**نموذج أجابة للفرقة الثانية حيوان\ كيمياء ساعات معتمدة.**

**اسم الأمتحان:- تشريح وظيفى للحبليات.**
**تاريخ الأمتحان2013/6/15 ؛ العاشرة صباحا.**
**زمن الأمتحان :- ساعتان.**
**اسم الدكتور واضع الأمتحان: ا.د/ سلوى ابراهيم عبد الهادى سعد.**
**اسم الكلية: كلية العلوم – قسم علم الحيوان.**

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**نموذج الأسئلة**

Benha University
Faculty of Science
Zoology Department

Second Session, June,2013
Physiological Anatomy.
Time Allowed: 2hrs.

Second Year Students of Zoology/Chemistry.

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Please illustrate your answers with a clear labeled diagrams whenever possible.

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## Answer the following questions:-

1. **Describe in detail the auditory organ in case of *Oryctolagus cuniculus* . 13 marks.**

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2. **Explain how the oxygenated blood arises from the heart and reaches to everywhere in the body of *Columba livia*. 11marks.**

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3. **Mention in detail the general characters of class Reptilia . 9marks.**

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4. **Give a short account <u>on three items</u> only from the followings:**

**a. The nervous system in *Amphioxus lanceolatus*. 5 marks.**
**b. The urinogenital system in *Petromyzon fluviatilis*. 5 marks.**
**c. Vertebral column in Scyliorhinus canicula 5 marks.**
**d. Digestive system in *Tilapia nilotica.* 5 marks.**
**e. Phylogenetic origin of Tetrapoda limbs. 5 marks.**

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**With my best wishes,**
**Prof. Dr. Salwa Ibrahim.**

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أجابة السؤال **الأول**

**The auditory organ of *Oryctolagus cuniculus***

A true external ear which catches and directs sound waves into the, auditory canal is found only in mammals. It is called the pinna or auricle. Wax glands , as well as protective hairs, are integumentary derivatives found in the auditory canal ( external auditory meatus ) . The tympanic membrane is situated at the end of this canal.

The middle ear is surrounded by a bony tympanic bulla which is part of the temporal bone . The Eustachian tubes open separately . Instead of a single auditory bone (the columella auris ), the mammalian middle ear contains an articulated chain of three auditory ossicles leading from ear drum to the fenestra ovalis; malleus , incus and stapes. The latter is much reduced and it is equivalent to the whole columellar apparatus. The malleus derived from the articular bone of lower forms. It connects at one end with the tympanic membrane and with the incus on the other . The incus , which is homologous with the quadrate bone of lower vertebrate, lies between the malleus and stapes. The three auditory ossicles serve to transmit sound vibrations from tympanic membrane to the membrane of the fenestra ovalis .

The equilibratory portion of the inner ear remains relatively unchanged from reptiles to mammals, hi Amniota the lagena is lengthened to form the cochlear duct, and the sensory basilar papilla is elaborated into the organ of Corti, which is the actual receptor organ for

the sense of hearing . The cochlear duct begins to assume a spiral form in crocodiles and birds . In mammalian the spiral becomes more complicated . Thus the cochlea is divided into three longitudinal spaces or chambers called the scalae. The upper one is the scala vestibuli, and the lower is the scala tympani. These are filled with fluid perilymph. Between the two is the scala media or cochlear duct. Like other parts of the labyrinth , it is filled with endolymph . The three scalae together make up the cochlea. The floor of the scala media is called the basilar membrane. This separates the endolymph in the scala from the perilymph in the scala tympani . The thin, sloping roof of the scala media is referred to as the vestibular, or Reissner's membrane . It separates the endolymph in the scala media from the perilymph in the scala vestibuli. At the apex of the cochlea the scala vestibuli is continuous with the scala tympani . The point of junction is the helicotrema. The scala media ends blindly at the helicotrema. The basilar membrane supports the organ of Corti. The latter is composed of numerous hair - like cells which have connections at their bases with fibers of the auditory nerve.

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أجابة السؤال الثانى

***The heart of Columba livia:-***

For the first time a completely double circulation occurs in birds where there is no point for mixing of oxygenated and unoxygenated blood. The sinus venosus has disappeared . There are two auricles and two ventricles. Generally, in birds, the heart is relatively much larger and more compact than in previous forms. The wall of auricles is thin . The ventricles are completely separated and the muscular wall of the left ventricle being much heavier than the right one . There is a single valve

which separates right auricle from right ventricle . Also there are two valves ( bicupsid valve ) between the left auricle and the left ventricle.

