

## ♣ CHAPTER TWO

### ❖ AMPHIBIAN - (FROG AND TOAD)

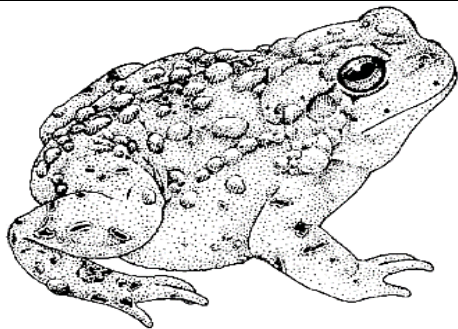
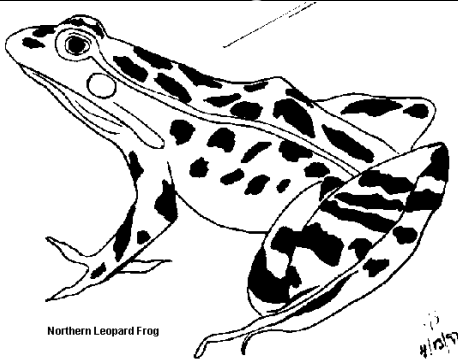
Amphibians live both in water and on land. Examples of amphibians include, toad, frog, salamander and newt; but the toad and frog are of interest at this level.

#### Classification.

**Question.** You are provided with specimen T. Classify it into the following groups and in each case give a reason(s) for your answer.

(i) Kingdom	➤ Animalia; ✓ <b>Reasons.</b> <ul style="list-style-type: none"> <li>• Has limbs; for locomotion; ✓</li> <li>• Has sense organs; for detection of stimulus; or irritability; ✓</li> <li>• Mouth; for heterotrophic nutrition; ✓</li> </ul>
(ii) Phylum	➤ Chordata; ✓ <b>Reasons.</b> <ul style="list-style-type: none"> <li>• Has dorsal, hollow nerve cord; ✓</li> <li>• Has post anal tail; ✓</li> </ul>
(iii) Class	➤ Amphibia; ✓ <b>Reasons.</b> <ul style="list-style-type: none"> <li>• Has webs; between digits of limbs; to increase surface area to generate propulsive force / thrust during leaping; ✓</li> <li>• Has moist glandular skin; for cutaneous gaseous exchange;</li> <li>• Wide gape; to take in food particles/ prey; ✓</li> </ul>
(iv) Order	➤ Anura; ✓ <b>Reasons.</b> <ul style="list-style-type: none"> <li>• Long hind limbs; to generate enough propulsive force for leaping/ jumping/ swimming/ locomotion; ✓</li> <li>• Short fore limbs; to absorb shock during landing; ✓</li> <li>• Has external ear drum/ tympanic membrane; for hearing/ detecting sound waves; ✓</li> </ul>

#### Difference between a toad and frog.

Toad	Frog
	 <small>Northern Leopard Frog</small>
1. <b>Skin:</b> rough; warty; moist 2. <b>Limbs:</b> moderately/ averagely long; folded onto the body; 3. <b>Body colour:</b> dark brown/ black;	1. <b>Skin:</b> smooth; shiny; moist; 2. <b>Limbs:</b> very long; slender; more flexible hind limbs highly folded onto the body; 3. <b>Body colour:</b> green with black/ dark brown/ yellow spots;

4. **Family:** bufonidae;
5. **Genus :** *Bufo*;
6. **Species:** *regularis*;

4. **Family:** ranidae;
5. **Genus:** *Rana*;
6. **Species:** *temporalis*;

#### **Habitat.**

**Frog:** damp environment; e.g. Grass near water, swamps, ponds, and slow flowing streams hence mainly aquatic habitat.

**Toad:** moist environment; under logs of trees, gardens, abandoned storage tanks, shaded leaf litter, underneath stones.

Note: however both the toad and the frog can survive on terrestrial and in aquatic habitats.

<b>Adaptations of a toad to living in a terrestrial habitat/ on land.</b>	<b>Adaptation of the toad to living in aquatic habitat.</b>
<ul style="list-style-type: none"> <li>• Short and stout fore limbs; for absorbing shock on landing;</li> <li>• Muscular hind limbs, to provide strong force of propulsion for leaping;</li> <li>• Streamlined body; for easy burrowing;</li> <li>• Nostrils; for breathing on land/ passage of gases;</li> <li>• Dark colouration dorsally, lighter colouration ventrally; for camouflaging on land;</li> <li>• Large bumps/ tubercles on the fore and hind limb; for digging burrows in the ground;</li> <li>• Jointed limbs; for flexibility during movement/ locomotion;</li> <li>• Nictating membrane; to protect and moisten the eye;</li> <li>• Numerous poison glands; for defense against enemies or predators;</li> <li>• Wide gape of the buccal cavity; for consuming prey of large size;</li> </ul>	<ul style="list-style-type: none"> <li>• Webbed hind digits; for easy swimming and to increase surface area to generate propulsive force / thrust during leaping;</li> <li>• Muscular hind limbs; for producing strong propulsive force for swimming;</li> <li>• Streamlined body; for easy swimming;</li> <li>• Nostrils at the tip of the snout; for breathing in water/ passage of gases;</li> <li>• Transparent nictating membrane; for protecting the eye against mechanical damage when submerged;</li> <li>• Flat ear drum/ tympanic membrane; providing a streamlined shape for easy swimming;</li> <li>• Dorso-laterally positioned, protruding eyes; for a wide vision;</li> <li>• Dark skin; for camouflage;</li> </ul> <p><b>Any other adaptation accepted.</b></p>

#### **Possible question.**

1. Carefully observe the animal and explain five structural features that suit the animal to live either on land or water bodies. (5marks)
2. Examine the specimen and give five observable adaptive features that enable the specimen to survive in its habitat. (5marks)

#### **State reasons why amphibians live near water?**

- (i) Maintain a moist skin; ✓ for cutaneous gaseous exchange; ✓
- (ii) Easily escape enemies/ predators; ✓ by drowning in water; ✓
- (iii) They lay eggs in water; ✓

#### **External and internal anatomy-major structures to identify.**

<ul style="list-style-type: none"> <li>• <b>External anatomy</b></li> </ul> <p>Head; Eyes; Tympanic membranes/ ear drums/ ears; Poison glands; Limbs;</p>	<ul style="list-style-type: none"> <li>• <b>Superficial features.</b></li> </ul> <p>Sub maxillary muscle, Musculo cutaneous vein, Xiphisternum, linea alba,</p>	<ul style="list-style-type: none"> <li>• <b>Buccal cavity</b></li> </ul> <p>Maxillary teeth, Internal naris, Vomerine teeth, Eye ball socket, Eustachian</p>
---	---	--

Mouth; Nares/ nostrils; Skin; Cloacal aperture/ cloacal opening.	Rectus abdominis, Pectoralis major; Pectoralis minor; biceps and triceps; thigh muscles. <b><u>Thigh muscles.</u></b> Triceps femoris; Sartorius; Adductor Magnus; Gracilis.	tube, Oesophagus opening, Vocal sac ( <i>in males</i> ), Tongue, Glottis
<ul style="list-style-type: none"> <li><b>Digestive system</b> <b><u>Alimentary canal</u></b> Oesophagus; Duodenum; Ileum; Rectum <b><u>Accessory/ associated organs</u></b> Pancreas, Liver, Gall bladder</li> </ul>	<ul style="list-style-type: none"> <li><b>Excretory system.</b> Lungs; liver; kidney; ureter; urinary bladder; cloaca.</li> </ul>	<ul style="list-style-type: none"> <li><b>Reproductive system.</b> <b>Male:</b> testes, vas efferentia, kidney, vesicular seminalis, cloaca <b>Female:</b> ovary, oviduct, ovisac, cloaca</li> </ul>

### EXTERNAL ANATOMY OF AN AMPHIBIAN.

The body is divided into two main identifiable regions: (i) head; (ii) trunk.

