Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Health and Social Care

Assessment Unit AS 14

assessing

Unit 14: Understanding Human Physiology

[A3H81]

WEDNESDAY 24 MAY, 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.

AVAILABLE MARKS

1 **(a)** Identify the name and **one** function of the organelles labelled A, B, C and D. (AO1, AO2)

A: Endoplasmic Reticulum (SER/RER)
Function: produces organic molecules like protein or fat
[1] for name; [1] for function

B: Nuclear membrane/Nucleus
Function: Allows passage of substances in and out of the nucleus/ controls cell activities
[1] for name; [1] for function

C: Golgi
Function: Packages and modifies organic substances like protein and fat or named protein or fat
[1] for name; [1] for function

D: Mitochondria
Function: Produces energy by the process of respiration
[1] for name; [1] for function

(8 × [1]) [8]

(b) Explain how each of the following cells is specialised to perform its function. (AO1, AO2)

Red blood cell: has no nucleus, allowing it to carry more oxygen or disc-shaped/biconcave to increase surface area or to pass through capillaries.
[1] for key phrase/s; [1] for explanation

Sperm cell: has enzyme vesicle to allow it to gain entry to the egg
or has long extension of cell membrane (tail) to allow it to swim
or has many mitochondria to provide energy for swimming.
[1] for key phrase/s; [1] for explanation

Motor neurone: long extension of cell membrane (axon) to allow messages to be transmitted more efficiently/faster
or has many dendrites to allow it to receive messages from several other cells.
[1] for key phrase/s; [1] for explanation

(3 × [2]) [6]

(c) Identify the tissues A, B and C. (AO1)

A: Cardiac muscle
B: Skeletal muscle
C: Smooth muscle

(3 × [1]) [3]

(d) Explain what is meant by the following terms. (AO1, AO2)

AVAILABLE MARKS

Organ: a group of tissues working together to perform a common function.
[1] for key phrase/s, [2] for explanation

System: a group of organs working together to perform a function.
[1] for key phrase/s, [2] for explanation

(2 × [2]) [4] 21

2 The diagram shows the structure of the skin.

AVAILABLE MARKS

(a) Use the diagram to discuss the role of the skin in controlling body temperature. (AO1, AO2, AO3, AO4)

Answers may address some of the following points:

If temperature drops below normal

- Receptors in the skin detect a drop in temperature and send messages to the hypothalamus
- Erector pili muscles contract pulling the hair upwards, causing goose bumps
- This traps a layer of air next to the skin, the air acts as an insulator reducing heat radiation from the skin surface
- Sweat glands cease producing sweat
- Blood vessels vasoconstrict keeping blood flow away from the surface of the skin, this prevents heat loss by radiation
- The skin will appear pale
- Muscles under the skin contract releasing heat (shivering)

If temperature rises above normal

- Receptors in the skin detect a rise in temperature and send messages to the hypothalamus
- Erector pili muscles relax making hair lie flat
- No air is trapped next to skin, this allows more heat to be lost by radiation from the skin surface
- Sweat glands produce sweat
- The sweat seeps onto the skin surface through the pores
- Evaporation of the sweat allows heat loss
- Blood vessels vasodilate allowing blood flow to the surface of the skin, this allows increased heat loss by radiation
- The skin will appear red

All other valid points will be given credit

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

Level 1 ([1]–[3])
Overall impression: basic

- Displays limited understanding of how structures in the skin facilitate temperature control
- There is limited discussion
- 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.

AVAILABLE MARKS

Level 2 ([4]–[6])
Overall impression: adequate

- Displays adequate understanding of how structures in the skin facilitate temperature control
- There is adequate discussion
- Candidates who focus only on temperature falling or only on temperature rising cannot achieve beyond this level
- 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 competent understanding of how structures in the skin facilitate temperature control. Candidates achieving in this mark band should show an awareness of the mechanism of heat loss
- There is 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]

(b) (i) Discuss how the body will react when the foot stands on the drawing pin. (AO1, AO2, AO3,AO4)

Answers may address some of the following points:

- An involuntary reflex reaction, which does not involve the brain, occurs
- Pain receptors in the foot will detect pain
- The receptors will send a message along the sensory neurone to the spinal cord (CNS)
- In the spinal cord the message will travel across a synapse to the association neurone
- The association neurone will synapse with the motor neurone
- The impulse will then travel away from the CNS along the motor neurone to the effector
- The leg muscles are the effector and they will contract pulling the foot away from the pin

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 a reflex arc
- There is limited discussion
- 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 a reflex arc and is able to correctly name some of the nerve pathways
- There is adequate discussion
- 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 a reflex arc. The receptors and effector are identified as well as the correctly named nerve pathway
- 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.

