



# **Mark Scheme (FINAL)**

Summer 2018

Pearson Edexcel International GCSE  
in Human Biology (4HB0) Paper 01

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## **General Marking Guidance**

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Notes	Marks
1 a	<p><b>C;</b> vertebral column and skull</p> <p>A includes elements of the appendicular skeleton            B includes elements of the appendicular skeleton            D includes elements of the appendicular skeleton</p>		1
b	<p><b>A;</b> to produce haemoglobin</p> <p>B haemoglobin does not improve blood circulation            C haemoglobin does not produce health white blood cells            D haemoglobin does not produce oxygen</p>		1
c	<p><b>D;</b> oxygen</p> <p>A carbon dioxide is not produced during photosynthesis            B methane is not produced during photosynthesis            C nitrogen is not produced during photosynthesis</p>		1
d	<p><b>B;</b> 12:1</p> <p>A 48:4 is not a 1:12 ratio            C 48:4 is not a 12:13 ratio            D 48:4 is not a 13:12 ratio</p>		1
e	<p><b>A;</b> sensory neurones</p> <p>B motor neurones are not found in the optic nerve            C relay neurones are not found in the optic nerve            D relay and motor neurones are not found in the optic nerve</p>		1
f	<p><b>D;</b> pituitary gland</p> <p>A LH is not produced in the uterus            B LH is not produced in the ovaries            C LH is not produced in the adrenal gland</p>		1
g	<p><b>B;</b> haploid cells 4 cells</p> <p>A meiosis results in four cells            C meiosis does not produce diploid cells            D meiosis does not produce diploid cells</p>		1

Question number	Answer	Notes	Marks
h	<p><b>C;</b> a change in the order of bases</p> <p>A mutation is not bases pairing up incorrectly                      B mutation is not the insertion of an incorrect amino acid                      D mutation is not the substitution of uracil for thymine</p>		1
i	<p><b>D;</b> aerobic respiration uses oxygen</p> <p>A both release energy                      B both use glucose                      C aerobic respiration does not produce lactic acid</p>		1
j	<p><b>B;</b> contractions of the uterus wall during labour</p> <p>A oxytocin does not cause the development of breasts                      C oxytocin does not cause the release of FSH                      D oxytocin does not cause ovulation</p>		1

**Total for Question 1 = 10 marks**

Question number	Answer	Notes	Marks										
2 a (i)	<ul style="list-style-type: none"> <li>• X = biceps(1);</li> <li>• Y = triceps(1);</li> </ul>	accept bicep accept tricep	2										
(ii)	<ul style="list-style-type: none"> <li>• work antagonistically/reference to antagonistic pairs(1);</li> <li>• muscle X/biceps contract (and muscle Y/triceps relaxes) to raise/bend the forearm(1);</li> <li>• muscle Y/triceps contract to lower/straighten the forearm (and muscle X/biceps relaxes)(1);</li> </ul>	allow shorten for contract for mp's 2 and 3	3										
b	<table border="1" data-bbox="368 869 1062 1167"> <thead> <tr> <th data-bbox="368 869 818 927">Structure</th> <th data-bbox="818 869 1062 927">Order</th> </tr> </thead> <tbody> <tr> <td data-bbox="368 927 818 985">skeleton</td> <td data-bbox="818 927 1062 985">4</td> </tr> <tr> <td data-bbox="368 985 818 1043">Bone cell</td> <td data-bbox="818 985 1062 1043">2</td> </tr> <tr> <td data-bbox="368 1043 818 1102">bone tissue</td> <td data-bbox="818 1043 1062 1102">3</td> </tr> <tr> <td data-bbox="368 1102 818 1167">nucleus</td> <td data-bbox="818 1102 1062 1167">1</td> </tr> </tbody> </table> <p data-bbox="368 1205 715 1238">4 above 2 is one mark;</p> <p data-bbox="368 1272 715 1305">2 above 3 is one mark;</p>	Structure	Order	skeleton	4	Bone cell	2	bone tissue	3	nucleus	1		2
Structure	Order												
skeleton	4												
Bone cell	2												
bone tissue	3												
nucleus	1												

