GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

PHYSIOLOGY HG

Possible Answers Feb / Mar 2006

SECTION A

Answer ALL questions in this section.

QUESTION 1A

1.1	C	1.16	C		
1.2	D	1.17	B		
1.3	B	1.18	D		
1.4	A	1.19	B		
1.5	C	1.20	B		
1.6	B	1.21	C		
1.7	B	1.22	A		
1.8	D	1.23	C		
1.9	B	1.24	D		
1.10	C	1.25	C		
1.11	A	1.26	B		
1.12	C	1.27	B		
1.13	B	1.28	B		
1.14	C	1.29	A		
1.15	B	1.30	B	30 x 2=	**(60)**

QUESTION 1B

1.31 Conjunctiva
1.32 Negative feedback
1.33 Hypothalamus
1.34 Vasodilatation
1.35 Astigmatism
1.36 Renal pelvis
1.37 Receptors
1.38 Nissl-bodies
1.39 Ataxsia
1.40 Fovea Centralis **(10)**

QUESTION 1C

1.41 C
1.42 D
1.43 C
1.44 B
1.45 A
1.46 B
1.47 C
1.48 B
1.49 B
1.50 A **(10)**

QUESTION 1D

1.51 ?
1.52 ?
1.53 ?
1.54 ?
1.55 ?
1.56 ?
1.57 ?
1.58 ?
1.59 ?
1.60 ? **(10)**

TOTAL FOR SECTION A: [90]

SECTION B

Answer ALL the questions in this section.

QUESTION 2

2.1 2.1.1 280 daysv (1)

2.1.2 3 monthsv (1)

2.1.3 Human chorionic gonadotropin/HCGv (1)

2.1.4 a) Oestrogenv
b) - inhibits the production of FSHv
- stimulates the production of LHv (2)

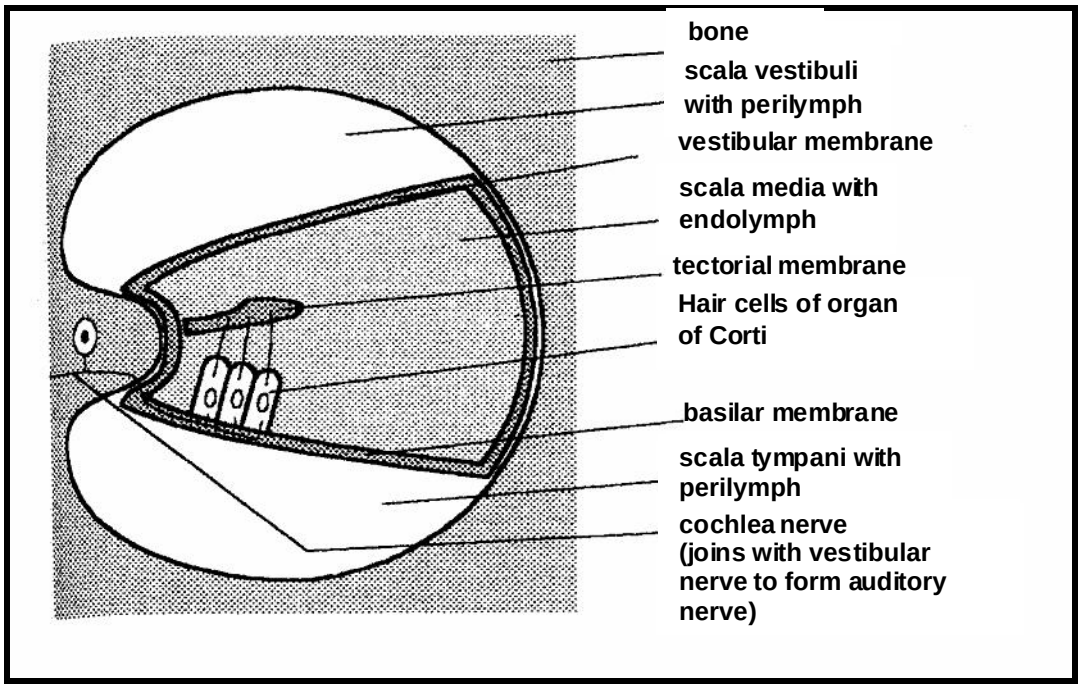
2.1.5 Corpus luteumv in the ovaryv releases progesterone after implantation, v and causes the level to increase.v When HCG hormone decreases,v the progresterone level of the corpus luteum decreases.v The placentav takes over the endocrine function and because of this, the progesterone levels increasev until just before the birth of the baby takes place/delivery.v

