

3 HOURS		02/ 11 / 2018			<b>EXAMS OFFICE USE ONLY</b>
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**University of the Witwatersrand, Johannesburg**

Course or topic No(s)		ANAT 2020			
Course or topic name(s) Paper Number & title		<b>HUMAN ANATOMY MORPHOLOGICAL, HISTOLOGY AND EMBRYOLOGY FINAL EXAMINATION</b>			
Examination to be Held during month of		NOVEMBER 2018			
Year of Study (Arts & Science leave blank)		SECOND			
Degree/Diplomas for which This course is prescribed		BACHELOR OF MEDICINE & BACHELOR OF SURGERY BACHELOR OF HEALTH SCIENCES & BSc (BIOMEDICAL ENGINEERING)			
Faculty/ies presenting Candidates		FACULTY OF HEALTH SCIENCES			
Internal examiner(s) And telephone extension Number(s)		PROFESSOR AO IHUNWO (011 – 717 – 2767) DR N BRIERS (011 – 717 – 2445) MRS A JOVANOVIC (011 – 717 – 2432)			
External examiner(s)		PROFESSOR G LEBONA and DR P ACKERMANN			
Special materials required (graph/music/drawing paper) maps, diagrams, tables, computer cards, etc.					
Time allowance		Course No.	ANAT 2020	HOURS	THREE
Instructions to candidates (Examiners may wish to use this space to indicate, inter alia, the contribution made by this examination or test towards the year mark, if appropriate)		ANSWER ALL QUESTIONS. RELEVANT AND CORRECTLY LABELLED DIAGRAMS MAY BE USED TO ENHANCE YOUR ANSWERS. <b>ONLY</b> SCRIPTS WRITTEN IN BLUE OR BLACK INK WILL BE MARKED. PENCIL MAY BE USED <b>ONLY</b> FOR DRAWINGS.			

**Internal Examiners or Heads of Department are requested to sign the declaration overleaf.**

**UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG**  
**SCHOOL OF ANATOMICAL SCIENCES**

**(ANAT 2020) HUMAN ANATOMY FOR MBBCH II, BHSc & BSc (Biomed Eng):**  
**END OF YEAR EXAMINATION: 2<sup>ND</sup> NOVEMBER 2018**

**TIME: 3 HOURS**

**TOTAL MARKS: 150**

**TOTAL NUMBER OF QUESTIONS = 25 MCQ AND 13 SHORT WRITTEN**  
**QUESTIONS**

**Instructions:**

1. Answer **all** questions.
2. Write your Anatomy number on each answer book/MCQ sheet.
3. **SECTION A: MCQ's** **50 MARKS**
  - i) Write your name, the degree for which you are registered, your student number, and anatomy test number on the "**Faculty of Health Sciences**" side of the computer sheet.
  - ii) On the "**circles**" side of the computer sheet in the block headed "**student number**" write your student number. **Fill in the circles with a soft HB pencil.**
  - iii) There are five (5) options each must be marked as either **CORRECT** or **INCORRECT**. For each question at least one of the options will be correct and one incorrect. **You need to have an answer for each of the five (5) statements.**
  - iv) **DO NOT** use CORRECTION FLUID on your MCQ sheet. You may use an Eraser with care.
  - v) **DO NOT** fold or bend the computer card.
  - vi) The computer sheet **MUST be filled in during the examination time.** NO TIME WILL BE ALLOWED after the end of the examination for filling in the sheet.
4. **SECTION B: WRITTEN ANSWER QUESTIONS:** **100 MARKS**
  - i) Answer all Morphological Anatomy questions in the **GREEN** book, all Histology and Embryology questions in the **WHITE** book.
  - ii) Relevant and correctly labelled diagrams may be used to enhance your answers.
  - iii) **ONLY** scripts written in blue or black ink will be marked. Pencil may be used **ONLY** for drawings.

**SECTION A: MULTIPLE CHOICE QUESTIONS**  
**QUESTIONS 1-25 BELOW ARE X-TYPE MCQS**

**TOTAL: 50 MARKS**  
**(2 MARKS EACH)**

**1. Regarding the long thoracic nerve:**

- a. Injury causes winging of the scapula.
- b. It innervates teres major.
- c. It takes origin from C5 – C7 roots of the brachial plexus.
- d. It has the same origin as the medial and lateral pectoral nerves.
- e. It traverses the suprascapular notch.

**2. Regarding lymphatic drainage of the female breast:**

- a. The superolateral quadrant drains predominantly to the pectoral/anterior axillary nodes.
- b. The subareolar plexus drains to the central nodes.
- c. The subscapular nodes are found along the anterior axillary folds.
- d. The upper limb drains predominantly to the lateral nodes.
- e. Parasternal nodes allow lymph drainage to the contralateral breast.

