

GAUTENG DEPARTMENT OF EDUCATION  
SENIOR CERTIFICATE EXAMINATION

PHYSIOLOGY HG

POSSIBLE ANSWERS / MOONTLIKE ANTWOORDE SUPP 2007

---

SECTION A  
QUESTION 1A

- 1.1 B
- 1.2 C
- 1.3 A
- 1.4 B
- 1.5 D
- 1.6 B
- 1.7 C
- 1.8 B
- 1.9 A
- 1.10 C
- 1.11 B
- 1.12 A
- 1.13 B
- 1.14 C
- 1.15 C
- 1.16 D
- 1.17 B
- 1.18 C
- 1.19 A
- 1.20 D
- 1.21 C
- 1.22 B
- 1.23 A
- 1.24 B
- 1.25 D

25 x 2= (50)

## QUESTION 2

	Column A (incorrect word)	Column B (correct word)
2.1	renal artery	renal vein
2.2	radiation	evaporation
2.3	myosin	myelin
2.4	melanin	keratin
2.5	deamination	denature
2.6	unipolar	multipolar
2.7	somatic	autonomic
2.8	dendrite	axon
2.9	anti-diuretic	diuretic
2.10	kidneys	liver

(10x2)= (20)

## QUESTION 3

- 3.1 C / I
- 3.2 G
- 3.3 A
- 3.4 N
- 3.5 M

5X2= (10)

## QUESTION 4

- 4.1 13
- 4.2 18
- 4.3 9
- 4.4 5
- 4.5 1
- 4.6 14
- 4.7 17
- 4.8 15
- 4.9 8
- 4.10 7

(10)

TOTAL FOR SECTION A: [90]

SECTION B  
QUESTION 5

- 5.1 5.1.1 2 – Thyroid gland (1)
- 5.1.2 1 – Larynx  
3 – Isthmus  
4 – Trachea / C-shaped cartilage (3)

5.1.3

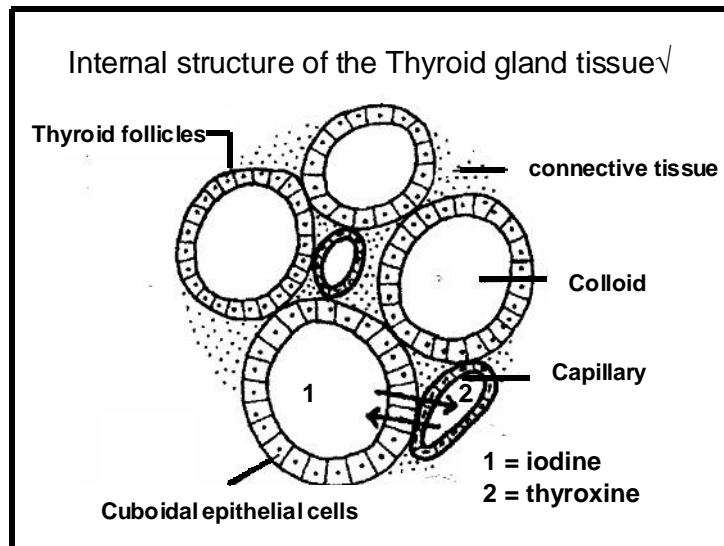


Figure 5.13

1 x heading  
4 x labels

- 5.1.4 Thyroxinev: – increase the metabolic rate v  
– promotes the normal functioning of the heart and the nervous system.  
Calcitoninv: – deposition of calcium in bonesv. (4)
- 5.1.5 **Hypothyroidism**  
Too little v thyroxine v in **children** v causes hypothyroidism and results in cretinism v. The child has a protruding thick tongue v and is physically v, mentally v and sexually retarded v.  
Hypothyroidism in **adults** v is known as myxoedema v, a condition which results in weight gain, dry coarse skin v and general mental v and physical sluggishness v. (8)
- 5.2.1 It results from poor access to the drainage system in the eye and is referred to as angle-closure because the small angle v between the iris v and the cornea v narrows, blocking the drainage v of aqueous humor. This causes an increase in pressure v inside the eye. (Any 4) (4)
- 5.2.2 Blindness v, intense pain v / nausea / haloes and rainbows around lights / blurred vision (Any 2) (2)
- 5.2.3 Ophthalmologist v (1)
- 5.2.4 Blind spot / optic nerve and blood vessels v (1)
- 5.2.5 Vitreous humor v (1)

