BIOLOGY - ZOOLOGY

Higher Secondary - First year

PRACTICAL MANUAL

HIGHER SECONDARY FIRST YEAR BIOLOGY-ZOOLOGY PRACTICALS

General Instruction

In order to get maximum benefit and good training it is necessary for the students to follow the following instructions.

1. The students must attend all practical classes. Each experiment in practicals has got important relevance to theory subjects.
2. Bring this practical manual to your practicals class.
3. Bring the following objects to the practicals class – Pencils (HB), Pen, Eraser, a scale and a small hand towel.
4. Record the title, date and findings of the experiment in the observation note book.
5. Carefully listen to the instructions given by your Teacher.
6. While observation slides or models draw the structure of the specimen as you see it neatly in your observation note book. Use pencil for drawing.
7. While doing experiments neither consult your neighbours nor look into their readings or observations.
8. If the object under the microscope remains without proper focusing immediately bring it to the notice of the Teacher.
9. Do not touch or lift the models or equipments kept for your identification.
10. **No need to draw diagrams from part III to VI in the record note. Relevant photograph can be collected, pasted and notes to be written.**

MODEL QUESTION

TIME: 75 Minutes

Marks: 7½

I.	Identify the given animal 'A' (picture/specimen) draw and write any 2 diagnostic features.	(1)
II.	Identify the given animal tissue 'B' (slide/photograph /picture) and write any 2 comments with diagram	(1)
III.	Identify and comment on the given bone/joint 'C'.	(1)
IV.	Identify the deficiency disease / disorder in the given picture/photograph "D". Write any three symptoms.	(1)
V.	1. Identify the given sample solution 'E' for the presence/activity of Ammonia/Urea/Salivary amylase (Any one).	(1½)
	2. Observe and write about the given experiment 'F' - Determine Your Blind Spot / Identify the sex of cockroach (Any one)	(1)
VI.	Identify the photograph / picture and write its economic importance 'G'	(1)
	Total	**(7½)**

MARKS ALLOTMENT

TIME: 75 Minutes

Marks: 7½

I.	Identification and Diagram - ½ ; Diagnostic features (any 2 points) -½	(1)
II.	Identification and Diagram - ½; Comments (any 2 points) – ½	(1)
III.	Identification – ½; Comments – ½ (any two points)	(1)
IV.	Identification – ½; Symptoms – ½ (any three points)	(1)
V.	1. Procedure – ½; Experiment- ½ ; Result - ½	(1½)
	2. Procedure - ½; Result - ½ / Identification - ½; Reason - ½	(1)
VI.	Identification – ½; Economic importance – ½ (any two points)	(1)
	Total	**(7½)**

NOTE: Any relevant points, diagnostic features and comments apart from those provided in the practical manual must also be considered for evaluation.

CONTENT

QUESTION NO-IV (D)		
S.No	**List of Slides/Pictures/Photographs**	
1	Addison's disease	9
2	Marasmus	10
3	Exopthalmic Goitre	10

QUESTION NO-V (E and F)		
S.No	**List of Experiments**	
1	Test for Ammonia	10
2	Test for Urea	11
3	Test for Salivary Amylase	11
4	Determine Your Blind Spot	11
5	Identify the sex of cockroach (using hand lens)	12

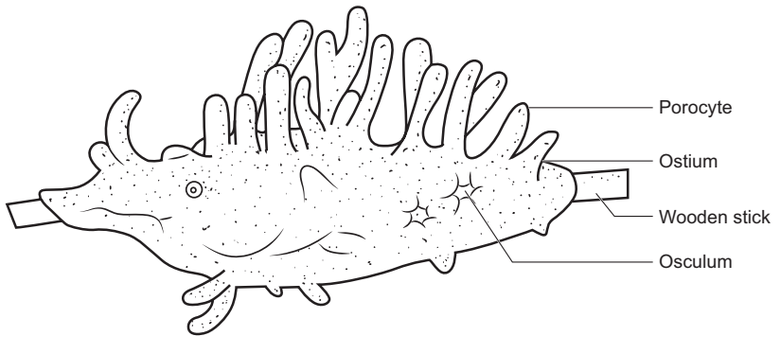
QUESTION NO-VI (G)		
S.No	**List of Photographs/pictures**	
1	Kangayam bull	12
2	Aquaponics	13
3	Honey bee	13
4	Bombyx mori	13

