Pearson Edexcel

Mark Scheme (Results)

Summer 2024

Pearson Edexcel International GCSE
In Human Biology (4HB1) Paper 02

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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.

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1 (a)

(b)</td><td><table><tr><td>Disease</td><td>Type of pathogen</td></tr><tr><td>cholera</td><td>Bacterium/bacteria;</td></tr><tr><td>AIDS</td><td>virus;</td></tr><tr><td>athlete’s foot</td><td>Fungus/fungi;</td></tr></table>
In the following order:

bacterium;
sexual intercourse;
barrier;
antibiotics;</td><td>Reject more than one line from any disease</td><td>(3)

(4)</td></tr>
<tr><td>(c) (i)

(ii)</td><td>• overall decrease;
• fluctuates
• steep decreases from 1990;

17 – 9;
8;</td><td>

Allow tolerance of +-0.5

ecf for mp2</td><td>(2)

(2)</td></tr>
<tr><td>(d)</td><td>C antigens,white blood cells produced,antibodies destroy pathogens;

The following are incorrect because –
A vaccinations do not contain antibodies
B platelets are not produced following a vaccination
D vaccinations do not produce platelets</td><td></td><td>(1)</td></tr>
</table>

Total for Question 1 = 12 marks

Question number	Answer	Notes	Marks
2 (a) (i)	• nucleus; • cytoplasm/RER/ribosomes;	Allow mitochondrion as an alternative mp	(2)
(ii)	Any two from: • RNA is single stranded/DNA double stranded; • RNA contains uracil/DNA contains thymine ; • RNA contains ribose /DNA contains deoxyribose;	Allow DNA is double helix Do not allow thiamine	(2)
(iii)	nucléotide ;	Allow mononucleotides	(1)
(b)	Any three from • incorrect base/ nucleotide/codon sequence; • incorrect amino acid sequence/amino acid; • faulty/different/incorrect protein made; • reference to protein being a different shape/has a different function;	Allow named mutation/substitution/ deletion/addition/ insertion/eq	(3)

Total for Question 2 = 8 marks

Question number	Answer	Notes	Marks
3 (a)	Smoking cigarettes; Causes (lung) cancer/emphysema/bronchitis/heart disease/eq ; OR lack of exercise; obesity/heart disease/high blood pressure/ type ii diabetes/eq;	Allow drugs or named drug and their effect on health for 2 marks.	(2)
(b)	Any two from: • production of bile reduced/affected; • less fat emulsified/fat not emulsified; • lipase less active/lipase unable to digest as much (fat)/slower lipase activity;	Allow bile not produced Allow description of emulsification	(2)
(c)	blurred/misty vision/blindness/less light passing through the lens / less light reaching the retina;		(1)
(d)	cerebrum/cerebellum/ cerebral cortex/cerebral hemispheres/hypothalamus/medulla (oblongata);	Allow any part of the brain that is affected by alcohol	(1)
(e)	Any three from: • reduces release of neurotransmitters; • reduced diffusion across synapse; • less neurotransmitters bind to receptors on post-synaptic membrane; • slows/ fewer transmission of impulses; • slower reaction /reflexes;		(3)
(f)	Any two from • increased heart rate; • increased breathing rate; • pupil dilation; • increase in blood sugar/glucose levels/ increased breakdown of glycogen to glucose; • increase in blood flow to brain/muscles; • increase in (aerobic) respiration (in muscles);		(2)

Total for Question 3 = 11 marks

Question number	Answer	Notes	Marks
4 (a) (i)	Correct labels to: trachea; bronchus/bronchi; alveoli;		(3)
(ii)	• many alveoli/large surface area; • short diffusion distance/ alveoli 1 cell thick/capillary 1 cell thick/ thin wall; • moist; • (dense/extensive/large) network of capillaries;		(4)
(b) (i)	any four from • reference to use of a nose clip; • reference to soda lime (to absorb carbon dioxide) • reference to sterilising mouth piece; • breathe in and out(normally) through a mouthpiece(connected to spirometer); • pen goes up and down (on a rotating drum);\ • measure peak to trough/ highest to lowest/top to bottom/ from the trace;		(4)
(ii)	4600 ÷ 30 (x 100) = 1380; 4600 – 1380 = 3220 (cm^3); or 4600×0.7=3220 (cm^3);;	ecf: allow correct calculation from values given for mp1. Max 2 marks	(2)