## 5.2.6 Cross-section through the (anterior) front part of the eye.v

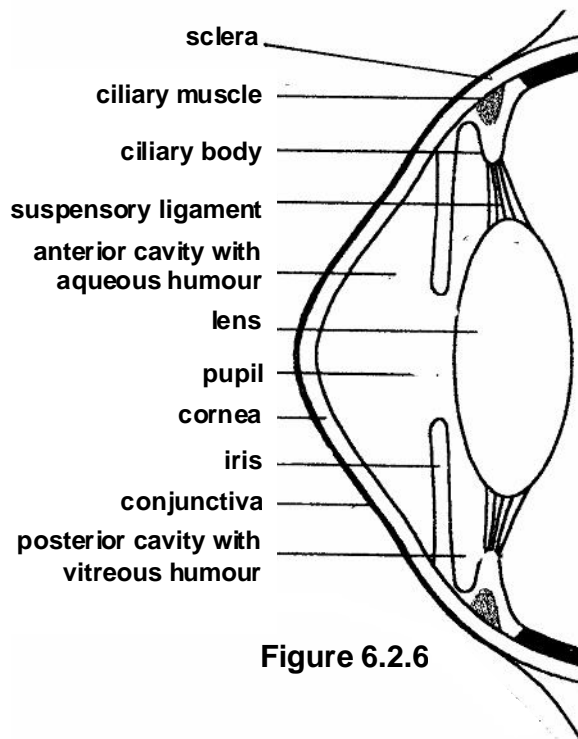


Figure 6.2.6

1 x heading  
1 x diagram  
8 x labels

(10)  
[40]

## QUESTION 6

- 6.1 6.1.1 Soldiers used it to suppress their appetite during the first World War.v (1)
- 6.1.2 (a) Increase heart ratev and body temperaturev, increase blood pressurev nausea / jaw clenching (Any 3) (3)
- (b) Hypothalamusv and medulla oblongatav (2)
- 6.1.3 Dancing and the use of ecstasy stimulate the alpha cellsv of the cellsv of the islets of Langerhansv in the pancreasv to secrete glucagonv which affects the liver cellsv. Glucogenv breakdown into glucosev. As a result, the liver releases glucose into the blood increasing the blood glucose levelv. (Any 5) (5)
- 6.1.4 (a) Into the veinsv (1)
- (b) Acetylcholinev and noradrenalinv / Adrenalin (2)
- (c) Jaw clenchingv (1)
- 6.1.5 (a) Glucose in the urinev (1)
- (b) Insulinv (1)
- (c) Converts glucose to glycogen.v (lowers blood glucose levels) (1)

- 6.1.6 - The raver's body temperature increases and therefore he sweats more  
 - High blood pressure is also a result of a high osmotic concentration in the blood due to dehydration. This stimulates osmoreceptors in the hypothalamus  
 - These will stimulate the posterior lobe of the pituitary gland to release the hormone (anti-diuretic hormone) ADH or vasopressin into the blood.  
 - In the kidney, this hormone enables more water to be reabsorbed from the filtrate.  
 - It does this by making the walls of the distal and collecting ducts more permeable to water  
 - More water moves from the filtrate back into the blood, returning the volume and composition of the blood to normal (Any 10) (10)
- 6.2.1 **Puberty** is the time when an immature individual undergoes certain changes and becomes capable of reproducing (1)
- 6.2.2 The onset of puberty is initiated by the anterior pituitary:
- In girls follicle stimulating hormone (**FSH**) causes a number of follicles in the ovary to grow into graafian follicles which will secrete the hormone **oestrogen**.
- The Luteinizing hormone (**LH**) initiates ovulation
- In boys the anterior pituitary secretes interstitial cell stimulating hormone (**ICSH**) / **LH** that stimulates the cells of Leydig in the testis to start producing the hormone **testosterone**.
- Oestrogen and testosterone** will cause external changes of puberty (Any 7) (7)
- 6.3 **Sympatic nervous system** – is part of the autonomic nervous system and prepares the body for action
- Parasympathetic nervous system** – is part of the autonomic nervous system and enable the body to recover from sympathetic stimulation to return to normal. (4)
- [40]

