



Important Instructions to examiners:

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q.N.	Answer	Marking Scheme
Q1		Attempt Any TEN of the following	20
	a)	Define repolarization and depolarization. Ans: Repolarization: Repolarization refers to the change in membrane potential that returns it to a negative value just after the depolarization phase of an action potential has changed the membrane potential to a positive value. The repolarization phase usually returns the membrane potential back to the resting membrane potential. Depolarization: It is the process of reversing the charge across a cell membrane. So causing action potential. In depolarization the inside of the membrane, which is normally negatively charged, becomes positive and outside negative.	1 1
	b)	Give function of blood. Ans: a) It transports oxygen and nutrients to various tissues. b) It transports waste products to organs of excretion. c) It carries hormones from endocrine glands to various tissues. d) It redistributes water from one part of body to the other. e) It contains antibodies and white blood cells which protects the body from diseases. f) Clotting of blood protects against hemorrhage.	2



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	<p>c) Give classification of bones. Ans: 1. Long bone. 2. Short bone. 3. Flat bone. 4. Irregular bone. 5. Sesamoid Bones.</p>	2
	<p>d) List instrument related to heart. Ans:</p> <ol style="list-style-type: none">1. ECG machine.2. Defibrillator.3. Pacemaker.4. Heart lung machine.5. Heart rate meter.6. Phonocardiograph.7. Sphygmomanometer.	2
	<p>e) State any two properties of cardiac muscles. Ans: Properties: 1) Contractility: by contraction of the cardiac muscle the heart pumps the blood out of its chamber. 2) Conductivity: The impulses for cardiac contraction are conveyed through specialized conduction system. 3) Rhythm city: The heart muscle has the inherent property of rhythmic contraction. Cardiac contraction occurs in a regular faction. The two atria and ventricles contracts alternately. 4) Refractory Period: during systole the heart does not respond to any other stimuli, however strong it may be. This is called as refractory period.</p>	1 each
	<p>f) State the function of pharynx and larynx. Ans: Pharynx Function- Passageway for air and blood. The pharynx is an organ involved in both the respiratory and the digestive system. Larynx Function – It consist of vocal cord which helps for production of voice.</p>	1 1
	<p>g) List instruments related to respiratory system. Ans:</p> <ol style="list-style-type: none">1. Spirometer.2. Ventilator.3. Respiration rate meter.4. X-ray.5. Nebulizer.	2



	h)	Name the organs involved in the digestive system.(any four) Ans: 1. Mouth. 2. Pharynx. 3. Oesophagus. 4. Stomach. 5. Small intestine. 6. Large intestine. 7. Rectum. 8. Anus.	½ each
	i)	Name the organs involved in the urinary system. Ans: 1. Kidney 2. Ureters 3. Urinary bladder 4. Urethra	2
	j)	List the endocrine glands. Ans: 1. Pineal gland 2. Pituitary gland 3. Pancreas 4. Ovaries 5. Testes 6. Thyroid gland 7. Parathyroid gland, 8. Hypothalamus and 9. Adrenal glands.	2
	k)	State the function of joints. Ans: 1. It allows movement in one direction only. 2. It allows rotational movement such as elbow. 3. It gives gliding movement. 4. Two pairs of articular surfaces allow movement in one direction only. For eg Knee.	2
	l)	Define (i) Heart rate (ii) Pulse rate Ans: i) Heart rate: Heart rate is the speed of the heartbeat measured by the number of contractions of the heart per minute (bpm) ii) Pulse rate: The rate of the arterial pulse usually observed at the wrist and stated in beats per minute.	1 1



