

GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

POSSIBLE ANSWERS FOR : PHYSIOLOGY SG

SECTION A
QUESTION 1A

- | | | | |
|------|---|---|-------------------------------|
| 1.1 | C | - | Glucose / D – Water |
| 1.2 | B | - | Posterior lobe |
| 1.3 | B | - | Medulla |
| 1.4 | B | - | Liver |
| 1.5 | C | - | Smell |
| 1.6 | A | - | Medulla oblongata |
| 1.7 | C | - | Somatotropic hormone / growth |
| 1.8 | A | - | Blood |
| 1.9 | C | - | Thalamus |
| 1.10 | C | - | Endocrine |
| 1.11 | B | - | Pancreas |
| 1.12 | A | - | Ear |
| 1.13 | B | - | Cones |
| 1.14 | C | - | 28 |
| 1.15 | B | - | Glucagon |
| 1.16 | C | - | Insulin |
| 1.17 | B | - | Middle ear to pharynx |
| 1.18 | D | - | 5 000 000 |
| 1.19 | D | - | Lack of iodine |
| 1.20 | A | - | Epidermis |

20x2=(40)

QUESTION 1B

- | | |
|------|-------------------------------------|
| 1.21 | Glomerulus |
| 1.22 | Blind spot |
| 1.23 | Hypophysis / Pituitary gland |
| 1.24 | Meninges |
| 1.25 | Fissure of Rolando / Central sulcus |
| 1.26 | Vas deferens / sperm duct |
| 1.27 | Accommodation |
| 1.28 | Amnion / Amniotic fluid |
| 1.29 | Prolactin |
| 1.30 | Spermatogenesis |

10x2=(20)

QUESTION 1C

- 1.31 J – Round window
 1.32 G – Hypothalamus
 1.33 I – Progesterone
 1.34 H – Insulin
 1.35 K – Neuron +2
 1.36 D – Nephron
 1.37 M – Aquaduct of Sylvius
 1.38 E – Medulla oblongata
 1.39 F – Cerebrum
 1.40 B – ADH

10x2=(20)

- | | Incorrect | | Correct |
|------|------------------|---|---------------------------|
| 1.41 | Sympathetic | – | Peripheral |
| 1.42 | Faeces | – | Urea / urine / uric acid |
| 1.43 | TSH | – | FSH |
| 1.44 | Tympanic | – | Renal capsule |
| 1.45 | Meibomian | – | Sebaceous |
| 1.46 | Fat cells | – | Melanin / melanocytes |
| 1.47 | Embryo | – | Blastula / blastocyst |
| 1.48 | Radiation | – | Evaporation |
| 1.49 | Bowman | – | Malpighian OR skin – nose |
| 1.50 | Thermoregulation | – | Osmoregulation |

10x2=(20)

TOTAL FOR SECTION A: [100]**SECTION B
QUESTION 2**

- 2.1.1 Longitudinal section through the kidney
 2.1.2 Urine
 2.1.3 Volume Approximately 1 500 ml of urine is formed each day. (2)
 Colour It is yellow and transparent. (The colour is due to the presence of urochromes.) (1)
 pH Urine is usually slightly acidic with a pH of about 6.
 Odour It has a very distinct and characteristic pungent odour. (If left standing, it becomes ammoniac due to bacterial activity.)
 Urea, uric acid, creatinine, ammonia, ammonium, hippuric acid, hormones, foreign substances / e.g. water, salts (6)
- 2.1.4 A (Renal) capsule
 B Cortex
 C Medulla
 D (Renal) pelvis
 E Calyx (Calyces) (small)
 F Hilum / capsule
 G Pyramid
 H Ureter (8)

	J (renal artery) + O ₂	I (renal vein) -O ₂
Differences	1. Contains urea, uric acid and creatinine etc. / N-afval 2. Contains 100% water	1. No urea, uric acid or creatinine / Nie N-afree 2. Less water – 99%
Similarities	1. Contains glucose and amino acids. 2. Contains plasmaproteins	1. Contains no glucose and amino acids 2. Contains plasma proteins

(Any 3) +2 (6)

2.1.6 **Excretion** is the removal from the body of toxic / e.g. harmful (poisonous) metabolic waste leg products, e.g. CO₂ and nitrogenous compounds, so that homeostasis can be maintained.

