

QUESTIONS AND ANSWERS ON TRUNK AND HEAD.

1 How many vertebrae in the spinal column?

Thirty-three in number, exclusive of those which form the skull, and have received the names cervical, dorsal, lumbar, sacral and coccygeal, according to the position which they occupy; seven being found in the cervical region, twelve in the dorsal, five in the lumbar, five in the sacral, and four in the coccygeal.

This number is sometimes increased by an additional vertebra in one region, or the number may be diminished in one region, the deficiency being supplied by an additional vertebra in another. These observations do not apply to the cervical portion of the spine, the number of bones forming which is seldom increased or diminished.

2 Names the divisions, giving the peculiar ones of each.

Seven cervical, twelve dorsal five lumbar, five sacral and four coccygeal.

The peculiar vertebrae in the cervical region are the first or atlas; the second or axis, and the seventh or vertebra prominens. The great modifications in the form of the atlas and axis are designed to admit of nodding and rotatory movements of the head. In the dorsal region the first, ninth, tenth, eleventh and twelfth are the peculiar ones.

In the lumbar region the fifth one is peculiar.

3 Describe each of the peculiar vertebrae.

The atlas has a small spinous process, large lateral processes and no body. The axis has an odontoid process which is in reality the body of the atlas. It has a large spinous process which is bifid.

The vertebra prominens has a long and prominent spinous process which ends in a tubercle for the ligamentum nuchae.

Peculiar dorsal vertebrae—the first has one facet and a demifacet.

The ninth has a demifacet only. The tenth has but one facet on the body and one on the transverse process.

The eleventh and twelfth have each but one facet on the body, and none on the transverse process.

The twelfth resembles a lumbar vertebra in size and shape.

The fifth lumbar is much deeper in front than behind; its spinous process is small, but its transverse processes are large and thick, and point slightly upwards.

4 Give a general description of the vertebra.

Each vertebra consists of a body and an arch, the latter being formed by 2 pedicles and 2 laminae, which support 7 processes.

Body is thick and spongy, convex in front from side to side, concave vertically, and on the upper and lower surfaces, which are surrounded by a bony rim. Anteriorly are small foramina for nutrient vessels, posteriorly a large foramen for the exit of the *venæ basis vertebrarum*.

Pedicles project backwards from the body, inclining outwards. They are notched above and below, thus forming, with the adjacent notches, the Intervertebral Foramina for the entrance of vessels and the exit of the spinal nerves.

Laminae, are 2 broad plates, meeting in the spinous process behind, and rough on their upper and lower borders for the attachment of the *ligamentum subflava*.

Transverse Processes one on each side, projecting outwards.

Articular Processes, two on each side, superior and inferior, project from the junction of the laminae and pedicles, and articulating above and below with the articular processes of the adjacent vertebrae. Their superior facets look upwards in the cervical region, outwards in the dorsal, and inwards in the lumbar.

Spinous Process, projects backwards from the junction of the laminae with each other, sometimes very obliquely.

Spinal Foramen, is the space enclosed by the body, pedicles and laminae; and which, when the vertebrae are articulated, forms part of the spinal canal.

5 Give ligaments of vertebral column.

1. The ligaments of the body are (a) Anterior common ligament, (b) Posterior common ligament, (c) Intervertebral substance.

2 Ligaments connecting the laminae (a) *Ligamenta subflava*.

3 Ligaments connecting articular processes (a) capular.

4 Ligaments connecting the spinous processes (a) supraspinous (b) interspinous.

5 Ligaments connecting transverse processes (a) intertransverse.

6 Give a general description of a rib.

Each rib has the following points:

Head is divided by a ridge into 2 facets, which articulate with the facets on the bodies of the dorsal vertebrae; the ridge giving attachment to the interarticular ligament.

Neck, about an inch long, having attached to its upper border the anterior costo-transverse ligament, to its posterior surface the middle costo-transverse ligament; its anterior surface is smooth.

Tuberosity, at the junction of the neck with the shaft, has a facet for articulation with the transverse process of the next lower vertebra, and a

rough surface for the posterior costo-transverse ligament.

Shaft, twisted on itself, is concave internally, convex externally, its upper border round and smooth, its lower border grooved for the intercostal vessels and nerves. At its external extremity is an oval depression for the insertion of the costal cartilage.

Angle, just in front of the tuberosity, is marked by a rough line, to which are attached the muscles of the deep layer of the back.

How are they developed? Each rib has three centers, one each for the head, shaft and tuberosity. The last two ribs, having no tuberosity, are developed each by two centers.

7 Name the peculiar ribs.

They are the 1st, 2d, 10th, 11th and 12th.

They respectively present the following peculiarities, viz—

First Rib is broad, short, not twisted, has no angle, only one facet on the head, but on its upper surface are seen two grooves for the subclavian artery and vein, and between them a tubercle for the Scalenus anticus muscle.

Second Rib is not twisted, its tuberosity and angle are very close together, and its upper surface presents rough surfaces for the Serratus magnus and Scalenus posticus muscles.

Tenth Rib has but one facet on its head.

Eleventh Rib has no neck, no tuberosity, and but one facet on its head.

Twelfth Rib has neither neck, angle, tuberosity nor groove, and but one facet.

8 How many layers of muscles in the back.

The muscles in the back are arranged in five layers. The Erector spinae which is in the fourth layer gets both the internal and the external divisions of the posterior branches of the spinal nerves. The external divisions supply those in the third layer. The internal divisions together with the sub-occipital and great occipital supply those in the fifth layer.

9 Name muscles in 1st layer and give nerve supply.

MUSCLES OF THE BACK.

FIRST LAYER.

Trapezius

Latissimus dorsi

10 Name the muscles in 2nd layer and give nerve supply.

SECOND LAYER.

Levator angulae scapulae

NERVES.

Spinal accessory; 3x4 cervical.

Middle or long subscapular

3x4 cervical

Rhomboideus minor 5 cervical

Rhomboideus major 5 cervical

11 Name muscles in 3rd layer and give nerve supply.

THIRD LAYER.

Serratus posticus superior

Serratus posticus inferior

Splenius capitis

Splenius colli

External divisions of posterior branches of the spinal nerves, in their respective regions.

12 Name muscles in 4th layer and give nerve supply.

FOURTH LAYER.

Sacral and Lumbar Regions

1 Erector spinae

DORSAL REGION.

2 Ilio-costalis

3 Musculus accessoris ad iliocostalem

4 Longissimus dorsi

5 Spinalis dorsi

CERVICAL REGION.

6 Cervicalis ascendens

7 Transversalis colli

8 Tracheo-mastoid

9 Complexus

10 Biventer cervicis

11 Spinalis colli

All the muscles in the fourth layer get the external divisions of posterior branches except the spinalis dorsi, and spinalis colli and the complexus.

They get the internal divisions of the posterior branches. The Complexus also gets the suboccipital and the great occipital nerves.

13 Name muscles in 5th layer and give nerve supply.

FIFTH LAYER.

Semispinalis dorsi

Semispinalis colli

Multifidus spinæ

Rotatores spinæ 11

Supraspinalis

Interspinalis *on pr.*

Extensor coccygis

Intertransversalis *on pr. C. region*

Rectus capitis posticus major

Rectus capitis posticus minor

Obliquus capitis superior

Obliquus capitis inferior

All these muscles in the fifth layer are supplied by the internal divisions of the posterior branches of the spinal nerves in their respective regions, except the recti and obliqui, and are supplied by the suboccipital. The inferior oblique also takes the great occipital.

14 Give a general description of the diaphragm.

The word diaphragm is a Greek word meaning a partition wall. It is a musculo-fibrous septum, situated between the upper one-third and the lower two-thirds of the trunk. It separates the thoracic cavity from the abdominal cavity. It is the floor of the former and the roof of the latter, its general shape is somewhat like that of an umbrella or an irregular dome. The upper surface of it is covered with the right and left pleura, between the two pleurae it is covered with the pericardium. Its circumference is elliptical in form, highest at the ensiform cartilage. The highest part of all the diaphragm is on the right side immediately above the liver. This is a little higher than the left side, the lowest part of it is the right crus which reaches to the fourth lumbar vertebra. The under surface is covered with peritoneum. It is one of the so-called double bellied muscles. It has its origin in front from the ensiform cartilage, from the sides. from the under surfaces of the cartilages and bony portion of the six or seven lower ribs interdigitating with the transversalis muscle, also from the two aponeurotic arches called the ligamentum arcuatum externum et internum. The ~~first~~ ^{first} one is the covering of the Psoas magnus, the other is the covering of the Quadratus lumborum. Behind it connected to the spine by two crura or legs, the right one is the longer extending from the anterior surface of the bodies and inter-vertebral substance of the three or four upper lumbar vertebrae; the left one from the anterior surface of the two upper ones. From this origin it passes to the central or cordiform tendon which consists of three leaflets, the right one is the largest, the left one the smallest and the middle is intermediate in size. On each side of the ensiform attachment there is a weak place which may be broken; then we may have what is called a phrenic or diaphragmatic hernia. Some of the contents of the abdomen may protrude into the chest, or pus in the mediastinum may descend through it into the abdominal cavity. The diaphragm has three large and several small natural foramina. The one most posterior is really not in the diaphragm but between the two crura which are joined posteriorly by a tendinous band. This is called the aortic opening, and transmits the aorta, vena azygos major, the thoracic duct and sometimes the left sympathetic nerve, when this nerve does not pass through this opening it goes through the left crus. The vena azygos major occasionally goes through the right crus. The second large opening is in front and little to the left of the aortic opening, it transmits the œsophagus and the pneumogastric nerves. The left pneumogastric passes in front of the œsophagus. The right one which passes behind it goes into the solar plexus which is situated behind the stomach. The third large opening is farther in front than the others

and lies in the central tendon. It is somewhat quadrilateral in form and is called the foramen quadratum, the inferior vena cava passes through it.

The smaller openings are through the crura. Those in the right crus transmit the greater and lesser splanchnics and the sympathetic nerves of the right side, occasionally the vena azygos major. The left crus transmits the vena azygos minor, the greater or lesser splanchnic nerves of the left side and the sympathetic nerve of the left side when it does not pass through the aortic opening. The blood supply of the diaphragm is derived from the two phrenic, the internal mammary and the lower intercostal arteries. The phrenic arteries are two small arteries which may arise separately from the aorta above the coeliac axis or by a common trunk which may come either from the aorta or coeliac axis. Often one is derived from the aorta and the other from the renal arteries. They very rarely arise as two separate vessels from the aorta. The nerve supply is the phrenic which comes from the 3rd, 4th and 5th cervical nerves. The phrenic plexus also helps to supply it. This plexus is made by the phrenic nerve and branches from the semilunar ganglion of the solar plexus. The laity call the diaphragm the midriff which comes from two Saxon words which mean the middle of the belly. Not long since I was reading a piece where a pugilist was telling how he intended to dispose of his opponent. He said: "I will him in the midriff, that will get his wind." The solar plexus or abdominal brain and the phrenic plexus are situated near the diaphragm. The former behind the stomach and the latter formed by branches from it. These plexus or plexuses belong to the great sympathetic system, which governs the involuntary actions. A severe blow upon the head may knock a man senseless but he still lives. His heart and lungs still act, being governed by the sympathetic system, but if he receives a severe blow upon the diaphragm it may produce instant death. The pugilist has learned this much about anatomy and if he were not trained to the hour more would be killed than are by this so-called solar plexus blow. The diaphragm is the chief muscle of respiration. The lower ribs may fall down thus drawing the diaphragm out of its natural position, in this way somewhat obstructing the passing of the blood through the aorta. I have known of one case in which the diaphragm was pulled down by the lower ribs causing an irregular action of the heart. As soon as they were replaced the heart acted in a natural manner. Tight lacing or any cause whatsoever which will impair the natural action of the diaphragm will cause much pain. Man is the only animal in which the transverse diameter of the diaphragm is greater than the antero-posterior. It begins to be developed about the ninth week of foetal life and grows from the circumference to the central tendon. All mammals or

milk-giving animals have a diaphragm. Man and the horse are examples of land animals, the whale and the sea cow are examples of water animals which have diaphragms. Birds possess a rudimentary form, which is best shown in the abteryx.

15 How many large openings are in it?

Three.

16 What passes through the aortic opening?

Aorta, vena azygos major, the thoracic duct and sometimes the left sympathetic nerve, when this nerve does not pass through this opening it goes through left crus. Vena azygos major occasionally goes through right crus.

17 What passes through the œsophageal opening?

Æsophagus and the pneumogastric nerves. The left pneumogastric passes in front of the stomach.

The right one which passes behind it goes into the solar plexus which is situated behind the stomach.

18 What passes through the other large opening in diaphragm?

The inferior vena cava.

19 What passes through the right crus?

The greater and lesser splanchnics and the sympathetic nerves of the right side, occasionally the vena azygos major.

20 What passes through the left crus?

Vena azygos minor, greater and lesser splanchnic nerves of left side, and the sympathetic nerve of left side when it does not pass through the aortic opening.

21 Give nerve supply of diaphragm.

Phrenic nerve and phrenic plexus. *Intercostal nerves*

22 Give blood supply of same.

The blood supply of the diaphragm is derived from the two phrenic, the internal mammary and lower intercostal arteries.

23 What is the meaning of thorax?

Literally a breast plate.

24 How formed?

By 24 ribs, 12 thoracic vertebæ, and the sternum.

25 What muscles pass through the upper opening in the thorax?

Sterno-thyroid, sterno-thyroid and longus colli muscles of each side.

26 What arteries?

Innominate, left common carotid and left subclavian, internal mammary and superior intercostal arteries.

27 What nerves?

Pneumogastric, phrenic, cardiac and sympathetic nerves, the anterior branch of first dorsal nerve, and the recurrent laryngeal nerve of left side.

28 What veins?

Right and left innominate and the inferior thyroid veins.

29 What unclassified structures?

Remains of thymus gland, trachea, œsophagus, thoracic duct, apex of each lung.

30 The sternum is divisible into what parts?

Manubrium, gladiolus and ensiform or xiphoid appendix.

31 Name muscles attached to it.

Nine pairs and one single muscle: the Pectoralis major, Sterno-cleido-mastoid, Sterno-hyoid, Sterno-thyroid, Triangularis sterni, aponeuroses of the Obliquus externus, Obliquus internus, Transversalis, Rectus muscles and Diaphragm.

32 What bones enter into the formation of the anterior lacerated foramen?

The foramen lacerum anterius, or sphenoidal fissure, is formed above by the lesser wing of the sphenoid, below by the greater wing; internally by the body of the sphenoid, and sometimes completed externally by the orbital plate of the frontal bone.

33 What bones form the middle lacerated foramen?

Sphenoid and temporal.

34 What bones form the posterior lacerated foramen?

Occipital and temporal.

35 What are the other names for these foramina?

The anterior one is called the sphenoidal fissure, the middle one is called sphenotic, the posterior one is called the jugular.

36 What structures pass through the anterior lacerated?

Third, fourth, three divisions of the ophthalmic division of the fifth, and the sixth cranial nerves. Filaments of cavernous plexus, ophthalmic vein, orbital branch of the middle meningeal, and recurrent branch of the lachrymal artery to dura mater.

37 What structures pass through the middle lacerated?

Carotid artery, and plexus; vidian nerve and meningeal branch of the ascending pharyngeal artery.

38 What structures pass through the posterior lacerated?

This opening is divided into three compartments, through the anterior one passes the inferior petrosal through the middle one the ninth, tenth and eleventh cranial nerves, through the posterior one the lateral sinus and meningeal branches of the ascending pharyngeal and occipital arteries.

39 The temporal bone is divisible into how many portions?

Three.

40 Name each part.

Squamous, mastoid and petrous.

41 The zygoma has how many roots, what are they called?

It has three roots. They are called anterior middle and posterior. The anterior one terminates in a rounded eminence, the *eminentia articularis*. The middle (post-glenoid) forms the posterior boundary of the mandibular portion of the glenoid fossa, while the posterior root, which is strongly marked, runs from the upper border of the zygoma, in arched direction, upward and backward, forming the posterior part of the temporal ridge (supramastoid crest).

42 The petrous bone presents for inspection how many points on its anterior, posterior and inferior surfaces?

The petrous portion has six points on the anterior surface, three on its posterior and eleven on its inferior.

43 Name each point on anterior surface.

1 An eminence near the center, which indicates the situation of the superior semicircular canal.

2 On the outer side of this eminence a depression indicating the position of the tympanum; here the layer of bone which separates the tympanum from the cranial cavity is extremely thin, and is known as the *tegmen tympani*.

3 A shallow groove, sometimes double, leading outward and backward to an oblique opening, the *hiatus Fallopii*, for the passage of the petrosal branch of the Vidian nerve and the petrosal branch of the middle meningeal artery.

4 A small opening, occasionally seen external to the latter, for the passage of the smaller petrosal nerve.

5 Near the apex of the bone, the termination of the carotid canal, the wall of which in this situation is deficient in front.

6 Above this canal a shallow depression for the reception of the Gasserian ganglion.

44 Name each point on posterior surface.

1 About its center, a large orifice, the *meatus auditorius internus*, whose size varies considerably; its margins are smooth and rounded, and it leads into a short canal, about four lines in length, which runs directly outward and is closed by a vertical plate, the *lamina cribrosa*, which is divided by a horizontal crest, the *crista falciformis*, into two unequal portions; the lower presenting three foramina or sets of foramina; one, just below the posterior part of the crest, consisting of a number of small open-

ings for the nerves to the sacculæ; a second, below and posterior to this for the nerve to the posterior semicircular canal; and a third, in front and below the first, consisting of a number of small openings which terminate in the *canalis centralis cochleæ* and transmits the nerve to the cochlea; the upper portion, that above the crista, presents behind a series of small openings for the passage of filaments to the vestibule and superior and external semicircular canal, and, in front, one large opening, the commencement of the *aquaeductus Fallopii*, for the passage of the facial nerve.

2 Behind the *meatus auditorius*, a small slit, almost hidden by a thin plate of bone, leading to a canal, the *aquaeductus vestibuli*, which transmits a small artery and vein and lodges a process of the *dura mater*.

3 In the interval between these two openings, but above them, an angular depression which lodges a process of the *dura mater*. and transmits a small vein into the cancellous tissue of the bone.

45 Name each point on inferior surface.

Passing from the apex to the base, this surface presents eleven points for examination:

1 A rough surface, quadrilateral in form, which serves partly for the attachment of the *Levator palati* and *Tensor tympani* muscles.

2 The large, circular aperture of the carotid canal, which ascends at first vertically, and then, making a bend, runs horizontally forward and inward; it transmits the internal carotid artery and the carotid plexus.

3 The *aquaeductus cochleæ*, a small, triangular opening, lying on the inner side of the latter, close to the posterior border of the petrous portion; it transmits a vein from the cochlea which joins the internal jugular.

4 Behind these openings a deep depression, the jugular fossa, which varies in depth and size in different skulls; it lodges the lateral sinus, and, with a similar depression on the margin of the jugular process of the occipital bone, forms the *foramen lacerum posterius* or jugular foramen.

5 A small foramen for the passage of Jacobson's nerve (the tympanic branch of the *glosso-pharyngeal*); this foramen is seen in front of the bony ridge dividing the carotid canal from the jugular fossa.

6 A small foramen on the outer wall of the jugular fossa, for the entrance of the auricular branch of the *pneumogastric* (Arnold's) nerve.

7 Behind the jugular fossa a smooth, square-shaped facet, the jugular surface; it is covered with cartilage in the recent state, and articulates with the jugular process of the occipital bone.

8 The vaginal process, a very broad sheath-like plate of bone, which extends backward from the carotid canal and gives attachment to part of the *Tensor palati* muscle; this plate divides behind into two laminae, the

outer of which is continuous with the auditory process, the inner with the jugular process; between these laminae is the 9th point for examination, the styloid process, a long, sharp spine, about an inch in length; it is directed downward, forward, and inward, varies in size and shape, and sometimes consists of several pieces, united by cartilage; it affords attachment to three muscles, the Stylo-pharyngeus, Stylo-hyoideus, and Stylo-glossus, and two ligaments, the stylo-hyoid and stylo-maxillary.

10 The stylo-mastoid foramen, a rather large orifice, placed between the styloid and mastoid processes: it is the termination of the aquæductus Fallopii, and transmits the facial nerve and stylo-mastoid artery.

11 The auricular fissure, situated between the auditory and mastoid processes, for the exit of the auricular branch of the pneumogastric nerve.

46 What forms the external ear?

First it consists of that portion commonly called "the ear," but which is in fact only the portal of that organ, and secondly of the external auditory meatus.

47 What forms the middle ear?

The middle ear or tympanum consists of an irregular shaped chamber about one-fourth of an inch from side to side and half an inch long. It contains air. It has three bones: Malleus, incus and stapes.

48 What forms the internal ear?

The internal ear or labyrinth. This portion is hollowed out in dense bone, and consists of three parts: the vestibule or ante-chamber, which is connected with the other two; cochlea or snail's shell, and the three semi-circular canals. The manner in which the nerve of hearing is distributed is remarkable, and is peculiar to this nerve. In the vestibule and the canals its fibres are spread out over the inner surface, not of the bony cavity, but of a membranous bag, which conforms to and partially fills the cavity, and which floats in it, being both filled and surrounded with a clear, limpid fluid.

49 What is sound?

Sound is that form of motion which is capable of affecting the auditory nerve.

50 How is this effect produced?

The sound waves which traverse the external ear strike the tympanic membrane, this is set in vibration which in turn set the malleus, incus and stapes in motion, this set the limpid fluid which is in the labyrinth in motion, thus the nerve-fibres are excited, and an impression is conducted to the brain, and we say sound is heard.

51 What fluids are in the ear?

Endolymph and perilymph.

52 Describe the ear stones.

Within the membranous bag of the labyrinth there are two small stones, and a quantity of fine powder of a calcareous nature, which is called "ear sand." When examined under the microscope these sandy particles are seen to lie scattered upon and among the delicate filaments of the auditory nerve, and it is probable that, as the sound-wave traverses the fluid of the vestibule, the sand rises and falls upon the nerve filaments, and thus intensifies the sonorous impression.