**3. Regarding the thoracic duct:**

- a. It originates from the cisterna chyli.
- b. It passes through the diaphragm with the oesophagus.
- c. It drains all the body tissue below the diaphragm.
- d. It usually drains the entire left side of the body.
- e. It empties into the left subclavian artery.

**4. Concerning the venous drainage of the heart:**

- a. Venae cordis minimae drain into all four chambers.
- b. The anterior cardiac veins drain into the right ventricle.
- c. The coronary sinus lies in the posterior interventricular groove.
- d. The middle cardiac vein is a tributary of the coronary sinus.
- e. The small cardiac vein is a tributary of the coronary sinus.

**5. With regard to the bones of the skull:**

- a. The hard palate is formed by the maxilla and palatine bones.
- b. Both greater and lesser wings of the sphenoid bones form part of the orbit.
- c. The maxilla forms the majority of the piriform aperture.
- d. The ethmoid lies posterior to the sphenoid.
- e. The coracoid process of the mandible lies anterior to the condyle.

**6. Regarding the salivary glands:**

- a. The parotid gland lies deep to the masseter muscle.
- b. The submandibular gland opens opposite the second maxillary molar.
- c. The sublingual glands form a horseshoe shape around the frenulum.
- d. Accessory salivary glands are located on the tongue.
- e. Lymphatic drainage of the submandibular gland is into superficial cervical lymph nodes.

**7. The cerebrospinal fluid:**

- a. Is found in the subdural space.
- b. Is produced by the arachnoid villi and granulations.

- c. Provides nutrition to the brain and the spinal cord.
- d. Reaches the fourth ventricle through the cerebral aqueduct.
- e. Is absorbed into the cerebellomedullary cistern (cisterna magna).

**8. The cerebellum:**

- a. Is located in the middle cranial fossa.
- b. Consists of two cerebellar hemispheres and a central vermis.
- c. Has a dentate nucleus that is associated with fine motor coordination.
- d. Is connected to the medulla by the middle cerebellar peduncle.
- e. Gets its arterial blood supply from the vertebrobasilar system.

**9. Regarding the liver:**

- a. It anatomically divided by the ligamentum teres and ligamentum venosum.
- b. It is functionally divided along the cholecysto-vena caval line .
- c. The caudate lobe is found between the gallbladder and the inferior vena cava.
- d. It has a dual blood supply formed by the hepatic arteries and veins.
- e. Each liver segment is supplied by the hepatic artery, portal vein and bile duct.

**10. The following structures form the boundary of the lesser peritoneal sac:**

- a. Gastrosplenic ligament
- b. Left triangular ligament of the liver
- c. Greater omentum
- d. Lesser omentum
- e. Splenorenal ligament

**11. The following are posterior relations of the urinary bladder in females:**

- a. Cervix
- b. Rectouterine pouch
- c. Anterior vaginal fornix
- d. Perineal body
- e. Seminal vesicles

**12. Regarding testicular descent:**

- a. During the descent of the testicles, the gubernaculum provides a mechanical force/traction.
- b. In males, the gubernaculum completely disappears.
- c. The development of the inguinal canal precedes testicular descent.
- d. Tunica albuginea testis is derived from the parietal peritoneum.
- e. Inguinal canals are only present in males .

**13. The saphenous nerve:**

- a. Accompanies the great saphenous vein.
- b. Is found in the femoral canal.
- c. Is found between the two heads of gastrocnemius.
- d. Supplies the lateral aspect of the leg.
- e. Is a sensory branch of the femoral nerve.

**14. The medial meniscus of the knee joint:**

- a. Consists of hyaline cartilage.
- b. Allows the shock on the knee joint to be absorbed.

- c. May tear in conjunction with the tibial collateral ligament.
- d. Is C-shaped.
- e. Is separated by the tendon of popliteus from the fibular collateral ligament.

**15. Plantar flexion of the foot is normally an action of the:**

- a. Triceps surae
- b. Flexor digitorum longus
- c. Extensor digitorum longus
- d. Fibularis longus and fibularis brevis
- e. Tibialis anterior

**16. Thick skin:**

- a. Has pronounced interdigitations between the epidermis and dermis
- b. Has sebaceous glands within the dermis
- c. Has a one cell layer thick stratum granulosum
- d. Is found on the palms of the hands and soles of the feet
- e. Has Pacinian corpuscles found within the dermal papilla

**17. With regard to the olfactory mucosa:**

- a. The epithelium rests on a distinct basement membrane
- b. The lamina propria contains serous secreting glands
- c. The olfactory cells are multipolar neurons
- d. The sustentacular cells have microvilli on their apical surface
- e. The muscularis mucosa comprises of smooth muscle

