B16

OXFORD Revise

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	23 46 alleles dominant recessive		1 1 1 1 1	AO1 4.6.1.6
01.2	BB − homozygous dominant Bb − heterozygous bb − homozygous recessive	award 2 marks for all three correct award 1 mark for one or two correct	2	AO1 4.6.1.6
01.3	BB − brown eyes Bb − brown eyes bb − blue eyes		1 1 1	AO1 4.6.1.6
01.4	the baby may be born with brown eyes, or may be born with blue eyes		1	AO2 4.6.1.6
01.5	the mother may be heterozygous for the eye colour gene		1	AO2 4.6.1.6
02.1	image B as the chromosomes are identical / XX		1 1	AO2 4.6.1.8
02.2	mother XX, father XY resulting allele combinations XX, XY, XX, XY half offspring boys, half offspring girls 50% chance of offspring being a girl		1 1 1 1	AO1 4.6.1.8

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02.3	0.5 × 0.5 × 0.5 = 12.5%	allow ecf from 02.2 award 1 mark for 50% chance for each child award 2 marks for $(0.5^3) \times 100$	3	AO2 4.6.1.8 MS1c
02.4	Manchester 1:1 ratio a statistical probability the larger the sample size, the more likely the sample will show the statistical likelihood		1 1 1	AO2 4.6.1.8
03.1	the allele which will always be expressed if present		1	AO1 4.6.1.6
03.2	DD and Dd	both required for 1 mark	1	AO2 4.6.1.6
03.3	DD, Dd DD, Dd		1 1	AO2 4.6.1.6
03.4	100% likelihood of dimples being present as all allele combinations contain the dominant allele		1 1	AO2 4.6.1.6 MS1c

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03.5	gametes contain half the parents chromosomes / alleles present in each gamete cell are random / different		1	AO2 4.6.1.6
	gametes fuse / join / combine randomly		1	
	so each offspring will inherit different combinations of allele, so will look different		1	
	overall, the alleles from which offspring are produced are the same so they look similar		1	
04.1	additional finger(s) / toe(s)		1	AO1 4.6.1.7
04.2	caused by dominant allele		1	AO1 4.6.1.7
	so if either parent passes on the dominant / faulty / polydactyly allele, the child will have the condition			
04.3	father – Dd		1	AO2 4.6.1.7
	mother – dd		1	
04.4	diagram correctly showing father's and mother's alleles	allow ecf from 04.3	2	AO2 4.6.1.7
	possible alleles of offspring: Dd, dd, Dd, dd			
04.5	1:1	accept 2:2	1	AO2 4.6.1.7

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04.6	genetic cross diagram / calculated value shows expected statistical outcome		1	AO2 4.6.1.7
	combination of alleles is random		1	
	so actual offspring will not necessarily follow statistical likelihood		1	
04.7	any **six** from: • polydactyly is caused by a dominant allele • only one allele is required to inherit condition • higher likelihood of inheriting condition • relevant figure quoted e.g. 75% chance of polydactyly from heterozygous parents • polydactyly does not reduce life expectancy • so allele for polydactyly likely to be passed on to offspring • CF is caused by a recessive allele • two recessive alleles need to be inherited to inherit condition • so likelihood of inheriting condition relatively low • relevant figure quoted e.g. 25% chance of CF from heterozygous parents • CF reduces life expectancy / can cause infertility • so allele for CF less likely to be passed on to offspring		6	AO3 4.6.1.7

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05.1	any **two** from: • regular lung infection • persistent coughing • shortness of breath • poor growth rate / weight gain • infertility	accept any other correct symptom	2	AO1 4.6.1.7
05.2	cystic fibrosis caused by recessive allele carrier will have the allele combination Cc disorder only expressed if both alleles are recessive		1 1 1	AO2 4.6.1.7
05.3	father's alleles Cc, mother's alleles Cc offspring alleles CC, Cc, Cc, cc		1 1	AO2 4.6.1.7
05.4	25%		2	AO2 4.6.1.7 MS 1c
05.5	280	accept for 1 mark: chance of couple meeting who are both carriers = $(1/25)^2$ = 0.0016 accept for 1 mark: chance of offspring of two carriers having CF = 0.25 accept for 3 marks: probability of a couple being carriers and having a child with CF = 0.0004 accept for 4 marks: number with CF = 700 000 × 0.0004	5	AO2 4.6.1.7 MS1c