NB: Thorax/thoracic region, abdominal region, and pelvic region; make up the trunk.

### HEAD

Position	Shape	Significance
<ul style="list-style-type: none"> <li>Attached at the cranial end of the trunk ( joined to the trunk directly); without a neck; extending to the shoulder region;</li> </ul>	<ul style="list-style-type: none"> <li>Triangular; tapering anteriorly (apex anterior and base posterior);</li> <li>Dorso-ventrally flattened;</li> </ul>	<ul style="list-style-type: none"> <li>For easy burrowing; to escape predation;</li> <li>Providing a streamlined shape; reducing air or water resistance; during motion on land or water.</li> <li>Dorso-ventrally flattened, to increase surface area for floating.</li> </ul>

### Possible questions.

- Examine the head of the specimen and describe how it is adapted to promoting the animal's survival. (5marks)
- (UNEB 2015): Examine the head of specimen, draw and label the dorsal view of the anterior part of the head to show the structures for sensitivity. (6marks)

	T - M - O - N - D - L - T -
IR - Whole specimen drawn.	

Ignore - mouth, nictitating membrane. NA - poison glands labelled; or any other view.	
--	--

3. Observe the structural features of on the head from the left hand side. Draw and label the features concerned with sensitivity and feeding. (6marks)

--	--

4. Examine the head of the specimen. Describe the shape of the head and its significance. (3marks)

-----

-----

-----

-----

-----

5. Carefully examine the external features of the head and describe its structure. (10marks)

-----

-----

-----

-----

-----

-----

-----

-----

-----

**NOSTRILS/ NARES- plural; (naris – singular).**

Position	Description and Shape	Significance
<ul style="list-style-type: none"> <li>Anteriorly positioned on the head; and close to the tip of the snout; above the mouth;</li> </ul>	<ul style="list-style-type: none"> <li>Are two (one pair); rounded/ oval shaped; small;</li> </ul>	<ul style="list-style-type: none"> <li>Allow gaseous exchange when the rest of the body is submerged in water;</li> <li>Detect smells of food, enemies in the environment, and other stimuli;</li> </ul>

**EYES.**

Position	Description and Shape	Significance
<ul style="list-style-type: none"> <li>Dorsally positioned on the head; for a wide field of view;</li> </ul>	<ul style="list-style-type: none"> <li>Are two (one pair); rounded; large; protruding/ bulging; facing laterally;</li> <li>Covered with a nictitating membrane;</li> </ul>	<ul style="list-style-type: none"> <li>Providing the animal with a wide field of view; to locate food, mates , and hide from predators;</li> <li>Draws across the eyes to clean; moisten; and protect the eye;</li> </ul>

**EAR DRUM/ TYMPANIC MEMBRANE.**

Position	Description and Shape	Significance
<ul style="list-style-type: none"> <li>Dorso-laterally positioned on the head; posterior to the eyes; to collect/ detect sound waves in all directions;</li> </ul>	<ul style="list-style-type: none"> <li>Are two (one pair); rounded ( circular patch; large/ prominent; thin; tough; tightly stretched;</li> </ul>	<ul style="list-style-type: none"> <li>Large; to increase surface area for maximum vibrations on receiving maximum sound waves;</li> <li>Tough; to resist pressure exerted by water and other obstacles;</li> <li>Thin; to easily vibrate;</li> <li>Tightly stretched out; to easily vibrating upon receiving sound waves; to make hearing easy;</li> </ul>

**Possible question.**

Describe the following structural features of the head.

(a) Mouth.

(2marks)

(b) Ear drum.

(2marks)

(c) Eye.

(4marks)

(d) Poison glands.

(3marks)

### CLOACA.

Position	Description and Shape	Significance
<ul style="list-style-type: none"> <li>Dorsal laterally located at the posterior end of the middle line of trunk; for proper discharge of wastes and gametes;</li> </ul>	<ul style="list-style-type: none"> <li>Narrow lumen; muscular elastic wall; smooth inner lining; moist and constricted cloacal opening;</li> </ul>	<ul style="list-style-type: none"> <li>Narrow; to regulate egestion.;</li> <li>Elastic muscular wall; for distension; to allow passage of both small and large materials;</li> <li>Opening is constricted; to allow egestion of large size. for passage of materials;</li> <li>Tubular to allow passage of materials.</li> <li>Moist; for easy egestion.</li> </ul>

- Smooth inner lining; for easy passage of materials.

## LIMBS.

**Question.** Observe both the fore limb and hind limb of the specimen. Draw and label.

FORE LIMB.	HIND LIMB.
A drawing of the fore limb;	A drawing of the hind limb;
<b>Structural Differences.</b>	
<ul style="list-style-type: none"> <li>• four (4) digits;</li> <li>• Digits have no webs;</li> <li>• Less muscular;</li> <li>• Thin;</li> <li>• Divided into two (2) regions; that is upper arm and fore arm.</li> <li>• L-shaped;</li> <li>• Two (2) joints;</li> <li>• Shorter;</li> <li>• Short claws;</li> </ul>	<ul style="list-style-type: none"> <li>• five (5) digits;</li> <li>• digits have webs;</li> <li>• more muscular;</li> <li>• thick;</li> <li>• Divided into three (3) regions; that is thigh, shank, and foot.</li> <li>• Z-shaped;</li> <li>• Three (3) joints;</li> <li>• Longer;</li> <li>• Long pointed claws;</li> </ul>
<b>Similarities.</b>	
Both: <ul style="list-style-type: none"> <li>• Have digits; have joints; are muscular; are divided into regions; have foot at distal end;</li> </ul>	
<b>Adaptations of the limbs to their function.</b>	
<b>Fore limb.</b> <ul style="list-style-type: none"> <li>• Short and muscular; to absorb shock on landing; and to support the body off the ground while at rest;</li> <li>• Jointed digits; for flexibility during locomotion;</li> <li>• Dull coloured; for camouflage;</li> <li>• Four webbed digits; for digging burrows in the ground, for hiding;</li> <li>• Ventral-laterally attached; to support the body above ground;</li> <li>• Attached on the anterior part of the body; to raise head above the ground;</li> </ul>	<b>Hind limb.</b> <ul style="list-style-type: none"> <li>• Long; for faster locomotion/ long jumping/ leaping;</li> <li>• Muscular; to provide a great forward thrust/ propulsive force; during leaping.</li> <li>• Webbed digits/ toes; to provide large surface area during swimming;</li> <li>• Long pointed claws; for firm gripping on rough surfaces;</li> <li>• Five long digits of variable length; for firm gripping;</li> <li>• Jointed digits; for flexibility during locomotion;</li> <li>• Dull coloured; for camouflage;</li> </ul>

## Possible questions.

1. UNEB 2015: Qn.1, modified. You are provided with specimen K which is freshly killed.

(a) (i) Measure the length of the fore and hind limbs and record the results in table below.

