



## **PTS Reading Week Question Series 2021**

### **Reproduction and Endocrine**

#### **Disclaimer:**

Peer Teaching Society and the authors are not liable for any misleading/ false information within this mock exam. The following paper has been written for students by students and bears no reflection on the real exam. This is a learning tool that has not been reviewed by the University of Sheffield and therefore the use of this paper for learning are at the student's discretion.

#### **Editor**

Faith Solanke

#### **Question contributor**

Ian Wei Lim

1. Which of the following hormones are not secreted by the anterior pituitary gland?

- a) FSH
- b) Prolactin
- c) TSH
- d) ADH
- e) LH

2. Where in the body are catecholamines such as adrenaline from?

- a) Zona Reticularis
- b) Zona Glomerulosa
- c) Zona Fasciculata
- d) Adrenal Medulla
- e) Adrenal cortex

3. Which one of the following statements is true of glucagon?

- a) Secreted by Beta cells
- b) Inhibits gluconeogenesis
- c) Composed of 2 polypeptide chains linked together via hydrogen bonds
- d) Decreases glycogenolysis
- e) Stimulates lipolysis

4. Which of the following best describes the effects PTH in response to a decrease in serum calcium?

- a) Directly stimulates osteoclasts to resorb bone to release calcium
- b) Constricts the afferent arterioles to reduce GFR and urinary calcium loss
- c) Activates vitamin D to increase absorption of calcium from small intestine
- d) Increases phosphate absorption at the distal convoluted tubule
- e) Increase calcium excretion at the kidneys

5. The anterior pituitary gland refers to the glandular lobe that along with the posterior lobe makes up the pituitary gland (hypophysis). The anterior pituitary regulates several physiological processes in the human body. Some of these include stress, metabolism, growth, lactation, and reproduction.

- a) Name the hormones of the anterior pituitary gland (6)

b) From 3 of those named, explain their functions (3)

6. A 60-year-old woman with hypocalcaemia has raised parathyroid hormone levels. This is a normal physiological response to try and raise her calcium levels.

a) What are the actions of parathyroid hormones? (4)

7. A 27-year-old woman was diagnosed with diabetes mellitus following presentations of weight loss, polyuria, and polydipsia. He has since been on insulin therapy in order to manage his condition.

a) Where is insulin secreted in the body and what are its effects? (3)

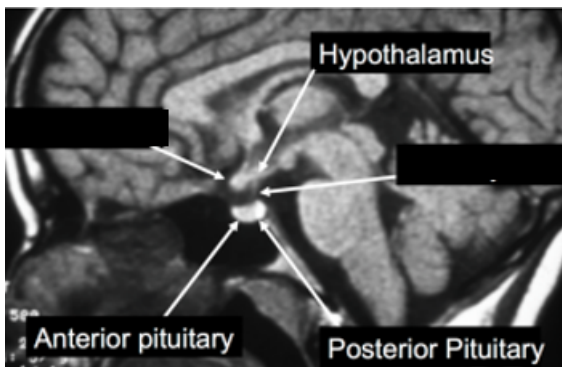
b) What substance provides information if whether high insulin levels are exogenous or due to endogenous insulin production? (1)

8. a) Where are incretins secreted from and what are their functions? (2)

b) Give 2 examples of incretins (2)

c) In response to an increase in blood glucose levels, the hormone insulin is secreted from the beta cells of the islets of Langerhans to promote the uptake of glucose into cells. Name two other cells in the islets of Langerhans and their hormones. (4)

9.



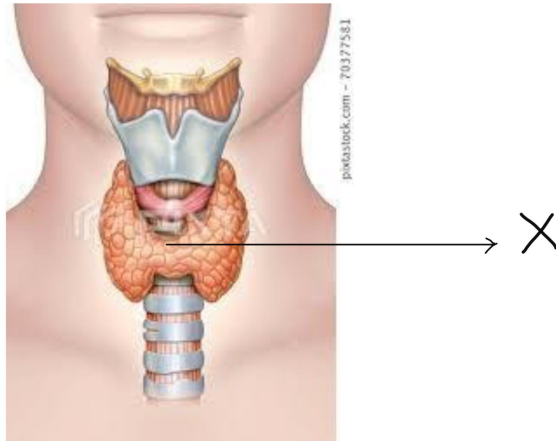
a) How does the anterior pituitary gland receive its blood supply? (1)

b) What connects the pituitary gland to the hypothalamus? (1)

c) What hormones are produced by the posterior pituitary gland? (1)

d) What are the functions of the hormones secreted by the posterior pituitary gland? (2)

10.