I. Identify the given animal 'A' (picture/specimen) and write any 2 diagnostic features with diagram.

1. SPONGILLA

Identification:

The given specimen is identified as ***Spongilla.*** It belongs to the Phylum **Porifera.**



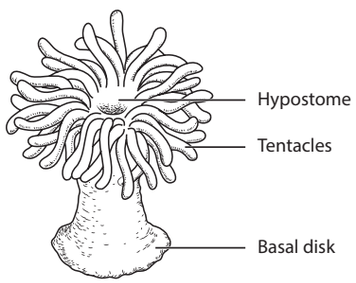
Reasons for identification:

- It is a pore bearing animal.
- It is an aquatic multicellular animals with cellular level of organization.
- It possess a canal system where the water enters into the central cavity, spongocoel through minute pores called ostia.
- The spongocoel is lined with special flagellated cells called choanocytes.

2. SEA ANEMONE

Identification:

The given specimen is identified as **Sea anemone.** It belongs to the Phylum **Cnidaria.**



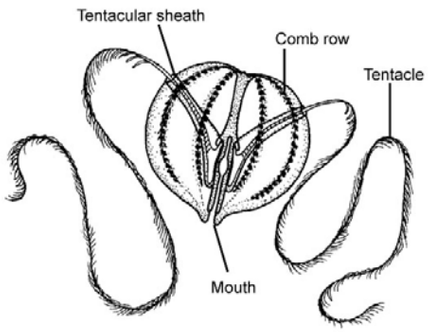
Reasons for identification:

- Sea anemone is diploblastic and the first group of animals to exhibit tissue level of organization.
- It has stinging cells called nematocysts on their tentacles.
- The central vascular cavity is called coelenteron which opens out through the hypostome.
- The nervous system is formed of a diffused nerve net.
- Cnidarians exhibit 2 basic body forms, polyp and medusa.
- The polyp represents the asexual generation and the medusa represents the sexual generation (Alternation of generation).
- Development includes a ciliated Planula larva.

3. PLEUROBRACHIA

Identification:

The given specimen is identified as **Pleurobrachia.** It belongs to the Phylum **Ctenophora.**



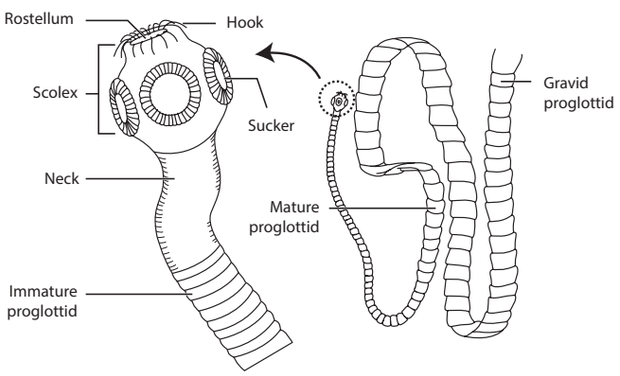
Reasons for identification:

- Pleurobrachia are exclusively marine, biradially symmetrical, diploblastic animals with tissue level of organisation.
- They have eight external rows of ciliated comb plates (comb jellies) which help in locomotion.
- Bioluminescence is well marked in ctenophores.
- They lack nematocysts but possess special cells called colloblasts which help in food capture.
- They reproduce only by sexual means. Fertilization is external and development is indirect and includes a larval stage called cydippid larva.

4. TAPEWORM

Identification:

The given specimen is identified as **Tapeworm.** It belongs to the Phylum **Platyhelminthes.**



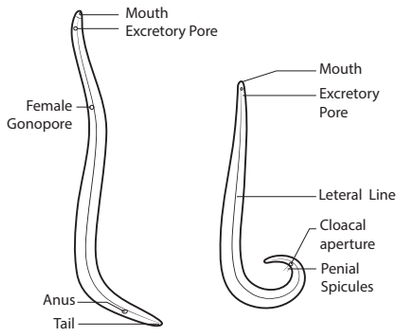
Reasons for identification:

- It is a dorsoventrally flattened, triploblastic, acoelomate animal with organ level of organization.
- It is an endoparasite.
- Hooks and Suckers act as organs of attachment.
- Excretion is carried out by specialized cells called flame cells.