Express the results as a ratio of length fore limb: length of hind limb. (2marks)

Length.	Fore limb.	Hind limb.
Ratio. .		

(ii) State the significance of the ratio. (1mark)

-----

-----

-----

(b) Examine the hind limb and state how it is adapted for the survival of the specimen in its habitat. (6marks)

-----

-----

-----

-----

-----

-----

-----

(c) Outline three differences between the fore and hind limbs. (3marks)

-----

-----

-----

-----

2. UNEB 2016: Qn.1 (a). You are provided with specimen R which is freshly killed. Examine the fore and hind feet of the specimen.

Draw and label the ventral side/ view of the left fore foot and the left hind foot of the specimen. Both drawings should be at the same magnification. (7marks)

(i) Fore foot.



--	--

(ii) Hind foot.

--	--

# SKIN.

## Description.

- ✓ thin, to reduce diffusion distance for fast gaseous exchange;/ ease diffusion of gases;
- ✓ dull coloured; for camouflage;
- ✓ tough; for protection;
- ✓ has poison glands/ poison secreting skin swelling glands; for chemical defense;
- ✓ moist; to dissolve diffusing gases;

- ✓ numerous blood capillaries (**only seen after dissection**); to increase surface area for gaseous exchange;

**Possible question.**

**1. (UNEB 2007).**

(a) Pin the specimen with the ventral side uppermost. **Dissect** and remove the skin, taking note of how it is attached to the underlying body wall.

(i) Describe the attachment of the skin to the body wall. (3marks)

- *Firmly attached;✓ to the body wall at fore limbs;✓ hind limbs;✓ and throat region;✓*
- *Loosely attached;✓ within the lower trunk;✓ and ventral abdominal region;✓*

(ii) Suggest the significance of the way the skin is attached to the body wall as described in (a) (i) above. (3marks)

- *Firm attachment; to hold the skin onto the animals body;✓ increasing rate of diffusion of gases;✓ by reducing the diffusion distance;✓*
- *Loose attachment; allows existence of fluid-filled space;✓ for dissolution of gases;✓*
- *Loose attachment;✓ to allow distension of the body wall;✓ and movement of skin; without rupture of internal organs;✓*

(b) Observe the pattern of blood circulation on the skin

(i) Describe the arrangement/ pattern of blood circulation on the skin. (4marks)

- *One main, large, size blood vessel/ **musculo cutaneous vein**;✓ from the base of the forelimbs/ arm pits;✓ branches/ ramifies;✓ into very many/ numerous, small, blood vessels/ capillaries;✓ to form a dense network which spreads all over the inner surface of the skin;✓*

(ii) Give the significance of the pattern of blood circulation described in (b) (i). (3marks)

- *Dense network increases surface area for gaseous exchange; and diffusion of gases;✓*
- *Numerous blood vessel increase transport/flow/drainage of blood; away from the skin;✓*
- *Numerous blood vessels merge into one large blood vessel; to control the flow of blood;✓*

**2. You are provided with a freshly killed toad.**

(a) Carefully observe the animal and describe the position and structure of the following: webbed toes, cloaca, head, tongue. (8marks)

-----

-----

-----

-----

-----

-----

-----

-----

-----

-----

-----

-----

-----

-----

(b) Lay the specimen ventral side uppermost. Dissect it in the usual way and remove the skin of the head, trunk, and fore and hind limbs up to the elbow and knee respectively. Describe the structural features of the skin and clearly indicate, how they relate to function. (5marks)

-----

-----

-----

-----

-----

-----

-----

-----

-----

-----

### SEX IDENTIFICATION.

Sex identification is not obvious. **Reason: no external genitalia.** However, other structural features and sex secondary characteristics can be used to distinguish males from females.

Male.	Females.
<ul style="list-style-type: none"> <li>• Slender/ narrow abdomen;</li> <li>• Nuptial pad on second digit of fore limb;</li> <li>• White throat;</li> <li>• Broader trunk;</li> </ul>	<ul style="list-style-type: none"> <li>• Broad abdomen; with eggs especially during breeding season;</li> <li>• Lacks nuptial pad;</li> <li>• Creamy white/ grey throat skin;</li> <li>• Slender trunk;</li> </ul>

### MOUTH.

Position	Description and Shape	Significance
----------	-----------------------	--------------

- Terminal; extending to the tympanic membrane
- Very large/ wide gape; with tight lips.
- To provide a wide gape; for ingestion of large food materials, and prey;

**NOTE:** opening up the mouth of the amphibian exposes the buccal cavity/ oral cavity;

❖ **BUCCAL CAVITY/ ORAL CAVITY.**

• **Roof of the buccal cavity/ upper floor;**

- Has a row of numerous; short; pointed; uniform and rough; maxillary teeth; used for gripping prey. Adaptation. Pointed; numerous and curved inwards;
- Has a pair of narrow openings called internal nares; for smelling and breathing;
- Has a pair of Vomerine teeth; for gripping prey;
- Has two, large, circular/oval protrusions of eyeballs; that press against the prey; for easy swallowing;
- Has a pair of narrow Eustachian tube; for equalization/ balancing pressure;

• **Floor of the buccal cavity/ lower floor/ pharynx;**

- Has a long, sticky, bilobed tongue; for capturing prey;
- Has a small, short, slitted; glottis; to regulate entry of air to and from the lungs.

❖ **Tongue:**

Position.	Description/ shape.	Significance.
<ul style="list-style-type: none"> <li>• Attached to the anterior end; on the floor of the buccal cavity; to trap prey at a distance.</li> </ul>	<ul style="list-style-type: none"> <li>• Long; elastic; muscular; flattened; sticky; wide base; forked tip; numerous glands.</li> </ul>	<ul style="list-style-type: none"> <li>• Long and elastic; to trap prey at a distance.</li> <li>• Muscular; to easily stretch and trap prey at a distance.</li> <li>• Flattened; to increase surface area for trapping prey;</li> <li>• Sticky; to trap small prey easily.</li> <li>• Wide base for firm attachment.</li> <li>• Forked tip; to easily trap prey.</li> <li>• Numerous glands; to secrete sticky mucus; to easily trap prey.</li> </ul>

**Possible questions.**

1. Open up the buccal cavity of the specimen to expose the inner structures.

(a) State the adaptations of the buccal cavity to perform its function. (6marks)

- Has numerous; sharp maxillary teeth; used for gripping prey;✓
- Has internal nares; for smelling and breathing;✓
- Has a pair of Vomerine teeth; for gripping prey;✓
- Has two, large, eyeballs; that press against the prey; for easy swallowing;✓
- Eustachian tube; for equalization/ balancing pressure;✓
- Has a tongue; for capturing prey;✓
- Has glottis; to regulate entry of air to and from the lungs;✓

(b) Draw and label the interior of the buccal cavity when the tongue is pulled at the front. (11marks)



2. Using forceps; open the mouth of the specimen.

(a) Carry out the following activities to examine the characteristics of the flowing buccal features. Record your answers in the table below. (6marks)

Activity+	Observation	Deduction/characteristic
With forceps, pull and release the tongue.		
Stroke a finger along the tongue.		
Stroke a long pin over the maxillary teeth and Vomerine teeth.		

