

## COCKROACH ANATOMY (DISECTION) QUESTIONS

1. You are provided with specimen K, which is freshly killed.
  - a) With the help of a hand lens, examine the head of the specimen. Using any four observable features on the head, explain how each of them enables the animal to survive in its habitat. (04mks)
  - b) View the anterior part of the head using a hand lens. Draw and label. (11 mks)
  - c) Cut off the head of the specimen then cut one eye with as little tissue under it as possible. Place the eye on the slide with the cut side facing downwards. View under the low power of a microscope.
    - (i) Describe the arrangement of the eye units. (05 mks)
    - (ii) Draw four adjacent eye units. Do not label. (06 mks)
    - (iii) What is the significance of the arrangement of the units? (02 mks)
  - d) With the dorsal side uppermost, dissect the specimen to remove the digestive system. Display the structures remaining on the ventral cuticle. Draw and label. (12mks)
  
2. You are provided with specimen K.
  - a) Place the specimen ventral side uppermost and cut off its antennae limbs, observe the head and the first thoracic segment. Draw and label.
  - b) Turn the specimen dorsal side uppermost and examine the wings when pulled outwards. Describe their structure.
    - (i) Outer wings.
    - (ii) Inner wings.
  - c) Cut off wings. Cut along the right lateral line of the body from the anterior part of the thorax up to the 8<sup>th</sup> segment. Turn the dorsal cuticle to the left and clear any fat tissues. Carefully displace only exposed structures on the ventral cuticle. Draw and label your dissection showing;
    - (i) All internal structures on both cuticles.
    - (ii) Parts of the digestive system use for storage, digestion and absorption.
  
3. You are provided with specimen Q.
  - a) Examine one of the specimens and state two external features in each case to classify the specimen into its phylum and class.
    - (i) Features for phylum (2 mks)
    - (ii) Features for class.
  - b) Using a hand lens and examine the left compound eye of the specimen including the first three segments of the antenna, from the base. Draw the structures observed. Do not label. (5 mks)
  - c) (i) Pin one specimen with the dorsal side uppermost. Dissect along the left lateral line of the abdomen. Displace the dorsal cuticle and clear any fat tissue. Without displacing any other structures, draw and label your dissection. (16mks)
    - (iii) By further dissection, cut and remove the whole alimentary canal to clearly display the structures on the ventral cuticle (keep the alimentary canal for question 2). Draw and label the structures associated with ventral cuticle, anterior to the last abdominal segment. (11 mks)

4. You are provided with specimen K.
- From your observation of the external features, state with reasons the sex of the specimen. (2mks)
  - Place the specimen ventral side uppermost. Draw and label the end of the abdomen. (5mks)
  - Using a hand lens examine one antenna and draw. Do not label. (2mks)
  - Place the specimen dorsal side uppermost and dissect to expose the structures within the abdominal and thoracic cavity.
    - Displace the structures to display the salivary glands on the left of the specimen.
    - Displace the alimentary canal to the right of the specimen. Remove all the unnecessary tissue to display all the parts of the alimentary canal and structures on the ventral cuticle. Draw and label. (24mks).

5. You are provided with specimen K.
- Examine the antennae and describe how they are adapted to their function. (3mks)
    - Carefully cut the whole left maxilla. Observe using a hand lens. Draw and label. (6mks)
    - Give three adaptations of maxilla to its functions. (3mks)
  - Place the specimen dorsal side uppermost. Cut along the left lateral line of the specimen to display the heart. Draw and label the circulatory system. (8mks)
  - Remove both the crop and the gizzard related to the function of the two organs. (4mks).
    - Describe the appearance of the inner surface of:
 

Crop.....

Gizzard.....
  - How are the inner surface of the crop and gizzard related to the functions of the two organs? (4mks)
 

Crop.....

