



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2016**

Health and Social Care

Assessment Unit AS 14

assessing

Unit 14: Understanding Human Physiology

[A3H81]

FRIDAY 24 JUNE, MORNING

MARK SCHEME

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes, and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.




The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

1 (a) Identify the cell, tissue or organelle whose structure and function are described below. (AO1, AO2)

- Mitochondria
 - Epithelial (accept any named epithelial cell or tissue, e.g. goblet cell or skin)
 - Ribosome
 - Erythrocyte/Red blood cell
 - Goblet cell
 - Golgi apparatus
- (6 × [1]) [6]

(b) Complete the table to explain how each of the following cells/tissues is specialised to perform its function. (AO1, AO2)

Diagram of specialised cell/tissue	Specialisation	Function
 <p><small>© Figure 2.1 (Page 20) and Figure 2.2 (Page 21) from Physiology & Anatomy: A Homeostatic Approach 2nd Edition by John Clancy and Andrew Mc Vicar. Published by John Clancy and Andrew McVicar, 2002.</small></p>	Regular arrangement of fibres [1]	Allows contraction and relaxation for movement at joints [1]
 <p><small>© Biology GCSE Edition by Geoff Jones and Mary Jones. Published by Cambridge University Press, 2nd Edition, 1987. (ISBN: 978-0521338691)</small></p>	Extension of cell membrane to form tail Excess mitochondria in mid section [1]	Allows locomotion to reach egg Provide energy for swimming [1]
 <p><small>© Biology GCSE Edition by Geoff Jones and Mary Jones. Published by Cambridge University Press, 2nd Edition, 1987. (ISBN: 978-0521338691)</small></p>	Extension of cell membrane to form axon Dendrites [1]	Allows faster transmission of impulses To pick up messages from other nerves [1]

Accept any function of the tissue
 (6 × [1]) [6]

(c) (i) Write down the name and function of each of the cells A to D. (AO1, AO2)

A Name: Lymphocyte
 Function: Produce antibodies against foreign bodies/disease
 [1] for name [1] for function

B Name: Phagocyte (monocyte)
 Function: engulfs cells and cell debris by phagocytosis
 [1] for name [1] for function

C Name: Erythrocyte/Red blood cell
 Function: Carries oxygen around the body using a pigment called haemoglobin
 [1] for name [1] for function

D Name: Neutrophil/phagocyte
 Function: engulfs cells and cell debris by phagocytosis
 [1] for name [1] for function

(8 × [1])

[8]

(ii) Describe how cells A and D work together to carry out their common function. (AO1, AO2, AO3)

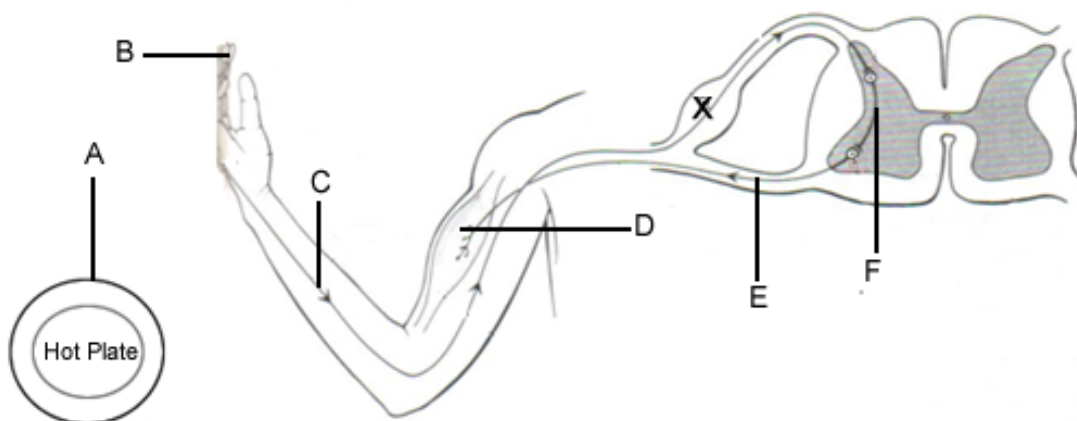
- Lymphocytes (A) secrete antibodies in response to foreign antigens
- Antibodies bind to the antigens and clump bacteria together
- Neutrophils (D) then engulf the clumped bacteria
- Neutrophils then phagocytose/digest/break down/destroy the bacteria