53 Eustachian tube is for what purpose? How long is it? Who was Eustachius?

For letting air to the middle ear to equalize the pressure upon the membrane. An inch and a half long. Eustachius was an Italian anatomist. He died in 1574. He was physician to the pope.

54 Name the cranial nerves.

First olfactory, second ^{optic} auditory, third motor oculi, fourth pathetic or Trochlear, fifth Trifacial or Trigeminus, sixth Abducent, seventh Facial (Portio dura), eighth Auditory (Portio mollis), ninth Glosso-pharyngeal, tenth Pneumogastric (Par vagum), eleventh Spinal accessory, twelfth Hypoglossal.

55 How does the 1st cranial nerve get out of the cranium?

Through the cribriform plate of the ethmoid.

56 How does the 2nd cranial nerve get out of the cranium?

Through the optic foramen.

57 How do the 3rd 4th, 6th and part of 5th?

Through the Sphenoidal fissure.

58 How does the 2nd division of the 5th?

Foramen rotundum.

59 How does the 3rd division of the 5th?

Foramen ovale

60 How does the 7th and 8th nerve get out of cranial cavity?

Internal auditory meatus.

61 How do the 9th, 10th and 11th nerve get out of cranium?

Through the middle compartment of jugular foramen.

62 How does the 12th nerve get out of the cranium?

Through anterior condyloid foramen.

63 Give difference between the American and English division

The American division gives twelve nerves, while the English gives nine, calling the 7th, 8th the 7th, and 9th, 10th and 11th the 8th, and the 12th the 9th.

64 Which are the nerves of special sense?

First, or olfactory; 2nd, or optic; and 8th, or auditory.

65 Which are purely motor?

Third, or motor oculi; and 4th or pathetic; 6th or abducent; and 7th or facial; and 12th or hypoglossal.

66 Which are mixed?

- { 5th, or trifacial.
 { 9th, or glosso-pharyngeal.
 { 10th, or pneumogastric.
 { 11th, or spinal accessory.

TABLE OF CRANIAL NERVES.

Classification of So-emmering.	Other Names.	Distribution.	Function.
First	Olfactory	Upper third of nasal cavity.	Spec'l Sense smell
Second	Optic	Retina	Spec'l Sense sight
Third	Oculomotor	{ Muscles of eyeball except External rectus and Superior oblique.	Motor
Fourth	Trochlear	Superior oblique of eyeball.	Motor
Fifth	Trifacial	{ Sensory part to face, fore part of scalp, external ear, eye, teeth, gum, cheek, fore part of tongue. { Motor part to muscles of mastication.	Ordinary Sense & Motor
Sixth	Abducent	External muscle of eyeball.	Motor
Seventh	Facial	{ Superficial muscles of face, Frontalis, Platysma, Stylo-hyoid, and posterior belly of Digastric.	Motor
Eighth	Auditory	Membranous labyrinth of ear.	Special sense (Hearing) & Equilibrium.
Ninth	Glosso-pharyngeal	{ Pharynx and hind part of tongue, some motor fibres.	Special sense (taste). Ord'y sense, Motor
Tenth	Pneumo-gastric or Vagus	{ Sensory to external ear, motor and sensory to pharynx, larynx, trachea, lungs, œsophagus, stomach, heart, sometimes to liver.	Ordinary sense & Motor
Eleventh	Spinal Accessory	{ Motor to Trapezius and Sternomastoid muscles. Rest is accessory to the pneumo-gastric.	Motor & Ordinary sense
Twelfth	Hypoglossal	Muscles of tongue.	Motor

67 The internal meatus extends how far? Is intercepted by what?
About one-third of an inch. By the lamina cribrosa.

68 What divides the Cribrosa?

A horizontal crest, the crista falciformis.

69 How many openings above? How many below?

Two sets of foramina above the crest, and three sets below it.

70 The Mastoid cells are filled with what?

Air and marrow.

71 What passes through above the crista falciformis?

Through one opening filaments to the vestibule and superior and external semicircular canals, in front of this opening is the commencement of the aquaeductus Fallopii, for the passage of the facial nerve.

72 What passes through below the crista falciformis?

The opening just below the posterior part of the crest is for the nerve to the saccule, the second one below and external to this is for the nerve to the posterior semicircular canal; the third opening in front and below this for the nerve to the cochlea

73 What structures pass between the external and internal carotid arteries?

Stylo-glossus, stylo-pharyngeus muscles, and the glosso-pharyngeal nerve, and pharyngeal branch of pneumogastric.

74 Where are the superficial and deep cardiac plexuses situated?

The cardiac plexus is situated at the base of the heart, and is divided into a superficial part, which lies in the concavity of the arch of the aorta, and a deep part which lies between the trachea and aorta.

75 How are they formed?

The deep cardiac plexus is formed by the cardiac nerves derived from the cervical ganglia of the sympathetic and the cardiac branches of the recurrent laryngeal and pneumogastric. The only cardiac nerves which do not enter into the formation of this plexus are the left superior cardiac nerve and the left inferior cervical cardiac branch from pneumogastric. The superficial cardiac plexus is formed by those cardiac branches which do not go into the deep plexus, together with filaments from the deep plexus. Occasionally the right inferior cervical cardiac branches of pneumogastric go into this plexus.

76 Where is the solar plexus situated and what are its other names?

Solar or epigastric plexus, or abdominal brain. It is situated behind the stomach and in front of the aorta and crura of the diaphragm.

77 How is the solar plexus formed?

This plexus, and the ganglia connected with it, receive the great splanchnic

nic nerve of both sides, and some filaments from the right pneumogastric. The semi-lunar ganglia of the solar plexus, two in number, one on each side, are the largest ganglia in the body.

78 What plexuses are formed from the solar?

From the solar plexus are derived the following:

Phrenic or Diaphragmatic plexus.

Suprarenal plexus.

Spermatic plexus.

Cœliac plexus. { Gastric.
Splenic.
Hepatic.

Superior mesenteric plexus.

Aortic plexus.

79 What nerves enter the cranium before passing out of it?

Nasal, which is a branch of the ophthalmic division of the 5th nerve; spinal accessory or 11th cranial nerve.

80 Where is the foramen cæcum?

Is an aperture formed between the frontal bone and the crista galli of the ethmoid, which, if pervious, transmits a small vein from the nose to the superior longitudinal sinus.

81 Name the coats of the spinal cord.

{ Dura mater.
Arachnoid.
Pia mater.

82 Name the sinuses in cranium.

The sinuses of the dura mater are venous channels analogous to veins, their outer coat being formed by the dura mater; their inner, by a continuation of the lining membrane of the veins. They are fifteen in number and are divided into two sets: 1st, those at the upper and back part of the skull; 2nd. those at the base of the skull.

The former are:

{ Superior Longitudinal.
Inferior Longitudinal;
Straight sinus.
Lateral sinuses.
Occipital sinus.

The sinuses at base of the skull are:

Cavernous, Circular, Superior Petrosal, Inferior Petrosal, and Transverse.

83 Where is the falx cerebri?

The falx cerebri is a fold of the dura mater between the superior and inferior longitudinal sinuses. It is situated in the longitudinal fissure of the brain.

84 Where is the falx cerebelli?

Falx cerebelli extends from the tentorium to foramen magnum, and is between the lateral lobes of the cerebellum.

85 Where is the tentorium?

The tentorium cerebelli is a process of the dura mater supporting the posterior lobes of the brain and covering the upper surface of the cerebellum. It encloses the lateral and superior petrosal sinuses.

86 How long, about, is the spinal cord?

About 17 inches.

87 About how long is the thoracic duct?

About 15 inches.

88 From how much of the body does it collect lymph?

From all the body except the right half of the head, the right half of the thorax, with its contents, the upper surface of the liver and the right arm.

89 Where does it empty?

It empties into the left subclavian vein.

90 How long is the right thoracic duct. Where does it empty?

About half an inch in length. It empties into the right subclavian vein.

91 What and where is the torcular Herophili?

The torcular Herophili is the dilated extremity of the superior longitudinal sinus. It is of irregular form, and is lodged on one side (generally the right) of the internal occipital protuberance. From it the lateral sinus of side to which it is deflected is derived. It receives also the blood from the occipital sinus.

92 How many and what muscles are attached to the atlas?

To the atlas are attached nine pairs: the Longus colli, Rectus capitis anticus minor, Rectus lateralis, Obliquus capitis superior and inferior, Splenius colli, Levator anguli scapulæ, First intertransverse, and Rectus capitis posticus minor.

93 Same of axis.

To the axis are attached eleven pairs: the Longus colli, Levator anguli scapulæ, Splenius colli, Scalenus medius, Transversalis colli, Intertransversales, Obliquus capitis inferior, Rectus capitis posticus major, Semispinalis colli, Multifidus spinæ, Interspinales.

94 Give blood supply, ossification, articulation, and attachment of muscles of the occipital.

Blood supply: Occipital, posterior auricular, middle meningeal, vertebral and ascending pharyngeal arteries.

Ossification: Varying from 4 to 11 centers.

Articulation: With six bones: two parietal, two temporal, sphenoid, and atlas.

Attachment of muscles: To twelve pairs: to the superior curved line are attached the Occipito-frontalis, Trapezius and Sterno-cleido-mastoid. To the space between the curved lines, the Complexus, Splenius capitis, and Obliquus capitis superior; to the inferior curved line and space between it and the foramen magnum, the Rectus capitis posterior, major and minor; to the transverse process, the Rectus capitis lateralis; and to the basilar process, the Rectus capitis anterior, major and minor, and Superior constrictor of pharynx.

95 Same of parietal.

Blood supply: Middle meningeal, occipital, and supraorbital arteries.

Ossification: One center.

Articulations: With five bones: opposite parietal, occipital, frontal, temporal, and sphenoid.

Attachment of muscles: Only one, the Temporal.

96 Same of frontal

Blood supply: Middle and small meningeal on cerebral surface. frontal and supraorbital on outer surface. The horizontal plate receives twigs from the ethmoidal and other branches of ophthalmic artery.

Ossification: From two centers, one for each lateral half.

Articulation: With twelve bones; two parietal, the sphenoid, the ethmoid, two nasal, two superior maxillary, two lachrymal, and two malar.

Attachment of Muscles: To three pairs: the Corrugator supercilii, Orbicularis palpebrarum and Temporal on each side.

97 Same of Temporal.

Blood Supply: Stylo-mastoid from posterior auricular; it enters the stylo-mastoid foramen.

Tympanic: From internal maxillary; it passes through Glasserion fissure.

Petrosal: From middle meningeal, transmitted by the hiatus Fallopii.

Tympanic: From internal carotid whilst in the carotid canal.

Auditory: From basilar, it enters internal auditory meatus, and is distributed to cochlea and vestibules.

Ossification: Ten centers.

Articulations: With five bones—occipital, parietal, sphenoid, inferior maxillary and malar

Attachment of Muscles: To fifteen.—To the squamous portion, the

Temporal; to the zygoma, the Masseter; to the mastoid portion, the Occipito-frontalis, Sterno mastoid, Splenius capitis, Trachelo-mastoid, Digastricus and Retrahens aurem; to the styloid process, the Stylo-pharyngeus, Stylo-hyoideus, and Stylo-glossus; and to the petrous portion, the Levator palati, Tensor tympani, Tensor palati and Stapedius.

98 Same of Sphenoid.

Blood Supply: Middle and small meningeal, anterior deep temporal and other branches of internal maxillary such as Vidian, pterygo-palatine and sphero-palatine. The body receives twigs from internal carotid.

Ossification: Fourteen centers.

Articulation: The sphenoid articulates with all the bones of the cranium, and five of the face—the two malar, two palate, and vomer.

Attachment of Muscles: To eleven pairs: the Temporal, External pterygoid, Internal pterygoid, Superior constrictor, Tensor palati, Levator palpebrae, Obliquus oculi superior, Superior rectus, Inferior rectus, External rectus, Internal rectus.

99 Same of Nasal.

Blood Supply: Nasal branch of ophthalmic, the frontal, the angular, and anterior ethmoidal arteries.

Ossification: One center.

Articulations: With four bones: two of the cranium, the frontal and ethmoid, and two of the face, the opposite nasal and the superior maxillary.

Attachment of Muscles: A few fibres of the Occipito-frontalis muscle.

100 Same of Superior Maxillary.

Blood Supply: Infra orbital, alveolar, descending palatine, ethmoidal, frontal, nasal and facial arteries.

Ossification: Seven centers.

Articulations: With nine bones: two of the cranium, the frontal and ethmoid, and seven of the face—viz., the nasal, malar, lachrymal, inferior turbinated, palate, vomer, and its fellow of the opposite side. Sometimes it articulates with the orbital plate of the sphenoid, and sometimes with its external pterygoid plate.

Attachment of Muscles: To twelve: the Orbicularis palpebrarum, Obliqui oculi inferior, Levator labii superioris alaeque nasi, Levator anguli oris, Compressor nasi, Depressor alae nasi, Dilator naris posterior, Masseter, Buccinator, Internal pterygoid, and Orbicularis oris, Levator labii superioris proprius.

101 Same of Lachrymal.

Blood Supply: Infraorbital, nasal branch of ophthalmic, anterior ethmoidal.

Ossification: One center.

Articulations: With four bones: two of the cranium, the frontal and ethmoid, and two of the face, the superior maxillary and the inferior turbinated.

Attachment of Muscles: To one muscle, the Tensor tarsi.

102 Same of Malar.

Blood Supply: Infra orbital, lachrymal branches of ophthalmic, transverse facial, and deep temporal arteries.

Ossification: Two or three centers.

Articulations: With four bones: three of the cranium, frontal, sphenoid and temporal; and one of the face, the superior maxillary.

Attachment of Muscles: To five: The Levator labii superioris proprius, Zygomaticus major and minor, Masseter and Temporal.

103 Same of Palate.

Blood Supply: Descending palatine, sphenopalatine, and pterygopalatine.

Ossification: One center.

Articulations: With six bones: the sphenoid, ethmoid, superior maxillary, inferior turbinated, vomer, and opposite palate.

Attachment of Muscles: To four: the Tensor palati, Azygos uvulae, Internal pterygoid and Superior constrictor of the pharynx.

104 Same of Inferior Turbinated.

Blood Supply.—

Ossification: One center

Articulation: With four bones: one of the cranium, the ethmoid, and three of the face, the superior maxillary, lachrymal, and palate.

Attachment of Muscles: None.

105 Same of Vomer.

Blood Supply: Anterior and posterior ethmoidal, naso-palatine through Stenson's canal.

Ossification: One center.

Articulations: With six bones: two of the cranium, the sphenoid and ethmoid; and four of the face, the two superior maxillary and the two palate bones; and with the cartilage of the septum.

Muscles: None.

106 Same as Inferior Maxillary.

Blood: Branches from internal maxillary.

Ossification: Six centers for each lateral half.

Articulation: With the glenoid fossae of the two temporal bones.

Attachment of Muscles: To fifteen pairs: to its external surface,

commencing at the symphysis, and proceeding backward: Levator menti, Depressor labii inferioris, Depressor anguli oris, Platysma myoides, Buccinator, Masseter; a portion of the Orbicularis oris, (Accessorii orbicularis inferioris) is also attached to this surface. To this internal surface, commencing at the same point: Genio-hyoglossus, Genio-hyoideus, Mylo-hyoideus, Digastric, Superior constrictor, Temporal, Internal pterygoid, External pterygoid.

107 Same of Ethmoid.

Blood Supply: Anterior and posterior ethmoidal, and from nasal or sphero-palatine branch of internal maxillary artery.

Ossification: Three centers.

Articulation: With fifteen bones: the sphenoid, two sphenoidal turbinated, the frontal, and eleven of the face—the two nasal, two superior maxillary, two lachrymal, two palate, two inferior turbinated, and the vomer. No muscles are attached to this bone.

Muscles: None.

108 How many elements in the body?

Of the many elements discovered by the chemists, only sixteen have been found in the healthy human body. Very few exist in it uncombined. Some oxygen is dissolved in the blood; and that gas is also found, mixed with nitrogen in the lungs.

109 Name them.

Of the sixteen elements found in the body, seven are metallic and eight non-metallic, and H has an intermediary place in the list. It is a constituent of both acids and bases, and of the neutral substance, water.

ORDER. --	Negative or Non-metallic elements, Acid-forming with H (usually OH).	{ Carbon Nitrogen Oxygen Sulphur Phosphorus Chlorine Fluorine Silicon Hydrogen
ORDER. - -	Positive or Metallic elements, base-forming with OH.	{ Sodium Potassium Calcium Magnesium Iron Lithium Manganese

110 Name the double-bellied muscles.

Occipito-frontalis, Biventes cervicis, Digastric, Omo-hyoid, and the Diaphragm.

111 What does meatus mean?

A passage.

112 Describe those of the nose.

The superior meatus, the smallest of the three, is situated at the upper and back part of each nasal fossa, occupying the posterior third of the outer wall. It is situated between the superior and middle turbinated bones, and has opening into it two foramina, the sphenopalatine at the back of its outer wall, and the posterior ethmoidal cells at the front part of the outer wall. The opening of the sphenoidal sinus is at the upper and back part of the nasal fossa immediately behind the superior turbinated bone and into a groove, the sphenothmoidal recess. The middle meatus is situated between the middle and inferior turbinated bones, and occupies the posterior two-thirds of the outer wall of the nasal fossa. It has two apertures: in front that of the infundibulum, by which the meatus communicates with the anterior ethmoidal cells, and through these with the frontal sinuses; near the center is the orifice of the antrum, which varies somewhat as to its exact position in different skulls. The inferior meatus, the largest of the three, is the space between the inferior turbinated bone and the floor of the nasal fossa. It extends along the entire length of the outer wall of the nose, is broader in front than behind, and presents anteriorly the lower orifice of the canal for the nasal duct.

113 Name all the foramina in the base of the skull and tell what passes through them.

There are numerous foramina at the base of the skull extending from the foramen cæcum to the foramen magnum. There are three large fossae in the base of the skull called anterior fossa, middle fossa and posterior fossa. The foramina in the anterior fossa are foramen cæcum which transmits a vein to the superior longitudinal sinus and often one from the frontal sinus. This is a single foramen, while the others of this fossa are in pairs; (1) Ethmoidal fissure which transmits the nasal nerve and the anterior ethmoidal vessels; (2) Olfactory—olfactory nerves and nasal branches of the ethmoidal arteries; (3) Anterior ethmoidal—anterior ethmoidal vessels and nasal nerve; (4) Posterior ethmoidal—posterior ethmoidal vessels; (5) Optic foramea—optic nerve and ophthalmic artery.

The middle fossa is on a lower level than the anterior one. It has eight pairs of foramina. (1) Foramen lacerum anterius, or spheroidal fissure; 3rd, 4th, three divisions of the ophthalmic division of the 5th, and 6th cranial nerves; filaments of the cavernous sympathetic plexus; ophthal-

mic vein; recurrent branch from lachrymal artery, orbital branch of middle meningeal artery, and a process of dura mater; (2) foramen rotundum—superior maxillary division of fifth nerve; (3) foramen Vesali—a small vein; (4) Ovale—inferior maxillary division of fifth, small petrosal nerve, and the small meningeal artery, which is a branch of the internal axillary artery; (5) foramen spinosum—middle meningeal artery, meningeal veins, filaments from cavernous plexus; (6) foramen lacerum medium—vidian nerve, a branch from ascending pharyngeal artery, carotid artery and carotid plexus; (7) hiatus Fallopii, for the transmission of the petrosal branch of the Vidian nerve and the petrosal branch of the middle meningeal artery; (8) small foramen, for the passage of the lesser petrosal nerve.

Posterior fossa is on a deeper level than either of the other two. It contains the foramen magnum and six pairs of foramina. (1) Meatus auditorius internus, facial and auditory nerves and the auditory artery; (2) aqueductus vestibuli—small artery and vein, process of dura mater; (3) foramen lacerum posterius, or jugular foramen. In this foramen there are three compartments, through the anterior one passes the inferior petrosal sinus, through the posterior the lateral sinus and some meningeal branches from occipital and ascending pharyngeal arteries; through the middle one the glosso-pharyngeal, pneumogastric and spinal accessory nerves; (4) mastoid foramen (often absent) small vein, and occasionally the mastoid artery; (5) anterior condyloid—hypoglossal nerve, meningeal branch of ascending pharyngeal artery; (6) posterior condyloid (often absent) posterior condyloid vein; (7) foramen magnum—medulla oblongata and its membranes; spinal accessory nerves; vertebral arteries; anterior and posterior spinal arteries, and the occipito-axial ligaments.

114 Give course of facial nerve.

The facial nerve passes in the internal auditory meatus for about one-fourth of an inch, then passes through the lamina cribrosa above the crista falciformis, then through the aqueductus Fallopii, which opens into the stylo-mastoid foramen. From here its branches are distributed to the muscles of the face.

115 The processus cochleariformis is between what structures?

The Eustachian tube and the canal for the Tensor tympani muscle.

116 What is in the Glasserian fissure?

In the Glasserian fissure—Levator tympani muscle, tympanic artery and the processus gracilis of the malleus.

117 What is in the canal of Huguier?

Chorda tympani nerve, which is a branch of the facial.

118 Give the fractional parts of the ilium that have aponeurosis of muscles attached.

The External oblique forms Poupart's ligament and is attached to the anterior one-half of the outer lip of the crest of the ilium. Internal oblique is attached to one-half of the ligament and the anterior one-third of the middle lip of the crest of the ilium. The Transversalis is attached to one-third of the ligament and to the anterior three-fourths of the internal lip of the crest of the ilium.

119 Name the muscles the aponeurosis of which pass either behind or in front of the Rectus muscle.

The aponeurosis of the External oblique passes in front of the Rectus muscle. That of the Internal oblique passes in front of the lower one-fourth of the Rectus, and divides for the upper three-fourths. That of the Transversalis passes in front for the lower one-fourth, behind for the upper three-fourths.