5. ASCARIS

Identification:

The given specimen is identified as ***Ascaris*.** It belongs to the Phylum **Aschelminthes.**



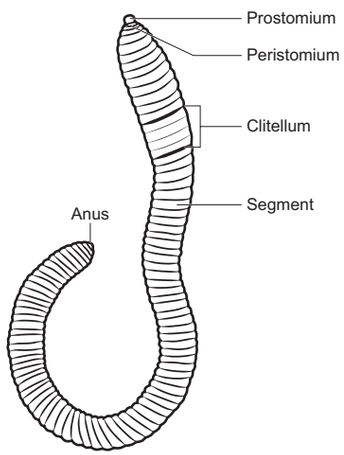
Reasons for identification:

- Ascaris is a roundworm because it is circular in cross section.
- It is a triploblastic, pseudocoelomate animal.
- The unsegmented body is covered by a protective layer called cuticle.
- Alimentary canal is complete with a well developed mouth, pharynx and anus / cloaca.
- Sexes are separate and exhibit sexual dimorphism.
- Excretion is carried out through Rennet glands.
- It is an endoparasite.

6. EARTHWORM

Identification:

The given specimen is identified as **Earthworm.** It belongs to the Phylum **Annelida.**



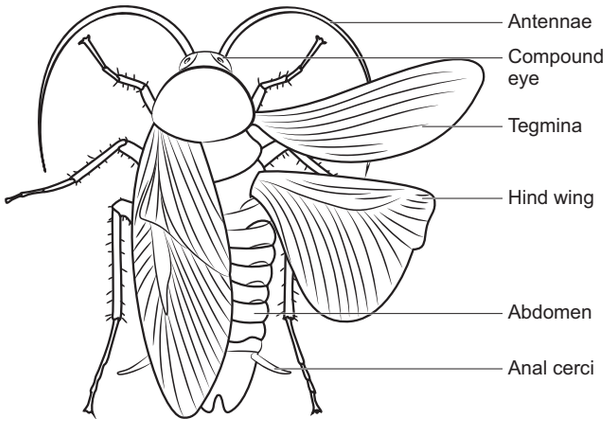
Reasons for identification:

- Earthworm is a triploblastic, schizocoelomate animal.
- Its elongated body is segmented.
- The longitudinal and circular muscles in the body wall help in locomotion.
- The circulatory system is of closed type and the respiratory pigment haemoglobin is present in the plasma.
- It is a hermaphrodite animal.

7. COCKROACH

Identification:

The given specimen is identified as **Cockroach.** It belongs to the Phylum **Arthropoda.**



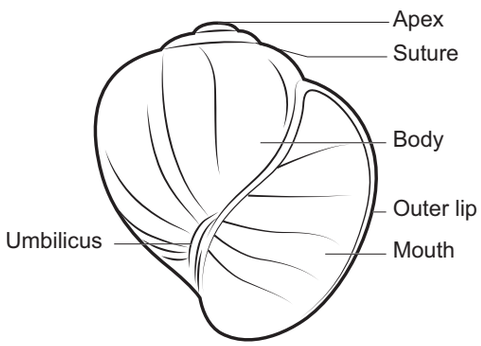
Reasons for identification:

- It is a triploblastic, schizocoelomate animal.
- It has jointed appendages which are used for locomotion.
- Body is covered by a chitinous exoskeleton which is shed off periodically by a process called moulting/ecdysis.
- Respiration is through trachea.
- Excretion is by malpighian tubules.

8. PILA

Identification:

The given specimen is identified as ***Pila.*** It belongs to the Phylum **Mollusca.**



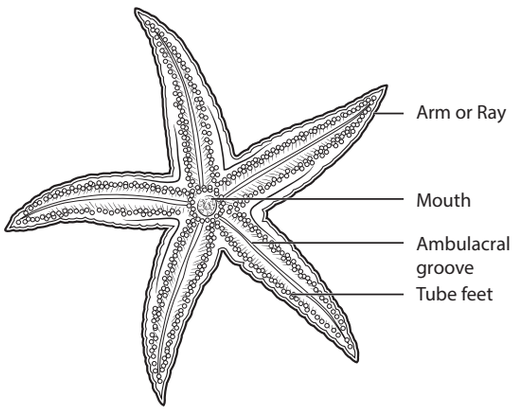
Reasons for identification:

- It is a triploblastic, coelomate animal.
- Body is covered by a calcareous shell.
- Internal organs are covered by a soft layer of skin called mantle.
- Respiration is carried out through a number of feather like gills called ctenidia.
- The mouth contains a rasping organ called radula.
- Excretory organs are the nephridia.
- Blood contains a copper containing respiratory pigment, haemocyanin.
- Their development includes a Veliger larva.