	<p>m) State any two respiratory parameters. Ans:</p> <ol style="list-style-type: none">1. Tidal Volume: The volume of gas inspired or expired (exchanged with each breath) during normal quiet breathing is known as tidal volume2. Expiratory Capacity: After normal inspiration the maximum amount of air that can be forced out is called expiratory capacity.3. Vital Capacity: The greatest volume that can be inspired from the resting end expiratory position.4. Expiratory reserve Volume: The volume of gas remaining after a normal expiration less the volume remaining after a forced expiration.5. Residual volume: The volume of air remaining in the lungs after a maximal exhalation.6. Inspiratory reserve volume: The maximal amount of additional air that can be drawn into the lungs by determined effort after normal inspiration.7. Vital Capacity: The greatest volume that can be inspired from the resting end expiratory position.8. Inspiratory capacity: This is amount of air that can be inspired with maximum effort.9. Functional residual capacity: This is the amount of air passages in the air the end of quit expiration.	<p>1 each</p>
	<p>n) Give classification of blood vessel Ans:</p> <p>There are three major types of blood vessels:</p> <p>the arteries, which carry the blood away from the heart;</p> <p>the capillaries, which enable the actual exchange of water and chemicals between the blood and the tissues; and</p> <p>the veins, which carry blood from the capillaries back toward the heart.</p>	<p>2</p>



Q2

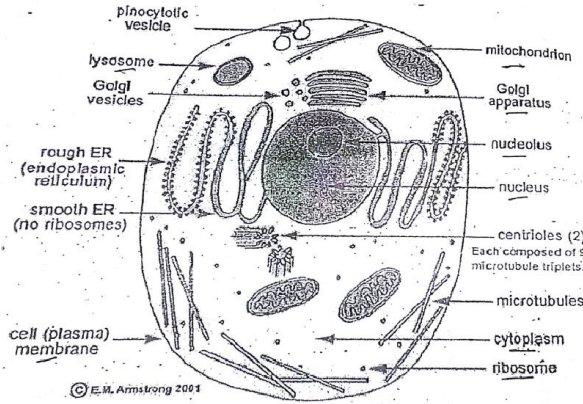
Attempt any TWO of the following:

16

a)

Draw and label the different organelles of the cell also state the function of each organelles.

Ans:



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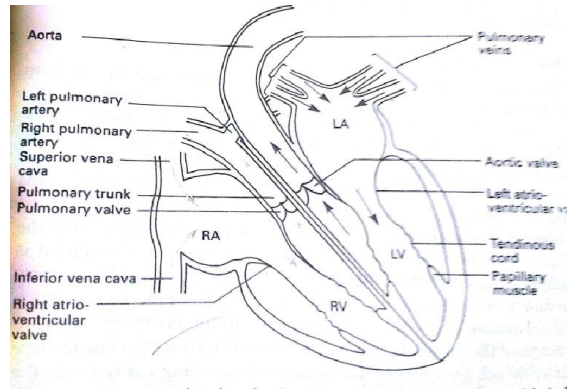
Name	Function
Cell Membrane	<ul style="list-style-type: none"> • Separates the cell from outside environment • Selectively permeable
Cell Wall	<ul style="list-style-type: none"> • Additional support, protection • Gives cell its shape
Nucleus	<ul style="list-style-type: none"> • Controls the cell activities
Nuclear membrane/ Envelope	<ul style="list-style-type: none"> • Allows material to move into & out of Nucleus (RNA pass through pores)
Nucleolus	<ul style="list-style-type: none"> • Assembly of ribosomes take place here
Cytoplasm	<ul style="list-style-type: none"> • Chemical reactions take place here
Ribosome	<ul style="list-style-type: none"> • Site of protein synthesis
Golgi Apparatus	<ul style="list-style-type: none"> • Sorts & packs protein into vesicle & transports them
Lysosome	<ul style="list-style-type: none"> • Digests food, bacteria, worn out organelle

4



b) With the help of neat labeled diagram explain the working of heart.