Gizzard.....
  - Place the specimen on the dissecting tray with dorsal side uppermost. Cut along the left lateral side of the abdomen to open up the abdominal cavity. Also cut along the right lateral line of the thorax to open up the thorax cavity. Fix the crop with a pin in its original position. Immerse the dissection in water. Displace the alimentary canal to the left. Draw and label the secretory and absorptive structures displayed.
  - Dissect the specimen to remove the whole dorsal cuticle. Discard this cuticle. Then clear off the fat to display the structures on the ventral cuticle. Displace only the intestines to the left of the specimen. Draw and label the visible internal structures. (19mks)

6. You are provided with specimen K.
- Cut off appendages at their proximal ends; remove all the wings including the tegmina Describe the structure of the animal's body. (10mks)
  - Lay the specimen dorsal side uppermost cut off the elytra and wings close to their base. Lift the 10<sup>th</sup> abdominal tergum. Draw and label the visible structures of the specimen. Describe the structures on the ventral cuticle. (4mks)

7. a)(i) You are provided with freshly killed specimen Q. Lay the animal ventral side uppermost. Observe the structures posterior to the trochanter of the hind limb. Draw and label. (10mks)  
(ii) Count the number of abdominal segments in this region. (10mks)
- b) Lay the animal dorsal side uppermost. Cut through the left lateral line of the abdomen and thorax, leaving the anterior most segment of the specimen intact. Lift the dorsal cuticle and displace it on one side of the specimen. Cover the dissection with water and clear away the fat bodies and displace the alimentary canal to the right of the specimen. Draw and label the structures on both cuticles. (18mks)
8. You are provided with specimen K.
- a) Cut off the antenna from its base.
- (i) Measure and record the length of the antenna and the rest of the body. (2mks)  
(ii) What is the significance of the ratio in promoting the survival of the features? (2mks)
- b) (i) Identify the sex of the cockroach, draw and label those external features which you used to determine the sex of the specimen. (4mks)
- (ii) Remove the wings of the specimen. Pin down the specimen with dorsal side uppermost. Lift the free edge of the tergum in the middle of the right lateral side of abdomen. Cut the anterior edge of the terga and remove all the terga except those posterior to the middle of the abdomen. Avoid damaging the organs. List all the visible organs after removing the terga. (4mks)
- (iii) Make a fully labeled drawing of the digestive system. (8mks)
9. You are provided with specimen K.
- a) Using a hand lens examine the antennal socket and four proximal segments of the antenna.
- (i) Describe the structural features of this part of the antenna. (2mks)  
(ii) Draw and label this part of the antenna. (5mks)
- b) Cut off the tegmina, posterior wings, antenna and limbs, place the specimen dorsal side uppermost, cut through its right lateral side and dissect to expose the structures within the abdominal and thoracic regions. Displace the salivary glands to the right of the specimen. Displace the alimentary canal to the left. Remove all unnecessary tissue to display the alimentary canal and the structures on the ventral cuticle the gut. Draw and label structures exposed in your dissection. (18mks)
10. You are provided with specimen K.
- a) Using a hand lens examine the compound eye, fenestra, antennary pit and antenna. Describe their structural features. (6mks)
- b) Examine the head region search for the mouth parts, describe their relative positions and associated structural features. (6mks)
- c) Using a low power microscope, examine the ventral view of the pretarsus.
- i) Describe the structure of the pretarsus. (3mks)  
ii) Draw and label (4mks).  
iii) Place the animal ventral side uppermost. Draw and label the posterior end of the abdomen together with its associated structures. (3mks)
- d) Place the specimen dorsal side uppermost, cut through the left hand edge of the exoskeleton of the abdomen and dissect to expose the structures within the abdominal region. Displace the

alimentary canal to the left of the animal. Remove the unnecessary tissue display all the parts of the alimentary canal and structures on the dorsal cuticle. Draw and label. (8mks)