- Cervical mucous increases
- Prevent contractions in myomethrium
- Decrease the production of epithelial cells in vagina
- Increase lobuli and alveoli in breasts / prepare breasts for milk production. (6)

Any (6)

2.1.6 Relaxinv (1)

2.2 Cross-section of the cochlea



1 x heading
1 x diagram
10 x labels (12)

2.3 (i) Allows light rays to pass throughv

(ii) Irisv

(iii) Lensv

(iv) Focus the lightv

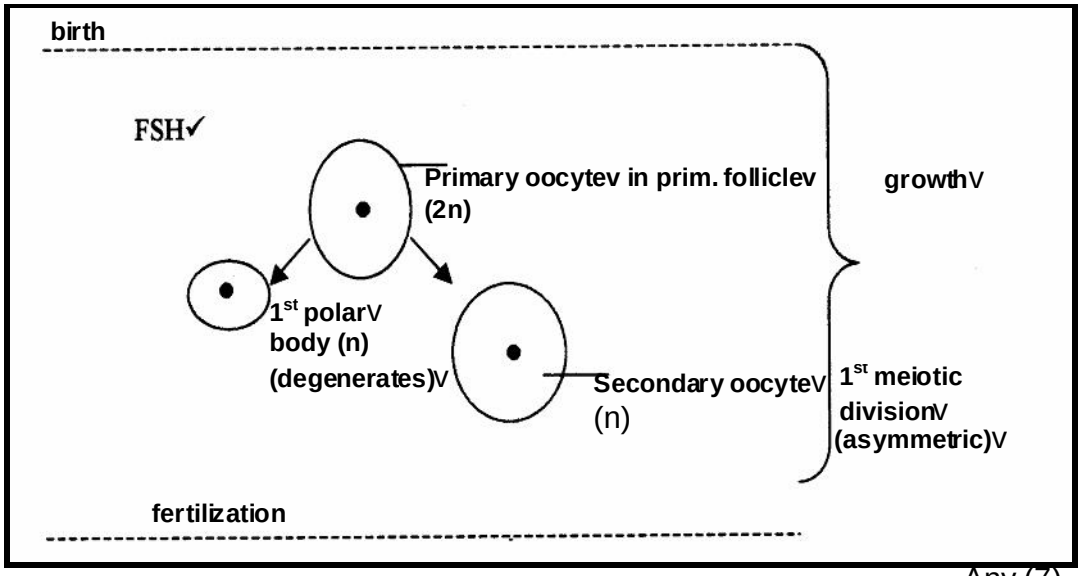
(v) Retinav

(vi) Receives a small, reversed imagev/stimulates receptor cells

(vii) choroidv

(viii) Absorbs excess light raysv/prevents reflection in the eye (8)

2.4 Oogenesis



Any (7) (7)
(40)

QUESTION 3

3.1 a) neuronv
b) reflex arcv
c) neurogliav (3)

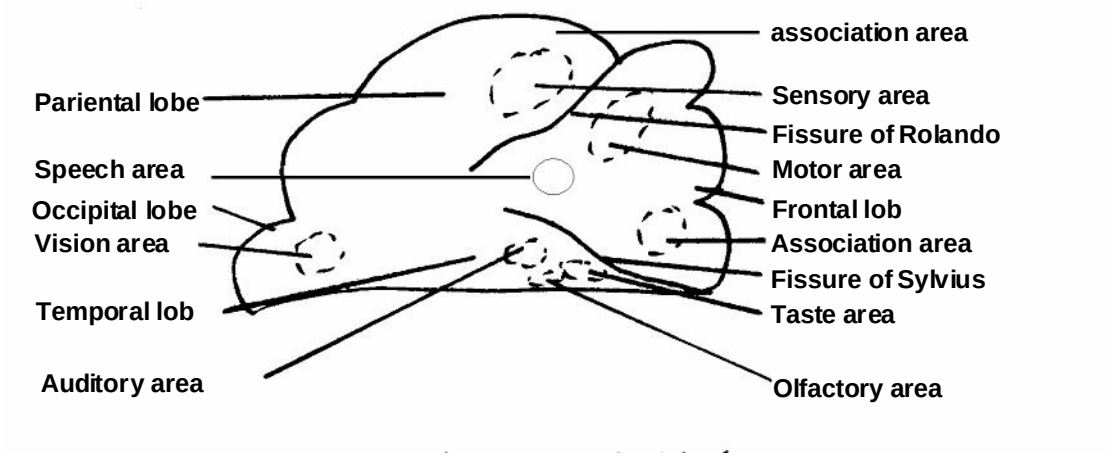
3.2 afferent fibre – conducts impulses to the cell body of the neuron
efferent fibre – conducts impulses away from the cell body of the neuron (2)