Ans:



Heart pumps the blood to drive the blood vessels as well as it receives the blood from different parts of the body. Blood collects from all parts of body by superior and inferior vena cava which are the largest veins collects deoxygenated blood in right atria, through right atria blood passes towards right ventricle. A right ventricle collects blood by atrioventricular orifice guarded by tricuspid or right atrioventricular valve, from here passes towards through pulmonary artery or trunk. After oxygenation of blood again is collected by left sided arteries by four pulmonary veins. After collection in left atrioventricular orifice or bicuspid valve. From left ventricle it passes outside the heart to provide different parts of body through aorta.

c) Describe cardiac muscles and its properties.

Ans:

Cardiac muscles found only in heart, it is striated like voluntary muscle, but it differs in that its fibers branch and anastomose with each other. They are arranged longitudinally as in striated muscle and characteristically red in color and involuntary in nature.

Properties :

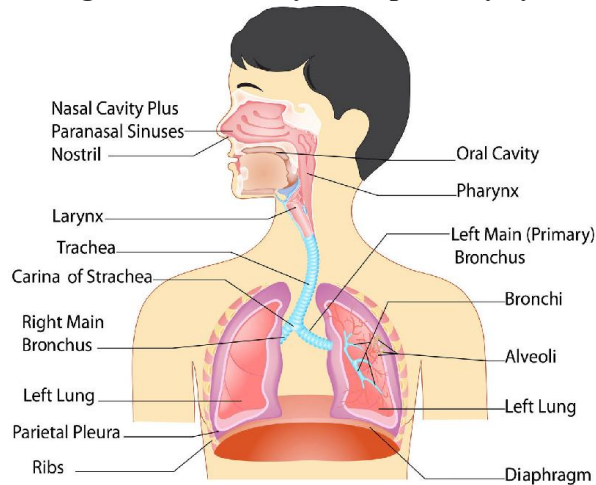
- 1) Excitability : Ability of cell to respond by generation of action potential when adequately stimulated
- 2) Automaticity/Autorthymicity: It refers to ability of cardiac muscle to initiate its own impulse at constant rhythmic interval known as Autorthymicity.
- 3) Conductivity: Transmission of impulse from one part to another part with help of specialized conducting tissue.
- 4) Contractivity: Ability of cardiac muscles to actively generate force to shorten and thicken to do work when adequate stimulus is applied.
- 5) Long refractory period: It is the interval of time during which a normal cardiac impulse can't excite the already excited area of muscles.



Q3		Attempt any <u>FOUR</u> of the following:	16
	a)	State the function of bones and muscles.(two each) Ans: Function of bones. <ol style="list-style-type: none">1. They form supporting framework for the body.2. They give protection to vital organs.3. They form blood cells in red bone marrow in cancellous bone.4. They form joints which are essential for the movement of the body.5. They provide attachment to the voluntary muscle. This helps in the movements of joints.6. Bones serve as a reservoir for calcium and phosphorus, essential minerals for various cellular activities throughout the body. Function of muscles. <ol style="list-style-type: none">1. They give shape, form and appearance to the body.2. They protect the vital organ of the body.3. They keep the joints in proper position4. They produce movements of the body.5. they help in venous return and lymphatic drainage	2 2
	b)	Give the mechanism of gas exchange in details. Ans: <p>Exchange of gases takes place at alveoli because of pressure of oxygen is more in inspiratory air, exchange of gases & diffusion process according to pressure law. Oxygen present in inspired air diffused and equalizes it with quantity present in deoxygenated blood, in the same way diffusion of carbon dioxide takes place more quantity diffused along with lower quantity of Co₂ in inspired air.</p>	4
	c)	Explain in detail blood groups. Ans: <p>There are four major blood groups determined by the presence or absence of two antigens – A and B – on the surface of red blood cells:</p> <p>Group A – has only the A antigen on red cells (and B antibody in the plasma)</p> <p>Group B – has only the B antigen on red cells (and An antibody in the plasma)</p> <p>Group AB – has both A and B antigens on red cells (but neither A nor B antibody in the plasma)</p> <p>Group O – has neither A nor B antigens on red cells (but both A and B antibody are in the plasma)</p> <p>Universal donor: TypeO– blood is considered the “universal donor” because it can be donated to people of any blood type.</p> <p>Universal recipient: Type AB+ blood is considered the “universal recipient” because people with this type can receive any blood type.</p>	4



d) Draw a neat labeled diagram of anatomy of respiratory system.



