



College of Intensive Care Medicine  
of Australia and New Zealand  
ABN: 16 134 292 103

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## SAQ MARKING EXAMPLES FOR CANDIDATES

Exam	First Part Written Examination	
Examination Date	2025.1	Question
Syllabus Mapping	Primary Syllabus Domain	S1(ii)
	Secondary Syllabus Domain(s)	N/A
Cognitive Domain/s	Knowledge/Understanding/Application	Knowledge
Angoff Mark	9.67	References
Average Mark	10	Barrett K et al. (2016). Ganong's Review of Medical Physiology. 25th Ed.
Pass Rate	55%	Guyton and Hall. (2016). Textbook of Medical Physiology. 13th Ed.p4 65-76 Kam P. and Power I. (2015). Principles of Physiology for the Anaesthetist. 3rd Ed. p299-300

**\*MARKING RUBRIC ON NEXT PAGE\***

**(a) Define innate immunity including how it differs from adaptive immunity (10% of marks)**

**Information for Examiners**

Innate immunity = immune mechanisms present at birth, first line of defense with no specificity and no memory. Limited set of activators.

Adaptive immunity = is specific and has memory. Requires sensitisation to create specific cell mediated response against antigens. Interacts with innate immunity as Ab's can stimulate innate responses also.

Below Standard	At Standard	Above Standard
0 Marks	1 Mark	2 Marks
Incorrect or no definition provided	Incomplete but must include the following: <ul style="list-style-type: none"> <li>• present at birth</li> <li>• limited set of activators</li> </ul>	Must include the following: <ul style="list-style-type: none"> <li>• present at birth</li> <li>• limited set of activators</li> </ul> Also includes comparison with adaptive <ul style="list-style-type: none"> <li>• need for sensitisation</li> <li>• broad range of antigens.</li> </ul>

**(b) Outline the components of the innate immune system including their role in the immune response.**

**Information for Examiners - Physiochemical**

Skin – physical barrier to pathogen entry , surface secretions ie. Fatty acids/lactic acid in sweat/sebaceous secretions prevent bacterial growth

Respiratory Tract Mucus – trap bacteria and foreign particles, removed by ciliary motion

Gastric Acid – HCl is bactericidal

Body fluid – urine/bile/saliva and gastric secretions provide continual flow thus flushing pathogens from sites of infection

Below Standard	At Standard	Above Standard
0-1 Marks	2 Mark	3-4 Marks
Incomplete list.	Comprehensive list however incomplete description explaining how each factor works to prevent infection	Provides a comprehensive answer which includes how each factor works to prevent infection.

**Information for Examiners - Humoral**

Complement – group of proteins produced by hepatocytes (and macrophages). Present as inactive proenzymes that are activated in a “complement cascade”. Lead to activation of a common membrane attack pathway. Initiation by IgG/IgM Ab/Ag, liposaccharide, endotoxin or IgA. MAC damages cell membranes. Other functions include opsonisation, chemotaxis, activation of neutrophils/monocytes and cell lysis.

Acute Phase Proteins – plasma proteins produced primarily by the liver expressed during acute infection including CRP, alpha 1 anti-trypsin and alpha 2 macroglobulin. These are involved in opsonisation and regulation of inflammation. CRP binds bacterial cell walls and activates the complement cascade.

Lysozyme – a bactericidal enzyme secreted in saliva, tears and mucus of respiratory and GI tract and in neutrophils. Causes bacterial cell lysis.

Below Standard	At Standard	Above Standard
0-3 Marks	4-5 Marks	6-7 Marks
Simple list of factors. No or very limited information on the role / function of each.	Incomplete list. Adequate description or at least 2 OR Excellent description of at least 1 (i.e. complement).	Provides all three factors (acute / negative phase protein, complement and lysozymes). Includes information on the role / function of each.