9. STARFISH

Identification:

The given specimen is identified as **Starfish**. It belongs to the Phylum **Echinodermata.**



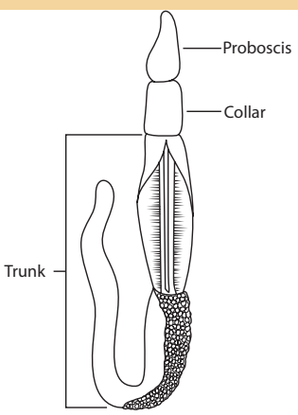
Reasons for identification:

- It has spiny skin.
- It has Water vascular system.
- Tube feet help in locomotion.
- The adults are radially symmetrical.
- Larvae are bilaterally symmetrical
- Circulatory system is open type without heart and blood vessels.
- It exhibits autotomy with remarkable power of regeneration.
- Bipinnaria is the first larva in its development.

10. BALANOGLOSSUS

Identification:

The given specimen is identified as ***Balanoglossus*.** It belongs to the Phylum **Hemichordata.**



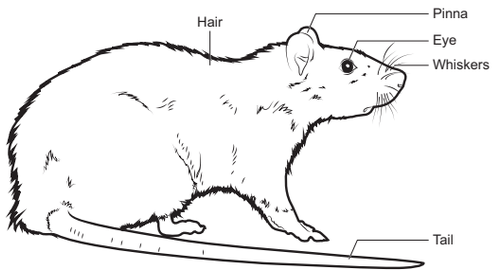
Reasons for identification:

- It is a connecting link between invertebrates and chordates.
- The body is divided into anterior proboscis, a short collar and a long trunk.
- It is a marine and bilaterally symmetrical animal.
- Excretion is by a single proboscis gland.
- Development is indirect with a free swimming Tornaria larva.
- Presence of buccal diverticulum is the significant character of this animal.

11. RAT

Identification:

The specimen kept for identification is the **Rat**. It belongs to the Phylum Chordata, Subphylum Vertebrata and Class **Mammalia**.



Reasons for identification:

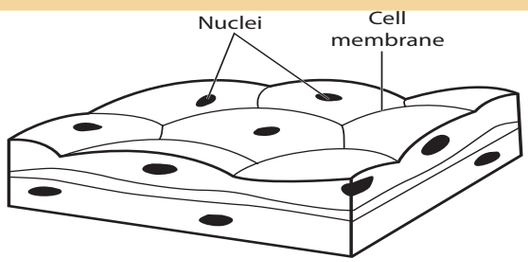
- Presence of mammary gland is the unique feature of mammals.
- Pair of pinnae or external ears are present.
- Heart is 4 chambered.
- Kidneys are metanephric and are ureotelic animal
- Rats are homeothermic and viviparous.

II. Identify the given animal tissue 'B' (slide/photograph/picture) and give any 2 comments with diagram.

1. SQUAMOUS EPITHELIUM

Identification

The given slide/ picture is identified as **squamous epithelium.**



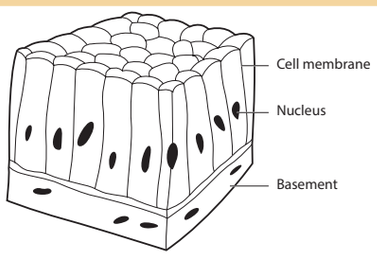
Notes:

- Squamous epithelium is a type of simple epithelium
- It is made of a single thin layer of flattened cells with irregular boundaries.
- Found in cheek, kidney glomeruli, air sacs of lungs, lining of heart and blood vessels.
- It is involved in diffusion and filtration.

2. COLUMNAR EPITHELIUM

Identification:

The given slide/ picture is identified as **columnar epithelium**.