11. You are provided with specimen K.

- a) Using a scalpel cut off the third leg of the specimen. Examine the inner view of the leg using a hand lens. Draw and label (10mks)
- b) i) Examine the tarsus, draw and label. (4mks)  
ii) Outline the adaptations of the tarsus to its functions. (04mks)
- c) (i) Search for the spiracles. Describe their location and structures. (3mks)  
(ii) Draw a thoracic spiracle (4mks) iii) Outline the difference between the thoracic and abdominal spiracle. (3mks)
- d) (i) Using a microscope, examine the antenna carefully  
(ii) State three adaptive features of the antenna. (3mks)  
(iii) Make a large labeled drawing of the antenna. (6mks)

12. a) You are provided with specimen A, examine the mouth parts and describe the structural features of the mouth parts. (10mks)

b) Draw and label:

- (i) Mandible (4mks)
- (ii) Maxilla (4mks)
- (iii) Labium (4mks)

c) Lay it on the dissecting board, dorsal side uppermost. Cut along the left lateral line except the posterior three terga. Displace the alimentary canal to the right. Draw and label the structures exposed on both the ventral and dorsal cuticles. (17mks)

13. You are provided with specimen Y. Examine it carefully and answer the questions that follow. Display the animal on the dissecting board with the dorsal side uppermost. Cut along one lateral line of the abdomen, except its three anterior most segments and displace the dorsal terga to the left and the alimentary canal to the right. Draw and label the structures exposed on the ventral and dorsal tergum that are used for removal of Insoluble nitrogenous waste products, sexual reproduction, coordination, breakdown and absorption and transport of the digested nutrients and oxygen (22mks)

14. a) You are provided with specimen A which is freshly killed.

Cut off the head and boil it in caustic soda/ alkali (sodium hydroxide) until when the head sinks. Cool the alkali and remove the head. Isolate carefully the first maxilla, second maxilla (labium) and the mandible.

- (i) Draw and label these structures. (12mks)
  - (ii) How are these structures drawn adapted to their functions/ roles? (10mks)
- b) Proceed to dissect and display all the structures lying on the dorsal cuticle. Draw and label (8mks)

15. You are provided with specimen K.
- a) (i) Cut off the wings and legs of the specimen. Examine the dorsal and ventral parts of the abdomen. Give three difference and similarities between the two cuticles. (6mks)
  - ii) Explain how descriptions in a(i) above relates to the mode of life of the animal. (6mks)
  - b) (i) Pin the specimen in the wax dish with the ventral side towards the wax. Dissect along the lateral line and remove the dorsal cuticle completely from the specimen. Turn this cuticle so that the internal structures are seen. Draw and label structures on the dorsal and ventral cuticles without displacing any. (12mks)
  - ii) Explain how the cuticle can be of advantage or disadvantage in the animal's life.
16. You are provided with specimen X. Use the specimen to answer the following questions.
- a) Cut off limbs completely to expose the thoracic segments clearly. Turn the specimen so as it faces you. Draw and label the anterior half of the specimen
  - b) Dissect the specimen as follows:
    - (i) Pin the specimen with dorsal side uppermost
    - (ii) Cut along the lateral line of the abdomen to the right hand side except the posterior most segments and displace the dorsal cuticle to your left. On the same drawing, draw and label the structures exposed on the dorsal and ventral cuticle.
17. You are provided with specimen E.
- a) Using a magnifying lens, examine the structures found on the head region of specimen E
    - i) State four features observed from the head region used to classify the specimen. (4mks)
    - ii) Using low power magnification, observe the left compound eye and the first three segments at the base of the antenna. Make an accurate drawing don't label (6mks)
    - iii) Give three descriptions of the compound eye and relate each description given to the role of compound eye in the specimen. (6mks)
  - b) Detach all the legs by carefully cutting at the point of attachment to the thorax. Then observe structures found in the anterior half of the specimen using magnifying lens.
    - i) Make an accurate drawing showing the structures in the anterior half of the specimen from the ventral view. Label only the segment structure. (15 mks)
18. You are provided with a freshly killed specimen K.
- a) Using a hand lens examine the dorsal view of the head. Draw and label. (7mks)
  - b) i) Place the specimen dorsal side uppermost. Cut one lateral line of the specimens to display organs that comprise the vascular, nervous, reproductive and excretory system. Draw and label the structures exposed in your dissection with the dorsal cuticle displaced to the right and alimentary canal to the left of the specimen. (18mks)
  - ii) Cut through the right lateral side of the abdomen and the two posterior most segment of the thorax, leave the prothorax intact. Displace and hold the dorsal cuticle to one side of the specimen. Cover the dissection with water and clear away the fat bodies. Draw and label the exposed structures on both cuticles. (17mks)

