GCSE

HUMAN HEALTH AND PHYSIOLOGY

44151H – Topics in Human Health and Physiology
Mark scheme

4415
June 2014

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from aqa.org.uk

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Question	Answers	Extra information	Mark	ID details
1(a)	Any **two** from: • Support / described • Protection • Movement / muscle attachment/ flexibility • Giving shape to the body	Allow production of (red) blood cells Ignore balance Allow (maintain) structure	2 max	E
1(b)	Any **two** from: • Broken bone / arm / leg / fracture • Dislocation • Pulled / torn / strained muscles • Tendon rupture • Torn cartilage • Tendonitis • Condition described – eg tennis elbow	Accept reference to an appropriately named bone Ignore hurt / damage / twisted / cramp / injury Allow pulled / torn ligament or sprain unqualified Allow strain unqualified	2 max	E
1(c)(i)	Flexor		1	A
1(c)(ii)	Extensor		1	A
1(d)	Loss of mobility described – eg stiffness / falling / loss of balance	Ignore arthritis Ignore dislocation Allow friction	1	E
1(e)(i)	Any **two** from: • Less bone / hip / joint removed • Fast(er) recovery time • Greater range of movement	Ignore whole joint not removed Ignore people recover in a few weeks unqualified	2 max	E

1(e)(ii)	Any **two** from: • Suitable for older people / people who are 60–80 / for any age • Do not know how long resurfacing will last • Patient does not need such strong bones	Ignore replacement lasts longer than resurfacing	2 max	E

1(e)(iii)	No surgery required so no risks **or** surgery requires time to recover / time off work or may not be successful	Accept example described eg damage due to anaesthetic / danger of infection – eg MRSA Allow no scarring Ignore cost	1	E

Total			**12**

Question	Answers	Extra information	Mark	ID details
2(a)	Midwife ***OR*** Gynaecologist	Need to be specific with type of doctor. Ignore doctor / nurse Accept obstetrician	1	E
2(b)	Any **two** from: • Healthy diet / balanced diet • (Moderate) exercise • Sufficient rest / avoid stressful activities / stop work • Stopping/reducing smoking • Stopping/reducing alcohol intake • Avoid heavy lifting • Avoid drugs / named eg	Allow taking folic acid (tablets) / calcium / iron / protein / appropriate vitamins & minerals **or** Avoid foods with known health risks – eg unpasteurised cheese **or** Avoid caffeine	2 max	E
2(c)	Any **two** from: • Breast milk contains all (nutrients) a baby needs / correct nutrients / balanced nutrients • Also contains many types of antibody / gives immunity • Babies are less likely to become obese	Ignore benefits to the mother eg preparation / cost Ignore more nutrients Allow psychological bonding between mother and child Allow reference to avoiding infection / allergy / coughs / colds	2 max	E
2(d)(i)	Overall pattern: decrease then increase; Suitable correct use of numbers – eg overall increase of 118 724 / overall % increase of 19.6 / approx 20% / decrease by 9807 and then increase by 128 531	Ignore dates Extra incorrect figures cancel	1 1	E

2(d)(ii)	Any **two** sensible suggestions - eg: • Housing • Education • Health Services / spread of disease • Food (supplies) • Pollution / waste disposal • Employment • Public transport / traffic • Power supply	Ignore resources unqualified	2 max	E
Total			**9**	

Question	Answers	Extra information	Mark	ID details
3(a)	128 – because: (ventricles) pump / force / push blood out (of the heart / to the body)		1	E
3(b)(i)	Heart beats faster ***OR*** beats more forcefully / more blood pumped (out per beat)	Accept higher pulse rate Accept increased stroke volume	1	E
3(b)(ii)	Glucose Oxygen	Accept sugar / $C_6H_{12}O_6$ Ignore carbohydrate / food Do not accept starch / glycogen / energy Allow ATP	1 1	G
3(b)(iii)	Used in (aerobic) respiration / (faster) respiration Supply (more) energy **or** (More) energy used	Must mention 'more' at least once for full marks Do not allow produce energy	1 1	E
Total			**6**	