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e) Explain the term resting potential and action potential.

Ans:

Resting potential is the electrical potential is present between the inside and outside cell when in arresting state. The resting membrane potential of a cell is about -70 mV this means that the inside of the neuron is 70 mV less than the outside. At rest, there are relatively more sodium ions outside the cell and more potassium ions inside that cell.

An action potential is a very rapid change in membrane potential that occurs when nerve cell membrane is stimulated. Specifically, the membrane potential goes from the resting potential (typically -70mV) to some positive value (typically about +30 mV) in a very short period of time (just a few milliseconds).

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f) State juices secreted by the various digestive organs and give one function of each.

Ans:

The five major organs that secrete digestive juices are the salivary glands, stomach pancreas, liver and small intestine.

Salivary Glands

The main salivary glands are found in the cheeks, under the tongue and around the jaw. They secrete about 1 quart of saliva each day.

Function of saliva :

1. Amylase, also called ptyalin, is an enzyme in saliva that breaks down carbohydrates. Carbohydrates are found in foods like bread and rice.
2. Lysozyme is another salivary enzyme, which helps to keep the mouth free from germs.
3. Saliva also contains mucus, which coats the food and enables each bite to travel smoothly through the digestive tract.

Stomach

Gastric juices are secreted from glands lining the stomach.

Function of Gastric juices:

1. To break down food in the stomach and kill bacteria.

4



2. The gastric juices break down the food in the stomach.
3. This nutrient is passed into the small intestine for further digestion and absorption to occur.
4. Gastric juices allow the body to absorb B-12.
5. A necessary nutrient for nervous system function and the production of blood cells.
6. Gastric juice excretes toxins, heavy metals and certain drugs like opium.

Pancreas

1. Pancreatic fluid contains digestive enzymes that help to further break down the carbohydrates, proteins, and lipids in the chyme.
2. It makes “enzymes to digest proteins, fats, and carbs in the intestines” and produces the hormones insulin and glucagon.

Liver

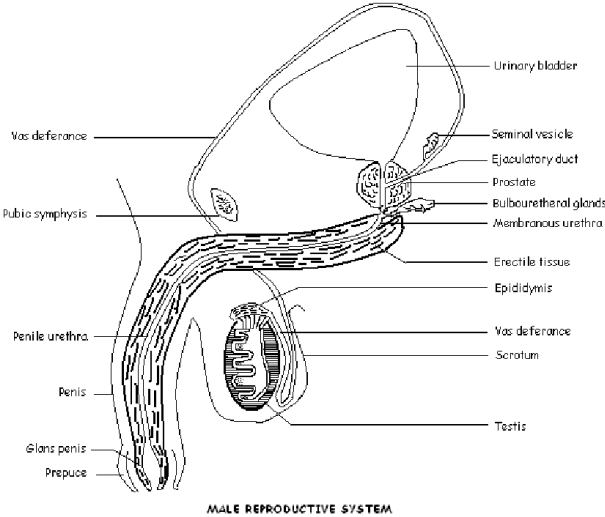
Functions of Bile Juice

1. The liver produces a greenish juice called bile, which is stored and concentrated by the gall bladder.
2. Function of bile juice.
3. It stimulates the functions of the proteolytic enzymes and Amylase.
4. It dissolves fatty acid, and glycerol.
5. It coordinates with lipase to convert the fat into fatty acids.
6. It helps in the absorption of the fatty acids and glycerol.
7. With the help of other digestive juices it neutralizes the acidic nature of food.