(1 × [9]) [9]

(ii) Name the neurone shown in the diagram (AO1)

Name: Motor neurone

(1 × [1]) [1]

AVAILABLE MARKS

(iii) Discuss how the structures labelled in the diagram speed up the transmission of the electrical impulse along this type of neurone. (AO1, AO2, AO3)

Answers may address some of the following points:
- The myelin sheath is made up of Schwann cells
- These cells insulate the axon
- This forces the impulse to jump from node to node thus speeding up the transmission of the impulse
- This process is known as saltatory conduction

[1] for key phrase/s[2] for adequate discussion [3] for fuller discussion

(1 × [3]) [3]

(iv) Multiple sclerosis (MS) occurs when this type of neurone is not working properly. Discuss how this happens. (AO1, AO2, AO3)

Answers may address the following points:
- Immune system attacks myelin sheath
- The myelin sheath becomes damaged forming plaques on the surface
- The speed at which nerve impulses are transmitted is much slower
- Motor function is reduced as a result
- All body systems can be affected in some way
- The illness is progressive

[1] for key phrase/s, [2] for adequate discussion, [3] for fuller discussion

(1 × [3]) [3] 25

AVAILABLE MARKS

3 (a) (i) Identify the parts of the brain A, B and C. (AO1)

A: Spinal cord
B: Cerebrum
C: Cerebellum

(3 × [1]) [3]

(ii) The pituitary gland, labelled in the diagram, is part of which other body system? (AO1)

Endocrine

(1 × [1]) [1]

(iii) Identify one substance released by the pituitary gland. (AO1)

Answers may address one of the following:
- Adrenocorticotrophic hormone (ACTH)
- Thyroid-stimulating hormone (TSH)
- Luteinising hormone (LH)
- Follicle-stimulating hormone (FSH)
- Prolactin (PRL)
- Growth hormone (GH)
- Melanocyte-stimulating hormone (MSH)
- Anti-diuretic hormone (ADH)
- Oxytocin

(1 × [1]) [1]

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

A: Lens
B: Iris
C: Retina/yellow spot/fovea
D: Optic nerve

(4 × [1]) [4]

(ii) Complete the following sentences to explain how the eye accommodates near and far objects. (AO1, AO2, AO3)

When looking at a near object the ciliary muscles **contract/tighten** and the suspensory ligaments **relax/loosen**. This causes the lens to appear **thicker/fatter**. The light is focused on the retina.
When looking at a far object the ciliary muscles **relax/loosen** and the suspensory ligaments **contract/tighten**. This causes the lens to appear **thinner/skinny**. The light is focused on the retina.

(6 × [1]) [6]

(iii) Explain the physiological cause of each of the following eye conditions. (AO1, AO2)

AVAILABLE MARKS

Answers may address the following points:

Glaucoma

- Glaucoma develops when the excess aqueous humor fluid cannot drain properly from the eye
- This causes pressure build up, known as the intraocular pressure
- This can damage the optic nerve or retina

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

Cataract

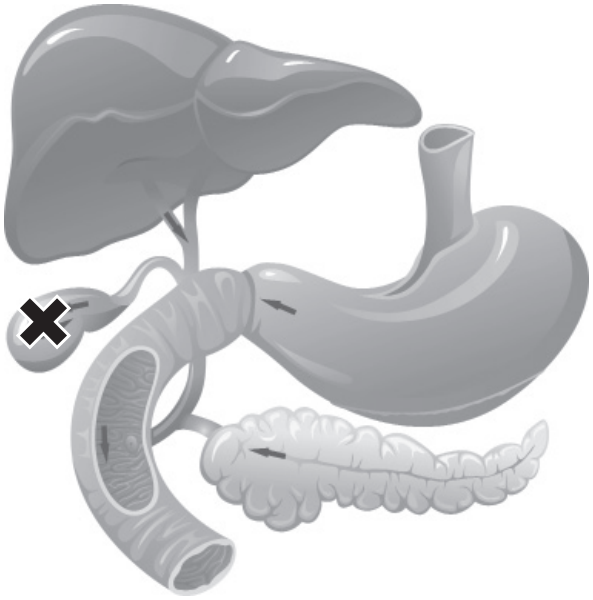
- Cataracts occur when there is a build up of protein in the lens that makes it cloudy
- This prevents light from passing clearly through the lens, causing some loss of vision/blurriness
- Cataracts are normally age related

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

(2 × [2]) [4] 19

AVAILABLE MARKS

4 (a) (i) The liver produces bile. On the diagram mark with an X the organ where bile is stored. (AO1)



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(1 × [1]) [1]

(ii) Explain the role of bile in digestion. (AO1, AO2)

Bile is used to emulsify fats; this increases the surface area on which enzymes can act.

