

**GAUTENG DEPARTMENT OF EDUCATION
SENIOR CERTIFICATE EXAMINATION**

POSSIBLE ANSWERS FOR : PHYSIOLOGY HG

SECTION A

QUESTION 1A

1	C		16	C
2	D/C		17	D
3	A / B/ C / D		18	C
4	A		19	D /A
5	D		20	A
6	B		21	D
7	B		22	D
8	C		23	B
9	A		24	D
10	C		25	C
11	C		26	C
12	A		27	D
13	B		28	A
14	C		29	D
15	A		30	A

30x2 = (60)

QUESTION 1 B

- 1.3.1 Amniotic fluid / Vrugwater / Amnionvloeistof
- 1.3.2 Umbilical arteries / Naeslstringslagaar.
- 1.3.3 Umbilical cord Naelstring
- 1.3.4 Umbilical vein / Naelstringaar.
- 1.3.5 Head / Kop / Slymprop / Vrugwater
- 1.3.6 Placenta /Nageboorte.
- 1.3.7 Oxytocin
- 1.3.8 Testes / Spermbuisies / Seminiferow tubules.
- 1.3.9 Uterus
- 1.3.10 Ovary / Graafian Follicle / Follikel van Graaff

(10)

QUESTION 1 C

- 1.4.1 B
- 1.4.2 F
- 1.4.3 H
- 1.4.4 I
- 1.4.5 J
- 1.4.6 G
- 1.4.7 C
- 1.4.8 D
- 1.4.9 A
- 1.4.10 E

10x 2 = (20)
TOTAL FOR SECTION A: [90]

SECTION B**QUESTION 2**

- 2.1.1 OSTEOPOROSIS - is a condition in which the bones are weakened due to a decrease in the bone mass that makes up the skeleton. Bones break easily because they become brittle. a.g.v. Ca Lack / oestrogen deficiency (2)
- 2.1.2 It goes untreated because it is difficult to diagnose/measure and it is not apparent until too late because no apparent symptoms are obvious, pynloos, (1)
- 2.1.3 60 - 80 years old. (1)
- 2.1.4 DEXA - Bone density scan. (1)
- 2.1.5 Young women produce all the sex hormones necessary to maintain bone strength. When a woman ages, she goes through menopause and she stops producing the oestrogen that is necessary to maintain healthy bones. They also become less active which makes them more susceptible for osteoporosis. hyperparathyroidism / over secretion of parathorone. (3)
- 2.1.6 Calcium (1)
- 2.1.7 Parathormone 1 Calcitonin
- 2.1.8 Parathyroids 1 Thyroid (1)
- 2.1.10 Severe convulsions due to lack of calcium in muscles and nerves. (1)
- 2.2.1 Blood in **A** has all the impurities removed and **B** still contains the impurities.
- sonder ureum / met ureum
 - sonder kreatinien / met kreatinien
 - sonder uriensuur / met uriensuur (2)
- Verwyder stikstofbev. afvalstowwe b.v. ureum
 - Beheer H₂O [] in bloed (oortollige H₂O)
 - Beheer pH van bloed (lae pH⁺)
 - Beheer soute in bloed (oortollige soute)

- 2.2.2 The blood that moves into the dialysis machine contains a lot of waste products e.g .urea, uric acid and creatinine. The excess water and all of these toxins are filtered out of the blood and the blood flowing back into his body will contain fewer toxins. (4)
- 2.2.3
 (a) * A kidney transplant is a permanent solution. 1 Beter gesondheid / lewensverwagt
 * Dialysis is a long process and patients cannot travel.
 (b) * A transplanted kidney can be rejected. 1 Baie medikasie (4)
 * Donors are very scarce.
- 2.3.1 8 hours (1)
- 2.3.2 The body processes slow down OR increase when a person is asleep / is awake. Heart rate, urine production and metabolism are linked to each other. (2)
- 2.3.3 Because the heart slows down during sleep, less blood is filtered through the kidney and therefore less of urine is produced. (3)
- 2.3.4 When a person is asleep and rests. Regeneration and recuperation are taking place-parasympathetic stimulation. 1 meer bloed navel Nee (1) + 6 (1)
- 2.3.5 When it is very cold and the body temperature drops, the heat-producing centre / hipotalamus hipophysis TSH will stimulate the thyroid gland to release more thyroxin which increases the metabolic rate. Shivering and muscle tone are increased and thus oxidation is increased. The result of this will have a direct effect on heart rate and will increase it. (7)
[40]