**Total for Question 2 = 7 marks**

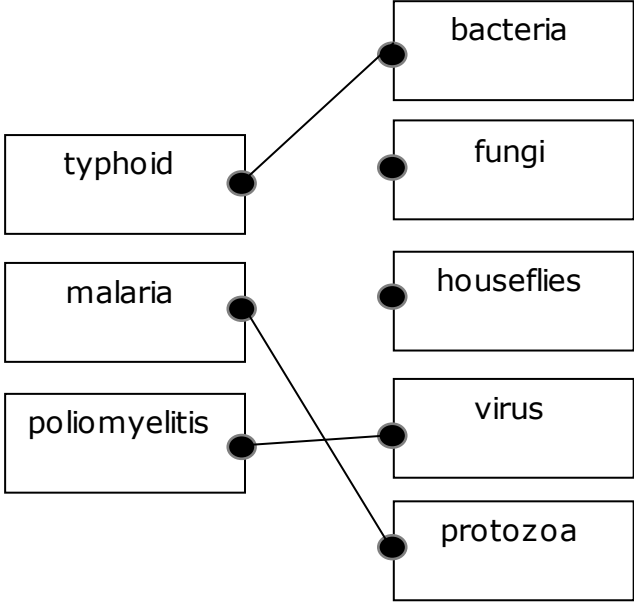
Question number	Answer	Notes	Marks																				
3 a (i)	any two from (food B) <ul style="list-style-type: none"> <li>• <u>more/greater/larger</u> amount of protein(1);</li> <li>• by 39g/21g vs 60g(1);</li> <li>• used for <u>growth</u> (1);</li> </ul>		Max 2																				
(ii)	any two from (food B) <ul style="list-style-type: none"> <li>• <u>more/greater/larger</u> amount of calcium(1);</li> <li>• by 53%/2% vs 55%(1);</li> <li>• (absorbed by bone to) maintain density/forms compact/hard bone(1);</li> </ul>	ignore makes bones stronger	Max 2																				
(iii)	any <b>three</b> from the following: <ul style="list-style-type: none"> <li>• high fat/cholesterol content(1);</li> <li>• fat/cholesterol blocks/builds up/deposited in/narrows (coronary) arteries/atherosclerosis/plaques(1);</li> <li>• high blood pressure(1);</li> <li>• reduced/no blood flow(1);</li> <li>• less/no oxygen(1);</li> <li>• to cardiac muscle(1);</li> </ul>	ignore clogs/clots	Max 3																				
b	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Nutrient in food</th> <th style="width: 12.5%;">carbon</th> <th style="width: 12.5%;">hydrogen</th> <th style="width: 12.5%;">oxygen</th> <th style="width: 12.5%;">nitrogen</th> </tr> </thead> <tbody> <tr> <td>carbohydrate</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> <td></td> </tr> <tr> <td>fat</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> <td></td> </tr> <tr> <td>protein</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> </tr> </tbody> </table>	Nutrient in food	carbon	hydrogen	oxygen	nitrogen	carbohydrate	/	/	/		fat	/	/	/		protein	/	/	/	/	one mark for each correct row.	3
Nutrient in food	carbon	hydrogen	oxygen	nitrogen																			
carbohydrate	/	/	/																				
fat	/	/	/																				
protein	/	/	/	/																			

**Total for Question 3 = 10 marks**

<b>Question number</b>	<b>Answer</b>	<b>Notes</b>	<b>Marks</b>
4	<ul style="list-style-type: none"><li>• deoxygenated(1);</li><li>• pulmonary artery(1);</li><li>• oxygen(1);</li><li>• red blood cells(1);</li><li>• plasma(1);</li><li>• atrium(1);</li><li>• ventricle(1);</li><li>• aorta(1);</li></ul>		1 1 1 1 1 1 1 1

**Total for Question 4 = 8 marks**



Question number	Answer	Notes	Marks
<p>5 a (i)</p>	 <p>(ii) <b>B</b> pathogen</p> <p>A an antigen is not a microorganism            C an antitoxin is not a microorganism            D a bacillus does not necessarily cause disease.</p>	<p>cancel mark if more than one line is drawn from the disease</p> <p>one mark for each correct line.</p>	<p>3</p> <p>1</p>
<p>b (i)</p> <p>(ii)</p>	<p>any <b>two</b> of the following:</p> <p>(bacteria)</p> <ul style="list-style-type: none"> <li>• has a (single) chromosome(1);</li> <li>• no nucleus(1);</li> <li>• contains a cell wall(1);</li> <li>• has a (slime) capsule(1);</li> </ul> <p>(chromosome)            controls cell activities/chemical reactions/contains DNA/genes/genetic material;</p> <p>(ribosomes)            protein synthesis;</p> <p>(cell membrane)            allows substances in and out of the cell;</p>	<p>allow reverse argument for animal cell</p> <p>allow pili(1);            allow 70s/smaller ribosomes(1);</p> <p>allow gives the cell its characteristics</p>	<p>Max 2</p> <p>1</p> <p>1</p> <p>1</p>