120 Name and give nerve supply of the muscles attached to the clavicle.

1. Sterno-cleido-mastoid—Nerve { Spinal accessory and
2-3 cervical nerves.
2. Trapezius —Nerve { Spinal accessory and
3-4 cervical nerves.
3. Pectoralis major—Nerve, external and internal anterior thoracic.
4. Deltoid—Nerve, circumflex.
5. Subclavius—Nerve, 5-6 cervical.
6. Sterno-hyoid —Nerve { Loop between descendens, and
communicans hypoglossi.

Sometimes the Sterno-thyroid—Nerve, same as above.

121 Those attached to scapula.

To the scapula there are seventeen: Supraspinatus and Infraspinatus are supplied by the suprascapular nerve; the Deltoid by the circumflex; Trapezius by the spinal accessory and the 3-4 cervical nerves; Subscapularis by the 1st and 3rd subscapular nerves; Serratus magnus by the posterior thoracic nerve; Biceps by the musculo-cutaneous; Triceps by the musculo-spiral; Teres major by the 3rd subscapular; Teres minor by the circumflex; Levator anguli scapulae by the 3rd and 4th cervical; Rhomboideus major and minor by the nerves to the Rhomboidei, which comes from the 5th cervical; Latissimus dorsi by the middle or long subscapular; the Coraco-brachialis by the musculo-cutaneous; Pectoralis minor by the internal anterior thoracic; Omo-hyoid by the branches from the loop of communication between the descendens and communicans hypoglossi.

122 Those attached to the humerus, except those attached to internal and external condyles.

To the greater trochanter—Supraspinatus, Infraspinatus and Teres minor. The first two get the suprascapular nerve, the last one gets the circumflex. To the lesser trochanter the supscapularis, which gets the 1st and 3d supscapular nerves.

On the external bicipital ridge, the Pectoralis major, which gets the external and internal anterior thoracic nerves.

On the internal bicipital ridge, the Teres major, which gets the third subscapular nerve. In the bicipital groove is the Latissimus dorsi, which gets the middle or long subscapular nerve

On the posterior portion of the humerus is the Triceps which gets the musculo-spiral.

On the lower anterior surface is the Brachialis anticus, which gets the musculo-spiral and the musculo-cutaneous. On the outer side of the shaft about the middle is the Deltoid which gets the circumflex.

On the inner side about the middle is the Coraco brachialis which gets the musculo-cutaneous.

123 Those in superficial layer of anterior radio ulnar region.

See page 10 of this book.

124 Those in deep layer of same.

See page 10 of this book.

125 Those in radial region.

See page 10 of this book.

126 Those in superficial layer of posterior radio ulner region.

See page 11 of this book.

127 Those in deep layer of same.

See page 11 of this book.

128 Those of the thumb.

See page 11 of this book.

129 Those of little finger.

See page 11 of this book.

130 Those of middle palmar region.

See page 11 of this book.

231 Those supplied by anterior crural nerve.

See page 33 of this book.

132 Those supplied by great sciatic nerve.

See page 33 of this book.

133 Those supplied by obturator nerve.

See page 33 of this book.

134 Those in the superficial layer of posterior tibio-fibular region.

See page 35 of this book.

135 Deep layer of same.

See page 35 of this book

136 Those in anterior tibio fibular region.

See page 34 of this book.

137 Those in fibular or external region.

See page 34 of this book.

138 Describe the temporal fossa.

The temporal fossa is bounded above and behind by the temporal ridge, which extends from the external angular process of the frontal upward and backward across the frontal and parietal bones, curving downward behind to terminate in the posterior root of the zygomatic process. This ridge is generally double—at all events in front, where it is most marked. In front it is bounded by the frontal, malar, and great wing of the sphenoid: externally by the zygomatic arch, formed conjointly by the malar and temporal bones; below it is separated from the zygomatic fossa by the pterygoid ridge, seen on the outer surface of the great wing of the sphenoid. This fossa is formed by five bones, part of the frontal, great wing of the sphenoid, parietal, squamous portion of the temporal, and malar bones, and is traversed by six sutures, part of the transverse facial, spheno-malar, coronal, spheno-parietal, squamo-parietal and squamo-sphenoidal. The point where the coronal suture crosses the temporal ridge is sometimes named the stephanion; and the region where the four bones, the parietal, the frontal, the squamous, and the greater wing of the sphenoid, meet at the anterior inferior angle of the parietal bone, is named the pterion. This point is about on a level with the external angular process of the frontal bone and about one and a half inches behind it. This fossa is deeply concave in front, convex behind, traversed by grooves which lodge branches of the deep temporal arteries, and filled by the Temporal muscles.

139 Describe the Zygomatic fossa.

The Zygomatic fossa is an irregularly shaped cavity, situated below and on the inner side of the zygoma; bounded, in front, by the tuberosity of the superior maxillary bone and the ridge which descends from its malar process; behind, by the posterior border of the pterygoid process and the eminentia articularis; above, by the pterygoid ridge on the outer surface of the great wing of the sphenoid and the under part of the squamous portion of the temporal; below, by the alveolar border of the superior maxilla; internally by the external pterygoid plate; and externally, by the zygomatic arch and ramus of the lower jaw. It contains the lower part of the Temporal, the External and Internal pterygoid muscles, the internal maxillary artery, and inferior maxillary nerve and their branches. At its

upper and inner part may be observed two fissures, the speno-maxillary and pterygo-maxillary.

140 Describe the speno maxillary fossa.

The Sphenomaxillary fossa is a small, triangular space situated at the angle of junction of the speno-maxillary and pterygo-maxillary fissures, and placed beneath the apex of the orbit. It is formed above by the under surface of the body of the sphenoid and by the orbital process of the palate bone; in front, by the superior maxillary bone; behind, by the anterior surface of the base of the pterygoid process and lower part of the anterior surface of the great wing of the sphenoid; internally, by the vertical plate of the palate. This fossa has three fissures terminating in it—the sphenoidal, speno-maxillary and pterygo-maxillary; it communicates with three fossae, the orbital, nasal and zygomatic, and with the cavity of the cranium, and has opening into it five foramina. Of these, there are three on the posterior wall: the foramen rotundum above; below and internal to this, the Vidian; and still more inferiorly and internally, the pterygo-palatine. On the inner wall is the speno-palatine foramen, by which the speno-maxillary communicates with the nasal fossa; and below is the superior orifice of the posterior palatine canal, besides occasionally the orifices of the accessory posterior palatine canals. The fossa contains the superior maxillary nerve and Meckel's ganglion, and the termination of the internal maxillary artery.

141 Describe the speno maxillary fissure.

The Sphenomaxillary fissure, horizontal in direction, opens into the outer and back part of the orbit. It is formed above by the lower border of the orbital surface of the great wing of the sphenoid; below, by the external border of the orbital surface of the superior maxilla and small part of the palate bone; externally, by a small part of the malar bone: internally, it joins at right angles with the pterygo-maxillary fissure. The fissure opens a communication from the orbit into three fossae—the temporal, zygomatic, and speno-maxillary; it transmits the superior maxillary nerve and its orbital branch, the infraorbital vessels, and ascending branches from the speno-palatine or Meckel's ganglion.

142 Describe the Pterygo-maxillary fissure.

The Pterygo-maxillary fissure is vertical, and descends at right angles from the inner extremity of the preceding; it is a V-shaped interval, formed by the divergence of the superior maxillary bone from the pterygoid process of the sphenoid. It serves to connect the speno-maxillary fossa with the zygomatic fossa, and transmits branches of the internal maxillary artery. It forms the entrance from the zygomatic fossa to the speno-maxillary fossa.

143 Describe the Orbits.

The Orbits are two quadrilateral pyramidal cavities, situated at the upper and anterior part of the face, their bases being directed forward and outward, and their apices backward and inward, so that the axes of the two, if continued backward, would meet over the body of the sphenoid bone. Each orbit is formed of seven bones, the frontal, sphenoid, ethmoid, superior maxillary, malar, lachrymal and palate; but three of these, the frontal, ethmoid and sphenoid, enter into the formation of both orbits, so that the two cavities are formed of eleven bones only. Each cavity presents for examination a roof, a floor, an inner and an outer wall, four angles, a circumference or base and an apex. The roof is concave, directed downward and forward, and formed in front by the orbital plate of the frontal; behind by the lesser wing of the sphenoid. This surface presents internally the depression for the cartilaginous pulley of the Superior oblique muscle; externally, the depression for the lachrymal gland; and posteriorly, the suture connecting the frontal and lesser wing of the sphenoid.

144 Describe the nasal fossa.

The nasal fossæ are two large, irregular cavities situated on either side of the middle line of the face, extending from the base of the cranium to the roof of the mouth, and separated from each other by a thin vertical septum. They communicate by two large apertures, the anterior nares, with the front of the face, and by the two posterior nares with the pharynx behind. These fossæ are much narrower above than below, and in the middle than at the anterior or posterior openings; their depth, which is considerable, is much greater in the middle than at either extremity. Each nasal fossa communicates with four sinuses, the frontal above, the sphenoidal behind, and the maxillary and ethmoidal on the outer wall. Each fossa also communicates with four cavities: with the orbit by the lacrymal groove, with the mouth by the anterior palatine canal, with the cranium by the olfactory foramina, and with the sphenomaxillary fossa by the sphenopalatine foramen; and they occasionally communicate with each other by an aperture in the septum. The bones entering into their formation are fourteen in number: three of the cranium, the frontal, sphenoid and ethmoid, and all the bones of the face, excepting the malar and lower jaw. Each cavity is bounded by a roof, a floor, an inner and an outer wall.

The ethmoid bone with all the bones it articulates with make the nasal fossæ. The frontal, sphenoid and ethmoid are common to the nasal fossæ and the orbits.

145 Describe the Hyoid bone.

The hyoid (like Greek letter *upsilon*''') or lingual bone is a small

V-shaped bone which may be felt at the base of the tongue, between the chin and the thyroid cartilage. It has a body and two pairs of cornua. The oblong body has a smooth, concave posterior surface, looking backward and downward toward the epiglottis. Its convex anterior surface, looking upward and forward, is divided by a transverse and sometimes a median vertical ridge into depressions for muscular attachment. The superior border attaches the thyro-hyoid membrane. The great cornua taper backward and upward from the sides of the body, ending in rounded tubercles to which the thyro-hyoid ligaments are attached.

The cornua are flattened above and afford attachment to muscles. The small cornua are small conical pieces of bone, often partly and sometimes wholly, cartilaginous which project upward and backward from the junction of the great cornua and the body. Their extremities attach the stylo-hyoid ligaments, which suspend the hyoid bone from the styloid processes of the temporal bones. There is a center of ossification for each cornu and for each lateral half of body.

Attachment of Muscles: Sterno-hyoid, Thyro-hyoid, Omo-hyoid, aponeurosis of the Digastric, Stylo-hyoid, Mylo-hyoid, Genio-hyoid, Genio-hyo-glossus, Chondro-glossus, Hyo-glossus, Middle constrictor of the pharynx, and occasionally a few fibres of the Lingualis. It also gives attachment to the thyro-hyoidean membrane and the stylo-hyoid, thyro-hyoid and hyo-epiglottic ligaments.

146 Describe the vidian canal.

The vidian canal is one of the ten openings which open external to base of skull. It is for the passage of the vidian nerve and vessels. It is in the pterygoid process of the sphenoid. The vidian nerve is formed by the great superficial petrosal from the facial and the great deep petrosal from the carotid plexus.

147 Describe the Otic ganglion.

The Otic (ear) ganglion is a small, reddish gray, oval body, compressed from side, and about one-sixth of an inch in its longest diameter. It is closely attached to, or may surround, the nerve to the internal pterygoid muscle, lying on the inner side of the mandibular trunk close to the foramen ovale. Behind it is the middle meningeal artery, and on its inner side are the Eustachian tube and Tensor palati muscle. Its motor and sensory roots reach it through the nerve to the internal pterygoid muscle; but it is also connected with the facial and glosso-pharyngeal nerve through the small superficial petrosal nerve. From the plexus round the middle meningeal artery it receives its sympathetic root. It distributes branches to join the auriculo-temporal, by which route the parotid gland is supplied from

the glosso-pharyngeal nerve, also muscular twigs to the Tensor palati and Tensor tympani, and a communicating filament to the Chorda tympani nerve. Of the muscular fibres most may be traced to the trunk of the mandibular division of the fifth nerve, without interruption in the ganglion cells.

148 Describe Meckel's ganglion.

The sphenopalatine ganglion (Meckel's), the largest of the cranial ganglia, is deeply placed in the sphenomaxillary fossa, close to the sphenopalatine foramen. It is triangular or heart-shaped, of a reddish-gray color, and is situated just below the superior maxillary nerve as it crosses the fossa.

Like the other ganglia of the fifth nerve, it possesses a motor, a sensory, and a sympathetic root. Its sensory root is derived from the superior maxillary nerve, through its two sphenopalatine branches. These branches of the nerve, given off in the sphenomaxillary fossa, descend to the ganglion. Their fibres, for the most part, pass in front of the ganglion, as they proceed to their destination, in the palate and nasal fossa, and are not incorporated in the ganglionic mass; some few of the fibres, however, enter the ganglion, constituting its sensory root. Its motor root is derived from the facial nerve through the large superficial petrosal nerve, and its sympathetic root from the carotid plexus, through the large deep petrosal nerve. These two nerves join together to form a single nerve, the Vidian, before their entrance into the ganglion.

149 Describe the ligaments of Zinn.

The ligament of Zinn is attached around the circumference of the optic foramen, except its upper and outer part.

150 Name and give nerve supply of the muscles in the cranial region.

Cranial region: Occipito-frontalis—facial nerve.

151 Auricular region.

Attollens aurem	} Facial nerve.
Attrahens aurem	
Retrahens aurem	

152 In palpebral region.

Orbicularis palpebrarum	} Facial nerve.
Corrugator supercilii	
Tensor tarsi	

153 In orbital region.

The Levator palpebræ, Rectus superior, Rectus inferior, Rectus internus, and Obliquus inferior are supplied by the 3rd nerve; the Rectus externus, by the 6th; Obliquus superior, by 4th.

154 In nasal region.

Pyramidalis nasi	}	Facial nerve.
Levator labii superioris alæque nasi		
Dilatator naris posterior		
Dilatator naris anterior		
Compressor nasi		
Compressor narium minor		
Depressor alae nasi		

155 In superior maxillary region

Levator labii superioris	}	Facial nerve.
Levator anguli oris		
Zygomaticus major		
Zygomaticus minor		

156 In inferior maxillary.

Levator labii inferioris	}	Facial nerve.
Depressor labii superioris		
Depressor anguli oris		

157 In intermaxillary region.

Buccinator, by facial and by buccal branch of inferior maxillary.
 Risorius, by facial.
 Orbicularis oris, by facial.

158 In temporo-maxillary region.

Masseter	}	Inferior maxillary nerve.
Temporal		

159 In pterygo-maxillary region.

Pterygoideus externus	}	Inferior maxillary nerve.
Pterygoideus internus		

160 Muscles of neck.

(a) Superficial region :

Platysma myoides, facial and superficial branch of cervical plexus.
 Sterno-cleido-mastoid, spinal accessory and deep branch of cervical plexus.

(b) Infra-hyoid region :

Depressors of the os hyoides and larynx.

Sterno-hyoid	}	These by the loop of communication between the descendens and communicans hypoglossi.
Sterno-thyroid		

Thyro-hyoid, by the hypoglossal.

Omo-hyoid	}	By the loop of communication between the descendens and communicans hypoglossi.

(c) Supra-hyoid region :

Elevators of the os hyoides and larynx.

Digastric	}	anterior belly, by mylo-hyoid branch of inferior dental. posterior belly, by the facial.

Stylo-hyoid, by the facial.

Mylo-hyoid, by mylo-hyoid branch of the inferior dental.

Genio-hyoid, by the hypo-glossal.

(d) Lingual region :

Muscles of the tongue.

Genio-hyo-glossus	} Hypoglossal
Stylo-glossus	
Hyo-glossus	
(Chondro-glossus)	
Lingualis	

Palato-glossus, probably innervated by spinal accessory nerve, through the pharyngeal plexus.

Inferior lingualis, according to some authors, by the chorda tympani.

(e) Muscles of the pharynx :

Constrictor inferior	} Branches from pharyngeal plexus.
Constrictor medius	
Constrictor superior	

Palato-pharyngeus, internal branch of spinal accessory.

Stylo-pharyngeus, by glosso-pharyngeal nerve.

Constrictor inferior is also supplied by an additional branch from the external laryngeal nerve and by the recurrent laryngeal.

(f) Muscles of the soft palate :

Tensor palati, by a branch from the otic ganglion.

Levator palati	} Internal branch of spinal accessory.
Azygos uvulae	
Palato-glossus	
Palato-pharyngeus	
Salpingo-pharyngeus	

(g) Muscles of the anterior vertebral region :

Rectus capitis anticus major	} First cervical nerve, and from loop formed be- tween it and the second.
Rectus capitis anticus minor	
Rectus lateralis	

Longus colli, by branches from the anterior divisions of the lower cervical nerves (5th, 6th, 7th, and 8th) before they form the brachial plexus.

(h) Muscles of the lateral vertebral region.

Scalenus anticus	} Same as Longus colli.*
Scalenus medius	
Scalenus posticus	

Scalenus medius also receives a filament from the deep external branches of the cervical plexus

(i) Muscles of the larynx.

Included in the description of the larynx.

161 Superficial muscles of abdomen.

Obliquus externus	}	Lower intercostal nerve.
Obliquus internus		
Transversalis		
Rectus		
Pyramidalis (Cremaster)		

Internal oblique also gets fibres from the ilio-inguinal nerve.

162 Deep muscles of abdomen.

Psoas parvus	}	*The Iliacus by anterior crural nerve.
Psoas magnus		
*Iliacus		Anterior branches of lumbar nerves.
Quadratus lumborum		

163 What is the longest anastomosis in the body?

That between the subclavian and the external iliac by the anastomosis of the superior epigastric, which is a branch of internal mammary, with the deep epigastric, which is a branch of the external iliac.

164 What is the circle of Willis?

An anastomosis at the base of the brain, between the branches of the internal carotid and vertebral arteries to equalize the cerebral circulation. The two vertebral arteries join to form the basilar which ends in the two posterior cerebral. These are connected with the internal carotid by the two posterior communicating.

The circle is completed by the connection of the two anterior cerebral branches of the internal carotid through the short anterior communicating artery.

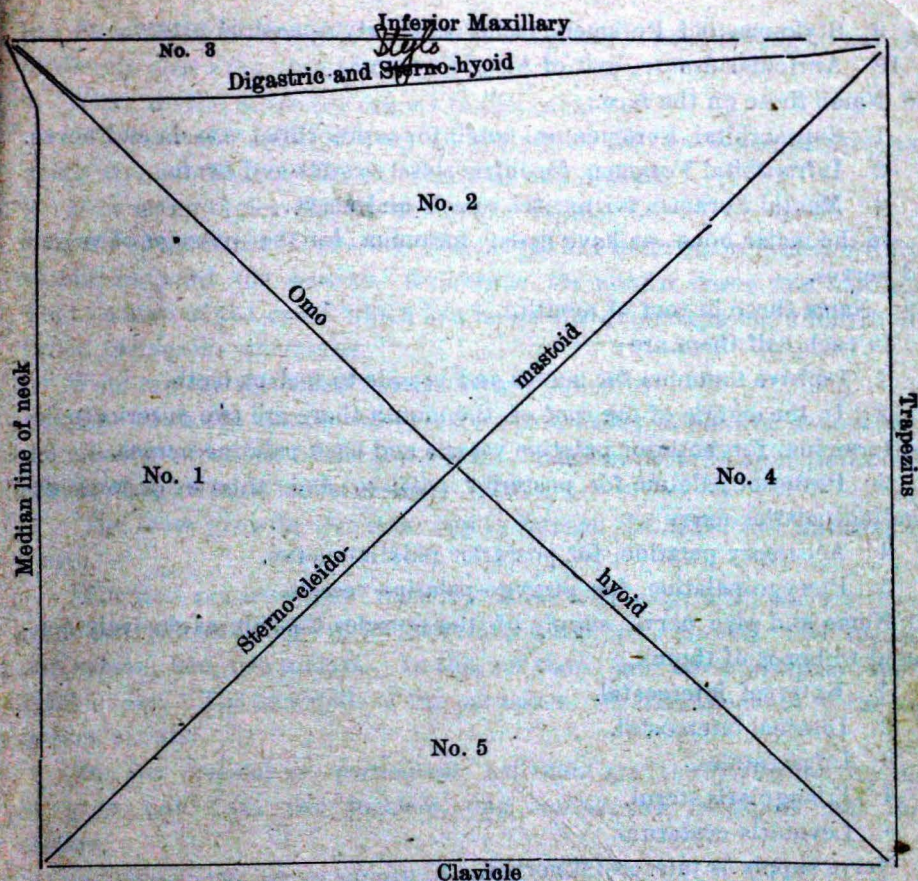
165 What important relations have the 3d and 5th cervical and 2nd lumbar vertebra?

The 3d cervical corresponds to—the bifurcation of the common carotid artery, and the superior cervical ganglion.

The 5th cervical, to—the junctions of the larynx with the trachea, and the pharynx with the œsophagus, and the middle cervical ganglion of the sympathetic.

The 2d Lumbar, to—the junction of the duodenum with the jejunum, the commencement of the thoracic duct and the portal vein, the origin of the superior mesenteric artery, the lower margin of the pancreas, the opening of the ductus communis choledochus, the lower end of the spinal cord, and the crura of the diaphragm.

166 { Draw the rectangle of the neck.
Divide it into its triangles and name them.



No. 1 Is the inferior carotid triangle.

No. 2 Is the superior carotid triangle.

No. 3 Is the sub-maxillary triangle.

No. 4 Is the occipital triangle.

No. 5 Is the sub-clavian triangle.

