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You are provided with the following materials.

- Iodine solution in a test tube.
- Distilled water in a beaker.
- A hand lens.
- A scalpel.
- Microscope slide.
- Cover slip.
- Light microscope.
- Specimen E.
- A 30 cm ruler.
- White tile.

Procedure

- Dip the petiole of specimen E in the distilled water provided in the beaker.
- Using the scalpel, cut off about 2 cm of the specimen E at the base while holding the cut area under water.
- Immediately transfer the petiole with the freshly cut end into the iodine solution and leave it undisturbed for about ten minutes. Do not discard the iodine solution as you may need it in question 3.
- Remove the petiole from the iodine solution and make a transverse section, about 1 cm from the end that had been dipped in the iodine solution.
- Place the cut section on the white tile and observe the freshly cut surface using the hand lens.

(a) (i) Make a labelled drawing of the structures observed from the cut section. (2 marks)

NOTE D1 for right, L1 Mark first diagram.

Magnification Just see it =

Labelling mark 1

- Am ~~to~~ correct.
- See others wrong spelling = RS.
- consider wrong and phloem for vascular bundles.
- RS Xylem and phloem for vascular bundles.
- Both should be correct.
- Labelling line should be continuous.
- Not bullets.
- No arrows.
- No crossing or label lines.
- No of dotted lines.
- Touch intended structure.

Diagram

MKS

D.V

Depression not must

Outline continuous and double

Vascular bundles

Circle or semicircle

NO partition for vascular bundles

Minum of 3 vascular bundles

Orientation of Vb.

No shading

Two dimension

Free hand

Structure not flowing into each other

Section drawn

If Epidermis is single dem D mark

If LS dent D mark

Mg X30

Epidermis

Vascular bundle

Pith

LS

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3) well developed
2. Curved - 1.5 cm
to 1.5 cm
NB Mark
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(c) Suggest the likely difference in observation if a blunt object was used to make slices of specimen E for observation. (2 marks)
Blunt object produces thick slices/sections which do not allow light to pass through and could be distorted/damaged/damaged;

2 You are provided with specimen F on a petri-dish, which is an organism belonging to a certain Phylum. Carefully observe it using a hand lens. (1 mark)
Underline
Arthropoda
Arthropod(s)

(a) Identify the Phylum to which specimen F belongs. (1 mark)
Arthropoda

(b) Give two reasons for the answer in 2 (a) based on the observable features of the specimen. (2 marks)
Jointed appendages/limbs/legs/monthparts/antennae.
segmented body (parts).
(presence of) exoskeleton.
Resect joined appendages/limbs/monthparts

(c) Explain three observable features that make the specimen to colonise most habitats. (2 marks)
1. 3 pairs of legs to enable it move on the ground/escape predators.
2. A pair of wings for flight is search of food/mate/escape predators/escape unfavourable environments.
3. (A pair) antennae to sense danger/predators/food/mate.
4. pair of eyes/mosaic vision/compound eyes to see danger/predators/food/mate.
5. (Dorso-ventral) flattened body to pass through/permeate/hide/move through crevices/cracks/moisture/exoskeleton that red- w/ lot of water/densation/offer protection

(d) State two harmful effects of the specimen to humans. (2 marks)
Contaminate food surfaces/disease vector
Iti wicket/body parts/droppings may trigger allergic reactions e.g. Coughing/skin mitch/dia
Damages clothes/shed food
Carries domestic pests/mite
Accept Damaging of home environment

(e) Account for the difference in the type of growth pattern found in specimen F and humans. F (4 marks)

Human	Human
Intermittent/discard/discontinuous pattern	Sigmoid pattern/S-shaped pattern
Reason: It has a hard exoskeleton that limits growth that is shed cyclically/moulting occurs to allow growth	Reason: It has endoskeleton that allows continuous growth (up to a given stage when growth rate stagnates)
Issue: Shade for shed	Accept: It has endoskeleton that grows together with the body.

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5) well developed mouthparts that enable it to feed on a variety of food
2 Brown colour black for common stage
10. Crises or cracks.
NB Mark first 3, see the rest.
11. Fungi are hard to offer protection against mechanical damage.

3 You are provided with the following materials:

- A light microscope.
- Microscope slides and cover slip.
- Specimen H, with some organisms grown on it, placed on a petri-dish.
- An optical pin/needle.
- A hand lens.
- A glass rod.
- Iodine solution in a test tube.
- A white tile.
- A test tube.
- A dropper.