All other valid points will be given credit
[1] for key phrase/s [2] for explanation [2]

(iii) Discuss the role of the liver in the breakdown of excess amino acids (deamination). (AO1, AO2, AO3)

Answers may address some of the following points:
- the amino acids are broken down into carbohydrates and ammonia by the liver
- the carbohydrates are used for energy or stored in the liver
- the ammonia is converted to urea and will be sent to the kidneys for excretion

All other valid points will be given credit
[1] for key phrase/s [2] for adequate discussion [3] for fuller discussion

(1 × [3]) [3]

(iv) Analyse how this (cirrhosis) may affect Timothy's lifestyle. (AO1, AO2, AO3, AO4)

AVAILABLE MARKS

Answers may address some of the following points:

Work:

- Timothy will probably be off work in the short-term as he is likely to need hospital treatment
- As liver cirrhosis cannot be cured he may have to stop work altogether in the longer term
- As Timothy often works in pubs and clubs where there is alcohol he may consider changing the type of work that he does
- If Timothy were to receive a liver transplant he may in time be able to return to his job as a musician provided he avoids alcohol

Income:

- Timothy's income may be reduced – he will lose his main source of income if he is no longer able to work
- Timothy will be able to receive benefits if he is no longer fit for work
- If Timothy receives a transplant he may be able to earn an income once again but this will take some time as he recovers

Leisure:

- Timothy will have symptoms such as tiredness, muscle wastage, pain, yellow itchy skin, swollen stomach and oedema. Depending on his symptoms he may not have the energy to take part in leisure activities
- Timothy will have to totally avoid alcohol and so may choose not even to go to watch the band playing reducing social contact
- Timothy may decide to take regular exercise on medical advice; this will prevent muscle wastage and may also help him fill his day

Diet:

- Timothy may be malnourished so he will be advised to eat a balanced diet to make sure he gets all the nutrients he needs, therefore his diet may be healthier than in the past
- Timothy should avoid salty foods and should not add salt to foods to reduce his risk of developing swelling in his legs, feet and abdomen
- The damage to Timothy's liver can also mean it's unable to store glycogen, a carbohydrate that provides short-term energy. When this energy is not available the body breaks down muscle to provide the extra energy. Therefore, Timothy will need to eat extra calories and protein in his diet to prevent muscle wastage

AVAILABLE MARKS

Relationships:
- He may find it difficult to maintain friendships if he is unable to work with his mates in the band
- Timothy may make new friends with his new healthier lifestyle or his good friends may go with him to do things that are less damaging to his health than drinking alcohol

All other valid points will be given credit

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

Level 1 ([1]–[4])
Overall impression: basic
- Displays limited understanding of how cirrhosis of the liver will impact on lifestyle
- There is limited analysis of lifestyle
- 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.

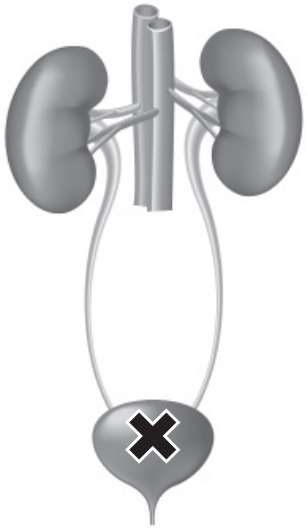
Level 2 ([5]–[8])
Overall impression: adequate
- Displays some understanding of how cirrhosis of the liver will impact on lifestyle
- There is adequate analysis of the effect on lifestyle, looking at more than one aspect, e.g. work, income, leisure, diet, relationships
- Quality of written communication 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 cirrhosis of the liver will impact on lifestyle
- There is a competent analysis looking at a range of aspects of lifestyle; work, income, lifestyle, diet, relationships
- 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.

(1 × [12]) [12]

AVAILABLE MARKS

(b) (i) On the diagram mark with an X the position of the bladder.



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(1 × [1]) [1]

(ii) Identify the two main functions of the urinary system. (AO1, AO2)

- Excretion – removal of waste the body has produced
- Osmoregulation – controls the amount of water in the blood.

(2 × [1]) [2]

(c) (i) Complete the table below to identify the parts of the nephron being described. (AO1)

Description	Part of nephron
Small substances are filtered out of blood here	**glomerulus/ Bowman's capsule**
This runs deep into the cortex and finely balances the amount of water and salts in the urine	**loop of Henle**
This empties into the ureter	**collecting duct**
This carries filtered blood back to the body	**venule**

(4 × [1]) [4]

(ii) Explain why: (AO1, AO2)

- There are no plasma proteins in urine as they are too large to be filtered out of the blood across the basement membrane into the Bowman's capsule
- Thre is no glucose in urine as it is needed by the body for respiration, so is actively transported or diffuses into the blood at the proximal, convoluted tubule
- Urea concentration is higher in urine than in the blood because less water in urine/more water in blood, as it is reabsorbed along the length of the nephron.

(3 × [2]) [6]

(iii) Explain the physiological cause of the following: (AO1, AO2)

Oedema is caused by liver, kidney or heart failure, resulting in fluid retention in the tissues

Incontinence is due to the sphincter muscle around the urethra becoming weak or no longer being controlled by the nervous system.

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

(2 × [2]) [4]

Total

AVAILABLE MARKS
35
100