(b) Examine its ventral surface of the tongue of specimen. Draw and label.

(5marks)

--	--

(c) Examine the roof of the buccal cavity. Draw and label its observable features. (7marks)

--	--

3. Open up the buccal cavity by cutting directly back through the angle of the jaw of the mouth on the left. Extend the cut posteriorly nearly to the shoulder. Pull the mouth ventrally to expose the structures of buccal cavity with the tongue pinned out. Draw and label.

(10marks)

--	--

--	--

**Practice question.**

4. You are provided with specimen T which is freshly killed.

(a)

- i. Pin the specimen dorsal side up with limbs fully stretched. Open the mouth wide using forceps. Examine the structure within the floor of buccal cavity. How relevant is its structure and attachment to the survival of the organism in its habitat. (03 marks)
  - ii. Draw and label only structures used for feeding. (07 marks)
- (b) Turn the dissecting dish sideways, Insert one blade of the scissors into the mouth and cut through the right hand angle of the jaw, continuing up to the side of the pharynx and oesophagus. Pin aside the floor of the buccal cavity to display the structures exposed in the buccal cavity without stretching the tongue. Draw and label the structures exposed on the floor and roof of the buccal cavity. (14 marks)
- (c) Observe the attachment of the skin as you dissect Remove the skin in the usual way and pin it back.
- (i) Describe the attachment of the skin to the body wall. (03 marks)

**INTERNAL ANATOMY OF AN AMPHIBIAN.**

**❖ SUPERFICIAL FEATURES/ STRUCTURES.**

Musculo cutaneous vessels.

**Thoracic muscles;** Xiphisternum, Pectoralis major; Pectoralis minor; forearm muscles) triceps and biceps).

**Abdominal muscles;** linea alba; rectus abdominis;

**Thigh muscles;** Triceps femoris (outer most); Sartorius; Adductor Magnus; Gracilis.

**Possible questions.**

1. Pin the specimen with ventral side uppermost. Dissect the specimen to display the muscles of the left thigh.
  - (a) Isolate the first muscle block on the outer part of the left thigh up to its attachment. Describe the structural efficiency of the muscle to its function. (3marks)
    - Large;✓ muscular;✓ spindle shaped;✓ attached to tendons; ;✓ on the bone; to easily contract and relax;✓ to allow flexibility of the limb;✓
  - (b) Draw and label the muscles of the left thigh. (8marks)

--	--

	T- M- D- L- N- O- F- LFT- TOTAL-
--	--

2. Pin the specimen ventral side uppermost with limbs fully stretched. Dissect to remove the skin from the body up to the first joint of the limbs. Draw the right hind limb and label only observable muscles of the thigh. (7marks)

	T- M- D- L- N- O- TOTAL-
--	--

3. Dissect specimen (toad), to display the main superficial muscles of the left thigh of the specimen. Draw and label your dissection. (9marks)

	T- M- D- L- N- O- TOTAL-
--	--

4. Dissect the specimen and remove skin from the ventral sides of the animal's head, abdomen and limbs. Search for superficial structures, draw but and label. (12 marks)



	<p>T- M- D- L- N- O- TOTAL-</p>
--	---

5. Observe the prominent superficial structures on the body wall and the inner surface of the skin. Draw BUT don't label. (07 marks)

	<p>T- M- D- N- O- TOTAL-</p>
--	--

--	--

### ❖ DIGESTIVE SYSTEM.

This is made up of the alimentary canal and associated organs.

**Alimentary canal** consists; of oesophagus/gullet, stomach, duodenum, ileum, rectum.

**Associated organs** include pancreas, liver, gall bladder. These help the alimentary canal to digest and absorb the digested food.

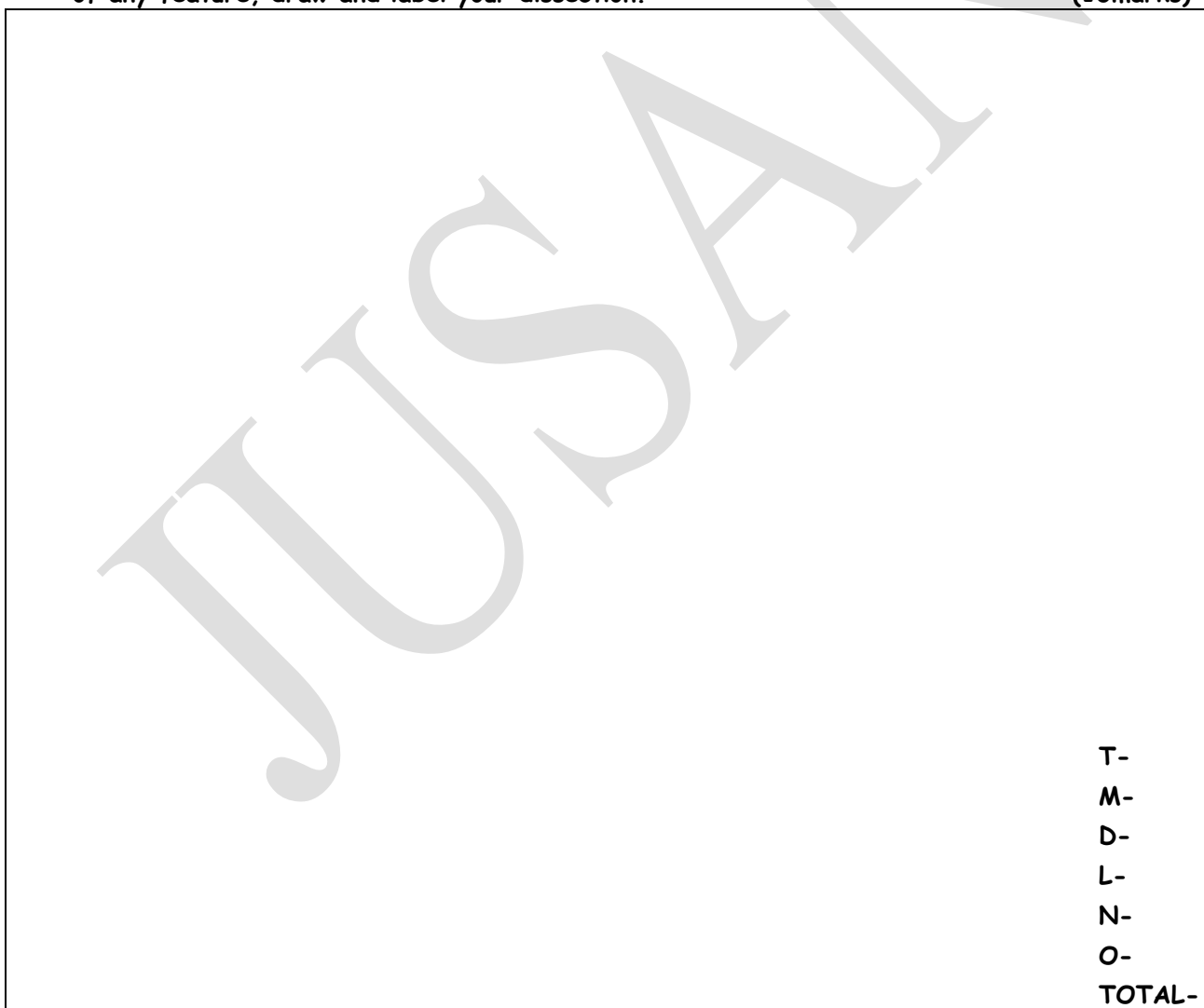
Part	Description of structure	Function	Adaptation for function
<b>Oesophagus.</b>	<ul style="list-style-type: none"> <li>Narrow, tubular, thin walled, smooth inner lining, folded longitudinally;</li> </ul>	<ul style="list-style-type: none"> <li>Swallowing.</li> </ul>	<ul style="list-style-type: none"> <li>Smooth inner lining; for easy passage of food materials;</li> <li>Thick elastic walls; to increase elasticity;</li> <li>Narrow lumen; for easy swallowing;</li> <li>Inner lining folded longitudinally; to expand; for passage of food.</li> </ul>
<b>Stomach.</b>	<ul style="list-style-type: none"> <li>Elongated, expanded, thin walled, inner lining folded longitudinally, posterior ended constricted, anterior end constricted.</li> </ul>	<ul style="list-style-type: none"> <li>Storage.</li> <li>Digestion.</li> <li>Absorption.</li> </ul>	<ul style="list-style-type: none"> <li>Elongated, and expanded; to increase food storage;</li> <li>thin walled, for elasticity;</li> <li>inner lining folded longitudinally, to increase surface area for digestion and absorption;</li> <li>posterior ended constricted, to control out flow of food from the stomach;</li> <li>Anterior end constricted, to prevent back flow of food.</li> </ul>
<b>Duodenum</b>	<ul style="list-style-type: none"> <li></li> </ul>	<ul style="list-style-type: none"> <li>Passage.</li> <li>Digestion.</li> <li>Absorption.</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>
<b>Ileum</b>	<ul style="list-style-type: none"> <li>Long; coiled; narrow; tubular; thin walled, numerous capillaries along it.</li> </ul>	<ul style="list-style-type: none"> <li>Digestion.</li> <li>Absorption.</li> </ul>	<ul style="list-style-type: none"> <li>Numerous capillaries, to increase surface area for absorption.</li> <li>Thin walled, to ease absorption,</li> <li>Long, to increase surface area for absorption and digestion;</li> </ul>
<b>Rectum</b>	<ul style="list-style-type: none"> <li>Short, thick walled, enlarged, wide tubular, found at distal end of the gut.</li> </ul>	<ul style="list-style-type: none"> <li>Storage of wastes/faeces /undigested food.</li> </ul>	<ul style="list-style-type: none"> <li>Contraction of rectal walls, to ease egestion.</li> </ul>

