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Mark Scheme (Results)

Summer 2024

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

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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.

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Question number	Answer	Notes	Marks
1 (a) (i)	X = incisor(s); Z = molar(s)/pre-molar(s);		(2)
(ii)	tearing/ripping/gripping/holding (food);		(1)
(b)	• amylase/carbohydrase; • sugar/maltose; • any value between 6.7 and 7.4; • decrease/reduce/stop/slow down/take more time;	allow glucose	(4)
(c) (i)	oesophagus;		(1)
(ii)	• muscular contractions/peristalsis; • push food/bolus (downwards/towards stomach);		(2)

Total for Question 1 = 10 marks

Question number	Answer	Notes	Marks
2 (a) (i)	<table><tr><th rowspan="2">Part</th><th colspan="3">Role</th></tr><tr><th>where sperm are deposited</th><th>where eggs are produced</th><th>where fertilisation takes place</th></tr><tr><td>fallopian tube</td><td></td><td></td><td>✓</td></tr><tr><td>ovary</td><td></td><td>✓</td><td></td></tr><tr><td>vagina</td><td>✓</td><td></td><td></td></tr></table>	one mark for each correct row	(3)
(ii)	• muscles/uterus wall contract; • to widen/dilate cervix;	allow description of widening cervix	(2)
(iii)	**C (a sperm cell fuses with an egg cell to form a zygote)** The following statements are incorrect because: A haploid cells are not produced from fertilisation B an embryo is not formed from fertilisation D a baby is not formed at fertilisation		(1)
(iv)	luteinising hormone/LH;		(1)

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(b) (i)		One mark for each diagram	(2)
(ii)	mitosis → two cells, each with 46 chromosomes meiosis → four cells, each with 23 chromosomes (two cells, each with 23 chromosomes; four cells, each with 46 chromosomes)	reject more than one line from each type of cell division	(2)

Total for Question 2 = 11 marks

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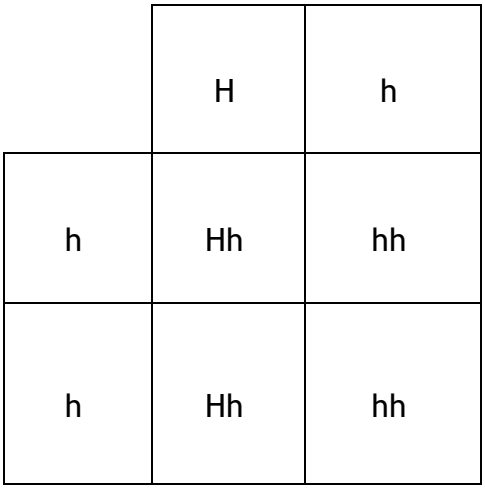
Question number	Answer	Notes	Marks
3 (a)	change in the order of bases in DNA;	Allow a description of a type of mutation	(1)
(b)	parent gametes; genotypes of offspring;  	Allow genetic cross Also allow different orientation of alleles in Punnett Square	(2)
(c)	**Advantages** • no (costly) visits to hospital; • no inconvenience of dialysis; • improved quality of life/ longer life/long term solution; **Disadvantages** • reference to difficulty in finding a donor; • rejection/reference to anti-rejection medication for life; • reference to risks associated with surgery;	any one from advantages and any one from disadvantages	(2)

Total for Question 3 = 5 marks

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Question number	Answer	Notes	Marks
4 (a) (i)	In the following order: 11, 31, 30		(1)
(ii)	31 (× 100); 100 = 31%;	send to review if other than 31	(2)
(b) (i)	**D (alternative forms of the same gene in a genotype)** The following are incorrect because: A two dominant genes are the same type of allele B two recessive genes are the same type of allele C alleles are not different genes		(1)
(ii)	• sperm and egg/gametes each contain one allele/haploid; • sperm and egg/gametes fuse; • during fertilisation; • (fertilisation) brings alleles together (in diploid cell)/chromosomes (from each gamete) are paired/one allele comes from each parent;		(4)
(c) (i)	Hh/heterozygous; hh/homozygous recessive;	either order any suitable letters to be used for alleles	(2)
(ii)	wheezing/coughing/shortness of breath/low weight / fatigue/over production of mucus/diarrhoea/male infertility;	allow other valid symptoms	(1)