19. You are provided with specimen K.

a) With the dorsal side uppermost, dissect the specimen to display the structures used for the removal of undigested and excretory materials from the specimen's body. Draw and label. (10mks)

b) Cut out the gut and remove unnecessary tissue to display the structures in the thoracic region. Deflect the dorsal cuticle to the left. Draw and label. (14mks)

20. You are provided with specimen K.

a) Cut all the wings and limbs of the specimen. Then place the specimen on its back and examine the lower half of the abdomen using a hand lens.

i) Draw and label the structures observed. (6mks)

ii) List two differences you expect to find in a specimen of the opposite sex. (2mks)

b) Measure and cut off 0.5cm length of the fore limb from the end towards the foot. Observe from the inner view under low power magnification of a microscope.

i) Draw, but don't label. (5mks)

ii) State three ways the part of the limb drawn in b)i) is structurally adapted for its function. (3mks)

c) i) Pin the specimen with its dorsal side uppermost. Dissect to completely remove the dorsal cuticle in the abdomen. Carefully clear off any unnecessary tissue.

Draw and label the visible structure at this stage of dissection. (13mks)

ii) Dissect further to display the whole alimentary canal. Proceed to cut and remove it.

Draw and label the internal structures attached to the ventral cuticle. (12mks)

21. You are provided with specimen K.

ii) Cut off the wings, legs and antennae of the specimen. Pin the specimen with the dorsal side uppermost. Dissect the specimen to remove the dorsal cuticle on the abdomen and display structures on the ventral cuticle that are associated with reproduction and the posterior half of the gut displaced to your left.

Draw and label your dissection. (16mks)

22 You are provided with specimen K, which is freshly killed.

i) Using candle wax, place your specimen with dorsal side upper most.

Cut along the ventral line to displace the dorsal cuticle of the abdomen to the right. Draw and neatly label your dissection. (10 marks)

(ii) Continue to dissect to remove the thoracic dorsal cuticle. Displace the digestive system and associated organs to the left of the specimen.

Draw and label your dissection including only structures attached to the ventral cuticle. (15marks)

- 23 a) Cut off the wings and limbs from their point of attachment of specimen K.  
Place the specimen with the dorsal side uppermost. Continue to carefully cut off the last tergal segment. Examine the exposed last sternum structures and those associated on the lateral side. Draw and label. (06marks)
- b) Dissect the specimen along the left lateral line of the abdomen on a wax dish and turn the dorsal cuticle. Remove any fat tissues with the aid of water. Displace the exposed parts of alimentary canal to the left to expose structures.
- i) responsible for digestion, absorption of nutrients and removal of undigested food materials.
- ii) within the ventral cuticle anterior to last segment and those of dorsal cuticle. Draw and label structures in (i) and (ii). (17 marks)
- 24 (*Requirements: Microscope & glass slides, Razor blade, dissecting kit*)  
You are provided with a freshly killed animal. Use it to answer the following questions.
- Using razorblade, remove the head of the specimen, boil it in a potassium solution in order to macerate its muscle tissues. Remove the tube from the flame at frequent intervals and observe the head. When it sinks quickly and remains at the bottom of the test tube it has been boiled enough. Wash the head with water.
- (a) (i) Remove the labium by using fine forceps by holding it near its base and pull gently. Be careful not to damage other mouth parts. Put it on a microscope slide and observe. Draw and label.
- (ii) What is the function of the labium to the specimen?
- (iii) How is the labium adapted to its function?
- (b) Remove the maxilla using a fine forceps by holding it near its base and pull gently. Place it on a slide. Observe it under a microscope. Draw and label.
- (c) (i) State the function of the maxilla to the specimen.
- (ii) How is the maxilla adapted to its function?
- (d) (i) In the same way remove the mandible. Put it on a microscope slide. Observe it under a microscope, draw and label
- (ii) What is the function of the mandible?
- (iii) How is it adapted to its function?
- (e) Place the specimen dorsal side uppermost and dissect to expose the structures within the abdominal region.
- (i) Displace the structures to displace the salivary glands on the left of the specimen.
- (ii) Displace the alimentary canal to the right of the specimen. Remove all the unnecessary tissues to display all the parts of the alimentary canal and the structures on the ventral cuticle. Draw and label.
- (iii) Also draw and label the system found on the dorsal cuticle of the specimen.