- a) What is the organ labelled X and where is it located? (2)
- b) What divides the organ into 2 lobes? (1)
- c) Which arteries supplies blood to this organ? (1)
- d) What hormone does this organ secrete and 2 of its functions. (3)

11. What ligament attaches the uterus to the pelvic wall?

- a) Round ligament
- b) Ovarian ligament
- c) Cardinal ligament
- d) Broad ligament
- e) Uterosacral ligament

12. What is the uterine artery a branch of?

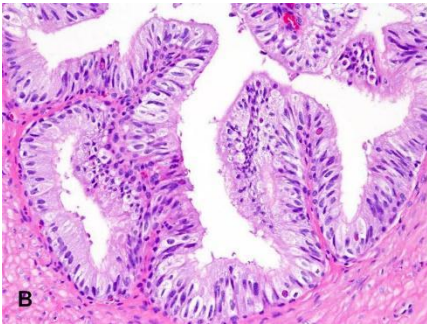
- a) Internal pudendal artery
- b) Abdominal aorta
- c) Superior mesenteric artery
- d) Vaginal artery
- e) Inferior mesenteric artery

13. Which of these does the Wolffian Duct NOT differentiate into?

- a) Vas deferens

- b) Epididymis
- c) Prostate
- d) Ejaculatory ducts
- e) Seminal vesicles

14.



The picture represents a slide taken from the Vas deferens. What is the epithelium lining the vas deferens?

- a) Simple squamous epithelium
- b) Stratified squamous epithelium lined by stereocilia
- c) Pseudostratified squamous epithelium lined by stereocilia
- d) Simple Columnar epithelium lined by stereocilia
- e) Simple Columnar epithelium

15) Where does fertilization occur?

- a) Isthmus
- b) Ampulla
- c) Cervix
- d) Fundus
- e) Body of uterus

16. The first few cellular differentiation of a zygote is called cleavage. When does cleavage occur?

- a) Day 1 -2
- b) Day 2-3
- c) Day 4

d) Day 5

e) Day 21

17. Which is not transmitted via the spermatic cord in males?

a) Ductus deferens

b) Processus Vaginalis

c) Cremasteric nerve

d) Ilioinguinal nerve

e) Lymphatic vessels

18. a) Where is the site of spermatogenesis? (1)

b) What is the pathway of sperm to the outside? (2)

c) What forms the blood testes barrier and what is the function of this barrier? (4)

19. What does an anteverted & retroverted uterus mean? (2)

20. a) Which cells do LH and FSH act on males and females? (4)

b) What are the functions of Sertoli cells, Granulosa cells, Leydig cells and Theca cells? (4)