**Remember the following during dissection of an amphibian.**

- (i) The stomach and duodenum are found on the left side of specimen.
- (ii) Spleen, left kidney, left testis/ ovary, ureter, ovisac/vesicular seminalis and oviduct are found on the left, but not visible without displacing the alimentary canal;
- (iii) Ileum is found on the right side of the specimen.
- (iv) The rectum is in the middle
- (v) Associated organs of the alimentary canal are pancreas and liver lobes.
- (vi) ***Passage of food, digestion of food and absorption stops at the ileum.***
- (vii) ***Absorption of materials stops at the colon.***
- (viii) ***Passage of undigested food, is through the rectum and cloaca.***

**Possible questions.**

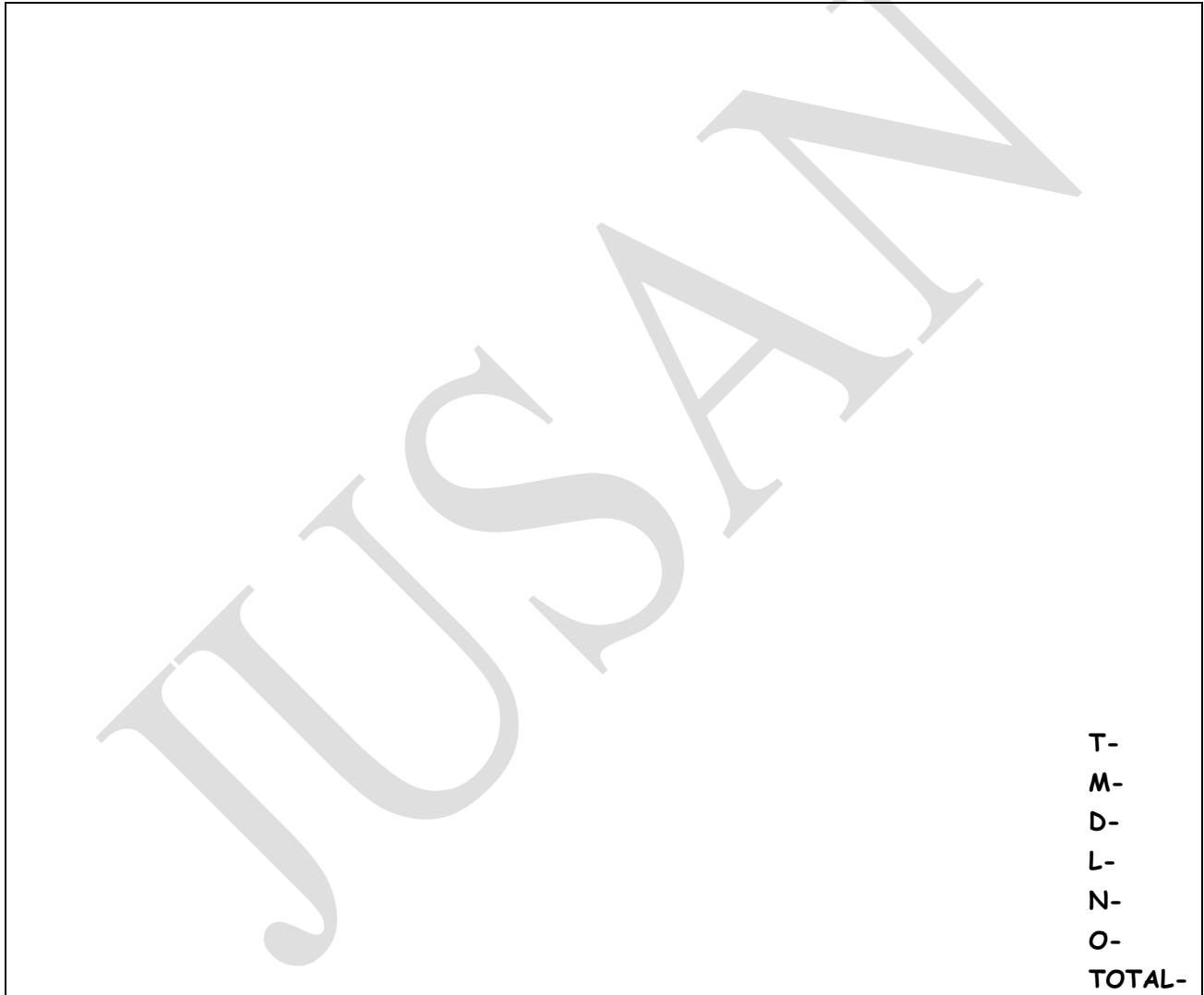
1. Open the specimen to expose internal thoracic and abdominal features. Without displacement of any feature, draw and label your dissection. (13marks)



T-  
M-  
D-  
L-  
N-  
O-  
TOTAL-

2. You are provided with specimen T. Dissect the specimen to expose the abdominal structures. Stretch out the lungs, turn the liver lobes anteriorly without obscuring the heart, stomach displaced to its left, duodenum and rest of the gut displaced to the right. Without breaking any mesentery, draw and label your dissection. (22marks)

Hint. The kidneys, testes or ovary are still not visible without removing the mesentery.



