

PTS Phase 1 Mock SAQ 2023

Paper 2 – [Answers]



Examiner Instructions:

- Time allocated for examination: 2 hours.
- You are **not permitted** to leave the examination hall in the first 90 minutes and last 10 minutes.
- You are permitted to use a Sheffield University approved calculator should you wish.
- The use of mobile phones or other electronic devices is **strictly prohibited** in this exam and should be handed in or switched off for the duration of the exam.
- Please complete all 12 questions
- The paper consists of 120 marks total.

Disclaimer:

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.

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(Question 1)

Mrs Jones has come to the GP complaining of hot flushes and vaginal dryness, she is diagnosed with menopause

1) What is the function of FSH? (1)

Stimulates the follicles to develop.

2) Where is FSH secreted from? (2)

Anterior (1) pituitary gland (1)

3) After menopause, why are women more likely to develop osteoporosis? (2)

There is low oestrogen (1) present in the body which has an effect on bone density by increasing the activity of osteoblasts (1)

4) State the cells that LH acts on in: (3)

a. Males

Leydig cells

b. Females

Theca cells

Plus, third point for getting both answers correct

5) Give two differences between spermatogenesis and oogenesis (2)

Any two from:

Location	Occurs entirely in testes	Occurs mostly in ovaries
Meiotic divisions	Equal division of cells	Unequal division of cytoplasm
Germ line epithelium	Involved in gamete production	Not involved in gamete production
Number gametes produced	4	One (plus 2-3 polar bodies)
Size of gametes	Sperm smaller than spermatocytes	Ova larger than oocytes
Duration	Uninterrupted process	In arrested stages

Onset	Begins at puberty	Begins in foetus
Release	Continuous	Monthly from puberty
End	Lifelong	Terminates with menopause

(Question 2)

Mr Clarkson has muscle weakness, polyuria, and resistant hypertension. Investigations show an increased Aldosterone-Renin ratio and the doctor consequently diagnoses him with Conn's syndrome for which the treatment is laparoscopic removal of the adrenal gland

1) What shape are the right and left adrenal glands? (2)

Right gland is pyramidal (1) and the left gland is semi-lunar (1)

2) What is the embryonic origin of the adrenal glands? (1)

Mesoderm

3) State the area of the adrenal glands which produce: (2)

a. Glucocorticoids

Zona fasciculata

b. Aldosterone

Zona glomerulosa

4) Describe the pathway for the stimulation of aldosterone secretion (5)

Decreased renal perfusion (1) stimulates granular cells to secrete renin (1)

Renin activates angiotensinogen to angiotensin 1 (1)

ACE activates angiotensin 1 to angiotensin 2 (1)

Angiotensin 2 acts on the adrenal cortex and stimulates increased aldosterone secretion (1)

(Question 3)

This question is about public health. A patient has come to the gp complaining of a raspy cough. They have been a smoker for the past 20 years but further questioning reveals that they would like to stop smoking and they would like some advice on this.

1) Define the term sick role behaviour (2)

Aimed at getting well (1), patients has good compliance and rests appropriately (1)

2) Describe the Health Belief Model (3)

Individuals must believe that they are susceptible to the condition (1) and that it has serious consequences (1).

Plus one of:

**This means that they will take actions to reduce their risk of getting the disease
Or that the benefits of these actions outweigh the costs**

3) State another model of behavioural change (1)

Transtheoretical model

4) Give two examples of methods to help a patient stop smoking (2)

Nicotine Replacement Therapy – patches, gums, nasal spray

Varenicline

Bupropion

5) State two laws that have been implemented to reduce smoking in the UK (2)

Any two of:

1908 – Children Act – sale of tobacco under 16s prohibited

1950 – Richard Doll and Austin Bradford Hill – Smoking and Lung Carcinoma

1965 – Parliament bans cigarette advertising on TV

2007 – Smoking in public banned and legal minimum age is raised to 18 in the UK to buy cigarettes

2015 – Smoking in the car with children is banned in the UK

(Question 4)

An 8-year-old boy presents to the emergency department with a hives and itching following peanut exposure at a school party. The doctors say he has had an anaphylactic reaction and he is given adrenaline.