[1] for key phrase/[2] for basic description/[3] for adequate description/
 [4] for full description [4]

24

2 The diagram below shows a reflex arc.

(a) (i) On the diagram, mark with an X the position of the cell body of the sensory neurone. (AO1)



[1]

(ii) Match the terms below with the letters on the diagram (AO1, AO2)

Effector	D
Association neurone	F
Stimulus	A
Receptor cells	B
Sensory neurone	C
Motor neurone	E

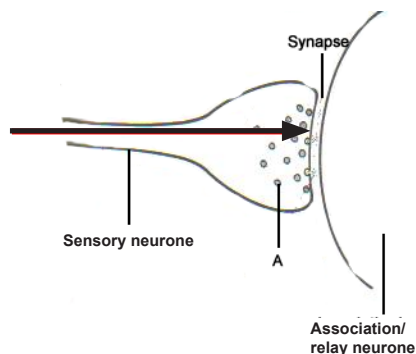
(6 × [1]) [6]

(iii) Reflex reactions are involuntary. Explain the term involuntary. (AO1)

Involuntary means we have no control over them they will happen automatically/without conscious decision.

[1] for key phrase/[2] for explanation [2]

(b) (i) On the diagram, mark with an arrow the direction of the impulse along the sensory neurone. (AO1)



[1]

(ii) Identify structure A. (AO1)

vesicle/neurotransmitter/acetylcholine

(1 × [1]) [1]

(iii) Discuss how the nerve impulse travels along the sensory neurone and across to the association/relay neurone. (AO1, AO2, AO3, AO4)

Answers may address some of the following points:

- The impulse travelling along the axon is an electrical impulse
- The electrical impulse reaches the presynaptic knob/end of the first neurone
- Vesicles in the presynaptic knob move towards the presynaptic membrane
- Vesicles fuse with the membrane

- The neurotransmitter/acetylcholine/chemical is released from the vesicle
- The chemical diffuses across the synaptic cleft/synapse
- The neurotransmitter/acetylcholine/chemical attaches to receptors on the association/relay neurone
- This stimulates an electrical response in the association/relay neurone

All other valid responses will be given credit

[0] is awarded for a response not worthy of credit.

[9]

Level 1 ([1]–[3])

Overall impression: basic

- displays limited understanding of how the impulse travels along the neurone or across the synapse
- there is limited discussion of the mechanism
- Quality of written communication is basic. The candidate makes a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

Level 2 ([4]–[6])

Overall impression: adequate

- Displays adequate understanding of how the impulse travels along the neurone or across the synapse; reference should be made to the electrical impulse becoming a chemical message at the synapse
- There is adequate discussion of the mechanism
- Quality of written communication is adequate. The candidate makes a reasonable attempt to select and use an appropriate form and style of writing. Relevant material is organized with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning evident.

Level 3 ([7]–[9])

Overall impression: competent

- Displays good understanding of how an impulse travels along the neurone electrically and across the synapse chemically; should make reference to the vesicles releasing neurotransmitter acetylcholine/chemical and that this initiates a response in the association/relay neurone.
- There is a competent discussion of the mechanism
- Quality of written communication is competent. The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organized with a high degree of clarity and coherence. There is extensive and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a high standard and ensure that the meaning is clear

- (c) (i) Explain what is meant by the term ‘the central nervous system’.
(AO1, AO2)

The central nervous system is the brain and spinal cord and co-ordinates nervous responses

[1] for key phrase/[2] for full explanation [2]

- (ii) Identify two symptoms of MS. (AO1, AO2)

Answers may address any two of the following:

- Pain
- Extreme tiredness (fatigue)
- Numbness and tingling
- Blurring of vision
- Problems with mobility and balance
- Muscle weakness and tightness
- Slurred speech
- Sudden onset of paralysis
- Lack of coordination
- Cognitive difficulties

(2 × [1]) [2]

- (iii) Write down two ways the motor neurone is adapted to ensure faster transmission of a nerve impulse. (AO1, AO2, AO3)

Answers may address any two of the following:

- Myelin sheath insulates the nerve and causes impulse to jump from node to node
- Long axon
- Branched dendrites increase the surface area to which the impulse can be delivered
- Multipolar so they can synapse with several other neurones

(2 × [1]) [2]

- (iv) Describe the physiological changes in the motor neurone that account for the loss of muscle control in MS. (AO1, AO2, AO3)

Answers may address the following:

- The body’s immune system attacks the myelin sheath
- This damages the myelin
- A hole develops in the myelin sheath
- This reduces the effectiveness of electrical conductivity
- Messages travel more slowly to the muscle
- Scar tissue forms around the damaged myelin

[1] for key phrase/[2] for explanation [3] for full discussion

(1 × [3]) [3]

3 (a) Define the term digestion. (AO1, AO2)

Digestion is the breaking down of large insoluble food molecules into small soluble ones to aid absorption, e.g. breaking starch into glucose, lipids into fatty acids and glycerol or protein into amino acids.

[1] for key phrase/[2] for full definition [2]

(b) Complete the table to identify the enzyme, substrate or product formed in the reactions of digestion. (AO1, AO2, AO3)

Enzyme	Substrate	Product
Carbohydrases	Carbohydrates [1]	Simple sugars, e.g. glucose [1]
Lipase [1]	Lipids	Fatty acids and glycerol [1]
Proteases	Protein [1]	Amino acids [1]

Any named substrate is acceptable

(6 × [1]) [6]

(c) (i) Identify parts A, B and C. (AO1)

A: Oesophagus

B: Bile duct

C: Duodenum/small intestine/ileum

(3 × [1]) [3]

(ii) Explain how the two layers of muscle shown in the diagram work together to aid digestion. (AO1, AO2)

The muscles will contract in different directions (in an action known as peristalsis); this allows the food to be mixed with the digestive juices in the stomach.

[1] for key phrases/[2] for explanation [2]

(iii) Identify one substance released by each of the following: (AO1)

The gall bladder

- Bile

The pancreas

Answers may address any one of the following

- Lipase
- Pancreatic juice
- Protease
- Carbohydrases
- Insulin
- Glucagon
- Somatostatin

(2 × [1]) [2]

(d) (i) Identify structures A and B. (AO1)

A: Goblet cell/epithelial tissue

B: Lacteal

(2 × [1])

[2]

(ii) List three ways the ileum is adapted for its function of absorption. (AO1, AO2)

Answers should address three of the following:

- Long length
- Good blood supply
- Large surface area
- Moist surface
- Epithelium wall is one cell thick

(3 × [1])

[3]

20

4 (a) Explain the term homeostasis. (AO1, AO2)

Homeostasis is the maintenance of a constant internal environment regardless of changing external conditions; equilibrium is usually brought about by a negative feedback mechanism.

[1] for key phrase/[2] for explanation

[2]

(b) Write down the normal range for blood glucose levels. (AO1)

4 to 7 mmol/dm³

(1 × [1])

[1]

(c) Describe the normal mechanism for the regulation of blood glucose levels in a healthy person (AO1, AO2, AO3, AO4)

Answers may address the following points:

- Blood glucose levels will normally increase following a meal/sugary drink
- The body detects the increase in blood glucose (sugar)
- The pancreas releases insulin
- Excess glucose is converted to glycogen by the insulin; this occurs in the liver
- The blood glucose level will be corrected
- If levels begin to drop after a period with no food or a period of exercise, the body detects the fall in blood glucose levels
- The pancreas secretes glucagon
- The stored glycogen is converted into glucose by the glucagon in the liver
- The glucose is released from the liver into the blood
- The blood glucose level will be corrected

All other valid points will be given credit

[0] is awarded for a response not worthy of credit.