QUESTION 3

- 3.1.1 (a) Mechanical sensations e.g. hearing, touching, pain and chemical sensations e.g. tasting and smelling, pressure, hittle, koue, sig (2)
 (b) The leg does not have the same number of sensory receptors as other parts of the body. (2)
 (c) Corpus callosum (1)
 (d) Parietal lobe (1)
- 3.1.2 (a) Tongue/lip (1)
 (b) Arm/trunk / Bene (1)
- 3.1.3 (a) Hands and face. mond. (2)
 (b) Feet / mond (2)
 (c) Ears would be much bigger because the rabbit can move his ears around whereas humans cannot. (2)

3.1.4

(B) Sensory neurons	(C) Motor neurons
Unipolar / Bipolêr	Multipolar
Conduct impulses towards the CNS	Conducts impulses away from CNS
Conduct afferent impulses	Conduct efferent impulses

(6)

3.2

- DENDRITES Conduct impulses towards the cell body/it enlarges surface area for receiving impulses
- NEUROFIBRILS in the neuroplasm of the cell body, transport molecules within the neuron.
- NISSL GRANULES made up of RNA molecules and are concerned with protein synthesis.
- AXON HILLOCK The section where the neurofibrils leave the cell body and enter the axon/action potentials start here.
- AXON Conducts impulses away from the body towards the terminal branches.
- SCHWANN CELLS Nourish the axon and bring about regeneration if damaged.
- MYELIN SHEATH provides electrical insulation enabling impulses to travel at great speed.
- NEURILEMMA It is the outer layer of the Schwann cell and has a protective function.
- NODES OF RANVIER are the gaps between the cells of Schwann allowing the impulses to be conducted faster
- TERMINAL BRANCHES conduct impulses from the axon to the synaptic knobs.
- SYNAPTIC KNOBS Secrete a neurotransmitter which carries the impulse across a synapse.
- Kern
- Neurofibroma
- Salmembraan

(20)
[40]

Any 10 + function

QUESTION 4

4.1.1 Proteins denature with pH fluctuations. Enzymes, being proteins, will stop onaktief /working. No process in the body can take place without enzyme intervention. Metaboliese prosesse stop (4)

4.1.2 The kidney controls pH of body fluid with buffers.
Bicarbonates from the tubular filtrate will combine with hydrogen ions (H⁺) to form carbonic acid (H₂CO₃) which breaks down into CO₂ and H₂O.
Phosphates found in the filtrate can also buffer the (H⁺) forming phosphate salts (H₂PO₄) which can be excreted.
Ammonia (NH₃) produced in tubular cells can also buffer (H⁺) and forms ammonium ions (NH₄⁺) which are excreted. (6)

- 4.2 Active re-absorption – causes molecules to move across membranes against the concentration gradient. Energy is required in the form of ATP. Across impermeable membrane, draer molekum
Substances like glucose and amino acids can be recovered from the filtrate. The functioning of the 'sodium pump' action also requires energy allowing water to be reabsorbed. (6)
- 4.3 VOLUME: Approximately 1 500 ml urine is produced each day.
COLOUR: It is yellow and transparent.
pH: Slightly acidic around 6 nie SUUR
ODOUR: It has a distinct pungent odour. If left standing it becomes ammoniac-like.
GRAVITY: It is slightly denser than water. (10)
- 4.4 Diabetes insipidus is an illness involving a fault in the hypothalamus and vasopressin stimulation hyposecretion of vasopressin, large excretion of water/low solutes in urine. (2)
- 4.5 (a) Acromegaly - hypersecretion of growth hormone / STH
(b) Eksoftamiese goitre Grave's disease - hypersecretion of thyroxin
(c) Cretinism - Hyposecretion of thyroxin
(d) Hypoparathyroidism - underactivity of the parathyroids
(e) Addison's disease - hypoactivity of the cortex of adrenals
(f) Hypersecretion of reproductive hormones. (12)

QUESTION 5

- 5.1 Thermoregulation is maintaining body temperature at a constant level by balancing heat production with heat loss. A negative feedback system is a self-regulating control mechanism consisting of three parts; sensory mechanisms that detect the deviation from the norm, a regulatory centre which processes the information and a motor mechanism that allows the conditions to return to normal.