The right auricle receives two precavals and one postcaval. The left auricle receives four pulmonary veins which return oxygenated blood from the lungs . The right ventricle gives one pulmonary artery which divides after a short distance into right and left pulmonary arteries each goes to one of the lungs. The left ventricle gives rise to one big vessel (right aortic arch) carrying the pure blood to various parts of the body . The left aortic arch is eliminated in birds.

**Arterial system :**

The single aortic arch which carries the pure blood and which arises from the left ventricle extends a short distance anteriorly giving rise to two innominate arteries; right and left ones then it curves to the right side and posteriorly where it extends as the median dorsal aorta . Each one of the two innominates gives a common carotid artery to the head region , a subclavian artery to the wing and a pectoral artery to the pectoralis muscle. The dorsal aorta extends in the mid-dorsal line giving to the alimentary canal three single vessels; coeliac artery, anterior mesenteric and posterior mesenteric . It gives to the kidneys a pair of first renal arteries, then gives the paired femorals and sciatics to the hind limb. From each sciatic arises the second and third renal arteries. Then it gives the paired iliacs to the pelvic region and it ends by a very short caudal artery .

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أجابة السؤال الثالث

There are several characters of class Reptilia which distinguish it from class Amphibia . These are :

1- The skin in Reptilia is dry, cornified and provided with homy scales. These scales are composed of horny substance and they are formed by the outer layer of the epidermis which becomes the horny layer. While in Amphibia the skin is very rich in glands, the skin of reptiles contains only very few glands which are found only at a certain area of the body such as the femoral glands (they are present on the ventral side of the thigh). Also the skin in Reptilia is not at -all used in respiration .

2- There are two pairs of limbs. Each one of them consists of five digits ending with horny claws which are modified to running , crawling or clinging , limbs are paddle - like in marine turtles, reduced in some lizards and absent in few other lizards and in all snakes

3- Respiration is carried only by the lungs . The respiratory movements are produced by the ribs .

4- There is only one single median occipital condyle. Where in Amphibia the skull is provided with two occipital condyles.

5- *As* generally the lower jaw of reptiles is composed of several bones, since its posterior edge is called the articular. It carries out the articulation with the skull.

6- The ventricle is incompletely divided into two chambers. The ,. crocodiles only have two separate ventricles.

7- Presence of twelve pairs of cranial nerves.

8- Body temperature is variable.

9- Fertilization takes place internally and each egg is large in size with a sufficient amount of yolk . Most of reptiles lay eggs ( oviparous) . In some lizards and snakes the eggs are retained in female for it development, but the embryos are nourished from the yolk of the eggs (ovoviviparous) .

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أجابة السؤال الرابع الجزئية (أ)

**Nervous system of *Amphioxus lanceolatus*** : .

It is in the form of a hollow tube lying directely above the notochord. The cavity of this tube is the central canal. At the anterior end the canal dilates into a brain vesicle. It is separated from the spinal cord by a cavity known as the dorsal dilatation which is covered only by connective tissue .

The brain gives off two pairs of cranial nerves which are sensary in function . The first arises from the anterior part of the brain , while the second arises from its roof. They are both distributed to the snout.

The spinal cord gives off paired spinal nerves. These consists of the dorsal nerves which are sensory and motor to supplying the skin and the transverse muscles and pass between the myotomes ,and the ventral nerves chiefly motor passing into the myotomes and lie opposite to myotomes . These nerves alternate on the two sides due to the asymmetry of the myotomes. These nerves do not unite outside the cord and the dorsal nerves carry no spinal ganglia .

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**The urinogenital system of *Petromyzon fluviatilis* :**

The urinary system composed of two kidneys which are long and strap-shaped. They lie on either side of the middorsal line, from which they are suspended by mesentery - like membranes. The ventral edge of the kidney is free . The kidney duct ( ureter) crosses along the free edge of the kidney. The two ureters unite posteriorly to open into a urogenital sinus which leads to the outside through an aperture at the tip of a small urogenital papilla . There are two openings connect the urogenital sinus with the coelom ( genital pores ) .

The sexes are separate. The adult female has a single gonad (representing a fusion of two ). It is attached to the middorsal body wall by a single inasovarium. At the breeding season the ovary occupies the greater part of the abdominal cavity .

