ii. Recombination

iii. Hybridization

d) i. Complete the diagram given below. **[1]**



ii. Give an example of a food chain with **5** trophic levels. **[1]**

e) Which do you think is more important, producers or predators? Choose either producers or predators and justify with **two** reasons. **[2]**

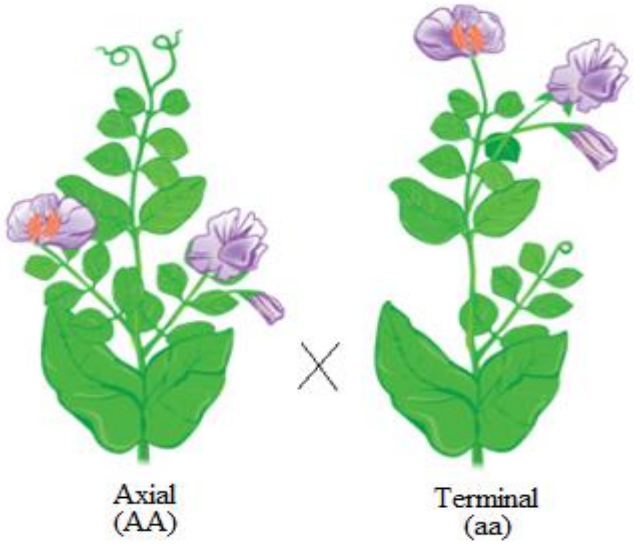
Producers	Predator

Question 6.

a) i. Define allele. **[1]**

ii. Briefly explain allopatric species. **[2]**

b) Study the diagram given below: **[3]**



Work out the phenotypic and genotypic ratios of offsprings in a monohybrid cross in F_2 generation for the above diagram.

c. Complete the table given below: **[2]**

Parts of cell	Function
1. i. _____	a. Allows molecules to move from one part of the cell to another.
2. Cytoplasm	b. ii. _____
3. iii. _____	c. Stores water, food, enzymes and other waste materials.
4. Ribosome	d. iv. _____

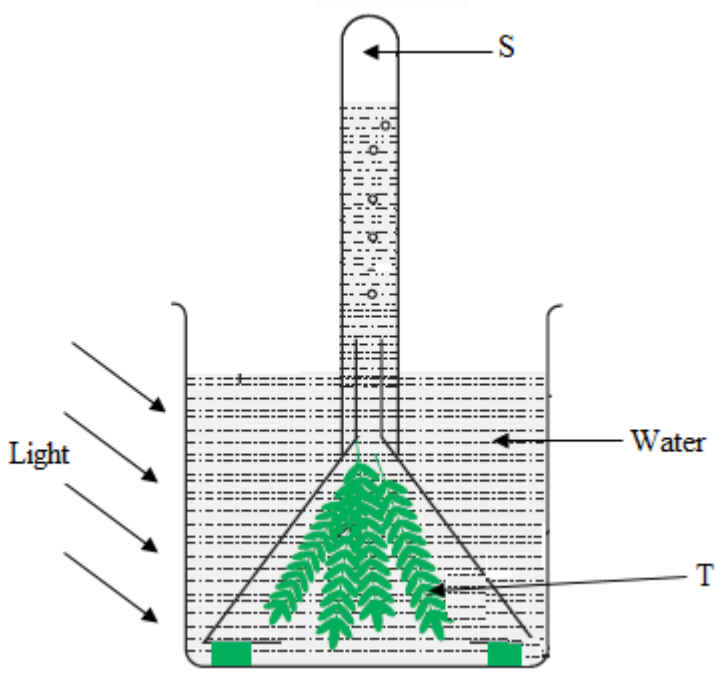
d. 'Photosynthesis is an important process occurring in green plants'.
Is this process important to us? Support your answer with **two** reasons. **[2]**

Question 7.

a. List **two** in-situ conservation strategies. **[1]**

b. Draw a diagram of the human digestive system and label any **four** parts. **[3]**

c. Study the experiment given in the figure below.



i. Label the parts marked S and T. **[1]**

ii. How can you test 'S' ? **[1]**

iii. What would happen if you keep the above experiment in a dark room? **[1]**

iv. Pond water is used in the beaker and not distilled water. Why? **[1]**

d. Father is a heterozygous tongue roller (Rr) and mother is a homozygous recessive non-roller (rr).

Find out the probabilities in their children using punnet square. Write their genotypes. **[2]**

Rough work

Rough work

Rough work