3.3 3.3.1 Each cerebral hemispherev has a lateral ventricle,v namely the firstv and second ventricle.v
They connect up with the third ventricle,v beneath the corpus callosum,v via the foramen of Monro.v
The third ventricle is linked to the fourth ventricle by a duct called the aqueduct of Sylvius.v The fourth ventricle,v is situated opposite the cerebellum.v The fourth ventricle is linked to the central canal of the spinal cord.v (10)

3.3.2 Cerebro spinal fluidv (1)

3.3.3 Function of the Cerebro-spinal fluid
- Absorbs shockv to protect the delicate structures of the brain
- Maintains constant pressurev around the CNS
- Provides the cells of the CNS with food and oxygenv
- Removes metabolic wastev
- Prevents the drying outv of cells (5)

3.4



(14)

(1) Diagram
(1) Subscript
(12) Labels

3.5 Excess CO_2 reacts withv to form H_2CO_3 carbonic acid.v
H_2CO_3 ionisesv into bicarbonate ions / HCO^-_3 / and hydrogen ions / H^+.
An increase in H^+ results in a lower pHv
The pH must be 7,4v
Extreme changes in pH can cause enzymes to denaturev. (5)
(40)

QUESTION 4

4.1 4.1.1 3 – Malpighi layerv
5 – end bulbs of Krausev
6 – end organs of Ruffiniv
9 – sebaceous glandv (4)

4.1.2 No. 1v
- to protect the lower tissue from mechanical injuriesv
- protects the rest against entry of germsv
- water proofv 1+2= (3)

4.1.3 Malpighi layer
- contains the pigment melanin,v that protects the rest of the skin against the harmful effect of ultra-violet raysv of the sun.
- forming cells through mitosisv to replace the shed upper layers.
- produces vitamin D.v
- produces skin colour.v Any (3) (3)

4.1.4 a) no.8v - free nerve endingsv
b) no.11v - Pacinian corpusclev
c) no.4v - Meissner's corpusclev / also free nerve endings (6)

4.1.5 Impulses from the hypothalamusv stimulate the erector musclev to contract.v
The air follicle is pulled uprightv this causes the hair on the skin to stand erectv - "goose pimples". Raised hair tries to trap a thicker layer of air and reduces heat loss.v Any (5) (5)

4.1.6 Keratienv (1)

4.1.7 Number 9v (1)

4.1.8 37ºCv
- enzymes become inactivev
- respiration tempo/heart rate decreasesv
- blood pressure decreasesv
- obstruction of brain activityv
- comav
- deathv 1+2= (3)

4.2 Osmo regulation/Excretion (1)

4.3 4.3.1 Due to ultrafiltratin / hydrostatic pressure v a large amount v of glucose is forced through the pores v in the gomerulusv and filter slitsv in the Bowman's capsule v to form part of the glomerular filtrate v. This results in the drop of glucose in the blood v. All the glucose v is reabsorbed in the proximal convoluted tubule v resulting in the higher concentration in the renal vein v. (Any 10) (10)

4.3.2 Cellular respiration (1)

4.3.3 A huge quantity of urea is filtrated through into the nephronv and is excreted by the kidneysv as part of the urine.v A part of the urea is reabsorbedv because it is a small moleculev and is therefore still present in the renal veins.v Any (2) (2)

(40)

QUESTION 5

5.1 5.1.1 increases the basal metabolic ratev
increases cardiac output and ratev
increases nervous activityv
promotes normal physical, mental the sexual growth (3)