### QUESTION 7

- 7.1.1 Protein molecules are too big to pass through the pores in the capillaries. (2)
- 7.1.2 Urea (1)
- 7.1.3 There is less water in the sweat gland for the urea to dissolve in in comparison to the amount of water in the blood plasma, so the urea concentration is higher. Deamination of amino acids by liver also increases urea levels in urine. (2)

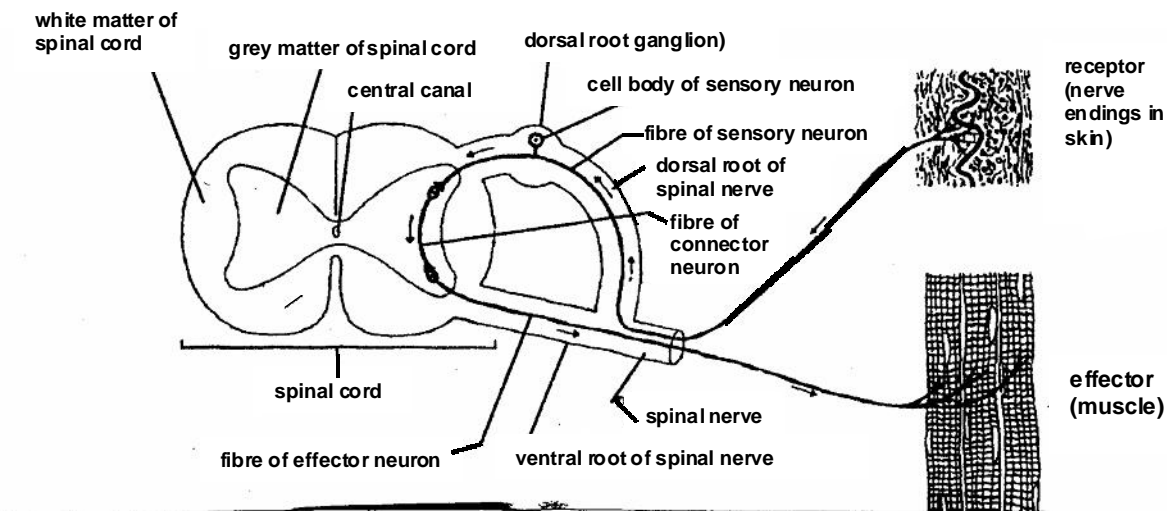
7.1.4 The person is a diabetic✓ or he ate a meal containing a lot of carbohydrates.✓ (2)

7.1.5 Proteins.✓ (1)

7.1.6 (a) Urine:  $92/95 \times 100/1 = 96,8\%$ ✓✓ (2)  
 Sweat:  $60/95 \times 100/1 = 63,15\%$ ✓✓

(b) It will be cold✓, that is why the person urinates more. (1)

7.2.1 Reflex action✓ is a fast, automatic response✓ by a muscle or a gland to a stimulus✓ by a receptor organ. (3)



7.2.2 A cross-section through the spinal cord and the pathway of a reflex

- 1 x heading
  - 1 x diagram
  - 1 x direction of impulse
  - 11 x labels
- (14)