167 Name ten pairs of openings external to base of skull.

1 For the Eustachean tube, letting air to the middle ear

2 For tensor Tympani muscle.

3 Vidian canal, the vidian nerve and vessels.

4 Glasserian Fissure, Laxator tympani muscle, tympanic artery and the processus gracilis of the malleus.

5 Opening of the canal of Huguier, Chorda tympani nerve.

6 Opening for Jacobson's nerve, tympanic branch of 9.

7 Opening of the aqueductus cochleae, vein to cochlea.

8 Foramen for Arnold nerve, auricular branch of 10.

- 9 Stylo-mastoid Foramen, facial nerve, stylo-mastoid artery.
- 10 Auricular fissure, exit of Arnold's nerve.
- 168 Name those on the face.
- 1 Supraorbital Foramen or notch for supraorbital vessels and nerve.
 - 2 Infraorbital Foramen, for infraorbital vessels and nerve.
 - 3 Mental Foramen for mental vessels and nerve.
- In the malar bone we have malar foramina for the passage of vessels and nerves.
- 169 Name those in roof of mouth.
- In each half there are:
- 1 Incisive foramina for nerves and vessels to incisor teeth.
 - 2 In the middle of the roof of the mouth there are two anterior palatine foramina, for anterior palatine vessels and naso palatine nerves.
 - 3 Posterior palatine for posterior palatine and anterior or large descending palatine nerve.
 - 4 Accessory palatine, for posterior palatine nerve.
 - 5 Pterygo-palatine, for pterygo-palatine vessels.
- 170 Name and give nerve supply of the muscles that are exclusively connected to bones of thorax.
- 1 External intercostal.
 - 2 Internal intercostal.
 - 3 Infracostales.
 - 4 Triangularis sterni.
 - 5 Levatoris costarum.
- Nerve supply is intercostal nerves.

QUESTIONS AND ANSWERS ON THE VISCERA.

SUB-DIVISION—ALIMENTARY CANAL.

- 1 What does the word Viscus mean?
Any internal organ of the body is a viscus.
- 2 Where are the viscera situated?
They are situated in the cranium, thorax, abdomen and pelvis.
- ✓ 3 What is the Alimentary Canal?
It is a musculo-membranous tube about 30 feet long, lined throughout with mucous membrane. It extends from the mouth to the anus.
- ✓ 4 Name its different parts.
Mouth, pharynx, oesophagus, stomach, small intestine, which has three divisions—duodenum, jejunum and ileum, and large intestine, which

has three divisions—caecum, colon and rectum. The diaphragm lies immediately above the stomach.

5 What are the accessory organs to this canal?

They are the teeth, salivary glands, which are three—the parotid, sub-maxillary, sub-lingual—Liver, Pancreas and Spleen.

6 How many tunics has the alimentary canals?

All of the canal above the diaphragm has three coats, which are from within outward the mucous membrane, the areolar tissue, and muscular. That portion of the canal which lies below the diaphragm has a fourth coat called the serous membrane.

7 What are the teeth and how many are there?

The teeth are dense, white structures, firmly implanted in sockets in the alveolar processes of the jaw bones. Each consists of three portions—a root or fang, a neck and a crown.

The teeth grow in two sets one in infancy the other in childhood and youth.

The first set are called temporary, milk, deciduous teeth and are twenty in number, there being five in each lateral half jaw, namely two incisors, one canine, and two molars. In this set there are no bicuspid and no third molar. The bicuspid of the permanent set take the place of the temporary molars.

In the second or permanent set there are thirty-two teeth; eight in each half jaw, two incisors, one canine, two bicuspid and three molars.

8 Give blood and nerve supply of teeth.

The arteries are derived from the inferior dental, and from the alveolar and infraorbital branches of the internal maxillary. The nerves are from the inferior dental branch of the inferior maxillary division of the 5th, and also from the anterior and posterior dental branches of the superior maxillary division of the same nerve.

9 What is the greatest number of teeth at one time in the jaws?

Just before the six-year molars are erupted from the gum forty-eight teeth in various stages of formation and retrogression can be recognized in the two jaws—twenty of the temporary set and twenty-eight of the permanent. The four wisdom teeth at this time are only embryonic buds.

10 What kind of muscles are found in the tongue?

Two kinds—intrinsic and extrinsic. The intrinsic muscles are the Superior lingualis, Inferior lingualis, Transverse lingualis and Vertical lingualis.

They are all supplied by the hypoglossal nerve. Some say the Inferior

lingualis gets the Chora-tympani.

The extrinsic muscles are the Genioglossus, Hyoglossus, Stylo-glossus and Chondroglossus. Nerve to these is the hypoglossal.

✓ 11. What does papilla mean and what ones are found on the tongue?

It means a bud, a nipple, a teat, a pimple. The lingual mucous membrane of the dorsum of the tongue is peculiar in several respects. It consists of a layer of connective tissue forming a corium supporting special papillae covered with epithelium. The corium is a network in which ramify numerous vessels and nerves. The papillae are of three kinds:

✓ 1 Large circumvallate ("walled around") papillae, seven in number, set in a **A** at the back of the tongue, shaped like truncated cones set on end in cup-like depressions, whence the name.

✓ 2 Middle-sized fungiform ("mushroom shaped") papillae scattered irregularly over the surface, forming rounded red eminences like mushrooms, whence their name.

✓ 3 Small conical or filiform ("thread-shaped") papillae covering the anterior two-thirds of the surface, each ending in a number of little processes. It is these that are concerned in the whitish coating or furring of the tongue. Besides these papillae there are several other simple ones.

✓ 12 What are taste-buds?

Occupying the entire thickness of the epithelium of the lateral surface of the papillae is a multitude of flask-shaped bodies, called taste-buds. They are composed of two kinds of epithelial cells gustatory and sustentacular, packed together closely. The microscopic structure of some papillae include certain bodies called taste-buds. Taste-buds are scattered also over the dorsal surface independently of papillae, and are especially numerous in posterior part.

✓ 13 Give nerve supply of tongue.

The nerves of the tongue are in four pairs

The hypoglossal is the motor nerve to the tongue.

The lingual (gustatory) of trifacial is distributed to the anterior two-thirds of the dorsum of tongue and also to sides of tongue. This nerve is one of sensation.

The lingual branch of glosso-pharyngeal is specially concerned in gustation (taste) and is distributed to the posterior one-third of dorsum and sides of tongue.

The function of the lingual branch of the facial (Chorda-tympani) is still in question. Its distribution is about the same as the lingual branch of the fifth. Some say it is a nerve of taste for the anterior two-thirds of the tongue. Others that it supplies the Inferior lingualis muscle,

Some authorities say that the anterior two thirds of tongue is supplied by the glosso-pharyngeal through the chorda-tympani.

✓ 14 Give blood supply of tongue.

The arteries of the tongue are derived chiefly from the lingual, the facial and ascending pharyngeal.

The veins of the tongue accompany the arteries.

✓ 15 How many kinds of glands has the tongue?

Two—mucous and serous.

The mucous glands are found all over the surface of the mucous membrane of the tongue. The serous are found only at the back of the tongue.

✓ 16 What is the fraenum lingual—foramen caecum?

The fraenum lingual is a fold of the mucous membrane of the mouth, which binds down the under surface of the tongue, and sometimes requires to be cut from too great restriction or from extension too far forward, causing the subject to be tongue-tied. Fraenum lingual means bridle of tongue.

The dorsum of the tongue is convex, marked along the middle line by a raphe, which divides it into symmetrical halves; this raphe terminates behind, about an inch from the base of the organ, in a depression, the foramen caecum.

✓ 17 Is the tongue the only organ of taste?

The tongue is not the only organ of taste as taste-buds are found on the back part of hard palate, on anterior part of soft palate, and to some extent in other parts of the pharynx

✓ 18 Tell about the lymphatics of the tongue.

The lymphatic vessels from the tongue pass to one or two small glands situated on the Hyo-glossus muscle in the sub-maxillary region, and from thence to the deep glands of the neck.

✓ 19 What is the pharynx?

The throat, technically the joint opening of the gullet and the wind-pipe. It is a musculo-membranous pouch situated at the back of the nasal cavities, mouth and larynx and extending from base of skull to the cricoid cartilage

✓ 20 What does it communicate with below?

The œsophagus.

✓ 21 It communicates above with what?

Nasal cavities, Eustachean tube, mouth and larynx.

✓ 22 What are the dimensions of the pharynx?

About five inches long It is widest (nearly one inch and a half) in upper laryngeal portion, and narrow above and below, having it least

diameter (half an inch) at its junction with the gullet.

Ventro-dorsally its measurement is everywhere small, only opposite the mouth being more than four-fifths of an inch. It is a cavity situated in front of the upper five cervical vertebræ.

- ✓ 23 What other system does the pharynx belong to besides the alimentary?

The respiratory system

The middle segment of the pharynx is common to the alimentary and respiratory systems, and the tracts followed by the food and air cross obliquely in it.

- ✓ 24 What tunics has the pharynx?

It has the mucous, areolar and muscular.

- ✓ 25 Name the muscles of the pharynx.

Superior constrictor.

Middle constrictor.

Inferior constrictor.

Stylo-pharyngeus.

Palato-pharyngeus

The constrictors are supplied by branches from the pharyngeal plexus, Stylo-pharyngeus by the glosso-pharyngeal nerve, and the Inferior constrictor gets in addition a branch from the external laryngeal nerve and by the recurrent laryngeal.

The ^{Palato}Glosso-pharyngeus probably gets its nerve supply from the internal branch of the spinal accessory, whose fibres are distributed along with certain branches of the pneumogastric through the pharyngeal plexus.

- ✓ 26 How is the Pharyngeal plexus formed?

This plexus is formed by branches of the vagus, sympathetic and glosso-pharyngeal. It supplies the muscles and mucous membrane of the pharynx.

- ✓ 27 Give blood supply of the pharynx.

Superior thyroid branches, Ascending pharyngeal, Pterygo-palatine, Descending palatine. First two are branches of External carotid, last two are branches of Internal maxillary.

- 28 What is the sinus of Morgagni?

This sinus is a space at the upper and back part of the Superior constrictor of the pharynx, just under base of skull, where the muscular fibres of the constrictor are deficient, the pharynx being consequently walled in behind by its own aponeurosis. Here the Eustachian tube opens into pharynx on each side.

- ✓ 29 What and where are the tonsils?

They are two prominent oval bodies, situated in the recesses formed

one on each side of the fauces, between the anterior and posterior palatine arches. They are composed of lymphoid follicles, surrounded by less dense lymphoid tissue, arranged around the walls of crypts.

They lie near the internal carotid artery.

30 Give blood supply of the tonsils.

Dorsalis lingual from the lingual; ascending pharyngeal from external carotid; ascending palatine from facial; tonsillar from facial; descending palatine from internal maxillary. The veins of the tonsil form a plexus which lies upon the outer side of the gland, and opens externally into the pharyngeal plexus.

31 Give nerves of the tonsils.

The nerves come from the fifth by means of Meckel's ganglion and from glosso-pharyngeal.

32 Where is Steno's duct?

This is a duct of the parotid gland, conveying saliva into the mouth; so named from the Danish anatomist, Nicholas Steno, of Copenhagen, (1638-86); also called parotid duct.

33 Where is Wharton's duct?

Named for Thomas Wharton, an English physician, 1656. The duct of the submaxillary gland, conveying saliva into the mouth, about two inches long, opening on a papilla at the side of the frenum linguae, or bridle of the tongue.

34 Where are the ducts of Rivinus?

Those ducts of the sublingual gland which open apart from one another and from Wharton's duct.

35 Where is the duct of Bartholin?

One of the ducts of the sublingual gland, running alongside of Wharton's duct, and opening into it or close to its orifice into the mouth.

36 What is the hard palate?

It is in the roof of the mouth and is formed by the palate processes of the superior maxillary and palate bones.

37 What is the soft palate?

It is a movable fold suspended from the posterior border of the hard palate, forming an incomplete septum between the mouth and pharynx.

38 Name muscles of soft palate and give nerve supply to them.

Levator palati,

Tensor palati,

Azygos uvulae,

Palato-glossus,

Palato-pharyngeus.

Tensor palati is supplied by the Otic ganglion. The remaining muscles of this group are in all probability supplied by the internal branch of

the spinal accessory, whose fibres are distributed along with certain branches of the pneumogastric through the pharyngeal plexus.

39 What is the gullet or œsophagus?

The œsophagus (carrying eatables) is a tube connecting the pharynx and stomach. It is about ten inches long, extending from the upper border of the sixth cervical vertebra to that of the eleventh thoracic.

40 How many tunics has the œsophagus?

Three: internal, or mucous; middle, or areolar; and external or muscular.

41 Give blood supply of œsophagus.

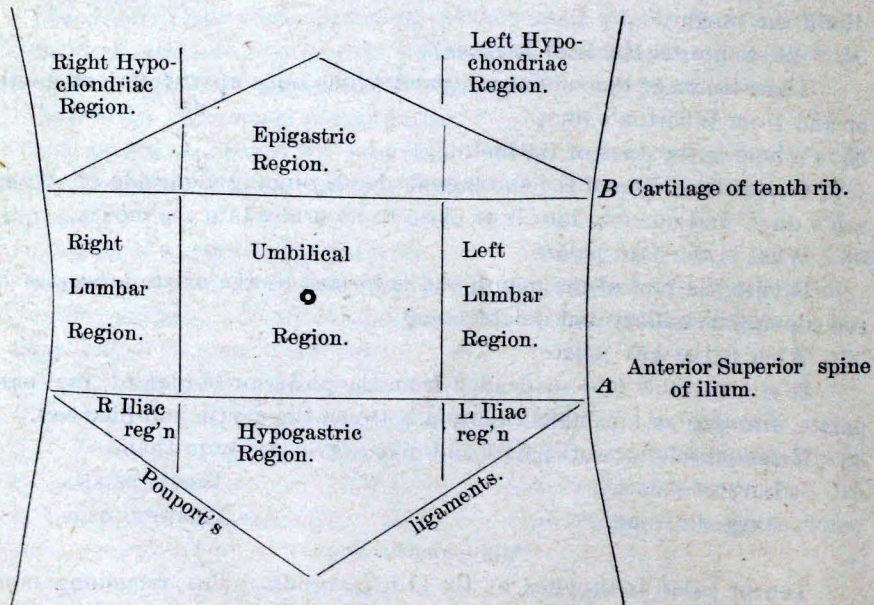
Inferior thyroid, which comes from the thyroid axis of the subclavian; branches from descending thoracic aorta; and from the gastric branch of coeliac axis of abdominal aorta.

42 Give nerve supply.

From the pneumogastric and sympathetic. They form a plexus in which are groups of ganglion-cells between the two layers of the muscular coats, and also second plexus in the submucous tissue.

43 Name the regions of the abdomen.

There are nine regions of the abdomen. Draw a line connecting the two anterior superior spines of the ilium; another parallel to this at the lowest part of the tenth costal cartilage. These two lines divide the abdomen in three divisions. Now draw two vertical lines from the middle of the two Poupart's ligaments. These lines will divide each of the three regions of the abdomen into three other divisions, thus making nine divisions of the abdomen.



Epigastric ("upon the stomach")

Hypochondriac ("under the cartilage")

Hypogastric ("under the stomach").

44 What is the mediastinum?

Medius, the middle; and sto, I stand.

In man the pleural folds do not meet, and the term mediastinum is extended to the space between them.

45 What does it contain?

It contains all of the thoracic viscera, except the lungs.

46 Give the divisions with contents.

Anterior mediastinum, the space between the sternum and the pericardium, contains the Triangularis sterni muscle, parts of other muscles, areolar tissue, lymphatic glands, etc.

The Middle mediastinum, nearly the same as the pericardiac cavity, contains the heart, ascending aorta, pulmonary artery, and superior vena cava, which are within the pericardium, and the phrenic nerves, roots of the lungs and lymphatic glands.

The Posterior mediastinum, the space between the spine and the pericardium, contains the descending aorta, azygos veins, thoracic duct, oesophagus, pneumogastric and splanchnic nerves.

The Superior mediastinum, is the space corresponding to the upper part of the sternum, extending from the manubrium in front to spine behind. It contains the trachea, oesophagus, thoracic duct, arch of aorta and the origin of the large arteries, the large veins, phrenic and pneumogastric nerves, thymus gland, etc.

✓ 47 What is the stomach?

The stomach is the most dilated and most distensible part of the alimentary canal.

✓ 48 Where is it situated, and what is its form and weight?

It occupies parts of the left hypochondriac and epigastric regions of the abdomen, immediately within the abdominal walls below the diaphragm and partly under the liver, to the right of the spleen and above the transverse colon. In form it is irregularly conoidal, and curved upon itself. When moderately distended it is about 12 inches long and 4 inches wide; it weighs 3 or 4 ounces. The size, shape and, hence, anatomical relations differ greatly in different states of distention.

The stomach is somewhat like a pear with the large end up and the small end bent sidewise to the right.

✓ 49 Name some of the principal points of the stomach.

First, the Fundus or splenic end is connected to the spleen by the gastro-splenic omentum. We might mention that an omentum is a special mesentery connecting the stomach with the liver, spleen and colon, respectively. The one that connects it to the spleen is called gastro-splenic

omentum. The one that connects it to the liver is called the gastro-hepatic omentum, and the one to the colon is called the gastro-colic omentum.

Second, the Pylorus, or lesser end, lies near the cartilage of the eighth rib, in contact with the under surface of the liver.

Third, the stomach has two curves a greater and lesser. The greater is convex and is connected to the colon by the gastro-colic omentum. The lesser one is concave and is connected to the liver by the gastro-hepatic omentum, and to the diaphragm by the gastro-phrenic ligament.

Fourth, the oesophageal or cardiac orifice is situated between the fundus and the lesser curvature.

The pyloric (janitor) is situated at the extreme right, and is more anterior in position than the cardiac orifice.

✓ 50 How many tunics has the stomach?

It has four: Serous, muscular, areolar or sub-mucous, and mucous.

✓ 51 Describe the serous coat.

The serous coat (peritoneum) encloses the stomach between two layers, derived from the lesser omentum.

The lesser omentum, omentum minimus, or gastro-hepatic, is a single fold (two layers) of peritoneum, extending between the transverse fissure of the liver and the lesser curvature of the stomach. It might be well to explain the greater omentum, omentum magnus or gastro-colic omentum, also called epiploön. It is the largest of all peritoneal duplications, and consists of four layers of peritoneum attached to the greater curvature of the stomach and to the transverse colon, whence it is looped down freely upon the intestines, forming a great flap or apron.

✓ 52 Describe the muscular coat.

The muscular coat has two distinct layers—an outer, longitudinal, and an inner, circular. Besides these two distinct layers some oblique fasciculi are found, internal to the circular.

✓ 53 Describe the areolar coat.

The areolar, submucous, also called vascular, is loose, and its meshes are largely occupied with the vessels and nerves going to and from the coats between which it lies.

✓ 54 Describe the mucous coat.

The mucous coat is thrown into irregular longitudinal folds called (rugae) The rugae invade the mucous and submucous coats.

✓ 55 Name the glands of the stomach.

They are of two kinds. The cardiac, or proper gastric glands, also called peptic (digest); and the pyloric glands.

✓ 55a Give nerve supply of stomach.

Right and left pneumogastric, and branches from the solar plexus of sympathetic nerves.

✓ 56 Give blood supply of stomach.

From the coeliac axis there is the gastric artery, which runs along the lesser curve from left to right, anastomosing with the pyloric branch of the hepatic. Along the greater curve run the right and left gastro-epiploic arteries, anastomosing at the middle of the border, the left being a branch of the splenic, the right a branch of the hepatic through the gastro-duodenal artery. The stomach also receives branches from the splenic (*vasa brevia*) at the fundus. The blood of the stomach is returned into the portal vein; the right gastro-epiploic vein opens into the superior mesenteric, the left into the splenic.

✓ 57 Give lymphatics of stomach.

The lymphatics are numerous; they consist of a superficial and deep set, which pass through the lymphatic glands forward along the two curvatures of the stomach.

✓ 58 What is the peritoneum?

It is a strong, uncolored, transparent, serous membrane, with a smooth, moist, shining surface, attached to the subjacent structures by the sub-peritoneal areolar tissue, and forming a closed sac, except in the female, where it is continuous with the mucous membrane of the Fallopian tubes, or oviducts.

✓ 59 Give the reflections of the peritoneum.

From the walls of the abdominal and pelvic cavities it is reflected at various places over the viscera, which it serves to invest and at the same time hold in position by its folds or duplicatures. These folds or duplicatures are of various kinds. Some of them constituting the mesenteries, connect certain parts of the intestinal canal with the posterior abdominal walls, others form the so-called ligaments of the liver, spleen, stomach, and kidneys, the broad ligaments of the uterus, the suspensory ligament of the bladder; still others from the omenta, folds attached to the greater and lesser curvatures of the stomach.

✓ 60 Give external and internal peritoneum.

That part which lines the abdominal and pelvic walls is called the parietal or external peritoneum; that which more or less completely invests the viscera, the visceral or internal.

✓ 61 Where is Winslow's foramen?

The communication between the greater and lesser cavities of the peritoneum is called the foramen of Winslow.

The cavity of the peritoneum is divided into two unequal parts by the constriction at Winslow's foramen; of these, the upper posterior one, lying back of and below the stomach and liver, is called the lesser cavity; the greater cavity lies in front and below.

62 What passes through the foramen of Winslow?

Nothing.

63 Give location and dimensions of small intestine (*intestinum tenue*).

The small intestine extends between the stomach above and the large intestine below. Its average length is about 22 feet. It may be as many as 34 feet or as few as 8 feet in length.

Its diameter diminishes in size from about two inches above to less than one inch below. It is to a large extent within the area bounded by the colon, occupying the umbilical and hypogastric regions and the adjacent portions of the lumbar.

64 How many coats has it?

It has four coats, which correspond in general arrangement and character to those of the stomach. They are the serous, muscular, areolar, and mucous.