Total for Question 4 = 13 marks

Question number	Answer	Notes	Marks
5 (a) (i)	**C** the type of antibiotic added The following are incorrect because: A the mass of bacteria added is irrelevant B the size of the inhibition zone is the dependent variable D the mass of agar in the Petri dish is irrelevant		(1)
(ii)	Any two from: • sterilise equipment/named equipment/disinfect/swab desk; • use of sterile agar; • reference to use of lid on Petri dish/ minimising the time the lid is removed; • Flame from Bunsen burner:		(2)
(iii)	(antibiotic) Q; greater inhibition zone /greater clear zone/ more bacteria killed;		(2)
(iv)	Any four from: • mutation; • (resistant) bacteria survive; • reproduce; • pass on resistant gene/allele; • Increase of resistant gene/allele in the population/ increase in allele frequency (over many generations)		(4)
(b)	• (bacteria/fungi/decomposers) release enzymes/named enzyme • breakdown dead/organic matter/ named organic matter; • release nutrients/named nutrients into the soil/environment;	Ignore carbon dioxide Ignore fertiliser	(2)

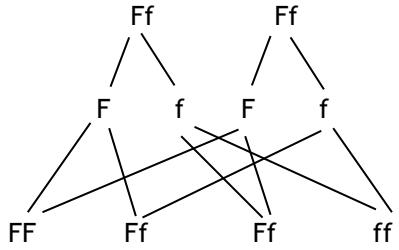
Total for Question 5 = 11 marks

Question number	Answer	Notes	Marks
6 (a)	• dim room or bright room/lamp at different distances; • allow time for (pupil) to adjust; • use a camera/video to take a picture/recording of the eye/ use of ruler; • measure the width/diameter of the pupil;	Ignore change light intensity	(3)
(b)	• diameter of pupil 6- 8 mm; • substitution 3.14 x radius of pupil; • accept any value between 28-51 mm^2;	If the diameter is used instead of the radius, then 2 marks can be awarded for any value between 113-201mm^2 Any value between 28-51 scores 3 marks	(3)
(c) (i)	• circular muscles relax; • radial muscles contract; • pupil gets larger/wider /dilates/ increase in size;		(3)
(ii)	• to allow more light to enter the eye; • to see image more clearly/better;		(2)

Total for Question 6 = 11 marks

Question number	Answer	Notes	Marks
7 (a)	Any four from: • less blood flow/blood flow slows/restricted; • to heart muscle/tissue/cells; • less oxygen/glucose; • less aerobic respiration; • heart muscle/tissue/cells die/angina/heart attack;		(4)
(b) (i)	• (women 29 ÷ 100 (x 33 500 000) 9 715 000; • (men 26 ÷ 100 (x 33 000 000) 8 580 000; • (9 715 000 – 8 580 000) 1 135 000/1.135 million/1.135×10^6;	ecf for mp3	(3)
(ii)	• calculate BMI; • mass÷(height)^2; • compare result to BMI chart/ obese if 30 or more;	Accept • waist: hip ratio; • waist÷hip • Compare result to hip:waist ratio chart/	(3)
(c)	• beta blockers bind/ attach to receptors (on cardiac muscle); • prevent neurotransmitters from binding/attaching (to receptors); • reduce heart rate/reduced blood pressure;	Accept beta blockers fits into receptors accept neurotransmitters do not fit into receptors	(3)

Total for Question 7 = 13 marks

Question number	Answer	Notes	Marks
8 (a) (i)	**B** individual 3 The following are incorrect because: **A** individual 1 is heterozygous **C** Individual 5 is heterozygous **D** individual 3 is homozygous dominant		(1)
(ii)	**D** 4 The following are incorrect because: **A** there are more than 1 heterozygous genotypes **B** there are more than 2 heterozygous genotypes **C** there are more than 3 heterozygous genotypes		(1)
(iii)	• they have a dominant allele; • over-rides/ masks the effect of the recessive allele/ must have two recessive alleles for the condition to show/ must have homozygous recessive alleles ;	do not allow dominant allele overpowering the recessive allele	(2)
(iv)	• heterozygous parent genotypes; • gametes; • genotypes of offspring; • offspring genotypes linked to the phenotype for the disease and showing that showing that 1 of the 4 genotype has the disease;  	mps 2,3 and 4 marks for correct Punnett square showing all details	(4)
(b)	• reference to use of restriction enzyme • (to obtain) the normal/ non faulty/ dominant allele); • use of virus/ correctly named virus; • inserts allele into person **cells**; • functional/normal protein produced;	Accept liposomes ignore plasmids Penalise one for using genes instead of alleles.	(3)

Total for Question 8 = 11 marks

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