21. Explain the functions of relaxin, prostaglandin and Hcg (Human chorionic gonadotrophin) during pregnancy. (6)

22. List 4 physiological changes during pregnancy (4)

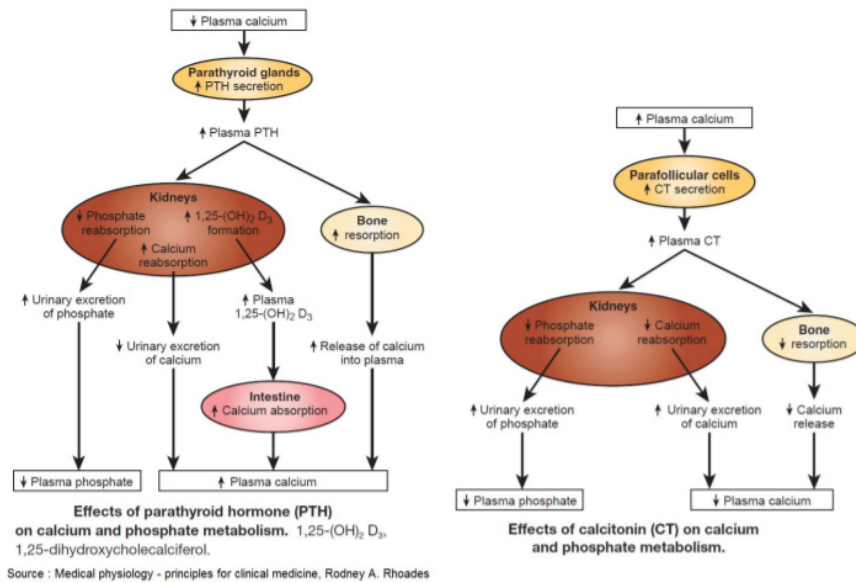
## Answers and Explanations

Questions	Explanations
1. D	<p>Hormones secreted by the anterior pituitary gland are:</p> <ul style="list-style-type: none"> <li>● FSH</li> <li>● LH</li> <li>● ACTH</li> <li>● TSH</li> <li>● Prolactin</li> <li>● GH</li> </ul> <p>Can be remembered by the mnemonic FLATPIG (I for ignore).</p> <p>ADH is synthesised by neurosecretory cells of the hypothalamus (Supraoptic nuclei) in response to dehydration. It is stored then released by the posterior pituitary gland.</p>
2. D	<p>The adrenal gland is subdivided into the <b>cortex</b> and the <b>medulla</b>. The cortex is then divided into 3 layers:</p> <ul style="list-style-type: none"> <li>● Zona glomerulosa – produces mineralocorticoids e.g., aldosterone.</li> <li>● Zona fasciculata – Glucocorticoids e.g., cortisol and small amounts of androgens</li> <li>● Zona reticularis – Produces and secretes androgens (sex hormones)</li> </ul> <p>The adrenal medulla contains chromaffin cells which secrete adrenaline and noradrenaline (catecholamines) which then act on the cortex to secrete other hormones</p>
3. E	<p>Glucagon is a hormone secreted by alpha cells in the islets of Langerhans in response to reduced blood glucose concentration. It functions to reverse hypoglycaemic states by acting on the liver to convert glycogen to glucose, stimulating breakdown of fats (lipolysis) (E) and muscles and forming glucose from lactic and amino acids.</p> <p>Glucagon is composed of a single polypeptide chain comprising of 29 amino acid residues while Insulin is composed of 2 polypeptide chains containing 51 amino acid residues.</p>
4. C	<p>PTH increases the activity of 1-<math>\alpha</math>-hydroxylase enzyme, which converts 25-hydroxycholecalciferol to 1,25-dihydroxycholecalciferol, the active form of vitamin D. Since osteoclasts do not have a PTH receptor, effects are mediated via osteoblasts.</p> <p>The remaining false answers can be eliminated via elimination since PTH functions comprise of:</p>

	<ul style="list-style-type: none"> <li>● Indirect stimulation of osteoclast/direct stimulation of osteoblast to resorb bone and release calcium into blood. (Not a)</li> <li>● Increasing calcium reabsorbed in the kidney so less is excreted. (Not b/e)</li> <li>● Increasing calcium reabsorbed in the small intestine. (Does this via the activation of Vitamin D) (Answer is c)</li> <li>● Decreasing phosphate reabsorption in kidney so more is excreted. (Not d)</li> </ul>
5.	<p>Hormones secreted by the anterior pituitary gland are:</p> <ul style="list-style-type: none"> <li>● FSH &amp; LH: Stimulate germ cell development (ovum and sperm in females and males respectively) and release of hormones (estradiol and progesterone in females, testosterone in males)</li> <li>● ACTH: Stimulates adrenal cortex to release cortisol in response to stress.</li> <li>● TSH: Stimulates secretion of T3 and T4.</li> <li>● Prolactin: Stimulates mammary glands to produce milk (lactation) and breast development</li> <li>● GH: Stimulates growth and protein synthesis.</li> </ul> <p>Can be remembered by the mnemonic FLATPIG (I for ignore).</p>
6.	<ul style="list-style-type: none"> <li>● Indirect stimulation of osteoclast/direct stimulation of osteoblast to resorb bone and release calcium into blood.</li> <li>● Increases intestinal calcium absorption by increasing activated vitamin D. Activated vitamin D increases calcium absorption.</li> <li>● Active reabsorption of calcium and magnesium from the distal convoluted tubule.</li> </ul>



- Decreases reabsorption of phosphate.