**18. With regard to the oesophagus:**

- a. The upper third of the muscularis externa comprises of skeletal muscle
- b. The epithelium is classified as stratified squamous keratinised
- c. The submucosa contains mucous secreting glands
- d. The oesophageal cardiac glands are found in the lamina propria
- e. An adventitia is present in the portion found in the peritoneal cavity

**19. The proximal convoluted tubules of the nephron:**

- a. Have villi that provide a large surface area for reabsorption
- b. Play a vital role in reabsorption of the glomerular filtrate
- c. Have lining cells that are tightly connected through junctional complexes
- d. Have cuboidal epithelium that stains eosinophilic
- e. Function under the influence of aldosterone

**20. Sertoli cells:**

- a. Are classified as epithelial cells
- b. Are characterised by the presence of continuous tight junctions
- c. Line the entire excurrent duct system
- d. Are responsible for production of testosterone
- e. Act as antigen-presenting cells

**21. With regard to the ovary:**

- a. The tertiary follicle ruptures at ovulation
- b. The antrum is formed in the primary multilaminar follicle

- c. The corpus luteum secretes estrogen and progesterone
- d. The theca externa becomes the theca lutein cell layer following ovulation
- e. The zona pellucida consists of glycosaminoglycans and glycoproteins

**22. With regard to the secretory phase of the endometrium:**

- a. The uterine glands are narrow and straight
- b. The stromal cells form the decidua
- c. The spiral arteries rupture
- d. The epithelial cells reconstitute the luminal surface
- e. The endometrium becomes edematous

**23. The cells of the zona fasciculata of the suprarenal gland**

- a. Are arranged in long straight cords
- b. Are binucleated
- c. Contain lipid droplets in the cytoplasm
- d. Are modified neurons
- e. Secrete catecholamines

**24. With regard to the embryonic development of the respiratory diaphragm:**

- a. The central tendon is derived from the pleuropericardial membrane
- b. It is innervated by the phrenic nerve from its superior aspect
- c. The dorsal meso-oesophagus contributes to its posterior aspect
- d. The septum transversum gives rise to central tendon
- e. Mesoderm from the levels of C4 contribute to the musculature of the diaphragm

**25. With regard to the development of the mesenteries:**

- a. Splanchnic mesoderm is a constituent of the mesentery
- b. "Flopping over" of the duodenum to the right hand side results in the duodenum remaining suspended and mobile in its mesentery
- c. The falciform ligament is formed by the dorsal mesogastrium
- d. A mesentery will only form where the intra-embryonic coelom is present
- e. The greater omentum develops from the dorsal mesogastrium

**SECTION B: SHORT ESSAY QUESTIONS**

**TOTAL: 100 MARKS**

**MORPHOLOGICAL ANATOMY**

**60 MARKS**

**QUESTION 1**

- a. Give the muscles in the superficial layer of the anterior compartment of the forearm and the nerve supply of these muscles. **(3 marks)**
- b. Fracture of the surgical neck of the humerus may endanger several structures.
  - i. Which nerve is in danger in the fracture area? **(½ mark)**
  - ii. Name any **TWO** muscles that are innervated by the nerve referred to in (a). **(1 mark)**
  - iii. Name **ONE** artery in direct relation to the fracture site? **(½ mark)**

**QUESTION 2**

- a. Give **TWO** main sources of the intercostal arteries. **(1 mark)**

b. Tabulate the differences between the right and left bronchi. (1½ marks)

Right bronchi	Left bronchus

c. Where will an inhaled object be lodged? Provide **TWO** anatomical reasons for your answer. (1½ marks)

d. Give **TWO** major arteries that originate from the left coronary artery. (1 mark)

### **QUESTION 3**

a. Describe the anatomy of the thyroid gland using the following headings:

- i. Position (1½ marks)
- ii. Blood supply (1 mark)
- iii. Innervation (1½ marks)

b. Using a simple diagram, illustrate the pharyngeal lymphatic ring (**Waldeyer's ring**). (2 marks)

### **QUESTION 4**

a. Give a well-labelled diagram to show the branches involved in the formation of the '**Circle of Willis**'. (3 marks)

b. List the areas where the first, second and third order neurons of the visual pathway are located. (1½ marks)

c. Name **THREE** nerves in the cranium that form part of the parasympathetic division of the autonomic nervous system and give one of the ganglia associated with each nerves. (2½ marks)

d. The dura mater is sensitive to pain. Give the nerves that innervate the dura mater. (2 marks)

### **QUESTION 5**

a. Copy the table below in your answer paper and give the structures that form the boundaries of the inguinal canal. (5 marks)