65 What are the divisions of the small intestine?

They are the duodenum (12 finger intestine), jejunum (empty intestine), and ileum (curved or twisted intestine).

66 What are the villi?

They are small projections on the mucous membrane of the small intestines, which are so numerous as to give it a velvety appearance. They are from four to ten millions in number. They collectively constitute the beginning of the absorbent or lacteal vessels of the intestine.

67 What are the *valvulae conniventes*?

They are transverse folds of the mucous membrane and underlying tissues found throughout a large extent of the small intestine. Their use is probably to retard somewhat the passage of the alimentary mass, and at the same time to offer a greater surface for absorption.

68 What glands are found in the small intestine?

Lieberkühn glands, crypts, are the simple or solitary glands of the intestine, also in large intestine and stomach. Brunner glands [so called from J. K. Brunner (1653-1727)], sometimes called duodenal glands are small compound glands of the duodenum and upper part of the jejunum, embedded in the submucous tissue, opening by minute orifices into the lumen of the intestine.

Then there are the solitary lymph-nodules, which are more frequently called solitary glands, though no more entitled to the name than the nodes,

which occur in the course of lymphatic vessels, having no secreting apparatus.

Peyer's Patches are found in the lower ileum. They are oval, are from one-half to three inches in length, and about an inch in breadth. They are placed the long axis of the bowel. These patches were named after J. K. Peyer, a Swiss anatomist (1653-1712). A lesion of these patches is one of the most constant signs of typhoid fever.

69 Give blood supply of small intestine.

The small intestine receives the blood from the superior mesenteric artery, and a branch coming indirectly from the hepatic, the superior pancreatico-duodenal. The superior mesenteric runs between the layers of the mesentery, and gives off 12 or 15 branches running downwards and to the left (*vasa intestini tenuis*), which break up and form a series of arches, finally encircling the intestine as small branches. It also gives off a small branch at the beginning, the inferior pancreatico-duodenal, which with the superior pancreatico-duodenal, forms an arch, which lies in the concavity of the duodenum, and which supplies it. The blood is returned by means of the superior mesenteric vein which, with the splenic, forms the portal vein.

70 Give lymphatics of small intestine.

The lymphatics form a continuous series, which is divided into two sets—that of the mucous membrane and that of the muscular coat. The lymph-vessels of both sets form a copious plexus and end in the mesenteric lacteals.

71 Give nerve supply of small intestine.

The small intestine is supplied by means of the superior mesenteric plexus, which is continuous with the lower part of the solar plexus. The branches follow the blood-vessels, and finally form the two plexuses, one (*Querback's*) which lies between the muscular coats; and another (*Meissner's*) in the submucous coat.

72 What glands are found in the stomach and the large and small intestine?

The follicles of Lieberkühn.

73 How long is the large intestine (*intestinum crassum*)?

About a quarter as long as the small intestine. It is called large on account of its diameter, being about two and a half inches in its broadest part.

74 What is its location?

It begins at the right and lower portion of the abdomen, passes upward and backward to the under surface of the liver, thence across the

belly to the spleen, from this point downward and forward to the left and lower part of the abdomen, here makes a number of curves, and finally plunges into the pelvis at its back part, and ends close to the perineum, near the inner opening of the anal canal.

✓ 75 What divisions has it?

The caecum; ascending, transverse, descending colon, sigmoid flexure, and rectum.

The caecum lies in the right iliac fossa; from this point the ascending colon passes to the liver. Here it forms the hepatic flexure, then passes transversely across the belly below the stomach, and here the splenic flexure is formed, then it passes downward, forming the descending colon. In the left iliac fossa it forms the sigmoid flexure, and then passes through the pelvis as the rectum.

76 How many coats has large intestine?

It has four coats, with the same arrangement as the stomach and small intestine: serous, muscular, areolar, mucous.

✓ 77 What glands has the large intestine?

It has the crypts of Lieberkühn and solitary glands. It has no villi, no valvulae conniventes, no glands of Brunner, no patches of Peyer.

✓ 78 What is the vermiform appendix?

It is a blind process given off from the caecum, varying in man from 3 to 6 inches.

✓ 79 What is the ilio-caecal valve?

The opening of the small intestine into the large is provided with prominent lips, which project into the cavity of the latter, and oppose the passage of matter from it into the small intestine, while they readily allow of a passage the other way. This is the ileo-caecal valve or valve of Bauhini.

✓ 80 Give blood supply of large intestine.

The large intestine is supplied with blood by the branches of the superior mesenteric and inferior mesenteric arteries, while it also receives a blood supply from the internal iliac at the rectum. The vessels form a continuous series of arches from the caecum, where the vasa intestini tenuis anastomosis with the ileo-colic, the first branch of the superior mesenteric given to the large intestine. The blood supply of the rectum is from the inferior mesenteric by the superior haemorrhoidal from the internal iliac by the middle haemorrhoidal, and from the internal pudic by the inferior haemorrhoidal. The vessels at the lower end of the rectum assume a longitudinal direction, communicating freely at the anus and less freely above

The blood of the large intestine is turned into the portal vein by means of the superior mesenteric and inferior mesenteric veins. At the rectum a communication is set up between the systemic and portal system of veins, since some of the blood of that part of the intestine is returned into the internal iliac veins. In the lower end of the rectum the veins, like the arteries, are arranged longitudinally. This arrangement is called the haemorrhoidal plexus.

81 Give nerves and lymphatics of large intestine.

They differ in no particular from those of the small intestine.

82 What is the rectum (*intestinum rectum*)?

The rectum extends from the sacro-iliac joint to the anus. It better deserves the name rectum (straight), when we say it begins at the front of the the third sacral vertebra, for then it is nearer straight.

83 How many coats has the rectum?

It has the same four coats that the intestine has. Its walls are thicker than those of the colon. The muscular coat and mucous coat differ from those of the other portions of the canal.

84 What are the appendices epiploicae?

The peritoneum of the upper part of the rectum is thrown into folds called appendices epiploicae.

85 What are the folds of Houston?

There are three semilunar transverse folds, one in the upper part of the rectum on the right side, another about the middle on the left side, and a third in front, opposite the base of the bladder. They are called the folds of Houston.

86 Give the muscles of rectum.

Sphincter ani, Internal sphincter and Sphincter tertius of Hyrtl.

87 How is the rectum supported?

It is supported by proper duplications of peritoneum, the mesorectum and other fasciae.

88 What is the liver (*hepar*)?

It is the largest gland in the body, and weighs 50 or 60 ounces.

89 What is a gland?

A gland is an organ which secretes and pours forth a liquid from one or more ducts or orifices, opening on the surface of the skin or mucous membrane.

90 Where is the liver situated?

It is situated in the right *hypochondriac*, the epigastric and partly in the left *hypochondriac* regions.

91 What are the functions of the liver?

It secretes bile and sugar and performs other important metabolic functions.

92 What surrounds the liver?

It is surrounded by a fibrous coat which is continuous at the transverse fissure with the capsule of Glisson.

93 What is the capsule of Glisson?

It is the sheath of connective tissue enveloping the branches of the portal vein, hepatic artery, and hepatic duct as they ramify in the liver.

94 How many surfaces and borders has the liver?

It has three surfaces: an upper or superior, an under or inferior, and a hind or posterior. It has three borders: an anterior, a postero-superior, and postero-inferior and two extremities, a right and a left.

95 How many and what fissures has the liver?

It has five fissures: umbilical, gall-bladder, portal or transverse fissures which are on the under surface. The ductus-venous and vena-cava fissures are on the hind surface.

96 How many lobes has the liver?

It has five lobes: the left lobe, the right lobe, which is sub-divided into Quadrate and Caudate lobes on the inferior surface. The Spigelian lobe is on the hind surface.

97 Name the ligaments of liver.

It has five ligaments: Suspensory, Broad or Falciform, Coronary, Right lateral or Right triangular, Left lateral or Left triangular. These four ligaments are peritoneal folds. The fifth one, the Round ligament, is the obliterated Umbilical vein.

98 Name the vessels of the liver.

There are five sets: branches of portal vein, branches of hepatic artery, radicals of hepatic veins, bile ducts, lymphatics. Thus it is seen that the liver is supplied with blood by the portal vein and hepatic artery, and discharges it by the hepatic veins.

99 Give nerve supply of the liver.

The nerve supply is from the hepatic plexus, which is an offset from the coeliac plexus and receives filaments from the left pneumogastric and right phrenic.

100 How may the portal veins be told from the hepatic.

The portal veins remain closed, because they are surrounded by the capsule of Glisson. The hepatic veins gape open, being adherent to the liver substance.

101 Give the relations of the liver.

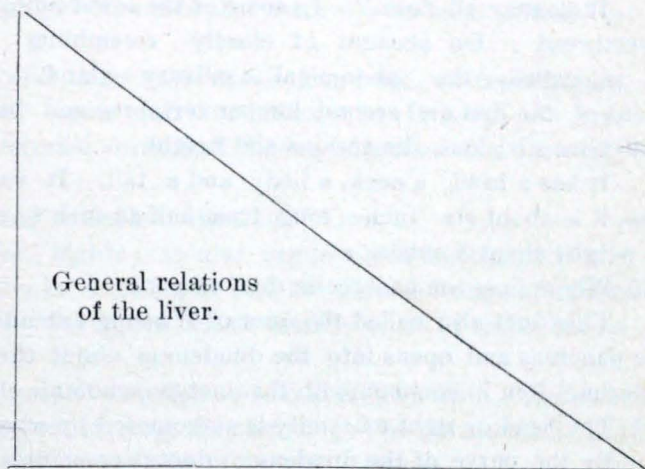
ABOVE.

Diaphragm and anterior wall of abdomen.

BEHIND.

Tenth and eleventh thoracic vertebrae, crura of diaphragm, lower end of the oesophagus, right supra-renal capsule, great vessels.

General relations
of the liver.



BELOW.

Cardiac end of stomach, hepatic flexure of colon, right kidney, first and second portions of duodenum.

102 Where is the gall bladder situated?

It retains the bile and is situated between the right and quadrate lobes on the under surface of the liver.

It is, of pyriform outline and when full is seen projecting beyond the anterior border of the liver, coming in contact with abdominal wall opposite ninth costal cartilage. It extends as far back as the transverse fissure.

103 How long is the gall bladder and what is its capacity?

About 3 or 4 inches long and will hold about $1\frac{1}{2}$ ounces.

104 Give vessels of gall bladder.

Cystic artery from right branch of hepatic. Two cystic veins usually empty into the right branch of the vena portal, twelve or fifteen from the fundus go directly into the liver.

105 Give nerves of gall bladder.

The nerves are from the coeliac plexus.

106 How is the hepatic duct formed?

It is formed by the right and left bile ducts descending from the liver.

107 What are the biliary ducts?

They are the cystic which comes from the neck of the gall bladder. It joins the hepatic forming the ductus communis choledochus. These three are called the biliary ducts. The ductus communis choledochus empties

into the descending duodenum about three inches from the pyloric end of stomach.

108 What is the meaning of pancreas and where is it located?

It means "all flesh." In some of the lower animals it is known as the sweetbread. On account of closely resembling the parotid glands it is called the abdominal salivary gland. It is situated in front of the first and second lumbar vertebrae and behind the stomach.

109 Give divisions, dimensions and weight.

It has a head, a neck, a body and a tail. It varies considerably in size, it is about six inches long, from half an inch to one inch in thickness. It weighs about 3 ounces.

110 Where does the pancreatic duct empty?

This duct also called the duct of Wirsung extends the whole length of the pancreas and opens into the duodenum about three inches below the pylorus, often in common with the ductus communis choledochus.

111 The head or right extremity is surrounded by what structures?

By the curve of the duodenum, ductus communis choledocus, and the pancreatico-duodenal arteries.

112 What is the situation of the tail or left extremity?

It lies above the left kidney and in contact with the lower end of the spleen.

113 Give blood supply of pancreas

The pancreas receives blood from the splenic artery through its pancreatic branches, and from the superior mesenteric and hepatic by the inferior and superior pancreatico-duodenal arteries, which form a loop running round, below and to the right of its head. The blood is returned into portal vein by means of the splenic and superior mesenteric veins.

114 Give lymphatics of pancreas.

The lymphatics terminate in two glands which lie on the superior mesenteric veins.

115 Give nerve supply of pancreas.

The nerves are branches of the solar plexus which accompany the arteries entering the gland.

116 What is the lesser pancreas?

Sometimes a lobe of the head is detached, and has a duct of its own opening into the duodenum about an inch above the pancreatic duct. This lobe is called the lesser pancreas.

117 What are the ductless glands?

They are the spleen, supra-renal capsules, thyroid and thymus glands. They have no excretory ducts and their functions are unknown.

The words ductless glands involve a seeming paradox, for the word "gland" implies the capacity to form a product known as a secretion, and no one has ever seen a secretion from one of these organs, but the absence of a channel of exit strengthened the idea that there was no such material to be discharged.

Investigations in recent years have shown that some of these organs have a profound influence upon nutritive changes in the body, and have established the fact of internal secretion. Though ductless they are really glands.

118 What is the spleen and where is it situated?

It is a non-glandular, highly vascular organ which is situated in the abdomen, on the left side, in connection with the digestive organs, and in which the blood, probably, undergoes certain modifications in respect to its corpuscles.

The spleen has no proper secretion and no excretory duct. It lies in the left hypochondriac region, capping the cardiac end of the stomach. The spleen has been supposed to be the seat of various emotions.

119 Give dimensions and weight of spleen.

Its dimensions are 1x3x5 inches, and weighs about five ounces.

120 Give general relations of the spleen.

In Front.

Stomach: Splenic flexure of colon.

Outer Side.

Diaphragm, ninth to eleventh rib. between axillary line.

General relations of the Spleen.

Inner Side.

Stomach: Pancreas, left kidney and capsule.

Behind.

Diaphragm.

120a Give blood supply of spleen.

The spleen receives its blood from the splenic artery, which is very large in proportion to the body it is going to supply, and it divides before entering into about six branches. The artery is very tortuous. The vein, on the other hand, is straight and lies below the artery.

121 Give lymphatics of spleen.

They are divided into superficial and deep set. The former forms a

plexus beneath the peritoneum. The latter are derived from fine perivascular spaces in the adenoid tissue around the vessels. They join at the hilum, and pass between the layers of the gastro-hepatic omentum to the glands in that neighborhood.

122 Give nerves of spleen.

The nerves are from the solar plexus. They pass along the splenic artery.

123 What and where is the thyroid gland?

It is a large and very vascular body, consisting chiefly of a congeries of blood vessels, but not provided with a duct or known to furnish any secretion, saddled upon the larynx and upper part of trachea. Its functions, if it has any, are unknown, it takes no part in respiration, though associated with the windpipe, and is apparently a vestigial organ or the remains of some undermined functional homologue of the lower vertebrates. It is the seat of the disease known as bronchocele or goiter.

124 Give the dimensions, weight and divisions.

It has two lateral lobes and an isthmus. The lobes are pyriform in shape, with their broad ends below, and measures about two inches in length, three-quarters of an inch in breadth, and about an inch in thickness near the middle.

It weighs from one to two ounces, but is larger in female, and is often increased in size during menstruation.

125 Give blood and nerve supply.

The arteries which are relatively large and frequently anastomose—are the two superior thyroids, the two inferior thyroids, and an occasional one which ascends on the front of the trachea, the thyroidea ima. This latter is derived either from the innominate artery or from the arch of the aorta. The superior thyroid arteries descend to supply the apices and inner and foreparts of the lateral lobes, whilst the inferior ascends to supply their outer and hinder portions below. The veins are the superior, middle and inferior thyroid. The first two join the internal jugular vein, and the last one the innominate of corresponding side.

The nerves are derived from the middle cervical ganglion of the sympathetic.

126 What and where is the thymus gland?

It is a foetal structure, vestigial in the adult, and has no known function, situated inside the thorax, behind the sternum, near the neck. The thymus of the sheep and veal is called sweetbread and more fully throat or neck-sweetbread, to distinguish it from the pancreas or stomach-sweetbread.

It reaches its highest development about the second year, and its weight is six drachms.

127 Give blood and nerve supply.

The arteries are derived from the internal mammary and from superior and inferior thyroids. The veins join the left innominate and thyroid veins. The nerves are very minute and proceed from the sympathetic and pneumogastric.

128 What are the supra-renal bodies?

They are two solid viscera resting each upon the upper extremity of the corresponding kidney

129 Give blood and nerve supply.

It is richly supplied with vessels and nerves. Its arteries are derived from three sources: the aorta, the phrenic and the renal, and pierce the organ in various places, but chiefly on the anterior surface along a furrow sometimes called the hilum. The veins terminate on the right side in the vena cava and sometimes by means of small branches in the phrenic and renal trunks: on the left side, in the left renal vein. The lymphatics pass to the renal glands, which, like the supra-renal bodies, themselves contain a good deal of pigment. The nerves form a rich and complex interlacement, and are derived chiefly from the solar and renal plexuses, but include filaments from the splanchnics, and according to some authors from the phrenic and vagus also

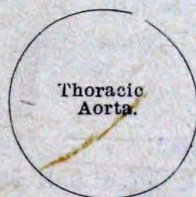
130 Give relations of Thoracic aorta

In Front.

Left pulmonary artery.
Left bronchus.
Pericardium.
Œsophagus.

Right Side.

Œsophagus (above).
Vena azygos major.
Thoracic duct.



Left Side.

Pleura.
Left lung.
Œsophagus (below).

Behind.

Vertebral column.
Vena azygos minor.

131 Give branches of same.

Pericardiac.
Bronchial.

Œsophageal.
Posterior Mediastinal.

Intercostal.

Cystic.

136 Give branches of Splenic artery.

Pancreaticæ Parvæ.

Gastric (Vasa Brevia).

Pancreatica Magna.

Gastro-epiploica Sinistra.

137 Give branches of Superior Mesenteric artery.

Inferior Pancreatico-duodenal.

Ileo-colic.

Vasa Intestini Tenuis

Colica Dextra.

Colica Media.

138 Give branches of inferior mesenteric artery.

Colica Sinistra.

Sigmoid.

Superior Hæmorrhoidal

139 Give relation of the common iliac arteries.

In front.

Peritoneum.

Small intestines.

Sympathetic nerves.

Ureter.

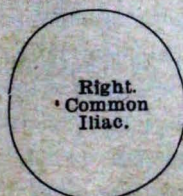
In front.

Peritoneum, small intestines.

Sympathetic nerves.

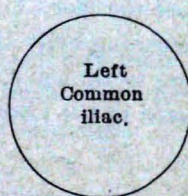
Superior hæmorrhoidal artery.

Ureter.



Outer side.
Vena cava.
Right common
iliac vein.
Psoas muscle.

Inner Side.
Left common
iliac vein.



Outer Side.
Psoas muscle.

Behind.

Last two lumbar vertebrae.
Right and left common iliac
veins.

Behind.

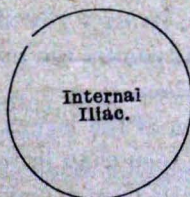
Last two lumbar vertebrae.
Left common iliac
vein.

140 Give relations of internal iliac artery.

In front.

Peritoneum.

Ureter.



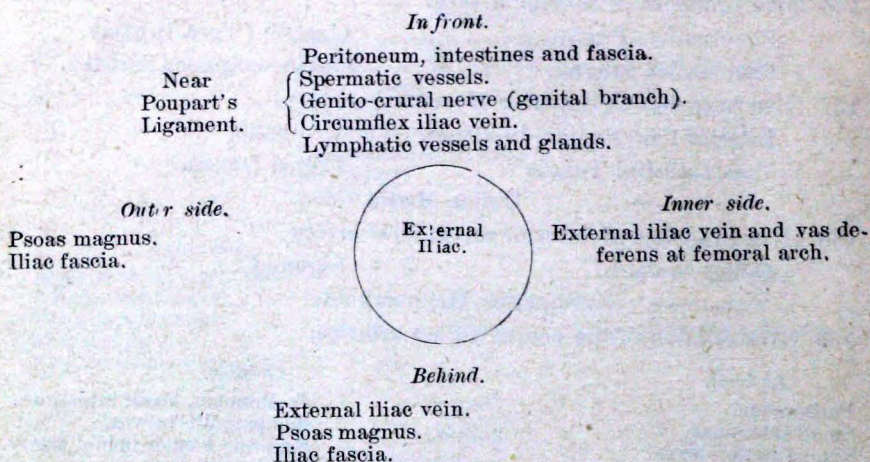
Outer side.
Psoas magnus.

Inner side.
Internal iliac vein.
Peritoneum.

Behind.

External iliac vein (above).
Internal iliac vein.
Lumbo-sacral nerve.
Sacrum.

141 Give relations of external iliac artery.

142 What does the word *Cœliac* mean?

Literal meaning belly, hol'ow.

Pertaining to the cavity of the abdomen, abdominal or ventricular,
now chiefly used in the phrase *cœliac axis*.

QUESTIONS AND ANSWERS ON VISCERA. Continued.

SUBDIVISION—THE ORGANS OF VOICE AND RESPIRATION.

1 What and where is the larynx?

The part of the windpipe in which vocal sound is made and modulated; the organ of phonation. It is the enlarged and modified upper end of the trachea, with some associate parts, as the epiglottis. It opens by the glottis into the pharynx; below, its cavity is directly continuous with that of the trachea or windpipe. It causes the protuberance of the throat called Adam's apple or pomum Adami.

2 What is the relative size of the larynx in men and women?

The larynx is larger in men than in women and boys by about one-third. In various animals the larynx may be situated anywhere along the windpipe, or even in the bronchial tube. It is generally at the top of the trachea. In birds there are two larynges, one at the top, the other at the bottom of the trachea. The latter is called the syrinx.

3 What is the glottis?

It is the mouth of the windpipe; the opening at the top of the larynx;

the fissure between the vocal cords. It is also applied to the opening with the contiguous limiting structures, as in the expression 'oedema of the glottis,' much as the term 'mouth' is used to include the lips. The ventral or anterior portion of the glottis, called *glottis vocalis*, is bounded by the true vocal cords; the dorsal or posterior part, *glottis respiratoria*, by the internal margins of the arytenoid cartilages.