7.

a) Insulin is secreted by beta cells in the islets of Langerhans, and they function by:

- Increasing the uptake of glucose by fat and muscle cells
- Increasing synthesis of fatty acids
- Increasing uptake of amino acids and synthesis of proteins
- Suppressing hepatic glucose output by decreasing glycogenolysis and gluconeogenesis
- Suppressing lipolysis and muscle breakdown

b) C peptide

In the synthesis of insulin, proinsulin is cleaved from the C peptide and packaged into secretory granules before being released into the bloodstream. Hence, when endogenous insulin is released, increased concentrations of C peptide from the cleavage of proinsulin is found in the bloodstream. Synthetic insulin does not contain C peptide.

8.

a) Incretins are secreted by endothelial cells in the GI tract. Its function is to increase the effect of insulin response to glucose

b) Glucagon like peptide. (GLP-1)

Glucagon dependent insulinotropic peptide. (GIP)

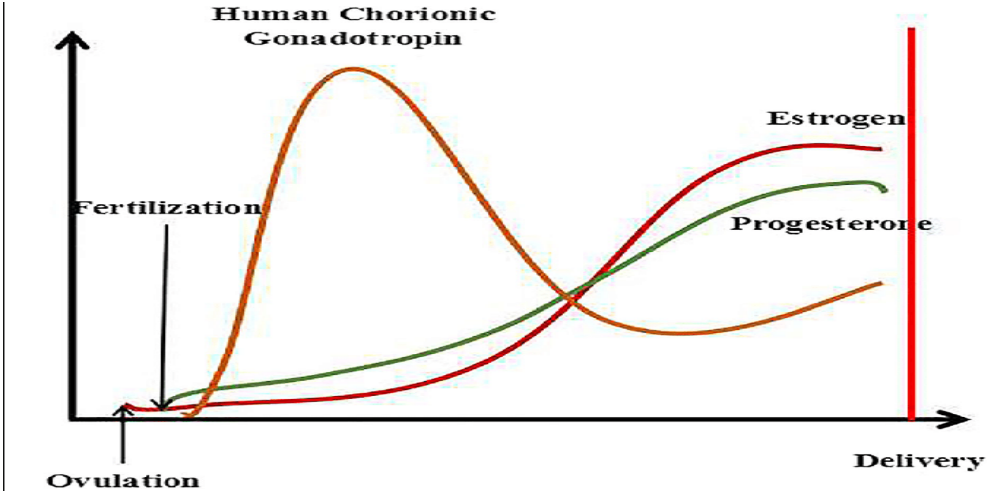
c) There are 4 main cells to focus on in the islets of Langerhans:

- Beta cells: insulin (70%)
- Alpha cells: glucagon (20%)
- Delta cells: somatostatin (8%)

	<ul style="list-style-type: none"> <li>● Pancreatic polypeptide secreting cells (2%)</li> </ul>
9.	<p>a) The anterior pituitary gland has no arterial blood supply and hence receives blood from the hypothalamus via the hypothalamo-hypophyseal portal vessels</p> <p>b) Infundibulum/ Pituitary stalk</p> <p>c) None. Trick question. The hormones ADH and Oxytocin are synthesised by the supraoptic nucleus and paraventricular nucleus respectively in the hypothalamus. They are then stored and released by the posterior pituitary gland when needed.</p> <p>d) ADH/Vasopressin:</p> <ul style="list-style-type: none"> <li>● Osmoreceptors in the hypothalamus detect an increase in plasma osmolality and in response secrete ADH. ADH then acts on collecting ducts and increases aquaporin 2 channels thereby increasing permeability of H<sub>2</sub>O and reducing water loss.</li> </ul> <p>Oxytocin:</p> <ul style="list-style-type: none"> <li>● Stimulates contraction of smooth muscles of breast for milk ejection.</li> <li>● Stimulates uterine contraction until baby is born</li> <li>● Promotes onset of labour</li> <li>● Is also thought to be involved in the expression of caring behaviours</li> </ul>
10.	<p>a) Thyroid Gland, located at C5-T1</p> <p>b) Isthmus</p> <p>c) External carotid artery Internal carotid artery</p> <p><u>From "Teachmeanatomy":</u> <b>Superior thyroid artery:</b> arises as the first branch of the external carotid artery. It lies in close proximity to the external branch of the superior laryngeal nerve.</p> <p><b>Inferior thyroid artery:</b> arises from the thyrocervical trunk (a branch of the subclavian artery). It lies in close proximity to the recurrent laryngeal nerve.</p> <p>d) Thyroid hormone T3 and T4. Increases metabolism, sympathetic action, heat production and is needed for growth and development.</p>
11. D	<ul style="list-style-type: none"> <li>● Round ligament: maintains the anteverted position of the uterus.</li> <li>● Ovarian ligament: Connects ovaries to uterus.</li> <li>● Cardinal ligament: Connects cervix to lateral pelvic wall. This provides support to the vagina and cervix. Also contains the uterine artery and vein.</li> </ul>