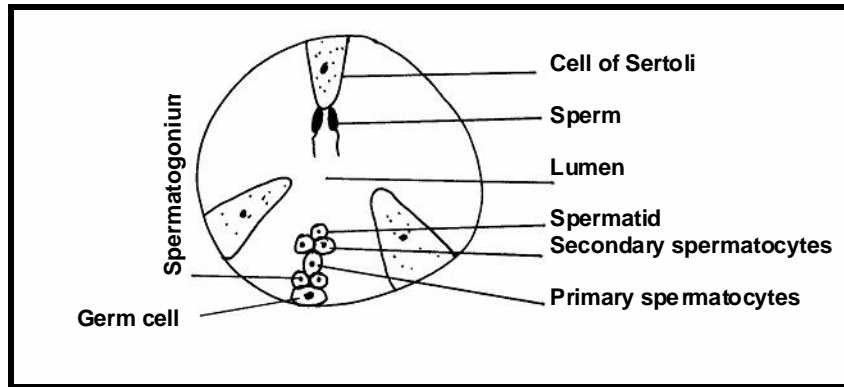
7.2 The adenohypophysis✓ is connected to the hypothalamus by means of a blood vessel.✓ Capillary beds make up a portal system.✓ The hypothalamus produces releasing factors,✓ which travel in the blood to the anterior lobe. The lobe releases the required hormones into the blood stream.✓ The neurohypophysis✓ is connected by means of nerve fibres/axons.✓ The cell bodies of these neurons are in the hypothalamus. They make the hormones,✓ which then pass down the nerve fibres to be stored✓ in the posterior lobe. When the body requires the hormones, the hypothalamus will stimulate this lobe to release the required hormones into the blood stream.✓ (Any (8) (8)

7.4 Somatotrophic hormone (STH)✓ – promotes skeletal growth✓  
 Thyroxin✓ - causes normal skeletal growth✓  
 Calcitonin✓ - deposits calcium in bones✓  
 Parathormone✓ - removes calcium from the bones✓  
 Sex hormones✓ - stimulate bone growth✓ and closes the epiphyseal growth✓  
 (Any (4) (4)

## QUESTION 8

- 8.1.1 The kidneys become severely damaged, so that they can no longer function properly.✓ (1)
- 8.1.2 - Children can be born with diseased kidneys.✓  
 - Their kidneys can stop functioning when they are older due to genetic weakness.✓  
 - Kidneys can be damaged by disease or injury.✓ (3)
- 8.1.3 - Oedema/swelling of tissue✓  
 - Rise in blood pressure✓  
 - Lowering of pH✓ (3)
- 8.1.4 (a)  $\text{CO}_2$ ✓ (1)
- (b) The build up of  $\text{CO}_2$  can change the pH.  $\text{CO}_2$  reacts with water✓ to form carbonic acid.✓ The carbonic acid ionises✓ into bicarbonate ions✓ and hydrogen ions✓. This increased hydrogen ion concentration will increase the acidity of the extra cellular fluids and the blood✓ thus lowering the pH.  
 (Any 5) (5)
- (c) Ammonia is a buffer✓ system in the kidneys which will react with excess hydrogen ions✓ in the filtrate in the tubules. Ammonia is formed in the tubular epithelium✓ by deamination✓ of the amino acid glutamine.✓ Ammonia combines with hydrogen ions✓ to form ammonium ions✓ which are excreted in urine.✓ This is for the correct functioning of enzymes.✓ (Any 5) (5)
- 8.2 - Excretion of nitrogenous waste,✓ e.g. Urea  
 - Excretion of toxic substances,✓ e.g. Drugs  
 - Osmoregulation of water and salts.✓  
 - Maintaining the pH of the body fluids.✓  
 - Maintaining ionic balance.✓  
 - Control blood pressure.✓  
 - Stimulate the production of erythrocytes in the bone marrow.✓ (Any 5) (5)
- 8.3 8.3.1 Cross-section through the human testis.✓ (1)
- 8.3.2 1 - epididymis✓  
 2 - rete testis✓  
 3 - seminiferous tubules✓  
 4 - septa✓  
 5 - vas deferens✓ (5)