4 What is the epiglottis?

A valve-like organ which helps to prevent the entrance of food and drink into the larynx during deglutition.

5 What are the true and false vocal cords?

The superior or false vocal cords, so-called because they are not directly concerned in the production of the voice, are two folds of mucous membrane, each enclosing a delicate rounded band, the superior thyro-arytenoid ligaments. The inferior or true vocal cords, so called from their being concerned in the production of sound, are two strong fibrous bands (inferior thyro-arytenoid ligaments), covered on their surface by a thin layer of mucous membrane.

Between the true and false vocal cords on each side there is a recess called a ventricle or sinus of the larynx, which leads into a pouch, the sacculus laryngæus, which is also called the sinus of Morgagni.

6 Name the cartilages of the larynx.

They are nine in number, three single and three pairs:

Single cartilages—

Thyroid.

Cricoid.

Epiglottis.

Paired cartilages—

Two arytenoid.

Two cornicula laryngis.

Two cuneiform.

From their general structure they are arranged as follows:

Hyaline—

Thyroid.

Cricoid.

Arytenoid (the tip of
this one is yellow elastic).

Yellow elastic—

Epiglottis.

Cornicula laryngis.

Cuneiform.

7 Name the ligaments of the larynx.

They are 19 in number—3 extrinsic ligaments, connecting the larynx to the hyoid bone; and 16 intrinsic, binding its several cartilages together, viz.—

Extrinsic ligaments (3) are the—

Thyro-hyoid membrane, bounded laterally by—

2 lateral thyro-hyoid ligaments, each contain a nodule of cartilage,

the cartilago triticea.

Intrinsic ligaments (16) are the—

Crico-thyroid membrane.

2 crico-thyroid capsular ligaments.

2 crico-arytenoid ligaments.

2 crico-arytenoid capsular ligaments.

2 superior thyro-arytenoid (situated in the false vocal cords).

2 inferior thyro-arytenoid (situated in the true vocal cords).

Hyo-epiglottic ligament.

Thyro-epiglottic ligament.

3 glosso-epiglottic folds.

8 Name and give nerve supply of the muscles of the larynx.

There are eight pairs of muscles of the larynx, three of which belong to the epiglottis. They are the crico-thyroid, crico-arytenoideus posticus, Crico-arytenoideus lateralis, Thyro-arytenoideus, Arytenoideus, Thyro-epiglottideus, Aryteno epiglottideus superior, and Aryteno-epiglottideus inferior.

The superior laryngeal nerves supply the mucous membrane of the larynx and the Crico-thyroid muscles. The inferior laryngeal nerve supplies the remaining muscles. The Arytenoideus gets both nerves.

9 Give blood supply of larynx.

The arteries of the larynx are the laryngeal branches derived from the superior and inferior thyroid. The veins accompany the arteries; those accompanying the superior laryngeal artery join the superior thyroid vein which opens into the internal jugular vein; while those accompanying the inferior laryngeal artery join the inferior thyroid vein which opens into the innominate vein. The lymphatics terminate in the deep cervical plexus. *glands.*

10 What is the trachea?

The trachea (from Greek word, rough) or windpipe is the air passage of the body, beginning at the larynx and ending at the bronchial tubes. It is a musculo-membraneous tube, stiffened and held open by a series of many (16 to 20) cartilages or osseous rings, the first of which is usually specialized (cricoid) and the last one or more of which are variously modified to provide for the forking of the single tracheal tube into a pair of right and left bronchial tubes (pessulus), this is a bony bar across the lower end of the windpipe, at the point where the trachea forks into the right and left bronchi. Through the larynx the trachea communicates with the mouth and nose and so with the exterior, and through the bronchial tubes with the lungs; the air passing through it with each inspiration and expiration. The trachea exists in all vertebrates which breathe air with lungs,

and is subject to very little variation in character. It is about four and one-half inches long, extending from the sixth cervical to the fourth dorsal where it branches into the bronchi, lying along the spinal column, the œsophagus interposing between it and the vertebrae. Its average diameter is four-fifths of an inch in the cadaver, the antero-posterior a trifle less, but both are smaller during life.

11 Give blood and nerve supply of trachea.

By the inferior thyroid arteries. The veins terminate in the thyroid venous plexus. The nerves from pneumogastric, and its recurrent branches from the sympathetic.

12 Describe the right bronchus (throat).

The right bronchus is about one inch in length. It is shorter and wider than the left, and in direction more horizontal in its passage to the root of the lung. It gives three branches to its lung.

13 Describe the left bronchus.

The left bronchus is smaller, longer and more oblique than the right, being nearly two inches in length. It enters the root of the left lung opposite the sixth dorsal vertebra, about an inch lower than the right bronchus. It passes beneath the arch of the aorta, crosses in front of the œsophagus, the thoracic duct and descending aorta, and has the left pulmonary artery lying at first above and then in front of it. It divides into two branches for this lung.

14 What are the lungs?

The lungs (Latin, *pulmones*, from which comes "pulmonary") are two large organs, which occupy a great part of the chest cavity, one in each side of it, and separated from each other by the heart, the gullet, the great blood-vessels, and other structures in the mediastinal space. They communicate with the pharynx through the trachea, and are organs of respiration in air-breathing vertebrates. The lungs are formed by repeated subdivision of the branches of their bronchi which finally end in saccular dilatations called *infundibula*. The *infundibula* and air-passages immediately leading to them are beset with air-cells. These air-cells or *alveoli* are from 1-50 to 1-70 of an inch in diameter. They are furnished with a close capillary network in which the branches from the pulmonary artery terminate, and the blood is separated from the air only by the capillary wall and the thin alveolar epithelium of the air-cells. This assemblage of minute saccular organs and air-bearing tubes is bound up by connective tissue into comparatively compact lungs. The bronchial arteries and veins provide for the nutrition of the pulmonary structures. Lymphatics abound and there are numerous lymphatic glands. Each lung is pyramidal in form,

its base resting on the diaphragm and its apex rising about an inch above the clavicle. The right lung is divided into an upper, a middle and lower lobe; the left one simply into an upper and lower. At the inner side of each lung, a little above the middle, the bronchus and blood-vessels enter, forming the root of the lung; and except for this attachment the lung lies free in its pleural cavity, which it completely fills. The lung is elastic and always on the stretch. The blood, in passing through the lungs, gives off carbon dioxide to the air in the alveoli and receives oxygen. This absorption and elimination seems to be a simple mechanical process, and independent of any secreting or other activity of the epithelial cells.

15 Give nerve supply of the lung.

The nerves are supplied from the anterior and posterior pulmonary plexuses, formed chiefly from the sympathetic and pneumogastric.

Filaments from these plexuses accompany the bronchial tubes, upon which they are lost. Small ganglia are formed upon these nerves.

16 Give weight, capacity, color and specific gravity of the lungs.

The two weigh forty-two ounces, the right one two ounces heavier than the left.

Capacity, nearly seven and one-half pints. The entire respiratory surface is more than 870 square feet.

The color before birth is reddish-brown; on inflation it changes to a rose pink; in early adult life it is grayish-white; in early middle life it becomes brownish in spots and streaks; and in old age it is often bluish-black.

Its specific gravity varies from 0.345 to 0.746, water being 1000.

17 What is the pleura (Greek word side)?

It is the principal serous membrane of the thorax, the shut sac, having a serous surface, which lines the walls of the chest, and is reflected over the surface of each lung. There are two pleurae, right and left, completely shut off from each other. Each is divided into a parietal or costal layer and a visceral or pulmonary layer. Like the other serous membranes, the pleurae are moistened with a serous secretion, which serves to facilitate the movements of the lungs in the chest. Different portions of the parietal layer are distinguished by special names, which indicate their position.

The costal pleura is that which lines the ribs, costal cartilages, and intermediate muscles.

The diaphragmatic pleura is that which is attached to the diaphragm.

The mediastinal pleura is that which is attached to the adjacent structures in the mediastinum.

The cervical pleura is that which covers the dome of the lung.

- 18 Give arteries and nerves to the pleura.

Internal mammary, intercostal, musculo-phrenic, thymic, pericardiac and bronchial.

The veins correspond to the arteries.

The lymphatics are numerous.

The nerves are from the sympathetic and phrenic.

- 19 What is the broad ligament of the lung?

The visceral layer of the pleura after covering the root of the lung come together directly beneath it, and form a double-layered, triangular sheet, extending vertically from the root of the lung to the diaphragm, and laterally, from the lung to the mediastinal pleura. This fold is the broad ligament of the lung.

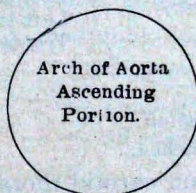
- 20 Give relations of ascending aorta.

In Front.

Pulmonary artery.
Right auricular appendix.
Pericardium.

Right Side.

Superior cava.
Right auricle.



Left Side.

Pulmonary artery.

Behind.

Right pulmonary artery.
Left auricle.
Pericardium.

- 21 Give branches of same.

The only branches of the ascending aorta are the two coronary arteries. They supply the heart, and are two in number, right and left, arising near the commencement of the aorta immediately above the free margin of the semilunar valves.

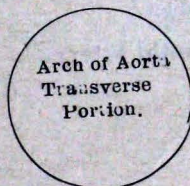
- 22 Give relations of the transverse portion.

ABOVE.

Left innominate vein.
Innominate artery.
Left carotid.
Left subclavian.

In Front.

Pleurae and lungs.
Remains of thymus gland.
Left pneumogastric nerve.
Left phrenic nerve.
Left superior cardiac nerve.
Left superior intercostal vein.



Behind.

Trachea.
Deep cardiac plexus.
Oesophagus.
Thoracic duct.
Left recurrent nerve.

BELOW.

Bifurcation of pulmonary artery.
 Remains of ductus arteriosus.
 Superficial cardiac plexus.
 Left recurrent nerve.
 Left bronchus.

23 Give branches of the arch aorta.

The branches given off from the arch of the aorta are three in number: the innominate artery, the left common carotid, and the left subclavian.

24 Give relation of innominate artery.

In Front.

Sternum.
 Sterno-hyoid and Sterno-thyroid muscles.
 Remains of thymus gland.
 Left innominate and right inferior thyroid veins.
 Inferior cervical cardiac branch from right pneumogastric nerve.

Right Side.

Right innominate vein.
 Right pneumogastric nerve.

Pleura*Left Side.*

Remains of thymus.
 Left carotid.
 Left inferior thyroid vein.
 Trachea.

*Behind,
Trachea.*

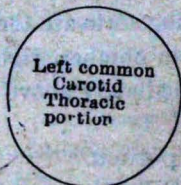
25 Give relations of the left common carotid thoracic portion.

In front.

Sternum.
 Sterno-hyoid and Sterno-thyroid muscles.
 Left innominate vein.
 Remains of thymus gland.

*Right**Internally.*

Innominate artery.
 Inferior thyroid veins.
 Remains of thymus gland.

*Left**Externally.*

Left pneumogastric nerve.
 Left pleura and lung.
 Left subclavian artery.

Behind.

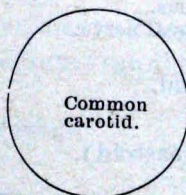
Trachea.
 Esophagus.
 Thoracic duct.

subclavian

26 Give relation of the common carotid artery.

*Ex'ernally.**front*

Integument and superficial fascia
 Deep cervical fascia.
 Platysma.
 Sterno-mastoid.
 Sterno-hyoid.-
 Sterno-thyroid.
 Omo-hyoid.
 Descendens and Communicans
 hypoglossi nerves.
 Sterno-mastoid artery.
 Superior and middle thyroid
 veins.
 Anterior jugular vein.
 Internal jugular vein.
 Pneumogastric nerve.

*Internally.*

Trachea.
 Thyroid gland.
 Recurrent laryngeal nerve.
 Inferior thyroid artery.
 Larynx.
 Pharynx.

Behind.

Longus colli.
 Rectus capitis anticus major.
 Sympathetic nerve.
 Inferior thyroid artery.
 Recurrent laryngeal nerve.

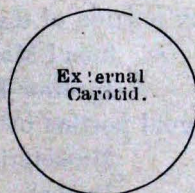
27 Give relations and branches of external carotid.

Branches—The external carotid artery gives off eight branches, which, for convenience of description, may be divided into four sets.

Anterior—	Posterior—
Superior Thyroid.	Occipital.
Lingual.	Posterior Auricular.
Facial.	
Ascending—	Terminal—
Ascending Pharyngeal.	Superficial Temporal.
	Internal Maxillary.

Externally.

Skin, superficial fascia.
 Platysma and deep fascia.
 Anterior border of Sterno.mastoid.
 Hypoglossal nerve.
 Lingual and facial veins.
 Digastric and Stylo-hyoid muscles.
 Parotid gland with facial nerve and temporo-maxillary vein in its substance.
 Internal carotid artery.

*In front.*

Ramus of jaw.

Behind.

Parotid gland.

Internally.

Hyoid bone.
 Pharynx.
 Superior laryngeal nerve.
 Stylo-glossus.
 Stylo-pharyngeus.
 Glosso-pharyngeal nerve.
 Parotid gland.

- 28 Give branches of superior thyroid.
 Hyoid. Superior Laryngeal.
 Superficial descending (Sterno-mastoid). Crico-thyroid.
- 29 Give branches of lingual artery.
 Hyoid. Sublingual.
 Dorsalis Linguae. Ranine.
- 30 Give branches of facial.
 Cervical Branches— Facial Branches —
 Inferior of Ascending Palatine. Muscular.
 Tonsillar. Inferior Labial.
 Submaxillary. Inferior Coronary.
 Submental. Superior Coronary.
 Muscular. Lateralis Nasi.
 Angular.
- 31 Give branches of occipital.
 Muscular. Auricular.
 Sterno-mastoid. Meningeal.
 Arteria Princeps Cervicis.
- 32 Give branches of posterior auricular.
 Stylo-Mastoid. Auricular. Mastoid.
- 33 Give branches of ascending pharyngeal.
 Prevertebral Pharyngeal. Meningeal.
- 34 Give branches of superficial temporal.
 Transverse Facial Middle Temporal.
 Anterior Auricular.
- 35 Give branches of internal maxillary.
 Branches of the first or maxillary portion of the internal maxillary.
 Tympanic (anterior). Small Meningeal.
 Middle Meningeal. Inferior Dental.
 Branches of the second or pterygoid portion of internal maxillary.
 Deep Temporal. Masseteric.
 Pterygoid. Buccal.

Branches of the third or spheno-maxillary portion of internal maxillary—

Alveolar.

Vidian.

Infra-orbital.

Pterygo-palatianæ.

Posterior or Descending Palatine.

Naso- or Sphenopalatine.

36 Give relations of internal carotid artery.

Externally.

Skin, superficial and deep fasciæ

Platysma.

Sterno-mastoid.

External carotid and occipital arteries.

Hypoglossal nerve.

Parotid gland.

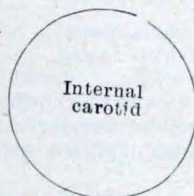
Stylo-glossus and Stylo-pharyngeus muscles.

Glosso-pharyngeal nerve.

Pharyngeal branch of the pneumogastric.

Internal jugular vein.

Pneumogastric nerve.



Internally.

Pharynx.

Superior laryngeal nerve.

Ascending pharyngeal artery.

Tonsil.

Behind.

Rectus capitis anticus major.

Sympathetic.

Superior laryngeal nerve.

37 Give branches of internal carotid.

The branches given off from the internal carotid are—

From the Petrous portion

Tympanic (internal or deep).

From the Cavernous portion

Arteriæ Receptaculi.

Anterior Meningeal.

Ophthalmic.

From the Cerebral portion

Anterior Cerebral

Middle Cerebral.

Posterior Communicating.

Anterior Choroid.

38 Give branches of ophthalmic artery.

Orbital group—

Lachrymal.

Supra-orbital.

Posterior Ethmoidal.

Anterior Ethmoidal

Palpebral.

Frontal

Nasal.

Ocular group—

Muscular.

Anterior ciliary.

Short ciliary.

Long ciliary.

Arteria Centralis Retinæ

39 Give branches of anterior cerebral.

Antero-median ~~and~~ Ganglionic.

Middle and Internal Frontal.

Anterior and Internal Frontal.

Posterior and Internal Frontal.

40 Give branches of middle cerebral.

Antero-lateral Ganglionic.

Ascending Frontal.

External and Inferior Frontal.

Ascending Parietal.

Parieto-sphenoidal.

41 Give the relation of the first portion of the right subclavian artery.

In front.

Skin, superficial fascia.

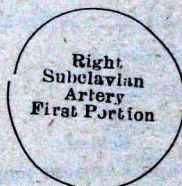
Platysma, deep fascia.

Clavicular origin of Sterno-mastoid.

Sterno-hyoid and Sterno-thyroid.

Internal jugular and vertebral veins.

Pneumogastric, cardiac, and phrenic nerves.

*Beneath.*
Pleura.*Behind.*

Recurrent laryngeal nerve.

Sympathetic.

Longus colli.

Neck of first rib.

42 Give the relations of the first portion of the left subclavian.

In front.

Pleura and left lung.

Pneumogastric, cardiac, and phrenic nerves.

Left carotid artery.

Left internal jugular, vertebral, and innominate veins.

Sterno-thyroid, Sterno-hyoid, and Sterno-mastoid muscles.

Inner side.

Trachea

Oesophagus.

Thoracic duct.

*Outer Side.*

Pleura

Behind.

Oesophagus and thoracic duct.

Inferior cervical ganglion of sympathetic.

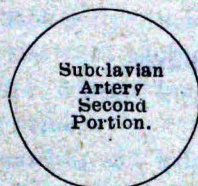
Longus colli and vertebral column.

43 Give the relations of the second portion of the subclavian.

In front.

Skin and superficial fascia.
 Platysma and deep cervical fascia.
 Sterno-mastoid.
 Phrenic nerve.
 Scalenus anticus.
 Subclavian vein.

Above.
 Brachial plexus.



Below.
 Pleura.

Behind.

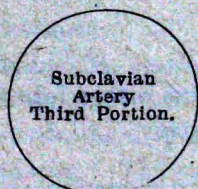
Pleura and Middle Scalenus.

- 44 Give the relations of the third portion.

In front.

Skin and superficial fascia.
 Platysma and deep cervical fascia.
 Descending branches of cervical plexus. Nerve to Subclavius muscle
 Subclavius muscle, suprascapular artery.
 The external jugular and transverse cervical veins.
 The clavicle.

Above.
 Brachial plexus.
 Omo-hyoid.



Below.
 First rib.

Behind.

Scalenus medius.

- 45 Give branches of the subclavian.

There are four branches, and all four—the vertebral, the internal mammary, the thyroid axis, and the superior intercostal, generally arise from the first portion of the vessel, on the left side, but on the right side the superior intercostal arises from the second portion of the vessel.

- 46 Give the branches of the vertebral.

Cervical—

Lateral Spinal.
 Muscular.

Cranial,—

Posterior Meningeal.
 Anterior Spinal.
 Posterior Spinal.
 Posterior Inf'r Cerebellar

- 47 What do the vertebral form?

- They form the basilar artery.
- 48 Give branches of the basilar.
 Transverse. Superior Cerebellar.
 Anterior Inferior Cerebellar. Posterior Cerebral.
- 49 Give branches of posterior cerebral.
 Postero-median Ganglionic. Postero-lateral Ganglionic.
 Posterior Choroid. Three Terminal.
- 50 Give branches of thyroid axis.
 Inferior thyroid.
 Suprascapular.
 Transversalis colli.
- 51 Give branches of the inferior thyroid.
 Inferior Laryngeal. Cesophageal.
 Tracheal. Ascending Cervical.
- Muscular
- 52 Give branches of the transversalis colli.
 They are the superficial cervical and the posterior scapular.
- 53 Give the branches of internal mammary.
 Comes Nervi Phrenici (Superior Phrenic). Anterior Intercostal.
 Mediastinal. Perforating.
 Pericardiac. Musculo-phrenic.
 Sternal. Superior Epigastric.
- 54 What divides the subclavian artery into three portions?
 The Scalenus anticus muscle

THE VISCERA.—Continued.

SUB-DIVISION—URINARY SYSTEM.

- 1 What is the function of the urinary system?

The double function of appropriation and elimination belongs both to the alimentary and the respiratory systems, each being concerned in the supply of new material, and also in casting off of effete substances, but the urinary system is simply excretory; its only office is relieving the body of certain waste products, which, if allowed to remain in it, would injure the organs and ultimately destroy life.

2 What are the organs of the urinary system?

They are the two kidneys, which form the urine from the materials furnished by the blood; the ureters, ducts which convey the urine away from the kidneys; the bladder, a reservoir in which the urine is stored until circumstances are convenient for its discharge, and the urethra, a tube through which the urine passes from the bladder and is finally voided.

3 What is the kidney (kite, the belly; neer, near)?

Thus from neer we get the word nephritis.

It is a glandular structure whose function is the purification of the blood by the excretion of the urine.

4 Give position, color, dimensions and weight of the kidneys.

They are situated in the loins, opposite the upper lumbar vertebrae, behind the peritoneum, embedded in fat and capped by the adrenals or suprarenal capsules.

The left is somewhat (about half an inch) higher than the right, which leaves room for the liver. They are purplish-brown in color, about four inches long, $2\frac{1}{2}$ broad and $1\frac{1}{4}$ thick; they weigh about $4\frac{1}{2}$ ounces.

5 What holds the kidneys in position?

They are held in place by their vessels, the peritoneum and the abundant fatty tissue in which they are embedded and which constitutes the "adipose capsule."

6 Give the relations of the kidneys.

The upper end of each kidney is capped by a suprarenal body, which laps over upon the front surface and inner border. The hind surface of each is in relation to the last rib, the diaphragm and the quadratus lumborum, and Psoas magnus muscles. The anterior surface of the right kidney is related from above downward to the suprarenal body, liver, duodenum, ascending colon, and jejunum-ileum. The anterior surface of the left kidney to the suprarenal body, spleen, stomach, pancreas, splenic flexure, descending colon and jejunum-ileum.