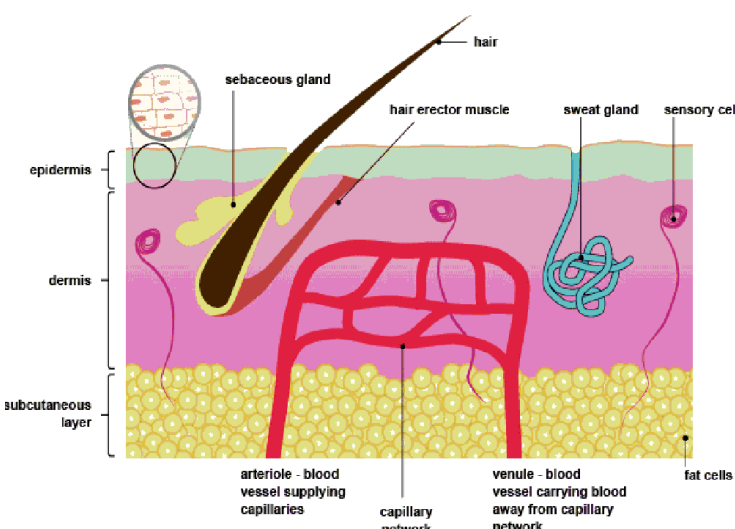
Small intestine.

1. MALTASE digest maltose to glucose
2. SUCRASE digests sucrose to glucose and fructose.
3. LACTASES digest lactose to glucose and galactose.
4. LIPASE digests fats to fatty acids.
5. PEPTIDASES digest small peptides to single amino acids.



Q4	Attempt any <u>TWO</u> of the following:	16
	<p>a) Describe the anatomy of male reproductive organ with neat labelled diagram.</p> <p>Ans:</p>  <p>Male reproductive system consist of male genital organs as follows</p> <ul style="list-style-type: none">a) Testisb) epididymisc) Deferent ductd) Seminal vesiclese) Ejaculatory ductf) Penisg) Prostateh) Bulbouretral glands <p>a) Testis – These are reproductive glands in male suspended in scrotum by spermatic cord. Testes are covered by pouch of peritoneum called tunica vaginalis. Tubules are supported by connective tissue which contains group of interstitial cells which secretes Testosterone hormone.</p> <p>b) Epididymis – It is a fine tightly coiled tube located and attached to back of testis. Seminiferous tubule of testis opens in to it and leads to deferent duct.</p> <p>c) Deferent duct – It is a continuation of epididymis (Tail of epididymis) passes through inguinal canal runs between base of urinary bladder and return to join duct of seminal vesicle at the base of prostate gland.</p> <p>d) Seminal vesicle – This is the gland located at the base of bladder and rectum. It secretes alkaline fluid containing nourishment which forms a large part of seminal fluid.</p> <p>e) Ejaculatory duct – It is formed by union of deferent duct and seminal vesicles. It ends at the opening of prostate utricle on posterior wall of urethra in prostate gland.</p>	4



	<p>f) Penis – It is tubular organ supplied by large venous sinuses which can fill to causes erection of penis. It passes urethra. At the tip there is enlargement called glans penis. Glans is covered by loose double fold of skin called prepuce or foreskin.</p> <p>g) Prostate – These glands situated around urethra at the neck of urinary bladder. It is a gland of chestnut size and contains opening of ejaculatory duct. It opens to secrete semen (fluid) which provides nourishment to sperm by its alkaline nature.</p> <p>h) Bulbourethral gland – These are situated on each side of membranous part of urethra. Its duct opens in to spongy part of urethra. It secretes substance which forms part of seminal fluid.</p>	
<p>b)</p>	<p>List any four instruments related to digestive system. Ans: The instruments related to digestive system are :</p> <ol style="list-style-type: none"> 1. Endoscope: The term endoscopy is used to refer to an examination of the upper part of the gastrointestinal tract. 2. X-ray-The tests utilize barium or an iodine-containing agent that allows visualization of the digestive tract and a form of X-ray machine called fluoroscopy. 3. Colonoscopy: This instrument used for examining the colon or large intestine. 4. CT: CT images within a range that is useful for the assessment of diseases of digestive system. 5. Ultrasound: Ultrasonography is most commonly used in the upper digestive tract and in the respiratory system. 6. MRI: magnetic resonance imaging (MRI) to obtain pictures of the bile ducts 	<p>02 each</p>
<p>c)</p>	<p>Draw the structure of skin and state any two function of skin. Ans:</p> 	<p>4</p>