T-  
M-  
D-  
L-  
N-  
O-  
TOTAL-

3. You are provided with specimen T which is freshly killed. Open up the buccal cavity between jaws of the specimen along the left side and proceed with your dissection to display the rest of the internal structures by displaying the floor of the buccal cavity on the right. Carefully displace the alimentary canal to the left of the specimen without damaging any mesentery. Draw and label all the structures seen lying wholly anterior to the bladder. (25marks)

Hint: the right testis or ovary, right kidney are visible; since the gut has been displaced to the left. However, the left testis or ovary and left kidney are not visible; because mesentery is intact/ not damaged.

JUSAN

	T-
	M-
	D-
	L-
	N-
	O-
	TOTAL-

4. You are provided with specimen T. Dissect the specimen to expose the abdominal features. Stretch the stomach and pin it to the left of the animal without tearing the pancreas and mesentery of the duodenum. Loosen the ileum and rectum, by cutting their mesentery. Stretch the ileum and pin it to the left of the animal. Open the pelvic girdle, clear off unnecessary materials to expose the features. Draw and label your dissection. (25marks)

Hint: the urinogenital system (testes or ovaries, ureter, vesicular seminalis, kidneys) is visible because all mesenteries have been cut out/damaged.



❖ **URINOGENITAL SYSTEM.**

**This is a system combination of the excretory and reproductive system.**

❖ **EXCRETORY SYSTEM.**

It is a system of organs that removes metabolic wastes from the body. It comprises of the;

- Lungs | Liver | kidney | ureter | urinary bladder | cloaca.

Part	Description of structure	Function
• Lungs	• spongy	• Excretes Carbon dioxide.
• Liver lobes	• Very large	• Excretes bile pigments etc.
• Kidney	• Large, elongated	• Excretes metabolic wastes from blood to form urine.
• Ureter	• Long, thin, tubular	• Passage of urine to the urinary bladder.
• Urinary bladder	• Membranous, broad, lobed	• Temporary storage of urine before it passes to the cloaca.
• Cloaca	• Narrow lumen, muscular elastic wall, smooth inner lining, narrow most and constricted cloacal opening/ aperture	• Elastic; smooth inner lining; tubular; to allow easy passage of materials.

**Possible questions.**

1. You are provided with male specimen T, which is freshly killed. Dissect the specimen and cut out the gut; open the pelvic girdle; clear any mesenteries in the viscera to expose structures for excretion of wastes posterior to the liver. Draw and label your dissection.

(10marks)

T-  
M-  
D-  
L-  
N-  
O-  
TOTAL-

2. You are provided with female specimen T, which is freshly killed. Dissect the specimen and cut out the gut; open the pelvic girdle; clear any mesenteries in the viscera to expose structures for excretion of wastes posterior to the liver. Draw and label your dissection.

(12marks)



T-  
M-  
D-  
L-  
N-  
O-  
TOTAL-



❖ **REPRODUCTIVE SYSTEM.**

This is a system used for sexual reproduction. The system components in males differ from those in females.

Male reproductive system.	Female reproductive system.
<ul style="list-style-type: none"> <li>• <b>Testes.</b> <i>Description:</i> elongated, cream. <i>Function:</i> produce gametes.</li> <li>• <b>Vasa efferentia.</b> <i>Description:</i> tubular <i>Function:</i> pass gametes to kidney tubules.</li> <li>• <b>Kidney.</b> <i>Description:</i> large, elongated. <i>Function:</i> has kidney tubules; which empty the gametes in the ureter.</li> <li>• <b>Ureter.</b> <i>Description:</i> long, thin, tubular. <i>Function:</i> empty/ pass gametes to the vesicular seminalis.</li> <li>• <b>Vesicula seminalis.</b> <i>Description:</i> small, oval shaped. <i>Function:</i> store gametes until breeding occurs</li> <li>• <b>Cloaca.</b> <i>Description:</i> (<i>see table for excretory system</i>) <i>Function:</i> pass out gametes to the exterior.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Ovary.</b> <i>Description:</i> elongated, cream. <i>Function:</i> produce gametes.</li> <li>• <b>Oviducts/ fallopian tubes.</b> <i>Description:</i> tubular <i>Function:</i> pass gametes to kidney tubules.</li> <li>• <b>Ovisac.</b> <i>Description:</i> <i>Function:</i></li> <li>• <b>Cloaca.</b> <i>Description:</i> (<i>see table for excretory system</i>) <i>Function:</i> pass out gametes to the exterior.</li> </ul>

**Possible questions.**

1. You are provided with male specimen T, which is freshly killed. Dissect the specimen and cut out the gut; open the pelvic girdle; clear any mesenteries in the viscera to expose structures for reproduction. Draw and label your dissection. (10marks)

T-  
M-  
D-  
L-  
N-  
O-  
TOTAL-

2. You are provided with female specimen T, which is freshly killed. Dissect the specimen and cut out the gut; open the pelvic girdle; clear any mesenteries in the viscera to expose structures for reproduction. Draw and label your dissection. (9marks)



T-  
M-  
D-  
L-  
N-  
O-  
TOTAL-

3. You are provided with female specimen T, which is freshly killed. Dissect the specimen and cut out the gut; open the pelvic girdle; clear any mesenteries in the viscera to expose structures of the urinogenital system. Draw and label your dissection. (15marks)



T-  
M-  
D-  
L-  
N-  
O-  
TOTAL-

### ❖ CIRCULATORY SYSTEM.

This is a system of connected muscular tubes which supply to, and drain blood from, different organs of the body of the animal. It is divided into two main blood systems.

**(i) Arteriole system, (ii) Venous system.**

**During dissection of the animal, the candidate should recall that;**

The amphibian's body is divided into two main identifiable regions: (i) head; (ii) trunk. NB: Thorax/thoracic/chest region, abdominal region, and pelvic region; make up the trunk. Therefore, the circulatory system should supply and drain all organs in the above regions as categorized in the table below.