8.3.3



**Cross-section through a seminiferous tubule**

1 x heading  
1 x diagram  
6 x labels (8)

8.4

- Male condoms
- Rhythm method
- Withdrawal
- Vasectomy/sterilisation

(Any 3) (3)

[40]

**TOTAL FOR SECTION B: [160]**

SECTION C

**QUESTION 9**

- 9.1.1 2 – Free nerve endings✓  
8 – End bulb of Krause✓  
11 – Meissner's corpuscle✓  
10 – Sebaceous gland✓  
12 – Pacinian corpuscle✓

(5)

9.1.2 On a hot day the dermal arterioles will dilate/vasodilation✓ allowing a large volume of blood to flow to the skin. The sympathetic nervous system✓ will stimulate the sweat glands to produce more sweat.✓ The heat necessary to change the sweat to vapour✓ is taken from the body tissues, thereby cooling✓ the skin and the blood flowing through it. (Any 5)

(5)

9.1.3 9,✓4,✓6✓ and 7.✓

(4)



- 9.2.1 A plaster<sup>√</sup> containing a high concentration<sup>√</sup> of the medicine is stuck on a part of the skin that is thinly layered.<sup>√</sup> Works constantly over a long period of time to release the medicine.<sup>√</sup> (Any 3) (3)
- 9.2.2 The medicine diffuses<sup>√</sup> through the layers of the epidermis into the tissue fluid<sup>√</sup> of the dermis. It is then absorbed into the capillaries<sup>√</sup> of the dermis. They form larger blood vessels that transport the medicine to target organs.<sup>√</sup> Oxygen<sup>√</sup> and nourishment will also reach the dermis via the blood vessels and then diffuse to the epidermis. Lymph capillaries in the skin transport tissue fluid from the skin.<sup>√</sup> (Any 5) (5)
- 9.3 – Ovaria<sup>√</sup> – produce ova<sup>√</sup>
- Fallopian tubes / Oviducti – transport ova to uterus  
– transport sperms in direction of ovaria
- Uterus<sup>√</sup> – Feeding of embryo
- Development of fetus
- Protection of fetus<sup>√</sup>
- Vagina<sup>√</sup> – Copulation  
– Menstrual flow  
– Birth control (Any 4 + 4)= (8)
- 9.4 9.4.1 The function of a receptor
- The first step in this process is to change<sup>√</sup> stimuli received (for example light waves, sound waves, pressure sensations) to impulses<sup>√</sup> that are understood by the nervous system (visual impulses, sound and mechanical or pressure impulses and others). (3)
- 9.4.2 If any stimulus causes a potential change in the receptor membrane, it reached the action potential to cause an impulse. (2)
- 9.4.3 **Sensory coding**
- Five types** of receptors are present in the nervous system:
- Mechanoreceptors<sup>√</sup>** – mechanical deformation<sup>√</sup> of the receptor of adjacent tissues is perceived.
- Different types of mechanoreceptors exist:
- Tactile (skin) <sup>√</sup> – touch, pressure and vibration<sup>√</sup>
  - Baroreceptors<sup>√</sup> (pressure changes in the blood vessels) <sup>√</sup>
  - Proprioceptors<sup>√</sup> (position of muscles and joints is monitored by the three types of proprioceptors, viz. the muscle spindles, Golgi tendon organs and the receptors in the joint capsules) <sup>√</sup>

**Thermoreceptors** ✓ – changes in temperature are perceived (heat or cold) ✓.

**Nociceptors** / pain receptors ✓ (free nerve endings in the skin) – perceive tissue damage (physical or chemical) ✓.

**Electromagnetic** or photoreceptors ✓ – observation of light on the retina. ✓

**Chemoreceptors** ✓ - observation of taste, smell, O<sub>2</sub> or CO<sub>2</sub> levels in the ✓ arterial blood, osmolality of fluids and others. ✓