1. State 3 natural barriers of infection that the body has. (3 marks)

- Any of: skin, mucous membranes, stomach acid, lysozyme in tears, coughing, sneezing, vomiting, diarrhoea**

2. Briefly describe the differences between adaptive and innate immunity. (4 marks)

- Any of:
 - Innate: immediate, first line response, cells: phagocytes, NK cells, mast cells, basophils, eosinophils etc.
 - Adaptive: often second line, delayed response (often > 4 days), B and T lymphocytes
3. What is the predominant mediator of a type I hypersensitivity reaction? (1 mark)
- Histamine
4. Describe the course of action of a type I hypersensitivity reaction. (2 marks)
- Antigen interacts with IgE bound to mast cells or basophils, degranulation of mediators leads to local effects
5. Give 2 examples of type I hypersensitivity reactions (2 marks)
- Anaphylaxis, hayfever

(Question 5)

A 48 year old man presents to the emergency department with severe dehydration after having food poisoning with extensive diarrhoea and vomiting. He is given IV fluid replacement after the diagnosis of acute kidney injury.

1- State and describe 2 ways GFR is regulated. (4 marks)

- Autoregulation
 - o Smooth muscle contraction in response to external stretching force. A passive mechanism which occurs in capillary walls
 - o E.g., pressure in afferent arterioles increases -> stretches vessel walls -> contraction of smooth muscle -> arteriolar constriction.
- Tubuloglomerular feedback
 - o Afferent arteriole constricts / dilates in response to increased / decreased NaCl concentration respectively. NaCl levels increase as GFR increases.

2- Give 4 factors determine the rate of which a molecule crosses the filtration barrier. (4 marks)

- Any of:
- Size of molecule
- Charge of molecule
- Blood flow rate
- Pressure
- Binding to plasma proteins

3- Name 2 forces that oppose glomerular filtration. (2 marks)

- Hydrostatic pressure of the Bowman's space (1)
- Oncotic pressure of the glomerular capsule (1)

(Question 6)

Miss Chapman is a 52 yo lady who presents to her GP with complete hearing loss in 1 ear. She frequently goes to concerts and listens to music through her headphones when she is running. She is diagnosed with noise-induced hearing loss.

- 1- What structure within the ear is damaged by loud noise? (2 marks) Hair cells within the cochlea.
- 2- Name the bones within the ear (3 marks). Malleus, incus, stapes.
- 3- What is the name and number of the cranial nerve associated with hearing? (2 marks) CNVIII - Vestibulocochlear nerve. (1 mark for number, 1 for name).
 - i. Which foramen does this cranial nerve pass through? (1 mark) Internal acoustic meatus.
 - ii. Which other cranial nerve passes through this foramen? (2 marks) CNVII - Facial nerve (1 mark for name, 1 for number).

(Question 7)

Mr James, a 66yo man, has a past medical history of hypertension and type 2 diabetes mellitus. He presents to the GP with chest pain and palpitations. After an ECG, he is diagnosed with atrial fibrillation and commenced on verapamil and aspirin.

- 1- In an ECG, what do the P wave and QRS complex represent and how long should they last? (5 marks)

P wave = atrial systole/depolarisation, 80-100ms.

QRS = ventricular systole/depolarisation and atrial repolarisation, 60-100ms.

- 2- Define tachycardia. (1 mark) **Heart rate of 100bpm+.**
- 3- Describe 2 differences between left sided and right sided heart failure. (4 marks)

Left sided = blood builds up in the lungs, causes pulmonary oedema.

Right sided = blood builds up in the body, causes peripheral oedema.

(Question 8)

Sarah Jones, an 8 year old girl, presents to a&e with a broken leg. An X - ray is performed to view the break and she is referred to surgery to have a rod put in place before plaster casting.

- 1- Which type of ossification occurs in fracture healing? (1)

endochondral

- 2- State two types of fracture (2)

Avulsion

Transverse

Spiral

Oblique, non displaced

Oblique, displaced

Linear

Greenstick

comminuted

3- Other than bony callus formation, list the stages of fracture healing. (3)

Explanations are not needed for marks:

Haematoma formation - traumatic rupture of blood vessels at fracture site, bleeding

Soft/fibrocartilage callus formation - new capillaries grow and supply nutrients, dead tissues undergo phagocytosis, connective tissues form a soft callus splinting the bone

(Bony callus formation)

Bone remodelling - response to mechanical stress, strong permanent patch formed, new bone stronger and more compact

4- Briefly describe how a bony callus forms during fracture healing (4)

Bony callus formation: osteoblasts and osteoclasts migrate to fracture and divide (1), replacement of soft fibrocartilage to spongy bone hard callus (2), bulge forms at fracture site (1)

(Question 9)

Mr Morris is a 78 year old man who presents to his GP with concerns of headaches and tunnel vision.