5.1.2 Because the hormone controls metabolism, it actually controls cellular respirationv that needs 0_2. (1)

5.1.3 Glucosev in their diet. (1)

5.1.4 Catabolic,v glucose/larger food particles are broken offv to CO_2 and H_20v (4)

5.1.5 Group Cv (1)

5.1.6 Group A uses most oxygenv because they have a lot of thyroxinev and thus has an increased cell respiration tempo.v Group C has too little thyroxine,v their cell respiration tempo is very lowv and they don't need a lot of O_2.v (6)

5.1.7 Group Cv Production of thyroxine is inhibited,v and the metabolic tempo decreases. Less food is usedv as a result of the low cell respiration tempo and it is stored in the body.v (4)

5.1.8 (i) Cretinismv (1)

(ii) protruding thick tonguev
physically, v mentallyv and sexually retardedv Any (2) (2)

5.1.9 Group A (1)

5.1.10 The rats lay stretched out because of the heatv because of the increased metabolism that has caused the release of heat energyv. More blood is pumped by the heart to the skinv to radiate heatv. This explains the pink ears and feet. (4)

5.2
- the breakdown process in the retinav
- generates an impulsev
- impulse is led to bipolar neuronsv to the ganglion cells
- the impulses then travel along the axonsv of the ganglion cells
- forms the optic nervev
- leaves the eye by the blind spotv
- the two optic nerves cross overv
- in the optic chiasmav
- impulses are carried to the visual cortex/occipital lobev of the cerebrumv
- where the sensation vision becomes visible/arises/ this reading becomes understandablev
- images are also inversed v Any (10) (10)

5.3
- completely colour blindv
- cones show no sensitivity to colour / lightv
- person sees everything in shades of white, black and greyv Any (2) (2)

(40)

TOTAL FOR SECTION B: [160]

SECTION C

Answer either Question 6 **or** Question 7.

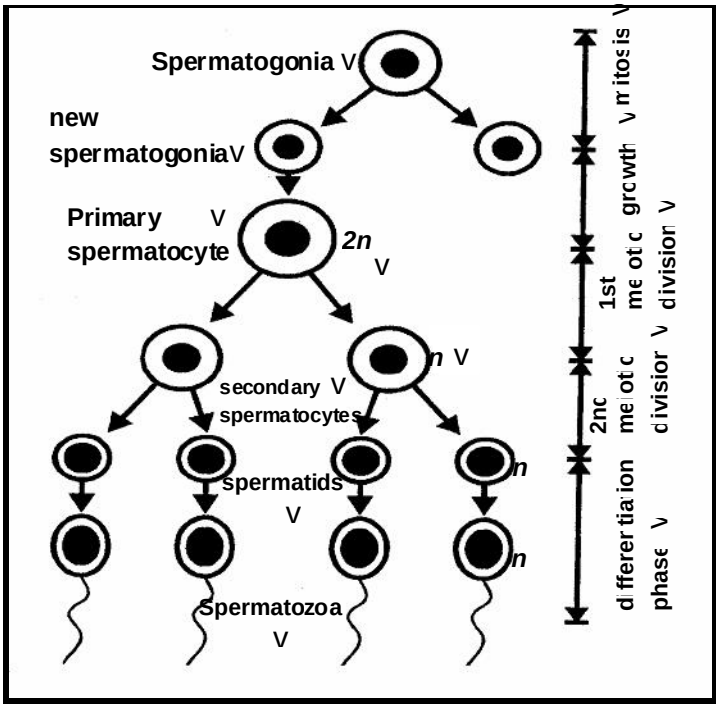
QUESTION 6

6.1 Advanced reproductive system

- Only one ovumv is produced per month, no wastage.
- Ovum is very well protectedv
- It is fertilized insidev the female body.
- Sperm are introduced into the female body by the penisv.
- Chances of fertilization is higherv.