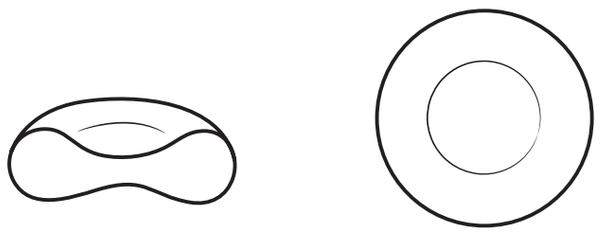
Notes:

- Columnar epithelium is a type of simple epithelium.
- It is composed of a single layer of tall cells with round oval nuclei at the base.
- It lines the digestive tract from the stomach to rectum.
- It is involved in absorption, secretion of mucus, enzymes and other substances.

3. RBC

Identification:

The given slide is identified as **Red blood corpuscles (Erythrocytes).**



Side view (cut) Top view

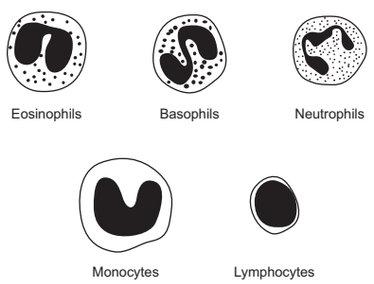
Notes:

- The red colour of the RBC is due to the presence of a respiratory pigment, haemoglobin.
- Haemoglobin plays an important role in the transport of respiratory gases.
- RBC's are produced in the red bone marrow of large bones and are destroyed in the spleen and liver.
- The average life span of an RBC in a healthy individual is about 120 days.

4. WBC

Identification:

The given slide is identified as **white blood corpuscles (leucocytes).**



Eosinophils Basophils Neutrophils

Monocytes Lymphocytes

Notes:

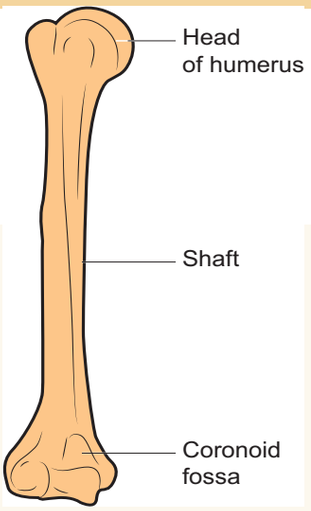
- Leucocytes are colourless, amoeboid, nucleated cells devoid of haemoglobin and other pigments.
- Based on the presence (or) absence of granules, WBC's are divided into two types, granulocytes (Neutrophil, Basophil and Eosinophil) and agranulocytes (Lymphocyte and Monocyte).
- WBCs are involved in protecting the body against pathogens.
- The life span of a white blood cell ranges from 13 to 20 days. These are destroyed in the lymphatic system.

III. Identify and comment on the given bone/joint 'C'.

1. HUMERUS BONE

Identification:

The given specimen/picture kept for identification is the **human – humerus bone.**



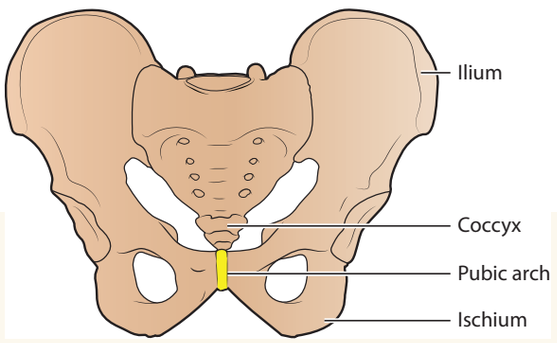
Comments:

- It is found between the shoulder and elbow.
- The head of humerus articulates with the glenoid cavity of the pectoral girdle.
- The other end of the humerus articulates with the two forearm bones namely the radius and ulna.

2. PELVIC GIRDLE

Identification:

The given specimen kept for identification is the **human pelvic girdle**.



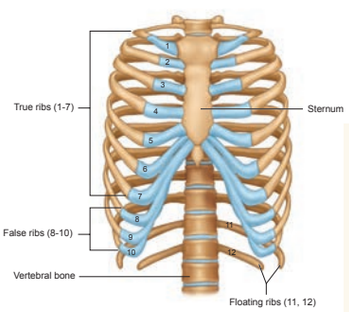
Comments:

- It is composed of 2 hip bones called coxal bones together with the sacrum and coccyx.
- It is a heavy structure specialized for weight bearing.
- Each coxal bone consists of 3 fused bones namely the ilium, ischium and pubis.
- At the point of fusion of the 3 bones, a socket called acetabulum is present.
- The acetabulum is meant for the articulation of the lower limbs.