Boundary	Lateral Third/Deep Ring	Middle	Medial Third/Superficial Ring
Roof			
Anterior wall			Aponeurosis of Ext. oblique (intercrural fibres), fibres of Ext. oblique extension as external spermatic fascia
Floor			
Posterior wall			Inguinal falx (conjoint tendon) and reflected inguinal ligament

b. Name the arteries supplying the stomach and give the origin of each of the arteries. (5 marks)

### **QUESTION 6**

- a. Give the layers of the scrotum and coverings of the spermatic cord that match the following structures of the anterolateral abdominal wall: **(4 marks)**
- Skin **(1/2)**
  - Superficial fatty and membranous fascia **(1/2)**
  - External oblique and aponeurosis **(1/2)**
  - Internal oblique and aponeurosis **(1)**
  - Transversus abdominis and aponeurosis **(1/2)**
  - Parietal peritoneum **(1/2)**
  - Transversalis fascia **(1/2)**
- b. Give the remnants of the embryonic gubernaculum in adult females. **(1 mark)**
- c. Describe the relations of the uterus. **(5 marks)**

**QUESTION 7 (a)**

Radiographs of an 82-year old woman show a fracture of the right femur neck. Her right leg is shorter than the left and her right foot is rotated laterally.

- Which arteries primarily supply the neck and head of the femur respectively? **(1½ marks)**
- Which muscles cause her left leg to be shorter than the right? **(1½ marks)**
- List **FOUR** muscles that cause her foot to be laterally rotated? **(2 marks)**

**QUESTION 7 (b)**

- List the contents of the femoral sheath. **(1½ marks)**
- Provide an anatomical reason why a femoral hernia would present in the femoral triangle. **(1 mark)**

**QUESTION 7 (c)**

Explain why the medial meniscus is more often torn in contact sports, compared to the lateral meniscus. **(4 marks)**

**QUESTION 7 (d)**

Bony landmarks are often used to locate important nerves and blood vessels for surgery or before administering local anaesthesia. Copy and complete the table: **(3½ marks)**

Blood vessel	Bony landmark	Nerve related to vessel
Great saphenous vein at ankle joint		
Posterior tibial artery		
Dorsal pedal artery		

**HISTOLOGY AND EMBRYOLOGY**  
**ANSWER QUESTION 1-6 IN THE WHITE BOOK**

**TOTAL MARKS: 40**

**QUESTION 1**



a. Match each question from column A with the best answer from column B. In your answering booklet write the numbers 1 – 8 and match it with the corresponding letters a - h. **(4 marks)**

Column A	Column B
1. What type of epithelium appears stratified but it is not?	a. Stratified columnar epithelium
2. What type of epithelium lines intercalated ducts?	b. Endothelium
3. What type of epithelium is keratinised?	c. Simple columnar epithelium
4. What type of epithelium lines major ducts of the submandibular gland?	d. Pseudostratified epithelium
5. What type of epithelium lines the lumen of blood vessels?	e. Simple cuboidal epithelium
6. What type of epithelium lines the ureter?	f. Stratified squamous epithelium
7. What type of epithelium is associated with goblet cells in the GIT?	g. Transitional epithelium
8. What type of epithelium covers the mesentery?	h. Mesothelium

b. Pertaining to your answer of the question 6, identify and classify this epithelium and write short notes on the difference in the histological structure relative to its two functional states. **(4 marks)**

## **QUESTION 2**

a. Differentiate between antigen-dependent and antigen-independent lymphocyte differentiation. **(1 mark)**

b. Complete the following table pertaining to the lymphatic system. Write only the letter and the correct answer in your answering booklet. **(6 marks)**

**QUESTION 3**

a. List the main accessory sex glands of the male reproductive system and the main

Lymphatic tissue/organ	Capsule	Primary/secondary lymphatic organ	Location	Diffuse/Nodular arrangement
A	Partially encapsulated	B	Oral cavity	C
Thymus	Encapsulated	D	Mediastinum	E
F	G	Secondary	Ileum	Nodular
H	Encapsulated	Secondary	I	Both. Superficial cortex nodular; paracortex and medulla diffuse
J	Unencapsulated	K	Marrow cavity	Diffuse
L	Unencapsulated	Secondary	Mucous membranes	Can be both

function of the secretions of each gland.

**(3 marks)**

b. Into which part of the excurrent duct system does each gland drain?

**(1.5 marks)**

c. List the phases of spermatogenesis in sequence.

**(1.5 marks)**

**QUESTION 4**

Describe the histological structure and function of the pars nervosa of the pituitary gland.

**(7 marks)**

**QUESTION 5**

a. Describe the embryonic development of the bladder.

**(5 marks)**

b. Describe the condition of ectopia vesicae.

**(1 mark)**

**QUESTION 6**

Utilising the embryonic development of the pancreas, explain how the bile duct comes to open into the left side of the duodenum in the adult.

**(6 marks)**