Question	Answers	Extra information	Mark	ID details
4(a)	Vitamins	Accept named vitamin	1	G
4(b)(i)	Carbohydrate	Accept sugar	1	G
4(b)(ii)	9 / 9.047 / 9.05 / 9.0	Correct answer = 2 marks, with or without working If answer incorrect / no answer allow 1 mark for: $\frac{760}{8400} \times 100$	2	E
4(b)(iii)	Any **two** from: • more active • larger person / more muscle • lives in a cold climate • pregnancy • high BMR / high metabolic rate	Accept example of activity eg sport / manual work Ignore job unqualified Ignore male unqualified	2	E
4(c)(i)	Grind / mix cereal with water Biuret test / add NaOH + $CuSO_4$ result = purple / mauve / lilac	Extra incorrect detail – cancel eg heating Ignore 'blue'	1 1 1	E
4(c)(ii)	Make cells / cell structures / make enzymes / haemoglobin / antibodies	Allow 'growth' / 'repair' Ignore energy	1	E
4(d)	Any **two** from: • To avoid (cholesterol) causing atheroma / atherosclerosis / described – eg fatty deposits • Narrowing of arteries / narrowing of blood vessels / blocked blood vessels / reduced blood flow • To avoid heart attack / CHD / angina / described re. lack of respiration / death of heart cells / blood clots form	 Ignore veins Ignore stroke Ignore heart disease unqualified	1 1 	E
Total			**12**	

Question	Answers	Extra information	Mark	ID details
5(a)	**A** retina **B** iris		1 1	G
5(b)(i)	Response / reaction (to a stimulus) Automatic / involuntary / without thinking	Ignore action Ignore reference to brain not being involved Ignore no control	1 1	E
5(b)(ii)	(Circular) muscles contract Reduces size of pupil / described	Do not allow radial / ciliary muscles	1 1	E
5(c)	Lens is diverging / bends light rays outwards Image / light now focused / image on retina / image on part **A**		1 1	E
5(d)	Light rays diverge / spread out (more) from a near object Need to bend / refract light rays more (to focus) Requires thicker lens **or** less flexible lens cannot become thick enough / inadequate accommodation	 Allow fatter, bulging, more convex, rounder Do not allow larger	1 1 1	E
Total			**11**	

Question	Answers	Extra information	Mark	ID details
6(a)(i)	Any **two** from: • (all) male / gender • (all) doctors • (all) 35 years old (at start)	Any order Allow (same) profession Allow (same) age	2 max	G
6(a)(ii)	Correct figures from Figure 8: Smokers = 74 Non-smokers = 84	Max. 1 mark if not identified	 1 1	E
6(a)(iii)	No – this is just an average / the 2 lines are not always 10 years apart	Ignore ref. to all males	1	E
6(b)(i)	Cell division / growth of cells / cell multiplication / mitosis which is out of control / abnormal / uncontrolled		1 1	E
6(b)(ii)	Change in DNA / gene / chromosome		1	E
6(c)(i)	Chemicals (from smoke) / tar / carcinogens (are more concentrated in the lungs) (Smoke is) inhaled / enters lungs first		1 1	E
6(c)(ii)	Chemicals / carcinogens / (malignant) cells Carried by blood / lymph	Accept metastasis	1 1	E
Total			**12**	

Question	Answers	Extra information	Mark	ID details
7(a)(i)	Microorganism Causes disease / illness	Accept named example – eg bacterium / virus / fungus / protoctistan	1 1	E
7(a)(ii)	1. mucus (in resp. passages) traps / catches microorganisms 2. cilia (in resp. passages) move mucus / microorganisms out 3. Acid in stomach / vagina / urethra kills / prevents growth of microorganisms **or** denatures their proteins	Pairs of points in any order Ignore blood clotting / skin / wbcs in blood or tissues Ignore hairs Allow away / up 4. accept macrophages / white blood cells <u>in airways of the lungs</u> engulf microorganisms 5. accept tears contain antiseptic / lysozyme kills bacteria / damages wall of bacterium	1 1 1 1 1 1	E
7(b)	Any **four** from: • Platelets are involved • Enzyme involved • Fibrinogen → fibrin • Soluble to insoluble / fibres formed / meshwork formed • Blood cells trapped	Platelets release clotting factors	4 max	E

7(c)(i)	Neither parent has haemophilia / allele for haemophilia does not show in parents / mother does not have haemophilia Son inherits haemophilia from mother / mother is a carrier	Allow that, if dominant, at least one parent would have haemophilia	1 1	E
7(c)(ii)	1. Gametes: **X^H** **Y** from one parent 2. Gametes: **X^H** **X^h** from other parent 3. Offspring genotypes correctly derived, eg: **X^HX^H** **X^HX^h** **X^HY** **X^hY** 4. **X^hY** identified as haemophiliac male in ¼ of offspring	Only Only Allow correct for student's gametes / P genotypes Only	1 1 1 1	E
Total			**18**	