Total for Question 4 = 11 marks

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Question number	Answer	Notes	Marks
5 (a)	(cardiac) muscle(s);		(1)
(b)	• pumps blood twice in one circuit; • right side pumps deoxygenated blood to lungs; • left side pumps oxygenated blood to body;		(3)
(c)	**C (lymphocytes and phagocytes)** The following are incorrect because: A platelets are not cells B antibodies and hormones are not cells D platelets are not cells		(1)
(d) (i)	hormones;		(1)
(ii)	platelets/fibrinogen/prothrombin;		(1)
(e)	(amount of blood in 1kg) 5.5 ÷ 70 = 0.07857; (amount of blood in 95kg) 0.07857 x 95 = 7.464; (number of red blood cells in 95kg) = 7.464 x 5.9 x 10^{12} = 4.4 x 10^{13};	allow 0.08 allow 7.5 allow 4.4038 × 10^{13} allow 4.425 × 10^{13} allow 4.484 × 10^{13} full marks for correct final answer	(3)

Total for Question 5 = 10 marks

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Question number	Answer	Notes	Marks
6 (a)	Any four from: • reduced blood flow to the heart/cardiac muscle/coronary arteries; • less oxygen to heart/cardiac muscle/tissue; • less (aerobic) respiration/less energy for contraction; • (cardiac) muscle/cells die; • (leading to) heart attack/heart disease;		(4)
(b) (i)	As the use of statins increases the level of blood cholesterol decreases;	allow inversely proportional	(1)
(ii)	1988 = 31; 2005 = 17; 1 : 1.8/1 : 0.54/1:0.548/1:0.55;	ecf for incorrect graph readings. if use 18:17 ratio is 1:1.0588 (accept 1:1.059, 1.06, 1.1) full marks for correct final answer	(3)
(iii)	• select sample of people; • record the number of people taking statins/not taking statins; • take blood samples; • measure the concentration/level of cholesterol (in blood); • repeat every year/between 1988-2008;		(5)
(iv)	any two from the following: • gender/age not taken into account; • sample size maybe too small; • reference to a named lifestyle not taken into account e.g. diet, level of activity/smoking; • genetic predisposition/diseases not taken into account;		(2)

Total for Question 6 = 15 marks

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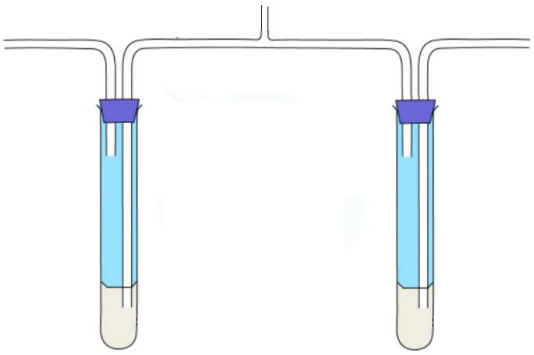
Question number	Answer	Notes	Marks
7 (a) (i)	glucose ⟶ lactic acid/lactate;	ignore any ref to CO_2 and H_2O on right side of equation	(1)
(ii)	$C_6H_{12}O_6$ + **$6O_2$;** ⟶ **$6H_2O$** + **$6CO_2$;**		(2)
(iii)	general diagram; tubing correct way round; 	labels not needed long short, long short short long, short long	(2)
(iv)	• inhale and exhale/breathe through the mouthpiece; • at rest; • time how long it takes the limewater to go cloudy/milky; • repeat following exercise;		(4)
(b)	any five from • energy released from (breakdown of) glucose; • during (aerobic) respiration; • (energy used) to add phosphate group; • to convert ADP to form ATP; • energy is released from ATP breakdown of ATP releases energy; • breaking of phosphate bond/ATP hydrolysed/ATP breaks down into ADP + P(i); • to provide energy for muscle contraction;		(5)

Total for Question 7 = 14 marks

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Question number	Answer	Notes	Marks
8 (a)	any three from • released from pancreas; • when glucose levels rise; • causes/stimulates conversion of glucose to glycogen; • in liver/muscles;		(3)
(b) (i)	• vasodilation; • more blood flows at/near the surface of the skin; • heat (from blood) radiated (away from body)/increased heat loss; • hairs lie flat; • less air trapped; • (more) heat radiated;		(3)
(ii)	vasoconstriction/blood vessels in the skin narrowed shivering/increased metabolic rate/hairs stand on end;		(1)
(iii)	• hypothalamus detects rise/fall/change in body temperature; • (named) mechanism reverses the change/brings back to set point/normal;	e.g. vasodilation, increase in sweating	(2)
(c)	• enzymes lose kinetic energy; • <u>enzyme</u> activity decreases/works slowly; • less enzyme substrate complexes formed/ less collisions between enzyme and substrate/binding with substrate; • rate of chemical reactions/metabolism slow down; • reference to symptom of hypothermia e.g. death/weak pulse/slower heart/breathing rate;		(5)

Total for Question 8 = 14 marks

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