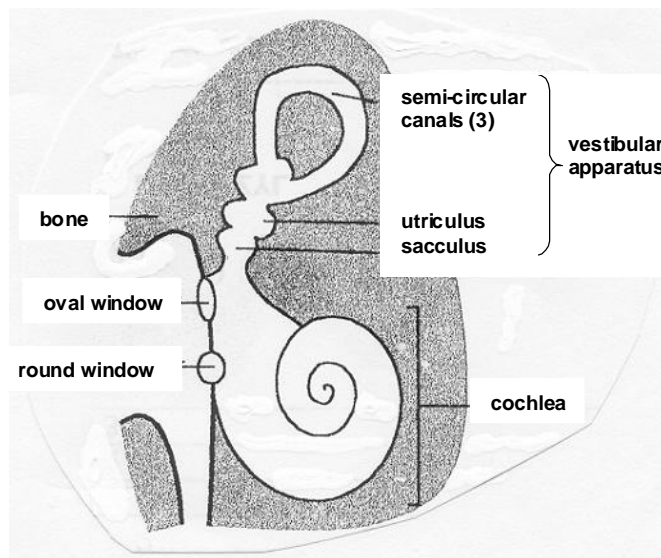
(15)

OR

## QUESTION 10

10.1 10.1.1

## The Inner Ear



1 x heading  
1 x diagram  
6 x labels

(8)

- 10.1.2 Disease√  
Injury√  
Medical poisoning√ (3)
- 10.1.3 The cochlea is a spiral, conical, bony canal.√ The membranous cochlear duct runs through the centre and ends blindly at the cochlear apex.√ This duct can be divided in three separate chambers:
- (i) the top scala vestibuli√ is next to the oval window,√ part of the bony labyrinth√ and filled with perilymph.√
  - (ii) the middle scala media√ the membranous cochlear duct√ and is filled with endolymph.√
  - (iii) The lower scala timpani√ ends at the round window,√ is part of the bony labyrinth√ and is filled with perilymph.√
- The helicotrema is at the apex of the cochlear duct.√ The roof of the cochlear duct is the vestibular membrane/Reissner's membrane.√ The floor is the basilar membrane.√ The organ of Corti√ with the overhanging tectorial membrane√ is found on the basilar membrane. Hairs from the hair cells of the organ of Corti are embedded in the tectorial membrane.√ The cochlear nerve runs from the organ of Corti.√ (13)
- 10.1.4 (a) Pinna√  
(b) Ossicles√  
(c) Organ of Corti√  
(d) Cochlear nerve√  
(e) Temporal lobe of the cerebrum√ (5)
- 10.2.1 (i)  $\pm 37,15^{\circ}\text{C}$ √  
(ii)  $\pm 36, 7^{\circ}\text{C}$ √ (2)
- 10.2.2 (i)  $\pm 45$  minutes√  
(ii)  $\pm 30$  minutes√ (2)
- 10.2.3 Tempo of cellular respiration√ and heat production in the cells.√ (2)
- 10.2.4 High temperature denaturate√ enzymes and could lead to a person's death. (1)
- 10.2.5 (a) The process that ensures that the content of the tissue fluid√ stays constant.√ / Maintenance of constant conditions in the internal environment of the body. (2)
- (b) With a negative feedback mechanism - a self-regulating control mechanism√ whereby a deviation from the norm√ of any factor is corrected√ by bringing about a change√√ in the opposite direction.√ (5)

10.3 The proximal convoluted tubule is very long and coiled√ which enables maximum reabsorption.√

It is surrounded by a dense capillary network√ to transport substances away.√

Walls of the cuboidal epithelial cells have a brush border of microvilli on their inner surface√ and a highly folded membrane on their outer surface√ for maximum reabsorption.√

Many mitochondria√ are found in the cells to produce ATP√ needed for active transport.√

(Any (7) (7)  
**[50]**

**TOTAL FOR SECTION C: [50]**

**TOTAL: 300**