Question number	Answer	Notes	Marks
5 c (i)	any <b>two</b> from the following: <ul style="list-style-type: none"> <li>• growth rate reduced/less multiplication/increases at a decreasing rate/increases then levels(1);</li> <li>• lack of/competition for nutrients/resources(1);</li> <li>• build-up of toxins/lower pH(1);</li> </ul>		Max 2
(ii)	any <b>three</b> from the following: <ul style="list-style-type: none"> <li>• 0 °C(1);</li> <li>• slowest growth rate/(bacteria) reproduce more slowly(1);</li> <li>• takes longer for the meat to smell bad/18 days(1);</li> <li>• does not spoil/become slimy until after 22 days(1);</li> </ul>		Max 3
d	any <b>three</b> from the following: <ul style="list-style-type: none"> <li>• phagocytes(1);</li> <li>• engulf/digest pathogens / phagocytosis(1);</li> <li>• lymphocytes(1);</li> <li>• produce antibodies(1);</li> <li>• (antibodies) cause pathogens to clump (1);</li> </ul>	allow white blood cells once as alternative to phagocyte or lymphocyte	Max 3

**Total for Question 5 = 17 marks**

Question number	Answer	Notes	Marks
6 a (i)	<p>any <b>four</b> of the following:</p> <ul style="list-style-type: none"> <li>• measure out a volume of hydrogen peroxide(1);</li> <li>• heat (hydrogen peroxide) water bath(1);</li> <li>• measure mass of liver (containing catalase)(1);</li> <li>• add liver to hydrogen peroxide</li> <li>• time(1);</li> <li>• measure oxygen/gas production(1);</li> <li>• reference to different temperatures(1);</li> </ul> <p>(ii)</p> <ul style="list-style-type: none"> <li>• independent variable = temperature(1);</li> <li>• dependent variable = (volume of) oxygen/gas(1);</li> </ul> <p>(iii) any <b>three</b> of the following:</p> <ul style="list-style-type: none"> <li>• optimum pH for enzyme/catalase activity/works best at pH7(1);</li> <li>• enzyme will denature at other pH's(1);</li> <li>• enzyme/active site will change (shape)(1);</li> <li>• no activity/no enzyme-substrate complex formed/substrate does not bind/fit active site(1);</li> </ul>	allow amount	<p>4</p> <p>2</p> <p>Max 3</p>

Question number	Answer	Notes	Marks
6 a (iv)	any <b>two</b> of the following: <ul style="list-style-type: none"> <li>• same volume hydrogen peroxide(1);</li> <li>• same concentration of hydrogen peroxide(1);</li> <li>• same mass of liver(1);</li> <li>• measure oxygen for same amount of time(1);</li> </ul>	allow amount for volume  allow amount/size / volume	Max 2
b (i)	1.0;	allow given value between 1.6 and 2.0	1
(ii)	Test 2 at 15% hydrogen peroxide		1
(iii)	<ul style="list-style-type: none"> <li>• does not follow the same pattern(1);</li> <li>• result should be higher/result too low(1);</li> </ul>		2
(iv)	any <b>two</b> from the following: <ul style="list-style-type: none"> <li>• volume of hydrogen peroxide measured incorrectly(1);</li> <li>• incorrect percentage/concentration of hydrogen peroxide used(1);</li> <li>• incorrect temperature of hydrogen peroxide(1);</li> <li>• mass of liver is lower(1);</li> <li>• difficult to read volume of gas/oxygen accurately(1);</li> <li>• incorrect timing(1);</li> <li>• gas escaping/leaking(1);</li> </ul>		Max 2

**Total for Question 6 = 17 marks**

Question number	Answer	Notes	Marks
7 a	<p>any <b>five</b> of the following:</p> <ul style="list-style-type: none"> <li>• remove solids/rocks/grit/named solid material(1);</li> <li>• sludge/solid material settles/forms (1);</li> <li>• anaerobic bacteria digest/breakdown sludge/waste (1);</li> <li>• methane gas produced(1);</li> <li>• sludge used as fertiliser(1);</li> <li>• aerobic bacteria digest / breakdown (organic material in liquid sewage/effluent)(1);</li> <li>• disinfect water/chlorination(1);</li> </ul>	allow biogas	Max 5
b	<p>any <b>three</b> from the following:</p> <ul style="list-style-type: none"> <li>• sewage contains nutrients/nitrates(1);</li> <li>• cause growth of algae/algal blooms(1);</li> <li>• microbes/bacteria decompose / breakdown algae/sewage(1);</li> <li>• bacteria multiply(1);</li> <li>• (remove oxygen from water by aerobic) respiration(1);</li> </ul>		Max 3