**Information for Examiners - Cellular**

Neutrophils - are produced in the bone marrow and primarily active against bacteria. Activated and attracted to sites of infection/inflammation by complement and inflammatory proteins like leukotrienes. Neutrophils adhere to the endothelium and phagocytose bacteria coated with opsonins and then kill bacteria through an oxygen dependent respiratory burst reaction.

Eosinophils – activated by complement and leukotrienes. Main role is against multi-cellular parasites.

Monocytes – formed in the bone marrow enter tissues to become macrophages. Involved in phagocytosis and antigen presentation to the acquired immune system. Important against intracellular pathogens. Chemotaxis attracts macrophages to the site of infection, interacting with neutrophils to attract and amplify the cellular response.

Mast Cells – activation by IgE as well as activated complement leading to degranulation of histamine molecules inducing inflammation and smooth muscle contraction.

Natural Killer Cells – large granular lymphocytes that kill target cells without sensitisation. Attack foreign antigens ie. Tumor cells or virus-infected cells.

Below Standard	At Standard	Above Standard
0-3 Marks	4-5 Marks	6-7 Marks
Incomplete list. Little information on role / function.	Almost complete list. Includes some information on role / function.	Comprehensive list of major cell types. Includes an outline of the role / function of each.

Innate → immune system present at birth  
first line of defense  
non-specific  
no memory  
limited antigens it responds to

Acquired → has memory  
requires first exposure to develop  
large antigen immune responses  
can stimulate innate immune response

### Components

#### Physicochemical

Skin → barrier → prevents pathogen entry  
→ sebum → anti-bacterial & growth

Gastric Acid → bactericidal

Respiratory Tract → mucus → traps bacteria  
→ cilia → remove particles/pathogen

### Humoral

Complement → group of proteins produced in liver  
amplification of response by activation  
results in membrane attack complex  
⇒ opsonisation and cell destruction also chemotaxis  
⊕ by acquired immune system → IgG/IgM  
⊕'s cellular response to i-f<sup>n</sup>

Acute phase proteins → ie. CRP from liver, α1-antitrypsin  
→ involved in opsonisation  
→ stimulates complement

Lysozyme → enzyme from saliva/tears/resp tract  
→ bactericidal

### Cellular

Neutrophils → bone marrow prod<sup>n</sup>  
→ active against bacteria → attracted to infection  
⊕ complement/acute phase  
phagocytose bacteria → resp burst to kill bacteria

Mast cells → IgE activation + complement → inflammatory response

Macrophages → become phagocytes/macrophages  
→ antigen presentation to acquired immune system

NK cells → attack foreign Ag ie tumor cells or virus infected

OUTSTANDING ANSWER - BREADTH + DEPTH SUFFICIENT TO DEMONSTRATE KNOWLEDGE

## BORDERLINE PASS SAMPLE ANSWER

### Innate Immunity

- present at birth
- no specificity
- no memory

in comparison to acquired immune → not present at birth  
→ specific  
→ memory from prior exposure to antigens  
→ greater response on subsequent exposure

### Components

#### Physicochemical

- GI secretion → gastric acid  
→ acidic pH denature bacteria
- Saliva → contain enzymes that denature bacteria
- Mucus Membrane → mucus helps to remove bacteria
- Tears → remove bacteria
- Skin → barrier to prevent pathogen entry  
→ sweat also plays a role

Humoral → complement  
→ acute phase proteins

#### \* Complement

- a group of proteins C<sub>1</sub>-C<sub>9</sub> that acts primarily against bacteria
- produced by liver
- functions - chemotaxis → direct chemical mediators to site of infection
- ↑ vascular permeability - phagocytosis
- ↑ vaso Ⓣ → ↑ flow ↑ mast cell degran<sup>n</sup>

#### - Activation: 3 methods

##### A - classical pathway

- activated by IgG/IgM of bacterial antigen
- ↑ production C<sub>3</sub> esterase which activate C<sub>5,6,7,8,9</sub>
- end product MAC → pokes holes in cells → cell death

##### B - Alternate pathway

- MBL binds carbohydrates on bacteria leads to activation of classical without Ig