7 Give the structure of the kidney.

A section of the kidney displays an outer cortical substance, darker and softer than the rest, consisting chiefly of uriniferous tubules and malpighian corpuscles; the inner or medullary substance is composed of numerous distinctly striated conical masses or malpighian pyramids, whose bases are directed peripherally, while their apices converge toward the anterior, ending in papillae, which project into the cavity of the pelvis. There are from 8 to 18 such pyramids, composed mainly of minute straight and looped uriniferous tubules, which proceed from the cortical substance to open on the papillae. One such papilla or a set of several papillae, pro-

trudes into a compartment of the general cavity called a calyx: the calyces unite in three infundibula, the beginning of the general cavity of the kidney, the pelvis, which is also the funnel-shaped beginning of the ureter, the tube by which the urine passes to the bladder.

8 What is the hilum?

The hilum of the kidney is the place on the median or concave side of the kidney, corresponding to the place of the scar on the bean, where the ureter goes out and the vessels and nerves enter.

9 What is the capsule of the kidney, floating kidney, a surgical kidney?

The capsule of the kidney is a smooth fibrous membrane closely investing the kidney and forming its outer coat.

Floating kidney is one which has become loose and displaced in the abdomen.

Surgical kidney is a term somewhat loosely applied to nephritic conditions, secondary conditions to mischief farther down in the urinary tract, but especially to suppurative pyelonephritis arising from cystitis.

10 What is the pelvis or sinus of the kidney?

It is the concavity or re-entrance at the hilum of the kidney.

11 What are the calyces of the kidney?

They are the cup-like or infundibuliform beginnings of the ureter in the pelvis of the kidney, surrounding the apices of the malpighian pyramids, each receiving usually more than one pyramid. There are from 7 to 13 such calyces, converging and uniting in the infundibula, which in turn combine to form the pelvis.

12 What are the infundibula of the kidney?

(a) The calyces; (b) the two or three main divisions of the pelvis of the kidney, formed by the confluence of the calyces.

13 What are the papillae of the kidney?

They are the apices of the malpighian pyramids, also called mammillae.

14 What are the malpighian pyramids?

They are pale-reddish conical masses forming the medullary part of the kidney, whose apices project into the calyces of the pelvis of the kidney, and are called papillae.

15 What are the malpighian corpuscles or bodies?

They are the glomeruli of the kidney surrounded by its capsule. These form the terminations of the branches of the uriniferous tubules, occur in the cortical substance of the kidney, and are about 1-100 of an inch in diameter. They are formed of the expanded end of the tube invaginated by the bunch of blood-vessels constituting the glomerulus which thus are

embraced in a double epithelial sac, and the blood is separated from the lumen of the tubule by the vascular wall and the epithelium of the inner layer of the capsule. There is reason to think that these bodies do most of the secretion of the water and less important salts of the urine, the remainder of the work of secreting the urine being done by the epithelial cells of the uriniferous tubules.

16 What is a malpighian tuft?

It is the glomerulus or vascular network or plexus in a malpighian body.

17 Who was Malpighi?

Marcello Malpighi (1628-94) was an Italian anatomist and physiologist.

18 What is the cortical substance of the kidney?

It is the outer part of the kidney-substance, which contains the glomeruli.

19 What are the columns of Bertin?

Named after E. J. Bertin, a French anatomist (1712-81). They are the prolongations inwards of the cortical substance of the kidney between the pyramids.

20 What are the tubes of Ferrin?

These tubes make the pyramids of Ferrin.

They are in the cortical substance and are convoluted.

21 What are the pyramids of Ferrin?

They are formed by a bundle of straight renal tubules which constitute the medullary rays, so named on account of their radiation from the medulla.

22 What are the tubes of Bellini?

They are the excretory tubes opening on the papilla. They are straight tubes.

23 What are the tubes of Henle?

The tubes of Henle connect those of Bellini and Ferrin. They are looped tubes.

24 What is the capsule of Muller?

It is the dilated extremity of a tube of Ferrin investing the Malpighian tuft probably by two layers, similar to the pleural investment of the lungs.

25 Give nerve supply of the kidney?

From the renal plexus, which is formed by filaments from the solar plexus and the lesser splanchnic nerve.

26 Give blood supply of the kidney.

It is from the renal artery and renal vein. (a) afferent (vessels carrying to), (b) efferent vessels (carrying from).

The kidney is very vascular. The larger arterial branches, if traced in section from the point at which they pierce the bottom of the sinus, will be found to run up between the pyramids of Malpighi to subdivide at their bases into cortico-medullary arches which lie between the cortex and medulla, giving off arterioles in both directions, the cortical branches supplying afferent twigs to the glomeruli within the capsules of Bowman.

The medullary branches running inwards to form plexuses around the straight and looped tubules of the Malpighian pyramids. The efferent vessels of the Malpighian glomeruli form a capillary plexus around the uriniferous tubules and terminate in renal veins.

The surface of the kidney receives small collateral arteries which pass through the fatty capsule from the suprarenal, spermatic and lumbar vessels. The superficial veins appear in the form of little stellate groups (stars of Verhayen) which communicate with the venous plexus in the adipose capsule and by means of this with the visceral and parietal veins in the neighborhood.

They are very distinct when the organ is congested.

27 Give lymphatics of kidney.

The renal lymphatics may be divided into two sets, capsular and par-enchymatous. They terminate in a series of glands lying with the renal vessels in the subperitoneal tissue, and their contents are ultimately conveyed into the receptaculum chyli.

28 What is the ureter?

It is the excretory duct of the kidney; a tube conveying the urine to the bladder, where that structure exists, as in mammals or into the cloaca, in case no bladder exists. In man the ureter is a very slender tube, from 15 to 18 inches long, running from the pelvis of the kidney to the base of the bladder, at the posterior angle of the trigonum. It rests chiefly upon the Psoas muscles, behind the peritoneum. Its structure includes a fibrous coat, longitudinal and circular muscular fibres, and a lining of mucous membrane with vessels and nerves from various sources. The ureter pierces the wall of the bladder very obliquely, running for nearly an inch behind the muscular and mucous coats of that viscus.

29 Give arteries and nerves of the ureter.

The arteries are branches from the renal, spermatic, internal iliac, and inferior vesical.

The nerves are from the inferior mesenteric, spermatic and pelvic plexuses.

30 What is the bladder?

The bladder (*vesica urinaria*, "the urinary bladder," always being meant when the noun is not qualified) is the reservoir in which the urine is collected from the ureters.

31 How many coats has the bladder?

It has four: the mucous, which is nearest the cavity; and then, in order, the areolar, the muscular, and the serous.

32 What is the trigonum?

It is a triangular space or area at the base of the urinary bladder, whose apex is at the beginning of the urethra, and whose other two angles are at the points of entrance of the ureters into the bladder; more fully called *trigonum vesical*.

33 What is the form, size and position of the bladder?

When the bladder is collapsed, its mucous walls fall together in such a way that a sagittal section shows the line between them in the shape of a V with unequal and widely spread arms, the point of the V indicating the opening of the urethra.

It is 3x5 inches and holds about a pint.

In the child the bladder is almost an abdominal organ; but in the adult it is in the pelvis.

34 What is the urachus?

It is a fibrous cord extending from the fundus of the bladder to the umbilicus. It represents in the adult a part of the sac of the allantois and associate allantoic vessels of the fetus, whose cavities have been obliterated. It is that intra-abdominal section of the navel-string which is constituted by so much of the allantoic sac and the hypogastric arteries as becomes impervious, the section remaining pervious being the bladder and superior vesical arteries. It sometimes remains pervious, as a malformation, when the child may urinate by the navel.

35 What is the allantois?

A fetal appendage of most vertebrates, developing as a sac or diverticulum from the posterior portion of the intestinal cavity. It is one of the organs of the embryo of all amniotic vertebrates, or those which develop an amnion, but is wanting or is most rudimentary in amphibians and fishes.

In birds and reptiles it is large and performs a respiratory function, and in mammals contributes to form the umbilical cord and placenta. Its exterior primitively consists of mesoblast, its cavity receiving the secretion of the primordial kidneys (*Wolffian bodies*). So much of the sac as remains pervious within the body of the embryo becomes the urinary blad-

der, or, in some degree, a urinary passage.

The umbilical arteries and veins course along the elongated stalk of the sac, which becomes the umbilical cord, and that part of these allantoic vessels within the bony which does not remain pervious becomes the urachus or round ligament of the liver.

The expanded extremity of the allantois, in most mammals, unites with the chorion, to form the placenta. In those vertebrates, as mammals, in which the umbilical vesicle has but a short period of activity, the allantois chiefly sustains the functions whereby the fetus is nourished by the blood of the mother, and has its own blood arterialized. In parturition, so much of the allantois as is outside of the body of the fetus is cast off, the separation taking place at the navel.

36 What is the *uvula vesicæ*?

It is a slight projection of mucous membrane from the bladder into the cystic orifice of the urethra.

37 Give blood supply of bladder.

The arteries of the bladder are the superior and inferior vesical, and, in the female, the uterine also; its veins are radicles of the internal iliac.

38 Give its lymphatics

They accompany the veins and terminate in the internal iliac gland.

39 Give nerve supply of the bladder.

The nerves are derived partly from the sympathetic system through the hypogastric plexuses, partly from the cerebro-spinal system through the third and fourth sacral nerves. The former supply the mucosa, the latter the muscularis.

40 Give ligaments of the bladder.

The bladder is held in place by ligaments, which are divided into true and false.

The true ligaments are five in number: two anterior, two lateral, and the urachus (superior).

The false ligaments, also five in number, are formed by folds of the peritoneum. The false are named the two posterior, two lateral, and superior.

40 What is the urethra?

It, like "ureter," is derived from the Greek word which means to 'urinate'. The male and female urethræ differ so materially that a separate description of each is necessary.

It is a modification of a part of a urogenital sinus into a tube or a groove for the discharge of the secretion of the genital or urinary organs or both; in most mammals, including man, a complete tube from the bladder

to the exterior, conveying urine and semen in the male sex; urine, only, in the female; in some birds, a penial groove for the conveyance of semen only. The urethra in the male is always a part of the penis, or a penial urethra, continuous usually with the urethral part of the urogenital sinus; that of the female is only exceptionally a part of the clitoris. In man the urethra extends from the bladder to the end of the penis, usually a distance of 8 or 9 inches.

42 How many portions has the male urethra?

It has three portions—the prostatic, the membranous, the spongy—the structures and the relations of which are essentially different. Except during the passage of the urine or semen the urethra is a mere transverse cleft or slit, with its upper and under surfaces in contact. At the orifice of the urethra, at the end of the penis, the slit is vertical, and in the prostatic portion somewhat arched.

43 How long is each portion?

The prostatic is $1\frac{1}{4}$ inches long.

The membranous $\frac{3}{4}$ inch long.

The apomy 4 $\frac{1}{2}$ inches.

The first and second portions are not subject to any physiological changes such as characterize the third.

44 How many coats has the urethra?

It has three: mucous, muscular, and erectile.

45 What is the bulb of the urethra?

It is the posterior enlarged rounded extremity of the corpus spongiosum of the penis.

46 What is the crista urethrae?

It is the crest of the urethra; a longitudinal fold of mucous membrane and subadjacent tissue on the median line of the floor of the prostatic urethra, about three-fourths of an inch in length, and one-fourth of an inch in height where it is greatest. On the summit open the ejaculatory ducts, also called colliculus seminales, caput gallinaginis, and verumontanum.

47 What is the prostatic sinus?

It is a longitudinal groove in the floor of the urethra on each side of the crest, into which the prostatic ducts open.

48 What is the pocularis sinus?

A small cul-de-sac, from a quarter to half an inch in its greatest diameter, situated at the middle of the highest part of the crest of the urethra. It corresponds with the uterus of the female. Also called prostatic vesicle, utricule, uterus masculinus.

49 What are the semilunar ducts?

They open on the margins of the sinus pocularis.

50 What are Cowper's glands?

In various animals, a pair of accessory prostatic or urethral glands of lobulated or follicular structure, which pour a mucous secretion into the urethra. In man they are small, about the size of a pea, lying beneath the membranous portion of the urethra, close behind the bulb, and emptying into the bulbous portion of the tract. Their size, shape and position vary in different animals, in some of which they are much more highly developed than in man.

51 What is the fossa navicularis?

(a) It is a recess in the urethra, near the urinary meatus, where the calibre of the tube is enlarged.

(b) A depressed space between the posterior commissure of the vulva and the fourchette.

52 What is the lacuna magna?

It is the largest of several orifices of mucous follicles, situated on the roof of the fossa navicularis.

53 What are the glands of Littie?

They are the crypts along the spongy portion of the urethra.

54 What are the prostate glands?

The prostate ("standing in front") is a glandular body, situated around the initial portion of the urethra. It develops at puberty, atrophies after castration, and in certain animals increases in size during the breeding season.

55 What is the female urethra?

It is a tube beginning at the meatus urinarius internus in the bladder and ends at the meatus urinarius externus in the vulva. It is about $1\frac{1}{2}$ inches long, imbedded in the anterior wall of the vagina, perforating the triangular ligament, and surrounded by the fibres of the Compressor urethrae muscle. Its diameter is about $\frac{1}{4}$ inch, but it is capable of considerable dilatation, being surrounded by softer structures than those around the male urethra. When dilated far beyond its usual calibre, it does not lose its tone.

QUESTIONS AND ANSWERS ON VISCERA.—Continued.

SUB-DIVISION—SPINAL CORD AND BRAIN.

1 What is the spinal cord?

It is the terminal portion of the cerebro-spinal axis and extends from the foramen magnum, where it is continuous with the oblongata, to the first or second lumbar vertebra.

It gives off the spinal nerves and may be regarded as made up of a series of segments, from each of which springs a pair of nerves; it is divided into cervical, thoracic, lumbar, sacral and coccygeal regions, corresponding to the nerves and not to the adjacent vertebrae.

It is bilaterally symmetrical, like all other parts of the axis.

2 What enlargements has it?

(a) The cervical enlargement where the nerves from the arms come in.

(b) The lumbar enlargement where those from the legs come in.

3 What can be said of a cross section?

It exhibits a central H-shaped column of gray substance incased in white.

4 How is it developed?

It is developed from an involution of epiblast in connection with a notochord.

5 What is the neuron?

It is the cerebro-spinal axis in its entirety; the whole of the encephalon and myelon or brain and spinal cord, considered as one.

6 What is the myelon?

The spinal cord; the part of the cerebro-spinal axis which is not the brain.

7 What is the encephalon?

That part of the cerebro-spinal axis which is contained in the cranial cavity as a whole; the brain.

8 Give shape and weight of spinal cord.

It is cylindrical and is slightly flattened ventro-dorsally.

It weighs nearly an ounce. *1 1/2 oz*

9 What is the terminal cone?

The lumbar enlargement begins at the ninth thoracic vertebra, attains its greatest size at the twelfth thoracic, and thence rapidly dwindles in a "terminal cone," from the apex of which is a delicate prolongation, the "filum terminale."

10 What is the cauda equina?

From the tapering cone at the end of the cord proper, the nerve roots are very long and perpendicular in direction, and from their resemblance to a horse-tail, is called "cauda equina."

11 What are the membranes of the spinal cord?

They are the dura mater, arachnoid and pia mater.

12 What is the gray commissure of the spinal cord?

It is the connection of the two lateral crescentic masses of gray substance.

13 What is the central canal?

The gray commissure contains the central canal of the spinal cord, a minute channel, continuous with the fourth ventricle of the brain, from which it extends to the middle of the filum terminale. It is not patent in every part of its course.

14 What is the cerebro-spinal fluid?

It is a fluid between the arachnoid and pia mater membranes investing the brain and spinal cord.

15 How many columns and fissures has it?

The columns are the longitudinal masses of white matter of the spinal cord, and the fissures are the creases running from end to end.

The fissures are the ventro-median, which is deep; the dorso-median, which is shallow, and about a quarter of the way around to the front is a shallow dorso-lateral fissure, and between the dorso-lateral and dorso-median, but nearer the latter, is the dorso-intermediate fissure. The ventral roots of the spinal nerves come off on each side from a vertical strip of the surface which is about as far from the ventro-median fissure as the dorsal roots are from the dorso-median fissure. The dorsal roots come from the dorso-lateral fissure.

Each lateral half of the cord is divided into three parts: one between the ventro-median fissure and the ventral roots—the ventral (anterior) column; a second between the ventral roots and the dorsal roots—the lateral column; and a third between the dorsal roots (or dorso-lateral fissure) and the dorso-median fissure—the dorsal (posterior) column, which is subdivided by the dorso-intermediate fissure into the dorso lateral column, and dorso-mesial column. All of the structures are composed of white nervous tissue.

Thus you see there are eight fissures and eight columns.

16 What are the columns or tracts of Goll?

The median portion of the posterior column of the spinal cord.

The Goll tract increases in size as it ascends.

17 What are the columns or tracts of Burdack?

The external portions of the posterior columns of the spinal cord. The Burdack tract varies but little from its average at different levels.

18 How long is the spinal cord?

About 17 inches in length, and its diameter one-half inch or less.

19 What are the columns of Clarke?

The columns of Clarke, vesicular columns of Clarke (after J. A. L. Clarke, an English anatomist, 1817-80), are two symmetrically placed tracts of medium-sized nerve cells of the spinal cord, laterodorsal of the central canal, confined chiefly to the thoracic region, but a little above and below it.

20 What is the brain and how many divisions has it?

It is the encephalon; the part of the cerebro-spinal axis which is contained in the cranium. Its divisions are the cerebrum or brain proper, the cerebellum or little brain, the pons Varolii, and the medulla oblongata.

21 What is the average weight of the brain?

In the male 49.5 ounces, in female 44 ounces.

Cuvier's brain weighed more than 64 ounces. The human brain weighs more than that of any other animal, except the elephant and whale. The elephant's brain weighs about 10 lbs; that of the whale 5 lbs.

22 What are the coverings of the brain?

They are the same as those of the spinal cord—the dura mater, the arachnoid, and the pia mater.

23 What is the cortical layer of the brain?

Like the bark (cortex) of a tree the cortical layer covers the surfaces of the brain. It is composed of cellular nerve-material.

24 What are the fissures or sulci?

They are the infoldings of the cortex, and the more numerous and deeper they are the greater is the amount of the peripheral gray substance.

25 What kinds of matter are in the brain?

Gray matter and white matter. The gray matter, which invests the cerebellum and cerebrum, is also called the cortical substance, in distinction from the white or medullary substance of the interior. The brain is, in fact, a collection of gray ganglia united by white commissures.

26 Is there any gray matter besides the cortex?

There are several ganglia or collections of gray matter in the interior, as the corpora striata, the optic thalami, the optic lobes or corpora quadrigemina, the corpora dentata of the cerebellum, and the corpora olivaria of the medulla oblongata.

27 Are there any non-nervous structures connected with the brain?

There are two non-nervous structures, the conarium or epiphysis cerebri and the pituitary body or hypophysis cerebri.

28 What are the convolutions or gyri (Anglicized into gyres)?

They are the prominences between the fissures or sulci.

29 Name the principal fissures of the cerebrum.

(a) The longitudinal fissure which separates the two hemispheres.

(b) The Sylvian fissure is the largest, deepest and most constant of the fissures of the brain. It has a short anterior and long posterior branch, the latter separating the temporal from the parietal lobes. It has the middle ^{cerebral} ~~meningeal~~ artery in it

(c) The fissure of Rolando or central fissure is a deep sulcus separating the frontal and parietal lobes of the cerebrum on each side.

(d) Parieto-occipital fissure extends from the longitudinal fissure outwards for about one inch between the parietal and occipital lobes.

(e) The Transverse fissure is a crevice through which the invagination of the pia is effected, it starts from the porta (foramen of Monro) nearly to the distal end of the middle horn on each side. It is at the base of the brain. It is also called choroid fissure.

(f) Calloso-marginal fissure is nearly concentric with the callosal and also with that of the margin of the hemisphere until a point above the hind end of the callosum is reached, at which the fissure turns, and runs upward and ^{backward} ~~downward~~ to the upper border.

(g) Calcarine fissure, (from calcar, 'a spur') runs from near the rather pointed hind end of the hemisphere upward and forward, and just beyond the middle, at the point where it receives the parieto occipital, bends downward and terminates beneath the rear end of the callosum. Encircling the callosum is a fissure, called the callosal.

(h) First temporo-sphenoidal fissure is below the fissure of Sylvius on the lateral surface of the brain.

30 What is the corpus callosum?

The corpus callosum (callous body) is the great white commissure of the hemispheres of the brain; the commissura magna or trabs cerebri. This structure is peculiar to the mammalia; it is first found in a rudimentary state in the implacentals, and increases in size and complexity to the highest mammals, coincidentally with a degree of other special cerebral commissures.

Also called callosum.

31 Name principal lobes of the cerebrum.

1. Frontal lobe is the anterior one of the cerebrum, separated from the parietal by the fissure of Rolando or central fissure.

2 Parietal lobe is the middle one of the vault of the cerebrum, separated from the frontal by the central fissure, or fissure of Rolando and marked off from the occipital by the parieto-occipital fissure. It is divided by an intra-parietal fissure into a superior and inferior parietal lobe. The frontal and parietal lobes which overlap the insula are known as the oper-

culum ("cover").

3. Occipital lobe is the posterior portion of the cerebrum marked off from the parietal lobe by the parieto-occipital fissure.

4. Temporo-sphenoidal lobe, also called temporal, is the lobe of the cerebrum which occupies the middle cerebral fossa of the skull, it is separated from the frontal and parietal lobes by the fissure of Sylvius.

5. The central lobe or Island of Reil is also called the lobule of the Sylvian fissure, lobule of the corpus striatum, is a portion of the cerebral cortex concealed in the Sylvian fissure, consisting of five or six radiations, convolutions, or the gyri operati ("covered gyri").