Secretion refers to the giving off of useful substances that can be used for an important function elsewhere in the body, e.g. the pancreas secretes hormones (which control blood glucose levels) and digestive enzymes. (4)

2.1.7 The kidneys are the most important excretory organs. They excrete waste nitrogen, e.g. urea, uric acid, creatinine and ammonium ions. They also remove excess water, salts, hormones and drugs. pH, blood pressure, osmoregulation, production of erythrocytes. (4)

2.1.8 Sketch Malpighian body / nephron

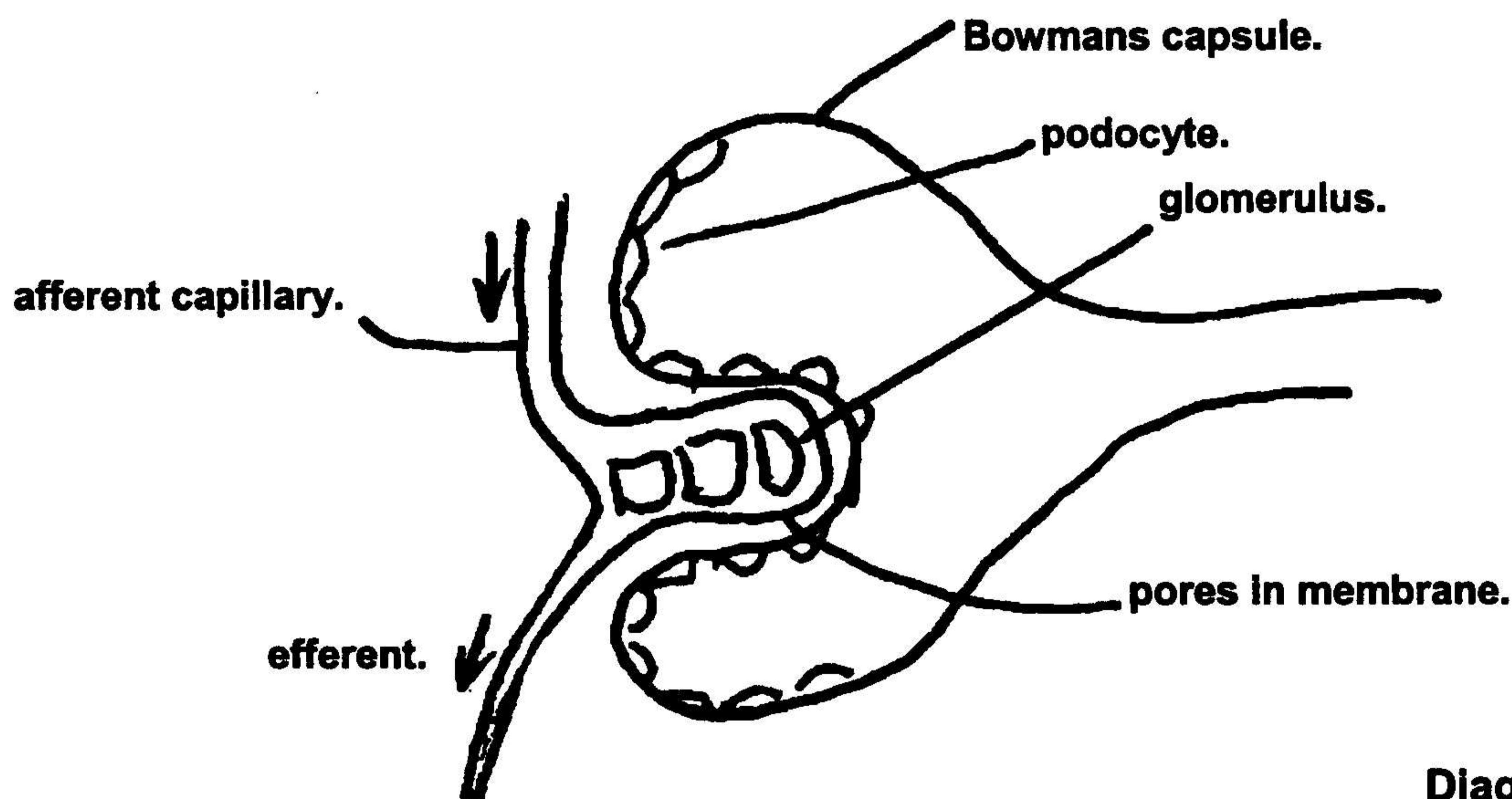


Diagram (1)
Labels (4) (5)