Question	Answers	Extra information	Mark	ID details
8(a)(i)	Any **two** from: • shorter / smaller / wider / smaller surface area • surface cells thicker / larger • fewer blood vessels / capillaries • blood vessels further from surface	Allow lymphatic / lacteal narrower	2 max	E
8(a)(ii)	0.6	Correct answer = 2 marks, with or without working Allow 0.59 to 0.61 Allow 1 mark for 0.06 Allow 2 marks for 0.06 cm If answer incorrect / no answer allow 1 mark for student's villus measure [73 to 77] × 0.2 scale bar size [23 to 27]	2	E
8(b)(i)	(Villi have) smaller surface area / capillaries further from surface / fewer capillaries / thicker surface cells So less diffusion	 Allow less active transport	1 1	E
8(b)(ii)	Less water absorption By large intestine By osmosis / diffusion (of water) (Due to) increased concentration of solutes in gut	 Allow colon Accept correct named examples – eg sugars Accept lower water potential	1 1 1 1	E

8(c)	Antibody has specific shape / is specific <u>Fits</u> only one type of antigen / only <u>fits</u> (part of) gluten	 Allow 'is complementary to' for fits	1 1	E

Total			**12**

Question	Answers	Extra information	Mark	ID details
9(a)(i)	Liver		1	G
9(a)(ii)	Any **two** from: • eating salty food • not drinking / thirst / dehydration • exercise / sweating • hot weather / sweating	Accept sports drink Allow sweating once only	2 max	E
9(a)(iii)	ADH / antidiuretic hormone	If full name, must be phonetic Accept vasopressin	1	G
9(a)(iv)	ADH causes water reabsorption (from the kidney) / described (more water needed) to dilute ions / to return to normal conc. / to dilute the blood	Ignore reference to urine	1 1	E
9(b)	Protein (molecule) is big Protein cannot pass through (filter) / holes in filter too small for protein Glucose (molecule) is small Glucose can pass through (filter) Glucose reabsorbed / glucose taken back into blood <u>All</u> (glucose reabsorbed)	(hence **no** protein at **Q** / hence no protein in urine) (hence glucose at **Q**) (hence no glucose in urine) Allow no glucose in urine for this point if glucose reabsorbed already given	1 1 1 1 1 1	E

9(c)(i)	Blood flows between partially permeable membranes	Allow selectively permeable / semipermeable / lets only small molecules through	1	E
	Dialysis fluid has ideal conc.	Allow has same conc. as normal blood	1	
	Named examples of at least 2 substances that leave the blood	eg water, urea, ions, glucose Accept other correct named examples	1	
	By diffusion / down conc. gradient	Only allow 'osmosis' for water	1	
	Until equilibrium / balance / equal concentrations **or** replenish fluid to maintain gradient		1	
9(c)(ii)	Kidney works all the time / no build-up of toxins / no build-up of fluid / pressure/ free to move around / only one operation / less danger of infection / cheaper / convenience if qualified	Accept converse for dialysis eg not spending several hours on dialysis / not paying frequent visits to hospital / diet is not restricted	1	E
9(c)(iii)	Rejection / shortage of donors / no suitable donors / danger of rejection of kidney / dangers of the operation	Allow no need to take (immuno-suppressant) drugs	1	E
Total			**19**	

Question	Answers	Extra information	Mark
10(a)	Marks awarded for this answer will be determined by the quality of written communication.		
	The answer is coherent and in a logical sequence. It contains a range of appropriate or relevant specialist terms used accurately. There is a clear description of the genetic engineering process **and** of the immune response.		4–5
	The answer has some structure and the use of specialist terms has been attempted, but not always accurately. There is at least an attempt to describe the genetic engineering process **and / or** the immune response, including some details of **one** of these.		2–3
	The answer is poorly constructed with an absence of specialist terms or their use demonstrates a lack of understanding of their meaning. The answer is limited to a simple account of **either** the genetic engineering process **or** the immune response.		1
	No relevant content.		0
	Examples of scientific points that may contribute to a student's response: Genetic engineering eg • Enzyme used to cut gene from hepatitis B virus • Purification of the gene • Gene taken up by yeast cell • Gene enters nucleus • Select modified yeast cells from non-modified • Culture / grow (modified yeast) in nutrient medium / broth • Gene expressed → surface antigen • Antigen released / extracted from yeast • purify antigen for use as vaccine Immune response eg • Antigen stimulates white blood cells / lymphocytes to make antibodies / active immunity • Immunological memory gives immunity / described		

Question	Answers	Extra information	Mark	ID details
10(b)	Heating may not inactivate all of the virus particles / virus can still reproduce	Accept some virus 'survives' Allow 'not killed'	1	E
	(Intact) virus contains DNA / genetically-engineered vaccine has no DNA	Accept GE vaccine has only protein / only the antigen	1	
	Virus particles could reproduce in (body) cells		1	
	(Virus) kills cells **or** virus causes disease / causes illness / causes damage / harm	Accept converse for GE vaccine Ignore dangerous / unsafe	1	
Total			**9**	