- (iv) For the same specimen, dissect to show the structures used in reproduction. Draw and label.
- (v) Care fully make a transverse section of gizzard and mount in balsam. Remove section from balsam, place on glass slide and cover with a cover slip. Mount it on a microscope and view under both low and high power. Draw and label.
- (vi) What is the function of structures labeled on your diagram above?

25 You are provided with specimen K.

- (a) Examine the specimen and name the external features which are characteristic of the class to which the specimen belong.
- (b) From your observations of the external features, state with reasons the sex of the specimen.
- (c) Place the specimen ventral side uppermost. Draw and label the end of the abdomen.
- (d) Using a hand lens examine one antenna and draw. Do not label.
- (e) Place the specimen dorsal side uppermost and dissect to expose the structures within the abdominal cavity.
  - (i) Displace the structures to display the salivary glands on the left of the specimen.
  - (ii) Displace the alimentary canal to the right of the specimen. Remove all unnecessary tissues to display all the parts of the alimentary canal and the structures on the ventral cuticle Draw and label.

26 You are provided with specimen K.

- (a) Examine the specimen and name the external features which are characteristic of the class to which the specimen belong.
- (b) From your observations of the external features, state with reasons the sex of the specimen.
- (c) Place the specimen ventral side uppermost. Draw and label the end of the abdomen.
- (d) Using a hand lens examine one antenna and draw. Do not label.
- (e) Place the specimen dorsal side uppermost and dissect to expose the structures within the abdominal cavity.
  - (i) Displace the structures to display the salivary glands on the left of the specimen.
  - (ii) Displace the alimentary canal to the right of the specimen. Remove all unnecessary tissues to display all the parts of the alimentary canal and the structures on the ventral cuticle Draw and label.

27 You are provided with specimen B which is an animal. Use it to answer the questions the questions below.

- (a) State;
  - (i) The habitant of the specimen and its adaptation to living in this habitant.
  - (ii) The habits of the specimen and its adaptations to these habits.
- (b) (i) Remove the head from the specimen. Examine it thoroughly remove using a hand lens provided. Make a labeled drawing of the lateral view of the head region showing the features of biological significance to the specimen.
- (c) Remove one antenna from the head of the specimen. Mount it on a glass side and observe it under a low power microscope. Using the features on the antenna, state;
  - (i) The sex of the specimen



- (ii) The function of the antenna
- (d) (i) Remove one anal cercus and from the specimen. Mount it on a slide and observe under a low power of a microscope. State one similarity and one difference between the anal cercus and the antenna.  
(ii) Remove the hind limb of the specimen and from it obtain a portion from the tibia to the claws. Mount this portion on a slide and view it under a microscope. Describe any three observable features of the limb stating how they are adapted to carry out their functions in the specimen.  
(iii) Make a well labeled drawing of showing the features stated in c(ii) as shown under the low power microscope.
- (e) Using a pair of scissors, cut off all the wings and of the specimen and the remaining limbs. Pin the specimen on the dissecting board with the dorsal part upper most. Dissect to the specimen to display the reproductive system. Make a well drawing of your dissection in the space provided.