- + proximal convoluted tubule
- distal convoluted tubule.
- collecting duct
- descending limb of Henle
- ascending limb of Henle.
- body / nephron

- 2.1.9 Glomerular membrane very porous, thin, with slits in the podocyte layer and podocytes. Afferent arteriole wider than efferent arteriole causing a high blood pressure in glomerulus. Large surface area because of cup shape of the Bowman's capsule and large number of capillaries. / in discussing the adaptations of the tubules. (4)
- 2.2.1 Negative feedback (1)
- 2.2.2 A Hypophysis / pituitary gland
B Thyroid (2)
- 2.2.3 TSH (Thyroid stimulating hormone) / thyrotropic hormone (1)
- 2.2.4 (a) Cretinism
(b) Myxoedema (2)
- 2.2.5 * Increases the metabolic rate / or heat production
* Needed for normal physical, mental / nervous system and sexual growth
* Increases cardiac rate and output
* Increases reflex times, alertness (any 2) (2)
- 2.2.6 ADH / and oxytocin
vasopressin (2)
[50]

QUESTION 3

- 3.1.1 Parietal lobe (1)
- 3.1.2 Meissner corpuscles – touch (light)
Pacinian corpuscles – pressure
End bulbs of Krause – cold
Organs of Ruffini – heat
Free nerve endings – pain (10)

3.2

NO	STRUCTURE	FUNCTIONS	STRUCTURAL ADAPTATIONS
A	Lens	Refracts light rays Focuses image on retina	Elastic / flexible Transparent
B	Choroid	Accommodation / Absorbs excessive light rays Prevents reflection / supply food + O ₂	Contains pigments + blood vessels
C	Iris	Controls amount of light entering the eye	Antagonistic circular and radial muscles
D	Retina	Converts light stimuli into nerve impulses Night vision Day / Colour vision	Rod cells Cone cells
E	Conjunctiva	Sensitive to pain stimuli Epithelium cells – protecting the eye	Contains nerve endings

(21)

3.3.1

- A – Semicircular canals / vestibular apparatus
- B – Oval window / stirrup (stapes)
- C – Round window
- D – Cochlea / bony labyrinth / passage
- E – Eustachian tube
- F – Middle ear
- G – Tympanic membrane / ear drum
- H – External auditory canal / meatus canal

(8)

3.3.2

cochlea (D)

(1)

3.3.3

(H) – / External auditory canal

(1)

3.3.4

Macula (e)

(1)

3.3.5

Maintain balance / pull of gravity / position of head / movements of head

(1)

3.3.6

The air pressure on the outside of the tympanum becomes lower than that in the middle ear. The tympanum bulges to the outside and becomes less moveable. This causes the feeling of deafness.

(4)

3.3.7

Open the mouth wide (yawn) so that air pressure is restored through the Eustachian tube or any other correct solution. Because the Eustachian tube is connected to farynx and therefore to atmospheric pressure. Some of the air pressure will be restored.