Head region.	Thoracic region.	Abdominal region.	Pelvic region.
<ul style="list-style-type: none"> <li>Starts from the jaws upwards;</li> <li>Since the toad lacks a neck, there is no clear cut line between the head and thoracic regions.</li> </ul>	<ul style="list-style-type: none"> <li>It's is posterior to the head and anterior to the abdomen.</li> <li>Contains heart and lungs; and vessels draining and supplying the region.</li> <li>Lacks diaphragm and rib cage; hence overlap of lungs with abdominal organs like the liver lobes</li> </ul>	<ul style="list-style-type: none"> <li>Stretches from the liver downwards to the urinary bladder.</li> <li>Contains liver, urinary bladder, and many other organs between are <i>abdominal features</i>.</li> </ul>	<ul style="list-style-type: none"> <li>Mainly contains the pelvic cavity</li> <li>Cavity contains the cloaca, vessels draining the things and cloacal opening at the posterior end of the body trunk.</li> </ul>

### • VENOUS SYSTEM.

This is a system of blood vessels called **veins**; which drain/remove blood; with carbon dioxide/ deoxygenated blood; from different body organs. Note that all veins originate from the **sinus venosus**; which is seen when the heart is displaced forwards/ anteriorly.


The table shows the various vessels draining body organs in the different body regions.

1. Head	<ul style="list-style-type: none"> <li>➤ <b>External jugular vein</b>; forms <b>lingual and mandibular veins</b>; draining tongue and lower jaws respectively.</li> <li>➤ <b>Innominate vein</b>; forms <b>internal jugular vein</b>; draining the brain</li> </ul>
2. Thoracic	<ul style="list-style-type: none"> <li>➤ <b>Innominate vein</b>; forms <b>Subscapular vein</b>; draining dorsal surface of shoulders.</li> <li>➤ <b>Subclavian vein</b>; forms <b>brachial veins</b>; and <b>musculo-cutaneous vein</b>; fore arm and draining the skin respectively.</li> <li>➤ <b>Pulmonary vein</b>; draining the lungs.</li> </ul>
3. Abdominal	<ul style="list-style-type: none"> <li>➤ <b>Posterior venacava</b> divides into; <ul style="list-style-type: none"> <li>• <b>Hepatic vein</b>; draining the liver lobes.</li> <li>• <b>Hepatic portal vein</b>; from the liver, drains the alimentary canal. Hepatic portal vein, divides into two joining the two livers and</li> </ul> </li> </ul>

	<p><b>Sinus venosus</b>; supplying the heart; divides to form;</p> <p><b>1. Anterior venacava</b>; (left and right); draining head and thoracic regions; then divides further into three major veins;</p> <ul style="list-style-type: none"> <li>➤ <b>External jugular vein.</b></li> <li>➤ <b>Innominate vein.</b></li> <li>➤ <b>Subclavian vein.</b></li> </ul> <p><b>And; pulmonary vein</b></p> <p><b>2. Posterior venacava</b>; draining abdominal and pelvic regions;</p>	<p>then branch into <b>gastro duodenal vein</b>; and <b>mesenteric vein</b>.</p> <p><b>1. Gastro duodenal vein</b>, divides into <b>gastric vein</b> and <b>duodenal vein</b>.</p> <ul style="list-style-type: none"> <li>(a) <b>Gastric vein</b>; drains the stomach;</li> <li>(b) <b>Duodenal vein</b>; draining the duodenum.</li> </ul> <p><b>2. Mesenteric vein</b> branches into <b>splenic vein</b>; draining the spleen before further branching into <b>anterior mesenteric vein</b> and <b>posterior mesenteric vein (rectal vein)</b>:</p> <ul style="list-style-type: none"> <li>❖ <b>Anterior mesenteric vein</b>; drains the ileum.</li> <li>❖ <b>Posterior mesenteric vein</b> drains colon.</li> <li>➤ After branching off to form the hepatic vein; the posterior venacava proceeds to drain the testis and kidneys.</li> <li>❖ <b>Testinal veins</b>; drain the testis.</li> <li>❖ <b>Renal veins</b>; drain the kidneys.</li> </ul>
4. Pelvic		<ul style="list-style-type: none"> <li>• <b>Renal portal vein</b>; from kidney divides into <b>outer femoral vein</b> and <b>inner sciatic vein</b>; connected by a <b>sciatic loop</b>; to draining the hind limbs/thighs;</li> <li>• <b>Pelvic vein</b>; from both left and right femoral veins; join into the <b>posterior abdominal vein</b>; also drains pelvic region; returning blood to the liver; through the <b>anterior abdominal vein</b>;</li> </ul>

Possible questions.

1. You are provided with specimen labeled T, is a freshly killed toad. Dissect the animal to display the blood vessels draining the left side anterior to the heart, with the heart turned forward. Draw and label. (16 marks)


	<p>T- M- D- N- O- TOTAL-</p>
---	--

2. UNEB 2007. Qn.1 (c). You are provided with a freshly killed specimen T. dissect the specimen to display;


(i) Blood vessels carrying blood from organs located on the left half of the abdominal cavity back to the heart.

(ii) Structures used for the elimination of unwanted materials from the body.

With the heart displaced anteriorly, draw and label the blood vessels and structures displayed in (c) (i) and (ii) on one diagram. (27marks)

	<p>T- M- D- N- O- TOTAL-</p>
---	--

3. You are provided with specimen T, which is a freshly killed toad. Dissect the animal to display the routes of blood flow that return blood from the limbs, and those that return blood from the right hand side of the head. Draw and label. (20 marks)

	<p>T- M- D- N- O- TOTAL-</p>
---	--

• **ARTERIOLE SYSTEM.**

This is a system of blood vessels called **arteries**; which supply blood; with oxygen; nutrients, or wastes to different body organs. Note that all arteries originate from the **truncus arteriosus**; which is seen when the heart is displayed/displaced downwards/posteriorly/or in situ.

**NB:**

- (i) Arteries are visible when all or most of the veins are removed; this is because, arteries are always beneath veins.
- (ii) Arteries may be distinguished from veins by their much paler colour due to greater thickness of their walls.
- (iii) Candidates MUST know; the name of artery; and part supplied by the particular artery.

The table shows the various vessels supplying body organs in the different body regions.

5. Head		<ul style="list-style-type: none"> <li>➤ <b>Carotid arch</b> divides into; <ul style="list-style-type: none"> <li>• <b>Lingual artery</b>; supplying the lower floor of the mouth and tongue.</li> <li>• <b>Carotid artery</b>; supplying the upper floor of mouth and brain.</li> </ul> </li> </ul>
6. Thoracic		<ul style="list-style-type: none"> <li>➤ <b>Pulmo-cutaneous arch</b> divides into; <ul style="list-style-type: none"> <li>• <b>Pulmonary artery</b>; supplying the lungs.</li> <li>• <b>Cutaneous artery</b>; supplying the skin.</li> </ul> </li> </ul>
7. Abdominal	<p><b>Truncus arteriosus</b>; from the heart divides to form; <b>Aortic arches</b>; (left and right); aortic arches divides further into three arches;</p> <ul style="list-style-type: none"> <li>➤ <b>Carotid arch.</b></li> <li>➤ <b>Systemic arch.</b></li> <li>➤ <b>Pulmo-cutaneous arch.</b></li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Systemic arch</b> divides into; <ul style="list-style-type: none"> <li>• <b>Subclavian artery</b>; supplying the fore limbs.</li> <li>• <b>Systemic artery</b>; supplying posterior body region, and branches off the <b>left coeliac mesenteric artery</b>, before forming the <b>dorsal aorta</b>.</li> </ul> </li> <li>3. <b>Coeliac-mesenteric artery</b>, divides into <b>coeliac</b> and <b>mesenteric arteries</b>.</li> <li>❖ <b>Coeliac artery</b> divides into; <ul style="list-style-type: none"> <li>(c) <b>Gastro-duodenal artery</b>; divides into <b>gastric artery</b> (supplying the stomach); And <b>duodenal artery</b> (supplying the duodenum).</li> <li>(d) <b>Hepatic artery</b>; supplying the liver.</li> </ul> </li> <li>❖ Mesenteric artery divides into; <ul style="list-style-type: none"> <li>(a) <b>Anterior mesenteric artery</b>; supplying the ileum.</li> <li>(b) <b>Posterior mesenteric artery</b>; supplying the rectum.</li> <li>(c) <b>Splenic artery</b>; supplying the spleen.</li> </ul> </li> <li>4. <b>Dorsal aorta</b> branches into; <ul style="list-style-type: none"> <li>❖ <b>Genital arteries</b>; supplying the testes or ovaries.</li> <li>❖ <b>Renal arteries</b> (usually 5) supplying the right and left kidney)</li> </ul> </li> </ul>