1- What is the name for a lack of peripheral vision? (2)

Bitemporal hemianopia

2- Pressure on which structure is usually associated with tunnel vision? (1)

Optic chiasm

3- Name a pathology which is usually associated with tunnel vision. (1)

Pituitary tumour

4- Which lobe is the primary visual cortex located in, and which sulcus is it located near? (2)

Occipital lobe, calcarine sulcus

- 5- Lesions of this sulcus tend to cause vision loss on the same side of each eye, with sparing of the macula. Why is the macula spared? (2)

**Macular vision is spared given the dual blood supply to the anterior portion (1) of the visual centre (Posterior communicating artery and Middle cerebral artery) (1).
Abbreviations not accepted.**

- 6- Name the two loops which carry information back to the visual area (2)

Meyer's loop, Baum's loop

(Question 10)

Mr Pollard, a 75 year-old man has come into see the GP after reporting needing to go to the toilet more frequently, especially in the middle of the night. He is sent to complete a urine sample, and upon further examination is diagnosed with Prostate Cancer. (Total 10 Marks)

- 1- Name three urinary buffers (3)

Ammonium, Phosphate, Bicarbonate

- 2- What foetal cells are responsible for secreting testosterone and during what week of development? (2)

Leydig Cells, Week 8 (1 mark for each)

- 3- Why does the Müllerian duct degenerate? (2)

Inhibiting substance is released from sertoli cells

- 4- What part of the trilaminar disc are the bladder and urethra formed from?(1)

Endoderm

- 5- What is the function of dihydrotestosterone? (2)

Stimulates the differentiation of male external genitalia

(Question 11)

Ms Holt, a 42-year-old is referred to a renal clinic for a transplant review with a renal Consultant after undergoing some tests for her Chronic Kidney Disease. (Total 12 Marks)

1- How much of the total cardiac output do the Kidneys receive? (1)

10%

2- What substance can be used to clinically estimate eGFR? (1)

Creatinine

3- In what 2 ways is eGFR regulated? (2)

Autoregulation, Tubuloglomerular Feedback

4- What 2 hormones are secreted by the Kidney? (2)

EPO (Erythropoietin), Renin

5- What is the function of ACE? (1)

Converts Angiotensin 1 into Angiotensin 2

6- What 2 cell types are found in the Collecting Duct? (2)

Principal Cells, Intercalated Cells

7- What 3 things make up the Glomerular Filtration Barrier?

Fenestrated Capillary Endothelium, Double layer basement membrane, Foot process of podocytes

(Question 12)

A GP practice has found there to be an increase in the number of diabetic patients with eye complications in the past 10 years. They are hoping to produce materials to better promote the diabetic eye screening service in an attempt to reduce this rise in case numbers. (Max 10 Marks)

1- What is screening in health care? (2 Marks)

A process or test that detects apparently well individuals who have a disease (or disease precursor), from those who don't. The aim is to prevent disease, or detect it early to alter it's progression.

2- Apart from diabetic eye screening, name 1 other screening service offered by the NHS and the age range screening occurs. (2 Marks)

Any of:

- **Abdominal aortic screening - men in their 65th year (if older can self refer)**
- **Bowel cancer screening - men and women aged 60-69 years (every 2 years, and if older can self refer)**
- **Breast cancer screening - women aged 50-70 years (every 3 years, and if older can self refer)**

- Cervical screening - women aged 25-64 years (when 25-49, every 3 years, and when 50-64, every 5 years)
- Antenatal and newborn screening - throughout pregnancy and the first 8 weeks of the infant's life

3- The Willson and Jungner criteria for screening highlight the important features of any screening program should include. Write 3 points that are included in the criteria. (2 Marks)

Any of:

- The condition must be important
- The condition must have a recognised latent phase
- The condition must have a recognised natural history (know how disease progresses)
- The screening test must be suitable, sensitive, specific, inexpensive
- The screening test must be acceptable
- The post-screening treatment options must be effective
- The post-screening treatment options must follow an agreed policy
- The organisation and cost must include adequate facilities
- The organisation and cost must not be overly expensive to achieve benefit
- The organisation and cost must have ongoing processes for improvements

4- Write 1 potential positive and negative for screening tests. (2 Marks)

Any of - Positive:

- Can detect conditions early, leading to better future health
- Early intervention is more effective and cheaper
- Patient satisfaction tends to be higher
- Can give patient's reassurance if they are told they are at low risk of a condition
- Can help patients make better informed decisions about health in the future

Any of - Negative:

- Still a chance of producing incorrect results
- Incorrect results can lead to anxiety of false reassurance
- Some screening test may lead to difficult decisions that the person would not have had to make initially - e.g termination of pregnancy
- Personal choice is compromised
- Over treatment
- Harms from screening tests

5- The diabetic eye screening service is found to have a low sensitivity. How would the sensitivity of the screening test be calculated? (1 Mark)

Sensitivity = Number of true positive results / Total number of screened people