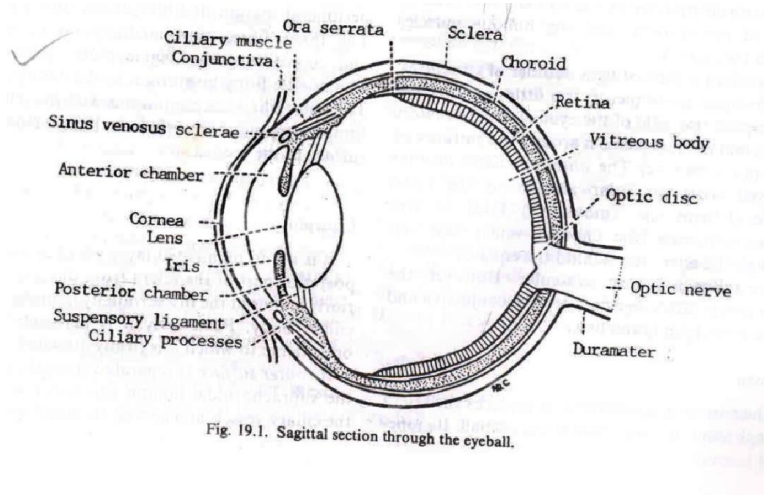


	Function: <ol style="list-style-type: none">1. Protection of underlying structures from injury.2. Excretion of salts like sodium chloride and metabolites like urea.3. Provides sensation which gives the awareness of environment.4. Secretion of sweat and sebum.5. Regulation of body temperature.6. Synthesis of vitamin D from ergosterol of skin by the action of UV rays of sun	4
Q5	Attempt any <u>FOUR</u> of the following:	16
a)	Describe the composition of blood. Ans: Composition of Blood Blood consist of solid and liquid part. Solid part contains blood cells (Corpuscles) and liquid part contains plasma. Blood cells form 45% and plasma form 55% of its whole contains. <u>PLASMA</u> Plasma or fluid part of blood is clear, straw colored watery fluid. Component of plasma Water- It forms 90 %of whole Mineral salt- includes chlorides, phosphates and carbonates of sodium, potassium and calcium. Plasma protein-Albumin, globulin, prothrobin and heparin. Foodstuff in their simplest form- glucose, amino acid, fatty acids, glycerol and vitamins Gases in solution- oxygen, carbon dioxide, nitrogen. Waste products from tissue- urea, uric acid and creatinine. Antibodies and autotoxins- these protects against bacterial infection. Hormones- from duct gland Enzymes Salts- they mainly maintains electrolyte balance. In the blood ,there are three types of blood cells or corpuscles <ol style="list-style-type: none">a) Erythrocytes or red blood cells.b) Leucocytes or white blood cells.c) Thrombocytes or platelets.	4
b)	Explain the mechanism by which respiration is controlled. This occurs 12 to 15 times per minute and it consists of two phases: <ul style="list-style-type: none">• Inspiration• Expiration Inspiration: When the capacity of the thoracic cavity is increased by simultaneous contraction of the intercostals muscles and diaphragm, the partial pleura moves with the walls of the thorax and the diaphragm. This reduces the pressure in the pleural cavity to a level considerably lower than atmospheric pressure. The visceral pleura follow the partial pleura. During this process the lungs are stretched and the pressure within the alveoli and in the air passage is reduced, drawing air into the lungs in an attempt to equalize the atmospheric and alveolar air pressure. The process of inspiration is active, as it requires expenditure of energy for muscle contraction.	4



e) Sketch the structure of eye and label different part of it.