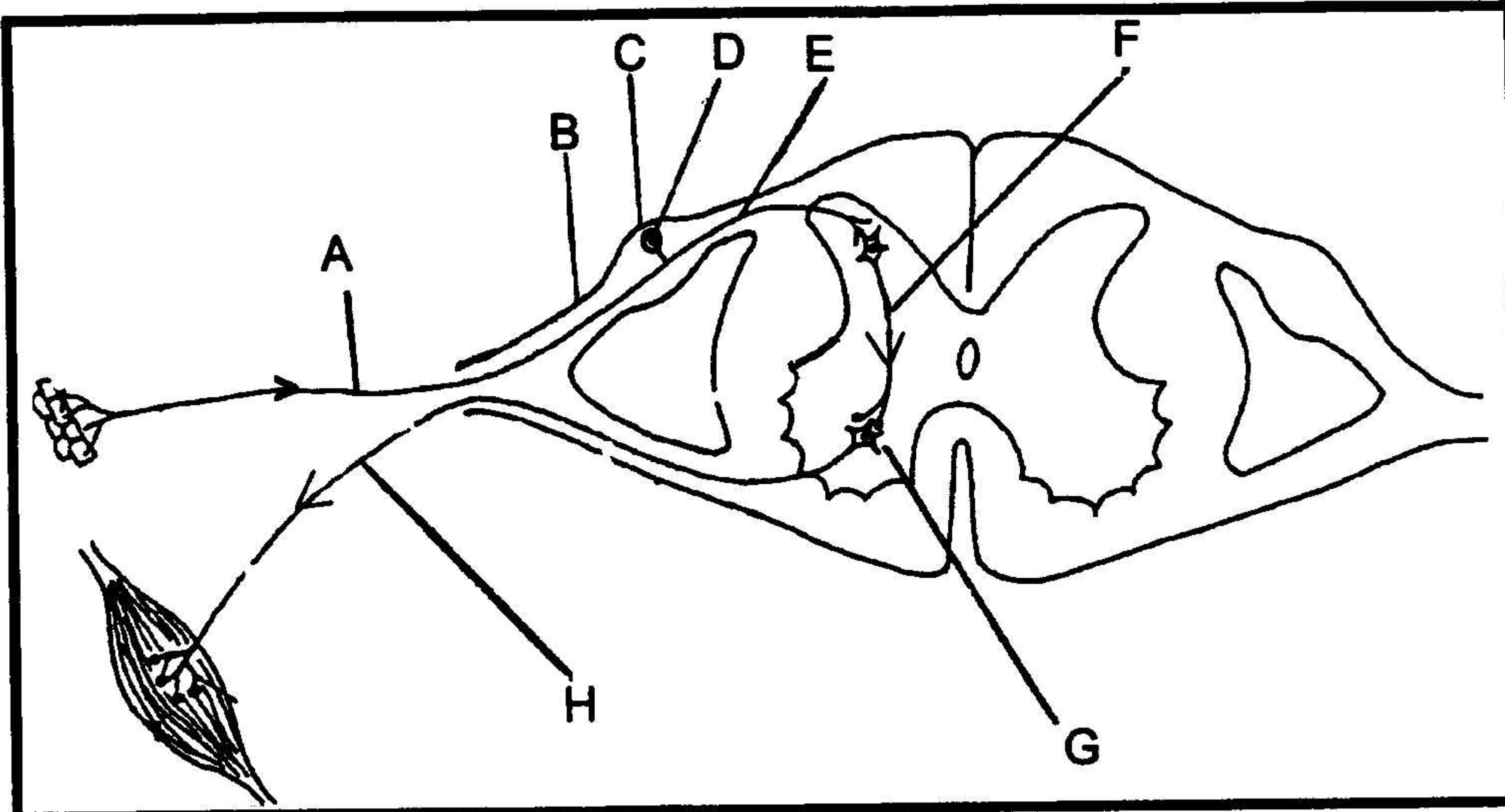
(2)

[50]

QUESTION 4

- 4.1.1 A Dendrite / neuroplasm.
 B Nucleus
 C Neuroplasm / Nissil bodies / cytoplasm
 D Neurofibril / axon hillock
 E Axon
 F Node of Ranvier
 G Schwann cell (nucleus of Schwann cell)
 H Myelin sheath (8)
- 4.1.2 Synapse (1)
- 4.1.3 (a) A – Carrying impulses towards the cell body (1)
 (b) E – Carrying impulses away from the cell body / to the next neuron (1)
 (c) H – Providing electrical insulation for axon
 Enabling impulses to travel at high speed (2)
- 4.1.4 (White matter) conducts afferent nerve impulses from body to brain (sensory).
 (White matter) conducts efferent nerve impulses to skeletal muscles (motor).
 (Gray matter) is the seat of primitive reflex actions – protects body.
 Contains cell bodies for sympathetic and certain parasympathetic reflex arcs. (4)
- 4.1.5 Vertebrae (1)
- 4.1.6 Providing a fluid cushion against shock / protection
 Maintaining uniform pressure around brain and spinal cord
 or: removes metabolic waste
 or: provide oxygen and food (2)