	<ul style="list-style-type: none"> <li>● Broad ligament: The broad ligament attaches the uterus to the pelvic wall. Also divides the pelvic cavity into the uterorectal pouch and uterovesical pouch.</li> <li>● Uterosacral ligament: Connects the cervix to the sacrum.</li> </ul>
12. A	<p>Both the uterine and vaginal arteries arise from the <b>internal pudendal arteries</b>.</p> <p>The ovarian arteries arise from the abdominal aorta.</p> <p>Superior mesenteric branches are the inferior pancreaticoduodenal arteries, jejunal and ileal arteries, middle and right colic arteries, and ileocolic arteries.</p> <p>Inferior mesenteric artery branches are the left colic, sigmoid branches, and superior rectal arteries.</p>
13. C	<p>Leydig cells produce testosterone. Testosterone then causes the Wolffian Duct to differentiate into the <b>epididymis, ejaculatory ducts, Vas deferens and seminal vesicles</b>.</p> <p>Testosterone eventually produces dihydrotestosterone. Dihydrotestosterone is required for the differentiation of the urogenital sinus, genital tubercle, labio-scrotal folds, and urogenital folds. This leads to the formations of the <b>Penis, Scrotum and Prostate</b>.</p>
14. C	<p>Epithelium of the Vas deferens is Pseudostratified squamous epithelium with stereocilia lined by smooth muscles.</p>
15. B	<p>Fertilization occurs within 24-48 hours of ovulation – Commonly occurs in the ampulla of the fallopian tube.</p>
16. B	<ul style="list-style-type: none"> <li>● Day 1: Fertilisation</li> <li>● Day 2-3: Cleavage (This results in increased cell numbers for sufficient cell differentiation)</li> <li>● Day 4: Compaction (Cells flatten and maximise intracellular contacts forming tight junctions and polarization of outer cells – Needed for quick differentiation)</li> <li>● Day 5: Cavitation and differentiation</li> <li>● Day 21: Implantation</li> </ul>
17. D	<p>The “Rule of 3s” is useful in remembering contents of the spermatic cord.</p> <p>3 Arteries: Testicular, Deferential, Cremasteric  3 Nerves: Genital branch of genitofemoral. Cremasteric, Sympathetic nerve fibres  3 Fascias: External spermatic fascia, Cremasteric fascia, Internal Spermatic fascia  3 Others: Ductus deferens, Processus vaginalis, Lymphatic vessels</p>