31a What are the gyri or convolutions of the cerebrum?

Every gyri in man has its own name; but several different systems of naming them are in vogue, and the nomenclature is still shifting. The attempt to identify the human gyri and sulci with those of other animals encounters difficulties which have thus far been insurmountable except in cases of the most constant and best-marked folds and fissures. Again different human brains vary in details of the gyri, and the same brain may differ on its opposite sides. The gyri are best marked when the mental powers of the individual are at their height.

Gyrus is synonymous with convolution.

32 Name the principal gyri.

1. Angular gyrus is a short one, arching over the upper extremity of the superior temporal fissure, the hindmost one of the four parietal gyri, separated by a short vertical sulcus from the supra-marginal gyrus.

2. Annectent gyrus is a small fold which may connect large or primary convolutions; applied to several such gyri on the occipital lobe, as those forming the connections of the cuneus or occipital lobule.

3. Ascending frontal gyrus is the one bounding the fissure of Rolando in front.

4. Ascending parietal is the one bounding the fissure of Rolando behind.

5. Callosal gyrus is a convolution of the median surface of the cerebrum immediately over the corpus callosum and below the calloso-marginal fissure. It is continuous behind with the gyrus hippocampi, and ends in the gyrus uncinatus, also called gyrus fornicatus, convolution of the corpus callosum.

6. Cuneate gyrus is one of the occipital lobe appearing as a wedge-shaped figure on the median aspect of the cerebrum in the fork between the parieto-occipital sulcus and the calcarine sulcus, also called occipital lobule and cuneus.

7. External orbital gyrus is that part of the orbital surface which lies outside of the triradiate sulcus.

8. The frontal gyri, three gyri which compose the superior and lateral surface of the frontal lobe of the cerebrum, all lying in front of the ascending frontal gyrus. They are defined by the superior and inferior frontal sulci, and by the vertical fissure or precentral sulcus.

9. The hippocampal gyrus is the continuation of the gyrus fornicatus where it dips down behind and below the corpus callosum, and continues forward to the uncinate gyrus; so called from its relation to the hippocampus.

10. Marginal gyrus:—

That part of the first frontal convolution which appears on the median side of the hemisphere.

The gyrus which arches over the extremity of the fissure of Sylvius

11. Occipital gyri are the three principal convolutions of the occipital lobe of the cerebrum, separated by two small, transverse sulci, and distinguished as first, second and third; from above downward, superior, middle and inferior.

12. The orbital gyri are upon the under or orbital surface of the frontal lobe of the cerebrum, which rest upon the orbital plate of the frontal bone. They are three in number, directly continuous with and corresponding to the frontal gyri. The two which are best marked are sometimes called internal and external.

13. The parietal gyri are four well-marked convolutions upon the superior and lateral surface of the parietal lobe; and especially two of these distinguished as the ascending parietal (or posterior central) and the superior parietal, the other two being commonly known as the supramarginal and angular gyrus.

14. Quadrate, or quadratus gyrus, is a convolution of somewhat square figure appearing on the median surface of the cerebrum between the callosum marginal sulcus in front and the parieto-occipital sulcus behind, and continuous below with the gyrus fornicatus, also called precuneus.

15. Sigmoid gyrus is the somewhat S-shaped fold which curves about the lateral end of the cruciate fissure, and whose surface includes several constant and well-marked "motor areas"

16. The temporal gyri, a general name of the temporal convolutions.

17. Uncinate gyrus is on the median surface of the cerebrum nearly opposite the gyrus fornicatus.

18. Gyri operi ("covered gyrus") is the insula.

19. The dentate gyrus is lodged in the hippocampi fissure, and is a long, slender roll of gray substance, notched upon its exposed surface.

33 What are the ganglia at the base of the brain?

Besides the gray matter of the cerebral hemispheres of the cerebellum and the medulla oblongata the—

(a) Olfactory bulb which is the anterior enlargement of the olfactory tract from which the olfactory nerves are sent off

(b) Corpora-striata (striped bodies) are large ganglia of the brain, of mixed white and gray substance, situated beneath the anterior horn of each lateral ventricle of the cerebrum.

(c) Optic thalami is a large ganglion of the thalamencephalon, situated upon the crus and separated from the lenticular nucleus by the internal capsule; also called thalamus. It gives origin to some of the fibres of the optic nerve.

(d) Tubercula Quadrigemina are on the dorsal part of the midbrain. The lobes are paired, right and left, and hence called corpora bigemina in animals below mammals. In man they are marked by a cross-furrow, so they are called corpora quadrigemina, and constitute what are called the nates and testes of the brain. The optic nerve arises in part from the optic lobes.

(e) Tuber annulare is the annular tuber of the brain, the pons Varolii.

34 What is a commissure?

A joint, seam, suture or closure; the place where two bodies or parts of a body meet or unite.

35 Name the transverse commissures of the brain.

There are nine of these—

1 Anterior-Commissure.

2 Middle Commissure.

3 Posterior Commissure.

4 Corpus Callosum.

5 Optic Commissure.

6 Pons Varolii.

7 Fornix, which is a longitudinal commissure also.

8 Posterior medullary velum. = *any veil-like organ*

9 Valve of Vieussens. *ve - uh - saung.*

36 Name the longitudinal commissures of the brain.

There are ten of these—

1 Olfactory tracts.

2 Taenia Semicircularis.

- 3 Crura Cerebri.
- 4 Processus-e-Cerebello ad Testes.
- 5 Peduncles of the Pineal gland.
- 6 Fornix.
- 7 Infundibulum.
- 8 Lamina Cinerea.
- 9 Gyrus Fornicatus.
- 10 Fasciculus unciformis.

37 What is a ventricle?

Literally a belly, a stomach.

A small cavity.

Those of the brain are a series of connecting cavities, containing fluid, within the brain, continuous with the central cavity of the spinal cord. They are the remains of the original neural canal, formed by a folding over of the epiblast.

38 Bound the optic commissure.

The commissure or chiasma, somewhat quadrilateral in form, rests upon the optic groove of the sphenoid bone, being bounded, above, by the lamina cinerea; behind, by the tuber cinereum; on either side, by the anterior perforated space. Within the commissure the optic nerves of the two sides undergo a partial decussation. The fibres which form the inner margin (inferior commissure of Gudden) of each tract are continued across from one to the other side of the brain. These may be regarded as commissural fibres (intercerebral) between the internal geniculate bodies. Some fibres are continued across the anterior border of the chiasma, and connect the optic nerves of the two sides, having no relation with the optic tracts. They may be regarded as commissural fibres between the two retinæ (inter-retinal fibres). The outer fibres of each tract are continued into the optic nerve of the same side. The central fibres of each tract are continued into the optic nerve of the opposite side, decussating in the commissure with similar fibres of the opposite tract.

39 What are the names of the ventricles?

Two lateral, third ventricle, fourth ventricle, fifth ventricle, and the ventricle of the corpus callosum.

40 Where are they found?

The lateral ventricles are found one in each hemisphere; they communicate with each other and with the third ventricle through the foramen of Monro. The third ventricle lies between the optic thalami. It communicates with the fourth ventricle through the aqueduct of Sylvius. The fourth ventricle lies between the cerebellum and the pons and medulla. The

so called fifth ventricle, or pseudocoele, has no connection with the other cerebral ventricles, being of a different nature and simply a small interval between the right and left layers of the septum lucidum

41 What is the septum lucidum?

It is the median partition of the lateral ventricles of the brain, inclosing the camera, pseudocoele or so-called fifth ventricle. Also called septum pellucidum, septum medium, septum ventriculorum, ventricular septum, septum medullare triangulare.

42 What is the fornix?

It is an arch. In the human brain it consists of two longitudinal bundles of fibres, one on each side, which rise from the corpora albicantia, pass up, as the anterior pillars of the fornix in front of the foramina of Monro and behind the anterior commissure, these, somewhat flattened and in apposition to each other, arch backward beneath the corpus callosum and above the velum interposition, forming the body of the fornix and then diverge toward the back part of the corpus callosum, to turn down, as the posterior pillars of the fornix (crura fornicis), into the floor of the descending cornua of the lateral ventricles, where their free edges form the fimbriae.

42 What is the fimbria?

It is narrow band of white fibres running along the median concave side of the hippocampus major. It is a continuation of the pillars of the fornix. Also called taenia hippocampa and corpus fimbriatum.

43 What is the taenia semilunaris?

It consists of commissural fibres between the corpus striatum and the optic thalamus.

44 What is the cerebrum?

It is that portion of the brain which lies in front of the cerebellum and pons Varolii. It comprises about seven-eighths of the weight of the brain. It is the center of intelligence and thought.

45 What is the cerebellum?

It is called the arbor-vitae or tree of life. It is the center for the control of muscles. It is between the corpora quadrigemina in front and the medulla oblongata behind, and forming part of the roof of the fourth ventricle.

46 What is the pons?

Also called pons Varolii and pons cerebelli. It is a great transverse commissure seen at the base of the brain in front of the medulla. Its fibres connect the hemispheres of the cerebellum with each other and the medulla.

47 What is the medulla oblongata?

(a) Marrow; (b) the so-called spinal nervous system; the myelon; more fully called medulla spinalis; (c) the hind most segment of the brain, continuous with the spinal cord.

48 What is the penial gland?

Also called conarium and epiphysis.

It is a small reddish body developed from the hinder part of the roof of the first cerebral vesicle, and lying in front of and above the nates. Its substance consists mainly of epithelial follicles and connective tissue; there is no evidence that it is a nervous structure, and its function, if it passes any, is unknown. It was formerly supposed by some (as by the Cartesians) to be the seat of the soul.

49 What is a peduncle?

Literally a little foot. There are numerous peduncles of the brain.

50 Name those of the cerebellum

They are three pairs in number and are stout bundles of nerve fibres which connect the cerebellum with other chief divisions of the brain. They are distinguished by their positions as superior, middle and inferior peduncles or crura. The superior pair emerge from the mesial part of the medullary substance of the hemispheres, and run forward upward to reach the nuclei tegmenti of the opposite sides, after decussation under the formatio reticularis. (also called crura ad corpora quadrigemina, crura ad cerebrum, processus cerebelli ad cerebrum, processus e-cerebello ad testes, brachia conjunctiva, and brachia conjunctoria).

The middle pair from the ventral transverse fibres of the pons, emerging from the lateral part of the white substance of the hemispheres. (Also called crura or processus ad medullam).

51 Name the fissures of the cerebellum.

They are three in number—two vertical and one horizontal. The great horizontal fissure of the cerebellum is a continuous fissure which separates the cerebellum into upper and lower portions. It begins in front at the middle peduncles, and extends around the outer and posterior border of each hemisphere. The vertical ones are:

1. Incisura cerebelli anterior, the anterior median notch of the cerebellum, into which the corpora quadrigemina are received.

- (2) The incisura cerebelli posterior, the median notch on the posterior outline of the cerebellum, formed by the projection of the cerebellar hemispheres beyond the vermis.

52 What is the vermis?

It is the median lobe of the cerebellum; the vermiform process of the cerebellum divided into the prevermis and postvermis

53 What is the olivary body?

It is the ganglion of the oblongata lying on either side just lateral of the pyramid, and forming an oval projection on the surface just below the pons. It consists of the nucleus olivaris inferior with a covering and filling of white matter, also called inferior olivary body, or inferior olive, and corpus semiovale.

54 What is the corpus dentatum?

(a) A plicated capsule of gray matter, open anteriorly, situated within the white substance of each cerebellar hemisphere. Also called ganglion of the cerebellum and nucleus dentatus.

(b) A somewhat similar mass of gray matter in each olivary body. Also called corpus ciliare.

55 What is the lateral tract?

It continues with the lateral column of the spinal cord, lies behind the olivary body and in front of the restiform.

56 What is the restiform body?

It is the inferior peduncle of the cerebellum, by which it connects with the oblongata and parts below. It contains the direct cerebellar-tract fibres, crossed and uncrossed from the posterior columns of the cord, and fibres from the centro-lateral (lower) olive.

57 What is the fillet?

Some special bundle of nerve-fibers; especially, a band of longitudinal fibers lying in the ventral and outer parts of the tegmental region of the brain. Its distribution is not known, but it seems to connect below with the posterior columns of the spinal cord and above with the corpora quadrigemina, optic thalami, lenticular nucleus, and cortex cerebri.

Also called lemniscus.

58 What is a vesicle?

A small, bladder-like structure, cavity cell, or the like, in a body.

59 How many vesicles are there in the brain?

There are three: anterior, middle and posterior. They are embryonic and so transitory, and have other names when matured. They are called anterior, middle and posterior corresponding to the fore-brain, mid-brain and hind-brain.

They are primitive structures and become the ventricles of the brain. The three commonly become five by the subdivision of two of them.

A FEW MISCELLANEOUS QUESTIONS.

1 What is the perineum?

Origin uncertain.

(a) It is the region of the body between the thighs, extending from the anus to the fourchette in the female, or the scrotum in the male. In the surgical and obstetrical sense of the word the term may include, in the female, all the deeper parts between the posterior wall of the vagina and the anterior wall of the rectum, or it may be more particularly applied to the superficial parts, the deeper parts receiving the name of perineal body.

(b) The region included by the outlet of the pelvis extending from the apex of the subpubic arch in front to the tip of the coccyx behind, and bounded laterally by the conjoined pubic and ischiatic rami, the tuberosities of the ischia, and the great sacro-sciatic ligaments.

It is occupied by the termination of the rectum, the uretra, the root of the penis in the male, or the termination of the vagina, the vulva, and the clitoris in the female, together with their muscles, fasciae, vessels, and nerves. In this sense, the division in front of the anus is termed the urethral part or the true perineum, and the posterior division, including the anus, is termed the anal part, ischio-rectal region, or the false perineum.

2 What is the ischio rectal fossa?

It is a deep pit in the perineum, on each side of the lower end of the rectum, between that and the tuberosity of the ischium, of triangular pyramidal form, its base directed to the integument of the parts, its apex corresponding to the divergence of the Levator ani from the Obturator muscle. It is founded internally by the Sphincter and Levator ani and Coccygeus muscles, behind by the edge of the Gluteus maximus and great sacro-sciatic ligament, and is filled with a mass of adipose connective tissue, the frequent site of abscesses.

3 What is the uterus?

It is that part of the female sexual passage to which a ripe ovum is conveyed from the ovary, and in which it is detained in gestation until the fetus is matured and expelled in parturition. The non-pregnant human uterus is a pear-shaped organ about 3 inches long; with a broad, flattened part above (the body), and a narrow, more cylindrical part below (the cervix). Within is a cavity which passes out into the Fallopian tube on each side above, and below opens into the vagina. The cavity narrows as it passes into the cervix at the internal os, and continues downward to the cervical canal, to terminate at the external os uteri or os tincae. The uter-

us is supported by the broad ligament, a transverse fold of peritoneum which embraces it on each side, and by accessory ligaments, such as the round, vesico-uterine, and recto-uterine ligaments. It consists of a [serous or peritoneal coat, a middle coat of smooth muscular fibres, forming most of its thickness, and an epithelial lining.

4 What are the Fallopian tubes?

They are a pair of ducts extending from the ovary to the uterus, conveying ova. In the human female they are three or four inches long, and lie between the folds of the peritoneum which constitute the broad ligament of the uterus on each side, near the upper border of these folds, and consist of a serous, a muscular and a mucous coat.

The outer or ovarian end is fringed with processes, and called the fimbriated extremity, or *morsus diaboli*, which is more or less closely applied to the ovary. One of these oviducts, right or left, receives the ripened ovum on its escape from the ovary, and conducts it into the womb.

5 What is the ovary?

That part of the female animal in which ova eggs or germs are generated or matured, the essential female organ of reproduction, corresponding to the testes of the male; the female genital gland or germ gland; the ovarium. The ovary in woman is a flattened ovoid body about $1\frac{1}{2}$ inches long, $\frac{3}{4}$ inch wide, and $\frac{1}{8}$ inch thick, resting on the broad ligaments of the uterus and closely connected with the Fallopian tubes or oviduct.

6 What is the heart?

It is a hollow, muscular or otherwise contractile organ which receives blood in its interior and by contraction drives it out again, and thus keeps up the circulation of the blood

1. How many chambers has it?

It has four: right auricle, right ventricle, left auricle, left ventricle.

2. Where is the tricuspid valve?

It is between right auricle and right ventricle.

3. Where is the bicuspid or mitral valve?

It is between the left auricle and left ventricle.

4. Give dimensions.

About $5 \times 3\frac{1}{2} \times 2\frac{1}{2}$ inches, and weighs from 8 to 12 ounces.

Its apex is felt between 5th and 6th costal cartilages on left side.

7 What is the pericardium (around and heart)?

It is a somewhat conically shaped membranous sac, inclosing the heart and the origin of the great vessels. It is composed of two layers, an outer fibrous one, dense and unyielding in structure, and an inner serous one, re-

flected on the surface of the viscus. Its apex is above while the apex of the heart is below. The pericardium forms one of the coverings of the upper surface of the Diaphragm. Between the serous and fibrous coats there is a thin fluid for lubricating the surfaces. There is about one drachm in quantity normally.

8 What is the endocardium (within and heart)?

It is the lining of the heart, as distinguished from the pericardium, or investing membrane of that organ; the membranes forming the inner surface of the walls of the cardiac cavities, or the surface itself. It forms by its reduplications, the cardiac, aortic and pulmonary valves, and is continuous with the lining membrane of the greater vessels.

9 What is diastole?

It is the normal rhythmical dilatation or relaxation of the heart or other blood-vessels which alternates with a systole or contraction, the two movements together constituting pulsation or beating; as auricular diastole, ventricular diastole.

10 What is systole?

It is the contraction of the heart and arteries for propelling the blood and thus carrying on circulation.

11 What is the position of the heart?

It lies obliquely in the chest with its broad fixed base uppermost, a little backward and to the right; its free apex downward, forward and to the left, so that its beating may be seen or felt at a point an inch or less to the inner side of, and about an inch and a half below, the left nipple between fifth and sixth ribs.

12 What are the nerves of the heart?

They are derived from the cardiac plexuses, formed by the pneumogastric and sympathetic nerves. Its actions are involuntary.

13 The nerves of the heart are derived from how many sources?

From three sources:

- (1) From nerve cells buried in its own substance and known as the intrinsic ganglia.
- (2) From the tenth pair (pneumogastric) of cranial nerves
- (3) From the sympathetic nervous system.

The intrinsic ganglia keep the heart beating, and the other two sets of nerves control the rate and force of the beat.

14 What is a motor nerve?

Any nerve whose function is to excite muscular contraction, and thus effect movement in an animal body. Most nerves are of mixed character or sensorimotor, effecting both motion and sensation.

15 What is a sensory nerve?

A nerve conveying sensory impulses, or, more strictly, one composed exclusively of sensory fibers; nearly equivalent to afferent nerve.

16 What are vaso-motor nerves?

Those which supply the muscular coats of the blood-vessels

17 What is a nerve-center?

It is a group of ganglion-cells closely connected with one another and acting together in the performance of some function, as the cerebral centers, psychical centers; respiratory or vaso-motor centers.

18 What is the shape of the eye?

It is spheroidal in shape, but consists of the segments of two spheres, a portion of the smaller sphere forming its anterior transparent part, and being set on the front of the posterior segment, which is a part of the larger sphere.

19 How many and what coats has it?

It consists of three coats—sclerotic, choroid and retina

- (a) The sclerotic coat is an opaque, white, dense, fibrous, inelastic membrane, continuous with the cornea in front, the two forming the external coat of the eyeball.
- (b) The choroid is a delicate, highly vascular membrane, forming one of the coats or tunics of the eyeball, lining the sclerotic, and lying between it and the retina, with which it is in contact by its inner surface.
- (c) The retina is the innermost and chiefly nervous coat of posterior part of eyeball, between the choroid coat and vitreous humor. It may be divided into ten layers.

20 How many and what refracting media has the eyeball?

It has three—the aqueous humor, the crystalline lens, the vitreous humor.

- (a) The aqueous humor is a limpid, watery fluid which fills the space between the cornea and the crystalline lens of the eye.
- (b) The crystalline humor or lens is a lentiform pellucid body, composed of transparent firm substance, inclosed in a membranous capsule, and situated in front of the vitreous humor and behind the iris of the eye.
- (c) The vitreous humor is a pellucid gelatine substance which fills about four-fifths of the ball of the eye, behind the crystalline lens.

EXAMINATION QUESTIONS WHICH WERE USED JUNE 20, 1899,
FOR THE FIRST TERM STUDENTS IN THE AMERICAN
SCHOOL OF OSTEOPATHY.

I

1. Define Anatomy—Name its nine divisions.
2. Group muscles of forearm and give nerve supply.
3. Name muscles of hand and give nerve supply.
4. Name the structures which pass through the six openings of the posterior annular ligament.
5. Name the muscles attached to the external intermuscular septum and the structures which pass through it.
6. The same for internal intermuscular septum. Give relations of radial artery.
7. Name the structures which pierce the costo-coracoid membrane. Name bones of nasal fossa: of orbit.
8. Give anastomosis of elbow; name bones of the wrist.
9. Origin and insertion of Supinator longus.

II

1. Name muscles in gluteal region; give origin and insertion of Tibialis anticus.
2. Tell what structures pass through greater and lesser sacro-sciatic foramina.
3. Give relations of femoral artery.
4. Bound Scarpa's triangle. Give floor of same.
5. Bound popliteal space.

III

1. Name five triangles of neck, (draw) Give boundaries of the same.
2. Name the twelve cranial nerves—tell how each leaves the cranium.
3. Give rule for branches and roots of spinal nerves.
4. Draw the Brachial plexus.
5. Name the structures which pass through the three lacerated foramina.
6. Give blood supply and muscles of the temporal bone.

Admissions
W 27
29
30
+ 8

... nerve is
called Bell's Paralysis

Par. of 5th is Lie Duden

Ant. com. is shortest artery in
body