		❖ <b>Iliac arteries;</b> supplying the left and right hind limbs.
8. Pelvic		• <b>Iliac artery</b> supplying hind limbs; and enters hind thighs as a <b>femoral artery</b> and <b>sciatic artery</b> ;


**NOTE:** *to display blood vessels supplying the digestive system; the alimentary canal must be displaced to the right.*

**Possible questions.**


1. You are provided with a freshly killed toad. Dissect the specimen and search for blood vessels that supply blood to the head, skin and stomach. Leave the heart undisplaced. Draw and label. (15marks)

JUSAN	T- M- D- N- O- TOTAL-
-------	--------------------------------------

2. You are provided with a freshly killed toad. Dissect the specimen and display the internal structures. Displace the stomach further to the right, the right lung to cover part of the heart. Search for blood vessels supplying the stomach, pancreas, and right hand side of the animal anterior to the heart. Draw and label. (16marks)

	<p>T- M- D- N- O- TOTAL-</p>
---	--

3. Lay the animal ventral side upper most. Dissect it in the usual way to display internal structures. i) Turn the dish sideways and cut through the right angle of the jaw, pharynx up to oesophagus. Pin a side the floor of the buccal cavity and pharynx. Search for structures used for feeding (ii) Search for blood vessels supplying the gut. Draw and label your dissection. (22marks)

	<p>T- M- D- N- O- TOTAL-</p>
---	--

○ ARETERIOLE AND VENOUS SYSTEMS COMBINED FORMAT OF QUESTIONS.


Possible questions.

1. UNEB 2015. Qn.1 (d). You are provided with a freshly killed specimen T. dissect the specimen to expose the heart. Turn the heart to display the main blood vessels;

- (i) Returning blood from the trunk to the heart.
- (ii) Supplying the structures for absorption of nutrients and excretory organs.

Draw and label your dissection.

(27marks)

	<p>T- M- D- N- O- TOTAL-</p>
---	--

**Practice questions**

2. You are provided with a freshly killed toad. Dissect the animal to display:
  - (i) The main routes of blood flow supplying the left anterior region of the specimen.
  - (ii) The main routes of blood flow draining the right hind limb of the animal to the heart, the heart pinned forward through the ventricle. Draw and label your dissection. (30marks)
3. You are provided with specimen T, which is a freshly killed toad. Dissect the specimen to display the:
  - (i) blood vessels returning blood from the left lung and fore limbs of the animal.
  - (ii) blood vessels supplying blood to the right side of the head and structures in the abdominal region of the animal. Draw and label. (22 marks)
4. Pin the specimen on the dissecting board/dish and proceed to dissect it to display (i) the blood vessels that transport blood from the heart to the thoracic region of the specimen and the right fore limb (ii) the blood vessels that transport blood from the part of the alimentary canal anterior to the ileum and other organs displayed with in the abdominal region back to the heart when part of the gut posterior to ileum is cut out. Displace the alimentary canal to your right then with the heart displaced. Draw and label your dissection in (i) and (ii) on the same drawing. (27 marks)
5. You are provided with a freshly killed toad labeled K. Dissect the specimen to display the:
  - (i) The main routes of blood flow to the left fore limb and lung of the specimen.
  - (ii) The main routes of blood flow returning blood from the right hind limb of the animal to the heart, when displaced to expose its dorsal surface. Draw and label your dissection. (29 marks)
6. Dissect the animal to open up the abdominal, chest and pelvic cavities. Continue to dissect and display the blood vessels draining blood from the left hind limb. Remove the alimentary canal and left hand gonads. Displace the left and right lung to cover their ventral surfaces and display the urinogenital system and the blood vessels that drain blood from it, the left hind limb and body wall of the animal. Draw and label your dissection. (15 marks)
7. You are provided with a freshly killed toad labeled T, Dissect the specimen further to display the routes of blood flow: (i) Carrying blood from the head region on the right hand side of the specimen back to the heart. (ii) Carrying blood to the alimentary canal, displaced to the right and to the kidneys, the right turned to appear on top of the left. Without displacing the heart, draw and label your dissection. (25marks)
8. You are provided with a freshly killed toad labeled T. Dissect the animal to display: i) Blood vessels supplying the left hand lung, fore limbs, skin and head. ii) Blood vessels draining blood from the right hand side of the animal EXCEPT the inner part of the hind limb. Turn the heart forward. Draw and label. (28marks)
9. You are provided with a freshly killed toad labeled T. Dissect and display (i) Blood vessels draining the left hand side anterior to the trunk (ii) Supplying the right, lung, gonads and hind limb. Without displacing the heart, draw and label. (22marks)
10. Dissect a freshly killed toad (frog) provided to display: Vascular system returning blood from the urino genital system. (ii) Vascular system supplying the right hand side of the head, lung and skin. Without displacing the heart, draw and label. (28mark)

11. You are provided with a freshly killed toad labeled T, Dissect to display;
- (i) Routes of blood flow taking (supplying) blood to the excretory structures.
  - (ii) Routes of blood flow, returning blood from the right hand side of the head. Draw and label. (20 marks)
12. Lay specimen T- ventral side upper most. Pin it and proceed to dissect, display: i) Routes of blood flow draining blood from the left hand side of the head and lung to the heart. ii) Routes of blood flow supplying the right hind limb, spleen and part of gut anterior to ileum. Displace the heart forward. Draw and label. (25marks)

❖ **NERVOUS SYSTEM.**

Nervous system consists of the main spinal cord; with 10 nerve fibres projecting from either side of it. The first nerve fibre, the hypoglossal nerve is connected to the head; the next two nerves are found in the thoracic region (thoracic nerves); the next three are found in the abdominal region (abdominal nerves); the last four nerves are connected to the hind limbs; where they join together into the sciatic plexus; which later enlarges dividing into main sciatic nerve and inner small coccygeal nerve.

All the spinal nerves are connected to the sympathetic cord from the brain at the sympathetic ganglia by the loop called ramus communicans.

**Drawing showing the ventral branches of the spinal nerves and the sympathetic nervous system of a toad;**

T-  
M-  
D-  
N-  
O-  
TOTAL-