##### Regulation - short life

- deactivated by many cells

#### \* Acute phase proteins

- CRP, ferritin, haptoglobin
- huchan → ↑ vascular permeability ↑ chemotaxis

#### \* Prokolytic (lysozyme)

- present in saliva or intraplacental fluid
- breakdown bacteria entering the body

**BORDERLINE PASS → EXCELLENT DETAIL HOWEVER**

**MISSED AN ENTIRE SECTION**

**→ SECTION OF COMPLEMENT COULD BE LEFT  
DOWN TO GIVE TIME TO INCLUDE  
CELLULAR RESPONSE**

# BORDERLINE FAIL SAMPLE ANSWER

Innate Immunity is part of the immune system that:

- not specific and does not have memory. The response to the 2nd exposure to a previous infection will not be different to the first
- present from birth
- is scalable → can be escalated

↑ Only half the part (i) addressed.

Components of the immune system

• Mechanical / Structural barriers

- skin, mucociliary escalator, mucous membranes, gut mli + enzymes, turbinates ← Needs expansion and specificity
- provide a structural barrier to pathogen entry

• Cell based

Granulocytes

- Neutrophils - components of immune system that can marginate at of capillary and phagocytose foreign pathogens + destroy them  
non-specific introduction not required, start with second hit
- Largest concentration of granulocyte
- Macrophages - Antigen presenting cells
  - Monocytes before entering tissues
  - are able to phagocytose pathogens and present antigens to activate adaptive immune system
- NK cells - destroy pathogens ? what type how
- Others - eosinophils, basophils → good against parasites

Complement

75 zymogen proteins that are able to be activated and amplify the response to a pathogen

- most C3 (3g/L) in blood and C4 → not needed detail
- complement proteins target pathogens for destruction (opsonisation) destroy them directly and produce chemotactic molecules to draw other immune cells to site of infection i.e. histamine cytokines
- C3 undergoes self amplification loop, activating other proteins that then activate others
- end result → Membrane attack complex → mention earlier and cut this out  
↳ C5, C6, C7, C8, C9 structure  
↳ creates holes in pathogen walls to induce inflow of H<sub>2</sub>O and destruction

→ DEFINITION DID NOT REFER TO ADAPTIVE SYSTEM  
BORDERLINE FAIL → LACKED DETAIL IN PHYSIOCHEMICAL TO GAIN MORE MARKS  
↓ MISSED A NUMBER OF POINTS DESPITE DETAIL ON COMPLEMENT / MACROPHAGES

## **Notes on the templates and marking processes.**

*“Information for Examiners” is designed as a guide for the type of information that is considered appropriate for this. In most cases to score full marks the whole section is NOT needed.*

*The sample answers provided in this document are de-identified examples taken from previous exams. They are designed to help candidates understand how the marking rubrics are applied to the SAQ and to understand the technique and information required to fulfil a passing mark. It also demonstrates how the depth and breadth of your answer is determined by the breadth of the question, the verb used in the question and the time limit. All answers were written in 9-10mins.*

*Two examiners mark each candidate’s answer, thus the interpretation of the marking rubric is open to variation. To account for this, the consistency of marking between examiners and thus interpretation of the rubric is compared at the beginning of marking periods and during the marking review period. If there is large variation, the question may be remarked by a third examiner and the angoff mark is likely to be adjusted to account for this, always erring on the side of giving the candidate the benefit of the doubt. Additionally, how the rubric is written and how the marks are allocated within a rubric informs the decision of the Angoff panel of what the “passing mark” should be. So the same question could have different pass marks if the rubric is different between exam sittings. We may find that a group of candidates score poorly on a question when we think it should not be the case and thus change the marking rubric to better consider what is do-able in the 10mins or reasonable to expect a candidate to remember. Thus the pass mark in the first exam will be lower than the second exam using the same question as the rubric has been made easier to score marks. All of these processes are designed to take the “guesswork” out of “what are the examiners looking for” and to make the exam fairer, ultimately improving the transparency and the validity of the exam.*