AVAILABLE
MARKS

Level 1 ([1]–[3])

Overall impression: basic

- Displays limited understanding of how blood glucose levels are normally regulated
- There is limited description
- Quality of written communication is basic. The candidate makes a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

Level 2 ([4]–[6])

Overall impression: adequate

- Displays adequate understanding of how blood glucose levels are normally regulated and should correctly name the hormones
- There is adequate description
- Quality of written communication is adequate. The candidate makes a reasonable attempt to select and use an appropriate form and style of writing. Relevant material is organized with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning evident.

Level 3 ([7]–[9])

Overall impression: competent

- Displays good understanding of how glucose levels are normally regulated; should correctly name the hormones and their site of production.
- There is a competent discussion
- Quality of written communication is competent. The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organized with a high degree of clarity and coherence. There is extensive and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a high standard and ensure that the meaning is clear [9]

- (d) (i) Describe the physiological cause of Type II diabetes (AO1, AO2)

Type II diabetes occurs when the pancreas doesn't produce enough insulin to maintain a normal blood glucose level or the body is unable to use the insulin that is produced. This is known as insulin resistance. The body becomes used to high levels of insulin all the time and becomes resistant to it. Since glucose is not being converted to glycogen for storage, glucose levels rise.

[1] for key phrases/[2] for adequate description/[3] for full description [3]

- (ii) Using the information above, analyse the potential impact of Type II diabetes on Janine's lifestyle.
(AO1, AO2, AO3, AO4)

Answers may address some of the following points:

Work:

- Janine's diagnosis should not affect her long term ability to do her job; however she may require some time off work until she gets her blood sugars under control.
- As Janine drives for a living she will need to have a medical licence check regularly.
- If at any time she is not medically fit to drive she will have to stop working as a lorry driver and therefore change her job.

Income:

- Janine will lose earnings if she is not able to work as she is self-employed
- She may be entitled to benefits while she is ill but this will be significantly less money that she would earn when driving.

Leisure:

- Janine is at a higher risk of stroke and heart disease due to the damage caused by Type II diabetes; so she needs to reduce her alcohol intake as alcohol is also a factor for these conditions.
- She could continue to go to the pub but drink less or avoid alcohol choosing low sugar alternatives.
- Janine will need to stop smoking as it increases the risk of stroke and heart disease further
- Janine may start to do more exercise by doing things other than going to the pub, this could help her lose weight which will significantly lower her risk of heart disease.
- Janine could join a slimming group and meet new friends who are also needing to lose weight and they could motivate one another

Diet:

- Janine will need to eat regular, planned meals to avoid hypoglycaemia/hyperglycaemic episodes.
- She needs to avoid excess sugar in her diet, e.g. take a healthy packed lunch.
- She will need to learn about what constitutes a healthy diet that can help manage her condition.

Relationships:

- Janine has plenty of friends and they should be supportive of her, e.g. they may start to go out to the cinema or to other events rather than the pub.
- Janine may lose contact with some acquaintances who don't want to support her healthier lifestyle.

All other valid points will be given credit

[0] is awarded for a response not worthy of credit

[12]

27

Level 1 ([1]–[4])

Overall impression: basic

- Displays limited understanding of how Type II diabetes may impact on lifestyle
- There is limited analysis
- Quality of written communication is basic
- The candidate makes a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary, presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

Level 2 ([5]–[8])

Overall impression: adequate

- Displays adequate understanding of how Type II diabetes may impact on lifestyle
- There is adequate analysis.
- Quality of written communication is adequate. The candidate makes a reasonable attempt to select and use an appropriate form and style of writing. Relevant material is organized with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning evident.

Level 3 ([9]–[12])

Overall impression: competent

- Displays good understanding of how Type II diabetes may impact on lifestyle
- There is a competent analysis with clear reference to the scenario
- Quality of written communication is competent. The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organized with a high degree of clarity and coherence. There is extensive and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a high standard and ensure that the meaning is clear.

Total**100****AVAILABLE
MARKS**