When there is a rise in body temperature because of external or internal factors the stimulus is sent by the thermo-receptors to the hypothalamus. The heat loss centre sends impulses via the vasomotor centre in the medulla oblongata to:

- The smooth muscles in the walls of the arterioles in the skin to relax and to allow them to dilate. More warm blood flows to the surface of the skin resulting in heat loss by radiation.
- The sweat glands are activated and more blood flows to them resulting in the increase in sweat production. – evaporation.
- The erector muscles of the hair will be stimulated, allowing the hair to lie flat trapping little air and less insulation therefore more heat is lost by means of radiation, convection and conduction.
- Muscle tone can also be lowered, further decreasing heat production. The secretion of thyroxin will be inhibited resulting in a lowered metabolism, so less heat production.
- Teenoorgestelde gebeur in die ligg temp daal ▼

When the body temperature falls the stimulus is sent by the thermoreceptors / of TL v Trause to the hypothalamus. The heat production centre sends impulses via the vasomotor centre in the medulla oblongata to:

- The smooth muscles in the walls of the arterioles in the skin to contract and to allows them to constrict. Less warm blood flows to the surface of the skin resulting in less heat loss by radiation.
- The sweat glands have less blood flow to them resulting in the decrease in sweat production.
- The erector muscles of the hair will be contracted allowing the hair to stand erect trapping more air and therefore less heat is lost by means of radiation, convection and conduction.
- Shivering and muscle tone is increased - which result in more heat released.

The secretion of thyroxin will be increased resulting in a faster metabolism, so more heat production.

(20)

- 5.2 FSH - (day 1 to 14). It will stimulate the growth of the Graafian follicle.
 OESTROGEN - Repairs the endometrium after menstruation. Inhibits the formation of FSH. and stimulate LH secretion
 This brings about ovulation. formation of CL.,
 PROGESTERONE – This further prepares the endometrium for implantation of possible embryo, inhiloiks FSH + LH;

4+10
(14)

5.3 Spermatozoid adaptations

- Head is covered by an acrosome, containing enzymes enabling the penetration of the membrane surrounding the ovum.
- Body is densely packed with mitochondria releasing energy required for movement.
- Tail needed for propulsion
 Tail with contractile fibres → propulsion.

(6)
[40]**TOTAL FOR SECTION B: [160]**

QUESTION 6

- 6.1 The image falls in front of the retina and close objects can not be focused precisely. (2)
- 6.2 The eyeball's lengthening is affected as well as the normal development of the lens. (2)
- 6.3 Close work such as reading, watching television and sitting at a computer. (3)
- 6.4 There is a dramatic increase. One of three people is now affected. (1)
- 6.5 The increase in myopia is due to the lower intake of fruit and vegetables. (2)
- 6.6 The more starchy food is ingested, the more insulin is excreted and the more dramatic the fall in blood glucose levels. (3)
- 6.7 Vitamin A (Retinol) (2)

- 6.8 Normal blood glucose levels must be maintained for normal cell metabolism. When starchy food is ingested and digested there will be a sharp rise in blood glucose levels. The blood flowing through the pancreas will trigger the Beta cells in the islets of Langerhans to secrete the hormone insulin. The insulin travels in the blood to the target organs being the liver and the muscles. In the liver and muscles the excess glucose will be removed from the blood membrane *meer deurlaats vir glukose* and stored as glycogen. This will result in a fall in blood glucose levels. Other factors that can cause a rise in blood glucose levels is in the case of a fright where adrenaline is secreted. This will stimulate the liver to release all the stored glycogen in the blood as glucose.