4.2



- A Sensory neuron (dendrite)
- B Posterior root (dorsal)
- C Posterior root ganglion (dorsal)
- D Cell body – of sensory neuron
- E Axon – of sensory neuron
- F Connector neuron / Axon of connector neuron
- G Synaps / grey matter / ventral horn
- H Axon / Motor neuron

Diagram (1)
 Labels (8)
 Subscript (1)
 Direction (1)

One mark for direction

(11)

4.3.1

- A Frontal lobe / motor area
- B Temporal lobe
- C Medulla oblongata

(3)

4.3.2

- A motor area / Controlling voluntary movements
Controlling speech

(2)

- C medulla / Conducting impulses to and from brain
Controlling vital involuntary reflex actions
Respiratory centre – breathing
Cardiomotor centre – heart rate
Vaso-motor centre – blood pressure / Temperature regulation
Visceral activities – peristalsis / swallowing
Controlling non-vital reflex actions
Salivation / sneezing / coughing / hiccupping / vomiting / blinking

(any 2) (2)

- D cerebellum / Co-ordinating muscles / tone
Maintaining balance and equilibrium
Controlling muscle tone and posture

(any 2) (2)

4.3.3

- (a) Lobes of cerebrum connected with corpus callosum
- (b) Vermis

(2)

4.4 Autonomic Nervous Centre

Two systems	1. Sympathetic 2. Parasympathetic
Overall function	1. Prepares body for action 2. Makes body recover after action
Neurotransmitter	1. Noradrenaline / norepinephrine 2. Acetylcholine
Action on muscles of iris	1. Dilates pupil 2. Constricts pupil

(8)
[50]

QUESTION 5

- 5.1.1 A – Ureter
B – Fallopian tube
C – Infundibulum
D – Ovary
E – Uterus
F – Cervix
G – Vagina
H – Bladder (8)
- 5.1.2 (a) H
(b) D
(c) G
(d) E
(e) B (5)
- 5.1.3 The diploid (2n) oocyte needs to undergo a meiotic division to divide the 46 chromosomes in half 23 (haploid) in the ovum. When the ovum is fertilized the 23 chromosomes of the sperm makes the zygote diploid (2n) again. (4)
- 5.1.4 Acrosome (2)
- 5.2.1 A – Oestrogen + B – progesterone (in volgorde) (2)
- 5.2.2 **Oestrogen** – repairs endometrium after menstruation
– inhibits secretion of FSH
– stimulates the secretion of LH on day 13.
Progesterone – prepares endometrium for fertilized ovum – nourish zygote
– makes endometrium glandular and vascular – prepare breasts
– inhibits release of FSH and LH (6)
- 5.2.3 ovulation – prevent abortion
– thickens mucus of cervix (2)

- 5.2.4 Low levels of progesterone up to day 14 – No Corpus Luteum.
On day 14, ovulation occurs and the corpus luteum has been formed and secretes high levels of progesterone.
As the corpus luteum disintegrates, less progesterone will be secreted. (6)
- 5.2.5 Causes the secretion of LH that will then trigger ovulation. (2)
- 5.2.6 If pregnancy occurs it maintains the endometrium in this state.
It inhibits the production of FSH and LH from the adenohypophysis, thus preventing ovulation.
It stops the pregnant uterus from contracting, thus preventing abortion.
It makes the mucus of the cervix thick and sticky, so protecting the cervical opening into the vagina.
It causes the production of secretions from the Fallopian tubes and uterine milk from uterine glands for the nourishment of the zygote until implantation occurs.
It helps prepare the breasts for lactation. (any 4) (4)
- 5.3 During fertilization –
– Spermatozoa with an X chromosome will fuse with an ovum producing an XX chromosome pair. The baby will be a female.
– Spermatozoa with a Y chromosome will fuse with an ovum producing an XY chromosome pair. The baby will therefore be a male. (4)
- 5.4.1 Blood transfusion with infected blood
Sex (2)
- 5.4.2 Use a condom.
Abstain from sex.
Have only one sex partner. (3)
don't use used needles. [50]

TOTAL FOR SECTION B: [200]

TOTAL: 300