- Developing foetus survives the early stages of development because it is well protected in the uterus.v
- Foetus absorbs food and oxygen from placenta. v
- Also – normally 1 fetus for effective development of a superior nervous system (intellent, frontal lobe – for abstract thinking) Any (5) (5)

6.2 Spermatogenesis



vv for correct sizes

(15)

6.3 Transport and nourishing of the sperm

- Sperms move from the tubuli semeneferiv to the cells of Sertoliv where they attach and feed.
- From there to the straight tubulesv and rete testesv and head of epididymisv
- In the head they become mature,v mobilev and capable of fertilizing an ovumv.
- They can be stored,v for several months in the tail.v
- From here they move into the vas deferensv to the ampullav with peristaltic waves.v

- The two seminal vesiclesv open here and secrete seminal fluidv into the vas deferens.
- This seminal fluid is alkalinev with fructosev (energyv for the sperm) and prostaglandinsv (makes cervical mucus more fluid).v
- The vas deferens leads the sperm to the ejaculatory ductv and to the urethrav. Sperm and seminal fluid mix.
- The prostrate glandv surrounds the urethra and produces a fluid to activatev sperm.
- Just below the prostrate, there are two Cowper glandsv which open into the urethra. They produce a thick mucusv before ejaculation. Protects sperm by neutralizing the acid environment of the urethra.v
- From here, the sperm swims into the urethra in the penisv and is carried to the vagina.v
- Antibacterial substancesv in semen protect the sperm by destroying certain bacteria.v
- Mucusv provides a passage way from vagina to the cervix.v
- Reverse contractionsv of the uterus help to move sperm.
- From here, sperm moves to the Fallopian tubesv and live for 48-hoursv on female secretions.v
- The sperm moves by spiral movements of the tailv and energy released by mitochondria (in bodies)v Any (25) (25)

6.4 Nourishment after fertilisation

- Cytoplasm of zygotev
- Secretions of Fallopian tubev
- Secretions from the endometriumv
- Trophoblast of blastocystv during implantation feeds the zygote, gets nutrients from cells in endometrium.
- Placentav takes over and feeds the foetus from the mother's deciduas via the umbilical veinv. (5)

[50]

OR

QUESTION 7

7.1 7.1.1 Unstable moleculesv that are formed in the body due to normal biochemical reactionsv necessary for metabolism and the sunv causes external photochemical free radicals. (3)

7.1.2 The foodv that we ate, provided us with more anti-oxidants against free radicals. (1)

7.1.3 Lowers our immunityv and breaks down our resistance against virus infections/colds/cancer of the skin. (1)

7.1.4 Improved circulation problems, v spastic colon, v constipation, v digestion problems, osteo-arthritis, stress, low libido, cholesterol, high blood sugar, low blood pressure, ulcers, winters feet, sinus, headaches, lower back pain, diabetes and haemorrhoids. Any (3) (3)

7.1.5 Hypothalamusv (1)

7.1.6 Maintains homeostasisv by regulating temperature,v water balance, food intake, thirst and sleep rhythm.
- controls aggression, self-defence / "drives"v and emotionsv
- controls functioning of hypophysis/secretions of neurohypophysis, controls the autonomic nervous systemv Any (4) (4)

7.1.7 a) Decreased blood flow / decreased blood volume. (1)

b) Specialized cells in the afferent arteriolev in the kidneys respond to a decreasev in the blood pressure and secretes the enzyme reninv .

Renin causes the production of angiotensinv
Angiotensin stimulates the adrenal cortexv to release aldosterone.v
This hormone travels in the bloodv to the loop of Henle/distal convoluted tubulev where it promotes the reabsorption of sodium ions in the bloodv.
Watervpassivelyv follows the sodium ions increasing blood volumev and blood pressure. (12)

7.1.8
- Very long and coiledv ? to maximum reabsorptionv
- Surrounded by a capillary networkv ? transports substancesv
- Cuboidal epithelial cells have microvilliv and a folded membranev ? increase surface areav
- Many mitochondriav produces ATPv for active transportv 4x2= (8)

7.2 Gonorrhoeav / genital herpes / Aids / syphilisv / veneral warts Any (2) (2)

7.3
- Relieves the workload of the higher centres of the brainv
- Speeds up reactionsv by by-passing the higher centres of the brain.
- Protection (2)

7.4 High blood sugar is the result of high levels of glucosev in the blood.v As this blood passes through the pancreas,v the islets of Langerhans'v insulin secreting cells (beta cells) v secretes insulinv into the blood. Cells of the liver and musclesv absorbs glucose from the bloodv converts into glycogenv and stores it.v Blood glucose levels lower,v and the pancreas will stop releasing insulin into the blood.v (12)

[50]

TOTAL FOR SECTION C: [50]

TOTAL: 300