3. RIB CAGE

Identification:

The given specimen kept for identification is the **human ribcage**.



Comments:

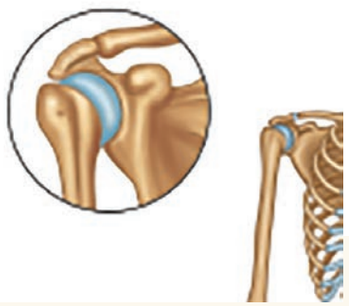
- There are 12 pairs of ribs.
- Each rib is connected dorsally to the vertebral column and ventrally to the sternum.

- The first 7 pairs of ribs are called true ribs.
- The 8th, 9th and 10th pairs of ribs do not articulate with the sternum but is joined with the 7th rib. They are called as false ribs.
- The last 11th and 12th pairs of ribs are not connected with sternum. They are called as floating ribs.

4. BALL AND SOCKET JOINT

Identification:

The specimen/model/picture kept for identification is the **Ball and Socket joint.**



Comments:

- It is a type of synovial joint.
- In this type, the ball shaped rounded bone fits into the cup like depression of another bone.
- It allows multi directional movements and rotation.
- This type of joints are found between the upper arm and shoulder and between the upper leg and hip.

IV. Identify the deficiency disease/disorder 'D' in the given picture/photograph and write any 3 symptoms.

1. ADDISON'S DISEASE

Identification:

The picture kept for identification depicts **Addison's disease.**

Comments:

- It is a disorder in which the adrenal glands do not produce enough hormones.
- It is caused due to hyposecretion of glucocorticoids and mineralocorticoids from the adrenal cortex.
- Muscular weakness, low BP, loss of appetite, vomiting, hyper pigmentation of the skin are the symptoms of Addison's disease.

2 MARASMUS

Identification:

The picture kept for identification depicts **Marasmus.**

Comments:

- It is a disorder due to protein deficiency in children.
- It is an acute form of protein malnutrition.
- This is due to a diet with inadequate carbohydrate and protein.
- Diarrhoea and emaciation are the symptoms of this disease.

3. EXOPTHALMIC GOITRE

Identification:

The picture kept for identification depicts Exopthalmic goitre.

Comments:

- The hyper function of thyroid gland results in exopthalmic goitre/gravis disease.
- It is characterized by increased BMR (50% - 100%) with increased pulmonary ventilation and protrusion of eye balls from the sockets (exophthalmos)
- Elevated respiratory and excretory rate with increased body temperature are the general symptoms.

V. 1. Identify the given sample solution 'E' f or the presence/activity of salivary amylase/ ammonia/urea.

2. Observe and write about the given 'F' experiment / specimen / picture. Determine Your Blind Spot / Identify the sex of cockroach

1. TEST FOR AMMONIA

Aim : To test the presence of Ammonia in the given sample solution.

Materials Required: Test tube and holder.

Solution Required: Sample solution and Nessler's Reagent.

Procedure:

1) Take 2ml of the given sample solution in a clean test tube.
2) Add few drops of Nessler's reagent in the test tube containing sample solution.
3) Appearance of dark yellow/brown colour confirms the presence of Ammonia in the given sample.

Inference: It is inferred that ammonia is present in the given solution.

2. TEST FOR UREA

Aim: To test the presence of urea in the given sample solution.

Material Required: Test tube, sample solution, test tube holder and pipette / dropper.

Required Reagents: Phenol red and Horse gram powder (which contains the enzyme urease).

Procedure:

1. Take 2 ml of sample solution in a clean test tube.
2. Add few drops of phenol red in the test tube containing sample solution.
3. Add a pinch of horse gram powder in the test tube and mix well.
4. Appearance of dark pinkish colour indicates the presence of urea in the given sample.

Inference: It is confirmed that the given sample solution contains urea.

3. TEST FOR SALIVARY AMYLASE

Aim: To test the presence of Amylase enzyme in the human saliva.

Materials Required: Test tubes, Potato, Mortar and Pestle.

Solutions Required: Iodine solution, Human Saliva.