**Total for Question 7 = 8 marks**

Question number	Answer	Notes	Marks
8 a	any <b>four</b> of the following: <ul style="list-style-type: none"> <li>• measure starting pulse (1);</li> <li>• exercise for a certain time period / named time period(1);</li> <li>• take pulse after exercise (for a set time) (1);</li> <li>• by using digital heart/pulse rate monitor/fingers on wrist/neck(1);</li> <li>• allow pulse to return to resting rate(1);</li> <li>• repeat test but carry out a different exercise(1);</li> </ul>		Max 4
b (i)	a line graph that shows the following: <ul style="list-style-type: none"> <li>• correct axes labels with units(1);</li> <li>• independent variable on the <i>x-axis</i>(1);</li> <li>• correct scales on axes(1);</li> <li>• correct plots(1);</li> </ul>	do not award mark for plots if given a bar chart	4
(ii)	<ul style="list-style-type: none"> <li>• suitable line (1);</li> </ul>	reject dot to dot	1
(iii)	<ul style="list-style-type: none"> <li>• as the amount of time exercising increases the number of breaths taken per minute increases(1);</li> <li>• there is a linear relationship/directly proportional/increases steadily/at a constant rate(1);</li> </ul>		2
(iv)	Any <b>three</b> of the following: <ul style="list-style-type: none"> <li>• more oxygen needed(1);</li> <li>• for (aerobic) respiration (1);</li> <li>• muscles working harder/contracting more/greater energy demand(1);</li> <li>• to remove CO<sub>2</sub>/oxidise/breakdown lactic acid(1);</li> </ul>	reject produces energy	Max 3

**Total for Question 8 = 14 marks**

Question number	Answer	Notes	Marks
9 a (i)	A = diaphragm(1); B = cartilage(1);		2
(ii)	<ul style="list-style-type: none"> <li>contracts/flattens(1);</li> <li>increases volume in thorax(1);</li> <li>decreases pressure in thorax(1);</li> <li>forces/pushes air into the lungs/reference to pressure differences between inside and outside of lungs(1);</li> </ul>	ORA for exhaling allow chest/chest cavity for thorax	3
(iii)	<p>residual volume</p> <p>tidal volume</p> <p>vital capacity</p> <p>the volume of air inspired during one normal, relaxed breath</p> <p>the maximum volume of air that can be forcefully exhaled in one breath</p> <p>the volume of air left in the lungs after a forced exhalation</p>	deduct one mark for each extra line from left hand boxes  2 marks for 2 or 3 lines 1 mark for 1 line	2
(iv)	any <b>two</b> from the following: <ul style="list-style-type: none"> <li>from a high concentration to low concentration/down a concentration gradient (1);</li> <li>by diffusion(1);</li> </ul>	reject along a concentration gradient	Max 2

Question number	Answer	Notes	Marks
9 b	<p>any <b>two</b> from the following:</p> <ul style="list-style-type: none"> <li>• tar is a carcinogen(1);</li> <li>• causes DNA to mutate(1);</li> <li>• leading to (lung) cancer(1);</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• cigarette smoke paralyses/destroys cilia(1);</li> <li>• mucus drops into lungs(1);</li> <li>• increased risk of infection / bronchitis/smokers cough(1);</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• emphysema/alveoli damaged / description of damage(1);</li> <li>• reduced surface area(1);</li> <li>• reduced gas exchange/less oxygen uptake</li> </ul>		Max 2

**Total for Question 9 = 11 marks**



Question number	Answer	Notes	Marks
10 a (i)	178; $(178/180) \times 100 = 99\%$ ;	full marks for correct final answer  allow 98.9/98.89% for correct final answer	2
(ii)	any <b>three</b> from the following: <ul style="list-style-type: none"> <li>• all glucose is reabsorbed/absorbed <u>back</u> (into blood)/(1);</li> <li>• used in respiration/to release energy(1);</li> <li>• in first/proximal convoluted tubule(1);</li> <li>• so no glucose found in urine(1);</li> </ul>		Max 3
(iii)	<ul style="list-style-type: none"> <li>• proteins are (too) large (to be filtered)(1);</li> </ul>		1
(iv)	<ul style="list-style-type: none"> <li>• kidneys(1);</li> <li>• pituitary gland/brain/hypothalamus (1);</li> </ul>		2
b	<ul style="list-style-type: none"> <li>• deamination/breakdown of amino acids(1);</li> <li>• in liver(1);</li> </ul>		2

**Total for Question 10 = 10 marks**

Question number	Answer	Notes	Marks
11 a (i)	18-15 / area indicated on the graph(1); 3 hours(1);	allow full marks for correct final answer	2
(ii)	any <b>three</b> from the following: <ul style="list-style-type: none"> <li>• genetically identical/clones/contain the same number of chromosomes/46 chromosomes/mass of DNA as parent cell(1);</li> <li>• diploid cells(1);</li> <li>• same characteristics as parent cell(1);</li> </ul>		Max 3
b	any <b>three</b> from the following: (sexual reproduction) <ul style="list-style-type: none"> <li>• two parents(1);</li> <li>• involves gametes(1);</li> <li>• fertilisation/description(1);</li> <li>• combining/mixing of genetic information(1);</li> <li>• produces offspring that show variation/genetically different(1);</li> </ul>	ORA for asexual reproduction	Max 3

**Total for Question 11 = 8 marks**