Ans:



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f) State two function of any two endocrine glands.

Ans:

1) Pituitary gland:

-Growth hormone: This hormone promotes growth in childhood. For adults, it helps to maintain healthy muscle and bone mass.

-Prolactin: In women, it stimulates milk production. In males, low levels are linked to sexual problems; however, most males make no use of the hormone.

-Adrenocorticotrophic: This hormone promotes the production of cortisol, which helps to reduce stress, maintain healthy blood pressure and more.

-Thyroid-stimulating hormone: Just as the name implies, this hormone helps to regulate the body's thyroid, which is crucial in maintaining a healthy metabolism.

-Luteinizing hormone: In women, this hormone regulates estrogen. In men, it regulates testosterone.

-Follicle-stimulating hormone: Found in both men and women. It stimulates the releasing of eggs in women and helps ensure the normal function of sperm production in men.

The back part of the pituitary gland is called the posterior pituitary. It produces the following two hormones:

-Oxytocin: This hormone causes pregnant women to start having contractions at the appropriate time and also promotes milk flow in nursing mothers.

-Antidiuretic hormone: Commonly referred to as vasopressin, this hormone helps to regulate water balance in the body.

2) Thyroid gland:

Found in both women and men, the thyroid controls a person's metabolism.

2 for each
glands



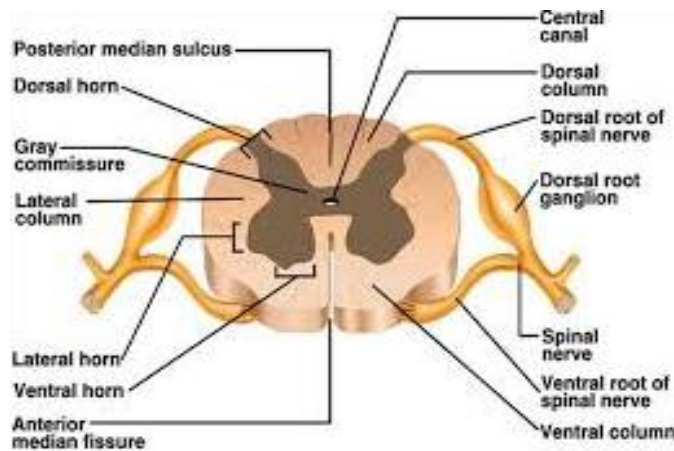
		<p>3) Parathyroid glands: This gland is vital to proper bone development because it helps control both calcium and phosphorous levels in the body.</p> <p>4) Adrenal (suprarenal) gland: This gland helps to control blood sugar. - Promoting proper cardiovascular function. - Properly utilizing carbohydrates and fats. - Helps distribute stored fat. - Promotes healthy gastrointestinal functions.</p> <p>5) Pancreatic islets: The main function of the pancreas is to maintain healthy blood sugar levels.</p> <p>6) Pineal gland or body: The pineal gland releases melatonin, which helps the body recognize when it is time to go to sleep. Researchers continue to learn more about this gland</p> <p>7) Thymus gland: This gland secretes hormones that are commonly referred to as humoral factors and are important during puberty. The role of these hormones is to make sure a person develops a healthy immune system.</p> <p>8) Gonads: Testes: Found in men, this gland produces testosterone, which promotes the growth of the penis as a male gets older as well as facial and body hair. It also deepens the voice of a male at a certain age. Other functions of testosterone include: - Maintaining sex drive - Promoting production of sperm - Maintaining healthy levels of muscle and bone mass Ovaries: found in women, this gland produces both estrogen and progesterone, which promote the development of breasts. They also help a woman maintain healthy menstrual periods.</p>									
Q6		Attempt any <u>TWO</u> of the following:	16								
	a)	<p>Distinguish between CNS and ANS (Write eight differences)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">CNS</th> <th style="width: 50%; text-align: center;">ANS</th> </tr> </thead> <tbody> <tr> <td>1. Central Nervous System (CNS) is made up of the brain, spinal cord and peripheral nerves (the nerves that run to the various parts of your body).</td> <td>1. ANS is composed of both your parasympathetic (rest and relax) system and your sympathetic (flight or fight) system</td> </tr> <tr> <td>2. It relays electrical signals to all of the organs throughout the body necessary for survival. Sensory nerves that gather information from tongue ie Taste.