Procedure I

- Use the hand lens to observe the organisms on specimen H.
- Using the pin, gently obtain a few strands of the organisms on specimen H and place them on the microscope slide. Stain them with a drop of iodine solution and cover with a cover slip.
- Mount and observe the specimen under low power objective lens of the light microscope.

(a) Draw and label the image observed.

Drawing conditions

- At least 3 hyphae with all parts (stolon, sporangium, spore(s)) and outline.
- continuous for all structures (3 marks)
- RI shading
- RI use of dots for spores

Labels conditions

- Do not hang labels
- RI label lines that are straight and not wavy
- RI use of extra underline
- mark are two correct and see the extra
- Accept plural or singular as stolon(s), spore(s)
- RI whole spelling
- RI broken label lines
- underline
- Fungi (1 mark)
- Fungi
- Fungi

(b) (i) State the Kingdom to which the organisms drawn in (a) belong.

Fungi (1 mark)

(ii) Give two reasons for the answer in b(i) above. (2 marks)

Reasons:

- Hyphae/sporangium/stolon/rhizoid/mycelium
- Sporangium/spore(s) accept sporulation/reproduction by sporulation
- Saprophytic/saprophyte obtain nutrients from substrate Accept decomposer
- Non green/lacks chlorophyll

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Turn

Diagram

- No shading
- Not 3 dimensional
- Double outline
- No use of geometrical instrument
- Continuous outline
- Continuous and phloem accepted
- Xylem and phloem bundle
- Consider orientation
- Minimum of 3 vascular bundles
- For sector drawing mark is accepted
- LS Resect Drawing mark - Accept labels
- Labelling marks 4
- AM 4 correct
- RS wrong spellings
- Parenchyma
- Magnification
- See magnification
- RS Vascular bundle
- RS Xylem and phloem
- The role of vascular bundle in petiole
- (1 mark)

(ii) Cut several other thinner slices from the freshly prepared of the petiole and observe the thinnest slice using the light microscope. Make a labelled drawing of the image observed.

Diagram

Epidermis

Cortex

Pith

Xylem

Cambium

Phloem

Phloem

Cambium

Xylem

NB = Annotate labels

(b) (i) State the aim of the experiment

- To compare the magnifying power of hand lens and light microscope

Accept - To study distribution / arrangement / position of vascular bundles in petiole

(ii) Explain the role of iodine solution in the experiment. (2 marks)

- To show / trace traces / traces through which water moves up a plant.
- To show / trace the traces in plant rich in starch / storage tissue.
- To make / stain the different parts of section / cells / structure / tissues; to item distinct / clear / more clear / more visible / more distinguishable

(iii) State why it was advisable to slice the specimen while holding the cut area under water.

- To prevent the air (bubbles) / gas from entering / blocking / obstructing / clogging the traces / traces

(iv) Why was it necessary to make very thin slices of the specimen for observation under the light microscope? (1 mark)

Thin (slices) allow light to pass through (when mounted on stage of microscope) enabling clear observation / study of tissues

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Table
Suspension; Iodine solution
RS if Iodine solution

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Procedure II

- (i) Using the scalpel, chop off a portion from specimen H without the organisms.
- (ii) Carefully mercerate or cut the portion into smaller pieces and gently crush the pieces using a glass rod on a white tile.
- (iii) Place the crushed pieces in a test tube.
- (iv) Add about 2 ml of distilled water into the test tube containing the crushed portion and shake to form a suspension.
- (v) Test for the food substance present in specimen H and complete the table. (5 marks)

Test	Procedure	Observation	Conclusion
(Test for starch) Accept starch test RS Iodine test.	To the suspension / food substance / specimen H / H ₁ add (2) drops of Iodine solution (and shake)	colour of Iodine solution retained / brown colour Light blue black / Pale blue black / Patches of blue black	starch absent. (Traces of / little amount of starch present)
Under line the following and continue marking: - starch - starch - starch	NB solution has to be mentioned, drops imply solution. Add Iodine Δ and continue marking	Blue black / black / RS Blue.	starch present

- (c) Account for the likely difference in observation if the food test was done on a fresh specimen H. (2 marks)

fresh portion of specimen H would give a deeper blue-black / more blue-black / more black, because starch has not been digested / broken down.
NB If a student fails to get observation in the table he can't score this

- (d) Explain why it was necessary to mercerate the portion. (1 mark)

To increase surface area for reacting / mixing with distilled water / reagent / iodine solution

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