If a person has not eaten in a long time this can also lead to a fall in blood glucose levels. Exercise has the same effect on blood glucose levels. The pancreas will monitor the levels and the alpha cells in the Islets of Langerhans will secrete the hormone glucagon into the bloodstream. This will travel to the target organs, (*spierselmemb minderdeurlaatbaar* which are the liver and the muscles. They will be instructed to release the stored glycogen as glucose causing a rise in blood glucose levels. Growth hormone, cortisol, thyroxin also influences bloods glucose levels by raising the blood glucose levels.

Enige
(18)

6.9 HYPERMETROPIA (long-sightedness)

- The image falls behind the retina because the
- Lens is too flat / the cornea is too flat / the eyeballs shortened.
- Remedy: convex lenses

PRESBYOPIA

- Because of age, the eyes lose its power to accommodate.
- Lens loses its elasticity / ciliary muscles weaken/lens proteins denaturate.
- Remedy: Bifocal glasses / reading glasses

ASTIGMATISM

- Curvature of the lens or cornea is not uniform
- Remedy: Glasses must be specially ground to compensate for the irregularities of the cornea or the lens/ cylindrical lenses

(14)

- 6.10 Photopsin (iodopsin) occurs in cones. Their function is daylight vision and colour perception; high degree of detail. (Enige 2) 1 + 2)

(3)
[50]

QUESTION 7

- 7.1 Metabolic waste is formed during reactions taking place in body cells. The most important waste products are waste nitrogen, CO₂, water, salts and excess heat. If these products (toxins) are not removed from the tissue fluid, then homeostasis cannot be maintained and cells would start to perish.

- CO₂ – due to respiration
- Urea – due to deamination
- H₂O – due to respiration

KIDNEYS: they are the most important excretory organs. They secrete waste nitrogen, e.g. urea, uric acid, creatinine and ammonium ions. They also remove excess water, salts, hormones and drugs. During the ultrafiltration process in the glomerulus all the blood plasma minus the plasma proteins pass through the porous glomerular membrane. During re-absorption only the useful substances are passively or actively reabsorbed. The waste products are not reabsorbed therefore becoming more concentrated in the filtrate.

During tubular secretion other waste products still in the blood can be actively secreted into the filtrate e.g. hippuric acid or creatinine. The ADH (vasopressin) controls the homeostatic control of water and the finer final re-absorption will take place in the distal convoluted tubule and the collecting ducts. Only after all the additions and subtractions are made, can the fluid be called urine. This will be temporarily stored in the bladder before being eliminated from the body.

LUNGS: They eliminate CO₂, a little water and heat. CO₂ diffuses readily out of the blood into the lungs because of a concentration gradient. Gaseous exchange & exhalation

SKIN: Sweat glands eliminate mainly water and heat and small quantities of salts and urea.

LIVER: Due to the deamination of amino acids, nitrogen as a waste product must be eliminated. Urea is excreted into the blood and then filtered out by the kidneys. Bile salts and cholesterol are also excreted into the colon.

COLON: Salts, bile pigments and a small quantity of water are excreted. (30)

- 7.2.1 An impulse is an electric current or wave of depolarisation that moves along nerve fibres. This gap is called a synapse. For the impulse to bridge this gap / synaps, a neurotransmitter is needed. 1When an impulse reaches a synaptic knob a neurotransmitter called acetylcholine is released from vesicles in the terminal endings. This substance sets up electrical impulses in the dendrites of the adjacent neuron or it may inhibit the firing of impulses. Acetylcholine (NT) is destroyed very rapidly by an enzyme cholinesterase, which prevents the re-stimulation of the terminal swellings ensuring that the impulses travel in one direction. Only impulses travelling across these synapses cause the contraction of muscles.

Versicles fuse with presynaptic membrane

NT released in synaptic cleft

NT attaches to post synaptic membrane

(17)

- 7.2.2 A substance like Botox will enter the Synaptic space and bind with the receptors in the dendrite. Neurotransmitters cannot enter the spaces and thus no impulse can be transported.

(3)

(20)

[50]

TOTAL FOR SECTION C:

[50]

TOTAL:

300

END