PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



MARK SCHEME

TOPIC 3: GENETICS (PACK 3)

SCORE	PERCENTAGE
/35	%

STEMUP

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Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(i)	T T G A T T G C G T A A A A C T A A C G C A T T award 1 mark for all the As and Ts in the top line correctly paired (1) award 1 mark for all the Cs and Gs in the top line correctly paired (1)	accept lower case letters	(2) AO2 1

Question number	Answer	Mark
(ii)	B 4 **The only correct answer is B** ***A*** *is incorrect because each 3 amino acids would need 9 bases to be present* ***C*** *is incorrect 6 amino acids would need 18 bases* ***D*** *is incorrect because 12 amino acids would need 36 bases*	**(1)** **AO2 1**

Question number	Answer	Mark
(iii)	D double helix **The only correct answer is D** ***A*** *is incorrect because a DNA molecule is not three separate strands* ***B*** *is incorrect because the DNA molecule consists of two strands* ***C*** *is incorrect because a DNA molecule is a double helix not a single helix*	**(1)** **AO1 1**

Q2.

Question number	Answer	Mark
	An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (2 marks): • faulty allele is carried on X chromosomes (1) • males only have one X chromosome (1) • allele always expressed (in the phenotype) (1)	**(3)**

Q3.

Question number	Answer	Mark
	C Aa **The only correct answer is C** ***A*** *is incorrect because there has to be a dominant and a recessive allele* ***B*** *is incorrect because there has to be a dominant and a recessive allele* ***D*** *is incorrect because the alleles are not co-dominant*	**(1)** **AO2 1**

Q4.

	Answer	Acceptable answers	Mark
(a)(I)	An explanation including **two** of the following: the dodo was multicellular (1) the dodo fed on other organisms /fed heterotrophically (1) the dodo did not have chlorophyll / cell walls (1)	Accept animals can't make food for themselves by photosynthesis Accept chloroplasts for chlorophyll Ignore references to legs /backbone etc	**(2)**
(a)(ii)	has a (supporting) rod / spinal cord	**Accept** backbone / spine / vertebrate	**(1)**
(a)(iii)	**B** ☒ genus		**(1)**
(b)	A suggestion including 3 of the following: • Predation / disease (1) • change in environmental conditions (1) • loss of food source / reduced food source (1) • increased competition (1)	Accept named environmental change / climate change Accept food source eaten by other animals / humans Accept unable to fly so cannot escape	**(3)**

	• limited adaptations / survival of the fittest (1) • unable to reproduce / reproduce less (1)			
(c)	**D** ☒ speciation		**(1)**	
(d)	A description to include two of the following: genetic (variation) (1) due to mutation (1) due to sexual reproduction / interbreeding / hybridisation (1) environmental (variation) (1)	Accept references to different genes/DNA Accept named environmental change e.g.change in climate	**(2)**	

Q5.

Question number	Answer	Mark
(i)	An answer that combines points of interpretation and evaluation to provide a logical description: • proteinase K breaks down protein molecules (1) • in cell and nuclear membranes to release the DNA (1)	**(2)**

Question number	Answer	Mark
(ii)	An answer that combines points of interpretation and evaluation to provide a logical description: • Aseptic techniques should be used to minimise transfer of genetic material / pathogens (1) • By sterilising equipment / autoclaving equipment (1) • Using protective clothing including gloves / facemask / goggles to prevent contamination (1)	(3)

Question number	Answer	Mark
(iii)	An explanation that combines application of knowledge (1 mark) and reasoning/justification – application of understanding: (1 mark): • activity decreases during storage at 37 °C (1) • because the active site of the enzyme has been affected / because the substrate can no longer bind to the enzyme (1)	(2)

Q6.

Question number	Answer	Mark
(i)	C	(1)

Question number	Answer	Mark
(ii)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • genotype is X^DX^d/she must have one dominant and one recessive allele (1) • because her daughter must have received the recessive allele and her son has inherited a dominant allele (1)	(2)

Q7.

		Indicative Content	
QWC	*	A description including some of the following points in sequence Points relating to DNA structural features: • two strands • double helix • (contains) bases • A, T, C, G • adenine / A paired with thymine / T • guanine / G paired with cytosine / C • hydrogen / H bonds joining bases Contributions from Scientists: • X-ray (crystallography) being used • to show helical structure • to show diameter of molecule • how base pairs are arranged was shown • how strands are arranged was shown • modelling • reference to using other people's ideas	

Level	**0**	No rewardable content
1	**1 - 2**	• a limited description that includes either: at least **three**DNA features **OR one**contribution • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3 - 4**	• a simple description that includes at least **three**features of DNA and at least **one**contribution **OR two**features of DNA and **two** contributions. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed description of the structure of DNA that includes at least **three**features and **two**contributions. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q8.