</td> <td>2. Autonomous nervous system (ANS) regulates basic vital functions It regulates the homeostasis of your entire body without much conscious effort.</td> </tr> <tr> <td>3. It is related with sensory and motor activity.</td> <td>3. It is related with the activity of the heart, various glands and the smooth muscles.</td> </tr> </tbody> </table>	CNS	ANS	1. Central Nervous System (CNS) is made up of the brain, spinal cord and peripheral nerves (the nerves that run to the various parts of your body).	1. ANS is composed of both your parasympathetic (rest and relax) system and your sympathetic (flight or fight) system	2. It relays electrical signals to all of the organs throughout the body necessary for survival. Sensory nerves that gather information from tongue ie Taste.	2. Autonomous nervous system (ANS) regulates basic vital functions It regulates the homeostasis of your entire body without much conscious effort.	3. It is related with sensory and motor activity.	3. It is related with the activity of the heart, various glands and the smooth muscles.	1 each
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	<p>4. It enables a person to adjust with external environment.</p> <p>5. The function of CNS occurs according to the will power of the person.</p> <p>6. It supplies nerves a skeletal muscles (motor nerves) and sensory nerves carry impulses from sense organ to brain.</p> <p>7. It carries out voluntary actions.</p> <p>8. The central nervous system, gives rise to the peripheral nervous system (the nerves on the periphery of the body).</p>	<p>4. It enables a person to adjust with internal environment.</p> <p>5. The function of ANS do not occurs according to the will power of the person.</p> <p>6. It supplies nerves to smooth muscles of visceral organs e.g ureters, uterine tubes, bronchi, trachea etc and heart and glands.</p> <p>7. It carries out Involuntary actions.</p> <p>8. The autonomic nervous system (ANS) is under control of central nervous system and is also part of the peripheral nervous system</p>	
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b) Draw structural diagram of spinal cord and explain the function of it.

Ans:



The spinal cord works a bit like a telephone switchboard operator, helping the brain communicate with different parts of the body, and vice versa. Its three major roles are:

- To relay messages from the brain to different parts of the body (usually a muscle) in order to perform an action
- To pass along messages from sensory receptors (found all over the body) to the brain
- To coordinate reflexes (quick responses to outside stimuli) that doesn't go through the brain and are managed by the spinal cord alone.

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	<p>c) List instruments related to nervous system and state the importance of peripheral nervous system.</p> <p>Ans:</p> <p>The instruments related to nervous system are</p> <ol style="list-style-type: none">1. Electroencephalograph2. CT3. MRI4. Nerve muscle stimulator.5. X-ray <p>Importance:</p> <p>The peripheral nervous system (PNS) provides the connection between internal or external stimuli and the central nervous system to allow the body to respond to its environment.</p> <p>The PNS is made up of different kinds of neurons, or nerve cells, which communicate with each other through electric signaling and neurotransmitters. The PNS can be broken down into two systems: the autonomic nervous system, which regulates involuntary actions such as breathing and digestion, and the somatic nervous system, which governs voluntary action and body reflexes.</p>	<p>4</p> <p>4</p>
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