Procedure:

1) Add mashed potato pieces in a test tube and add warm water. Shake well.
2) Collect the clear supernatant in a test tube.
3) Add few drops of iodine solution to the liquid in the test tube.
4) Note the bluish black (dark blue) colour in the test tube.
5) Collect a few drops of saliva in a clean test tube.
6) Transfer the saliva into the test tube containing the sample solution and shake well.
7) Leave the sample undisturbed for 5 minutes. Observe the colour change in the sample solution.
8) The solution gradually becomes colourless.
9) This confirms the presence of amylase in the human saliva.

Inference: It is inferred that human saliva contains the enzyme amylase that digests the starch.

4. DETERMINE YOUR BLIND SPOT

Procedure:

1. Cover your left eye.
2. Hold the figure shown about 50 to 60 cm away from your face and directly in front of your right eye.

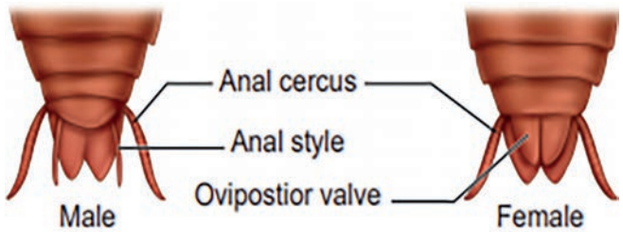
3. Stare at the cross in the shown figure. You can also see the circle.
4. Continue to stare and slowly bring the figure nearer to your eye.
5. Note the point at which the circle will seem to disappear. This is your blind spot.
6. Record the distance.
7. Test your other eye in a similar manner, but focus on the circle and watch for the cross to disappear.

Result:

1) Blind spot of my right eye is _____cm
2) Blind spot of my left eye is_____cm

5. Identify the sex of the cockroach by observing the given specimen/picture /model and write two reasons.

Identification :



Reasons:

VI. Identify the photograph / picture 'G' and write its economic importance

1. KANGAYAM BULL

Identification:

The photograph kept for identification is Kangayam bull.

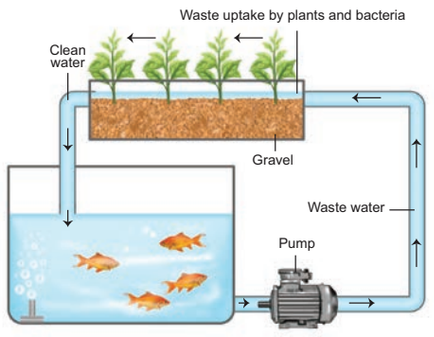
Economic importance:

1. It is originated from the place called Kangayam in Tamilnadu.
2. This breed is meant for pulling carts, ploughing fields etc.
3. This breed is exclusively used in the traditional game called Jallikattu (manju virattu) in Tamilnadu.
4. It is a best example for a draught breed.

2. AQUAPONICS

Identification:

The photograph kept for identification is Aquaponics.



Economic importance:

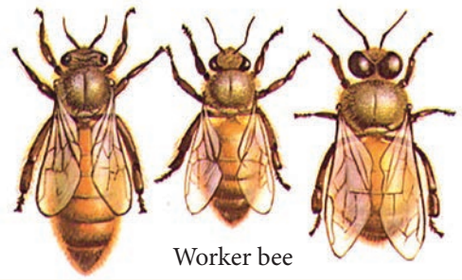
1. Aquaponics is a technique which is a combination of Aquaculture and Hydroponics.
2. It maintains balanced ecosystem by recycling the waste and excretory products produced by the fish.
3. Cultivable fishes like Tilapia, Gold fish, Koduva etc. are cultured in aquaponics.
4. Plants like tomato, pepper and cucumber can be cultivated in this method.

3. HONEY BEE

Identification: The photograph kept for identification is Honey bee.

Economic importance:

1. The chief products of bee keeping industry are honey and bee wax.
2. Honey is the healthier substitute for sugar.
3. It is used as an antiseptic, laxative and as a sedative.
4. Bee wax secreted by the abdomen of the worker bee is used for making candles, polishes for floors and furniture etc.



Queen bee Worker bee Drone bee

4. BOMBYX MORI

Identification:

The photograph kept for identification is silkworm Bombyx mori

Economic importance:

1. Silk fibre produced by this silkworm is called mulberry silk.
2. It mainly feeds on mulberry leaves
3. It is used in manufacturing silk cloths, fishing fibres, tyres of racing cars, in medical dressings, parachutes etc.

Biology - Zoology - Higher Secondary First Year

Practical Manual - List of Authors and Reviewers

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