The testis of the male lamprey is not voluminous. It is a single structure , representing a fusion of two. Spermatozoa are discharged through the outer wall of the restis and are shed directly in the coelom due to lacking of reproductive ducts in lamprey. From the coelom the reproductive cells pass to the urogenital sinus through the genital pores and out by means of the urogenital papilla. Fertilization is externally take place .

The eggs are small about one mm. in diameter. In three to four weeks the young hatches from the egg (Ammocoetes larva) about 1 cm. long. The larva lies in tunnels of mud where it feeds. The larval period is of long duration , it is three to four years, but in some lampreys it may be seven years. At the end of this period metamorphosis occurs. The endostyle becomes a thyroid gland; the oral hood becomes the buccal funnel with horny teeth $_s$ tongue and round mouth ; the esophagus separates from the pharynx and comes to lie dorsal to it and the continuous dorsal fin breaks into two dorsal and a single caudal fin. Metamorphosis is completed within few weeks .

Ammocoetes larva is of special interest because it shows similarities with Amphioxus and because it is very primitive and generalized vertebrate . It may be regarded as a connecting link between Amphioxus and cyclostomes.

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أجابة السؤال الرابع الجزئية (ج)

**Vertebral column of *Scyliorhinus canicula* :**

It is divided into two distinct regions :

1- The trunk region is composed of the trunk vertebrae

2- The tail region is composed of the caudal vertebrae .

The trunk vertebra bears a biconcave (amphicoelous ) centrum through its center the compressed notochord (notochord rudiment) runs . The notochord is not constricted between the centra of the successive vertebrae. The centrum is formed by the invasion of the notochordal sheath by cartilage . Then the notochord gradually decreases in size until it disappears in the adult animal. Some mesodermal cells is appeared around the notochord to form a skeletogenous tissue which is more condensed at four places, two dorsal above the notochord and two ventral below it. These are two basidorsal and two basiventral respectively .

The two basidorsals extend dorsally forming the neural arch enclosing the neural canal which includes the spinal cord, and carrying at its apex a dorsal process ( neural spine ) . In trunk region the basiventrals extend laterally forming the transverse process, but in the tail region they extend ventrally forming the haemal arch surrounding the caudal artery and vein, and carrying at its lower edge a ventral process ( haemal spine ).

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أجابة السؤال الرابع الجزئية (د)

**The digestive system *Tilapia nilotica* :-**

The mouth leads to the wide pharynx. The side walls of pharynx are perforated by five vertical gill slits. The gills are fringed by teeth-like structures (the gill rackers). The pharynx leads by means of a short esophagus into the stomach. The stomach is characterized by possessing a large posteriorly closed caecum. There is no spiral valve in the intestine and instead of it is much coiled and is composed of duodenum, ileum and rectum. There are no sharp lines of demarcation between these parts. There is no rectal gland, no cloaca and the rectum opens to the exterior by a distinct anus. The liver is large, bilobed, but the left lobe is larger than

the right and extends nearly as far backwards as the posterior wall of the body cavity. The gallbladder is large and spherical. A bile duct extends from it to open into the anterior end of the intestine. The pancreas is diffused inside the liver and part of it is found as patches of whitish tissue near the anterior end of the intestine. The spleen lies between the caecal portion of the stomach and the left lobe of the liver.

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أجابة السؤال الرابع الجزئية ( ى)

**Phylogenetic origin of tetrapod limbs :**

In tetrapods, the skeleton of the limbs is not the same, but it is built of several parts arranged in a same plane. The skeleton of the fore limb consists of humerus , radius and ulna, carpals , metacarpals and phalanges and in the same plane the skeleton of the hind limb (femur, tibia and fibula, tarsals, metatarsals and phalanges . Also the skeleton of pectoral girdle is composed of scapula, precoracoid and coracoid and related to it the skeleton of pelvic girdle (ilium, pubis and ischium)

The fossil remains of rhipidistian crossopterygian indicate that the skeletal parts of the fins of this primitive fish can be closely homolog-ized with those of the limbs of tetrapods.

Each fin of rhipidistian crossopterygian has a chain of bones along the postaxial side, from which a series of radials comes off. It is believed that the first bone at the base of the fin is equivalent to the humerus (femur), and the second to the ulna (fibula). The first radial is comparable to the radius (tibia). The rest of the radials are believed finally to have become carpal ( tarsal ) bones whereas metacarpals ( metatarsals ) and phalanges have arisen as new distal outgrowths from the margin of the fleshy , muscular portion of the paddle- like fin .

أنتهت الأجابة النوذجية للأمتحان