	Answer	**Acceptable answers**	**Mark**
	A description including the following linked points • ref to a gene (coding for protein)(1)	Accept on either DNA or RNA base pairs	**(4)**

	• sequence of bases determines sequence of amino acids (1) • idea of one code / triplet / codon / 3 bases (for one amino acid) (1) • several amino acids make up a protein / (poly)peptide (1) • transcription / detail of transcription (1) • translation / detail of translation (1)	Accept a chain of amino acids eg mRNA made eg mRNA attached to ribosome	

Q9.

Question number	Indicative content	Mark
	An answer that combines points of interpretation and evaluation to provide a logical description: • RNA polymerase attaches to non-coding portion of DNA located in front of the gene for proteinase K (1) • RNA polymerase produces a complementary messenger RNA strand from the coding DNA of the gene for proteinase K (1) • messenger RNA leaves the nucleus via the nuclear pore and enters cytoplasm of cell (1)	**(3)**

Q10.

Question number	Answer	Mark
	C	**(1)**

Q11.

Question number	Answer	Additional Guidance	Mark
(i)	to precipitate the DNA	accept so the DNA is visible / so the DNA is not soluble (in ethanol)	**(1)** AO1 (2)

Question number	Answer	Additional Guidance	Mark
(ii)	Any two from: • mass of fruit (1) • volume of buffer (1) • crushing method /crushing time / crushed evenly (1) • volume of ethanol (1) • temperature (1) • pH /same buffer solution (1)	accept amount of fruit / number of fruit cells /size of fruit ignore amount of buffer accept idea of incubation time ignore amount of ethanol accept fully filtered (1) accept same concentration of ethanol (1)	**(2)** A02 (2)

Question number	Answer	Additional Guidance	Mark
(iii)	Any one from: • to obtain more data (1) • to identify anomalies (1) • see if the results are {the same /reliable/correct} (1) • to calculate a {mean/average} (1)	accept to be sure their {results are valid / conclusion is valid} (1) ignore accuracy/precision	**(1)** AO2(2)

Q12.

Question number	Answer	Additional guidance	Mark
(i)	Homozygous recessive / 2 lower case letters e.g. hh	accept any recognisable upper/lower case letters as appropriate	**(1)**

Question number	Answer	Additional guidance	Mark
(ii)	• Homozygous dominant / HH(1) • Heterozygous / Hh (1)	accept any recognisable upper/lower case letters as appropriate	**(2)**

Question number	Answer	Additional guidance	Mark
(iii)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (2 marks): • the female in the 1st generation is heterozygous / Hh (1) • because some of her children had Huntington's / some of her children did not have Huntington's (1) • to have the disease they must inherit a dominant allele / to not have the disease they must inherit (two) recessive alleles (1)	accept if she was HH all her children would have Huntington's accept correct Punnett square with identification for 2 marks	(3)

Q13.

Question Number	Answer		Mark
	Phenotype: • must be unaffected male (1) Explanation including the following: • he has the dominant allele / males have one copy of the allele as is on the X chromosome (1) • (needs a dominant allele) in order to have an unaffected daughter (1)	accept X^DY (accept any other capital letter) for 1 mark accept a Punnett square to show marking points if annotated.	(3) AO 3 1b AO 3 2a AO 3 2b

Q14.

	Answer	Acceptable answers	Mark
(i)	**D** ☒ homozygous recessive		**(1)**
(ii)	**A description to include three of the following points:** tired / lethargic (1) short of breath / reduced oxygen carrying capacity / problems exercising (1) swelling of hands and feet (1) painful / weak joints (1) blocked blood vessels / blood clots(1)	**Accept weak/fatigued/** Accept difficulty breathing Accept reference to pain or painful episodes/sickle cell crisis Ignore references to the shape of the red blood cell Ignore references to mucus	**(3)**

Q15.

	Answer	Acceptable answers	Mark
(a)(i)	0.5 / 0.5 picogram	Accept: 0.5 picograms accept: the same (mass) as the sperm cell	**(1)**
(a)(ii)	**C** haploid		**(1)**
(a)(iii)	**A** thymine with adenine, cytosine with guanine		**(1)**
(a)(iv)	weak hydrogen bonds / hydrogen bonds / hydrogen (1)	H (bond)	**(1)**
(b)(i)	A description including **three**of the following points: • cell divides / cell division / cell splits(1) • two cells produced (1) • (both) diploid (1) • (both) cells are <u>genetically</u> identical (1)	credit correct reference to stages of mitosis: DNA replication / chromosomes duplicate (1) Chromosomes line up along the equator / middle of the cell (1) chromosomes pulled to either end of cell (1) cytokinesis / cytoplasm splits (1)	**(3)**
(b)(ii)	A description including three of the		**(3)**

	following points: • ref (to many) cell divisions / eq (1) • growth (1) • ref to differentiation / specialisation (1) • ref to stem cells (1)	accept: gets bigger / larger accept: become specific cells	