	<p>The ilioinguinal nerve is not transmitted within the spermatic cord but instead runs outside in the inguinal canal</p>
<p>18.</p>	<p>a) Seminiferous tubules</p> <p>b) Seminiferous tubules -&gt; Rete testis -&gt; Efferent Ducts -&gt; Epididymis -&gt; Vas deferens-&gt; Ejaculatory duct -&gt; Urethra -&gt; Penile Urethra</p> <p>Mnemonic: SREEVE UP</p> <p>c) Blood testis barrier consists of seminiferous tubules bounded together by basement membrane. Sertoli cells extend from the basement membrane into the lumen centre of the tubule, each joined to one another by tight junctions.</p> <ul style="list-style-type: none"> <li>• This prevents chemicals from the blood stream into the lumen of seminiferous tubules</li> <li>• Helps retain luminal fluid</li> <li>• Provide proper conditions for germ cell development and differentiation within the tubules</li> </ul>
<p>19.</p>	<div data-bbox="363 987 911 1579" data-label="Image"> <p>(a) Normal (anteflexed, anteverted)</p> <p>(b) Retroflexion (uterus still anteverted)</p> <p>(c) Retroversion (uterus still anteflexed)</p> <p>(d) Retroversion and retroflexion</p> <p>Fig. 101 Variations in uterine position and their terminology.</p> </div> <p>Anteverted uterus: An anteverted uterus with respect to the vagina means that the uterus is rotated towards the surface of the body.</p> <p>Retroverted uterus: In a retroverted uterus, the uterus is rotated towards the posterior abdominal wall.</p>
<p>20.</p>	<p>a) Males: FSH acts on Sertoli cells and LH acts on Leydig cells</p> <p>Females: FSH acts on Granulosa cells and LH acts on Theca cells</p>

	<p>b)</p> <p>Sertoli cells:</p> <ul style="list-style-type: none"> <li>• Sertoli cells release Mullerian inhibiting factor which is needed for the degeneration of the Mullerian duct.</li> <li>• When stimulated by FSH Sertoli cells also releases inhibin which regulates FSH secretion via a negative feedback</li> </ul> <p>Granulosa cells</p> <ul style="list-style-type: none"> <li>• Converts androgens into oestrogen using the enzyme aromatase</li> </ul> <p>Leydig cells:</p> <ul style="list-style-type: none"> <li>• Produce testosterone</li> </ul> <p>Theca cells:</p> <ul style="list-style-type: none"> <li>• Produces the androgens which will be converted to oestrogen by granulosa cells</li> </ul>
21.	<p>Relaxin: Secreted by ovary and placenta (High in early pregnancy). Limits uterine activity, softens cervix and is involved in cervical ripening for delivery.</p> <p>Prostaglandin: PGF2a is the main one although PGE2 is 10x more powerful. They are secreted by uterine tissues and play a role in the initiation of labour.</p> <p>hCG: Stimulates Oestrogen and Progesterone production by Ovaries. Secretion reaches a peak around 60-80 days after which it decreases and remains constant until the end of pregnancy. By then the placenta takes over and secretes large amounts of Oestrogen and Progesterone.</p> 
22.	<ul style="list-style-type: none"> <li>• <b>Cardiovascular changes</b> <ul style="list-style-type: none"> <li>- Increased CO</li> <li>- Reduced systemic blood pressure</li> </ul> </li> </ul>

	<ul style="list-style-type: none"><li>– Reduced total peripheral resistance</li><li>– Increased uterine blood flow</li><li>– Increased blood volume</li><li>– Increased plasma and blood cell mass</li></ul> <ul style="list-style-type: none"><li>• <b>Respiratory changes</b><ul style="list-style-type: none"><li>– Increased alveolar ventilation</li></ul></li></ul> <ul style="list-style-type: none"><li>• <b>Gastrointestinal changes</b><ul style="list-style-type: none"><li>– Linea nigra (a brown streak due to linear hyperpigmentation)</li><li>– Striae gravidarum (Pregnancy stretch marks)</li><li>– Darkened areola of breasts</li></ul></li></ul> <ul style="list-style-type: none"><li>• <b>Skin changes</b><ul style="list-style-type: none"><li>– Increased alveolar ventilation</li></ul></li></ul> <ul style="list-style-type: none"><li>• <b>Biochemical changes</b><ul style="list-style-type: none"><li>– <b>Weight gain</b> (More common for slim women than Obese women) Obese women do not put on much weight during pregnancy since they already have fat stores that can be utilised to provide energy. Slim women lack these fat stores and thus put on more weight.</li><li>– Increased <b>protein &amp; lipid synthesis</b></li><li>– Increased <b>Insulin resistance</b></li></ul></li></ul>
--	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

We hope you have found these questions useful. Please fill out our feedback form so we can improve;

<https://docs.google.com/forms/d/e/1FAIpQLSfp6LVdcxvKezwk4rib9MDCiNj9uOH6XxSEe1fe4zz-6AIQ/viewform?vc=0&c=0&w=1&flr=0>