Question	Answers	Extra information	Mark	AO / Specification reference
06.1	mitosis		1	AO1 4.6.1.1
06.2	any **three** from: • DNA replicates / 2 copies of the chromosomes are formed • one set of chromosomes is pulled to each end of the cell • the nucleus divides • cytoplasm and cell membrane divides • to form 2 identical cells		3	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Specification reference
06.3	any **six** from: sexual reproduction – advantages: • offspring are a genetic mix of both parents / increases genetic diversity • adaptable to environmental change / some of the population may survive even after a change in environmental conditions sexual reproduction – disadvantages: • slow – can only produce a small population in a period of time • lots of energy needed – requires more resources • two parents needed / requires both parents to be together, mature and fertile asexual reproduction – advantages: • only one parent needed • reproduction can happen at any time • quick – can produce a large population in a short time • does not need much energy – few resources required asexual – disadvantages: • offspring genetically identical to parents – no genetic diversity • limited ability to adapt – whole population could die off if their environment changes	to gain 6 marks, answers should compare advantages and disadvantages of **both** types of reproduction	6	AO3 4.6.1.3

Question	Answers	Extra information	Mark	AO / Specification reference
07.1	24		1	AO2 4.6.1.6
07.2	12		1	AO2 4.6.1.6
07.3	two parents are required gametes fuse together		1 1	AO1 4.6.1.6
07.4	any **four** from: • copies of the DNA / genetic information are made • cell divides twice • to form four gametes / pollen cells • each with a single set of chromosomes • each pollen cell is genetically different / non-identical		4	AO2 4.6.1.2
08.1	polymer / chain of nucleotides two strands arranged as a double helix		1 1 1	AO1 4.6.1.4
08.2	specific sequence of amino acids create a specific protein (which carries out a particular function)		1 1	AO1 4.6.1.4
08.3	the complete set of genes / genetic material present in a cell / organism		1	AO1 4.6.1.4

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08.4	find genes linked to disease understand / design treatments for inherited disorders trace ancestry / human migration		1 1 1	AO1 4.6.1.4
09.1	ovaries		1	AO1 4.6.1.2
09.2	testis		1	AO1 4.6.1.2
09.3	any **four** from: similarities: • starts with one parent cell • genetic material is copied differences: • mitosis produces 2 cells / meiosis produces 4 cells • mitosis produces diploid cells (2 sets of chromosomes) / meiosis produces haploid cells (1 set of chromosomes) • in mitosis the cell divides once / in meiosis the cell divides twice • mitosis produces clones (genetically identical cells) / meiosis produces genetically different cells	to achieve full marks, answer must mention at least one similarity and one difference	4	AO1 4.6.1.2 4.1.2.2

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09.4	any **three** from: • each gamete is (genetically) different • random combination of half of the parents' chromosomes • meeting of sperm and egg is random • unique combination of parental chromosomes / alleles combined		3	AO1 4.6.1.2
09.5	gamete cells are produced by meiosis		1	AO1
	contain half the number of chromosomes / haploid cell		1	4.6.1.2
	when egg and sperm join, chromosome number is returned to normal / a full set / diploid cell		1	4.1.2.2
	cells in early embryo / fertilised egg divide by mitosis to grow into a fetus / baby		1	
10.1	pancreas releases digestive enzymes for fats / starches / proteins		1	AO2 4.6.1.7
	if these are blocked, large insoluble molecules will not be digested / broken down		1	
	villi provide large surface area for digestion		1	
	if surface area reduced, fewer soluble / digested molecules will be able to pass into bloodstream		1	

Question	Answers	Extra information	Mark	AO / Specification reference
10.2	any **two** from: • pathogens enter lungs and are trapped in mucus • cilia are unable to move mucus out of the lungs • pathogens remain and cause infection		2	AO2 4.6.1.7

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10.3	any **six** from: social: • allows a couple a choice about whether or not to being a child into the world with a genetic disorder • screening enables health service / support services to plan extent of support networks economic: • cost of procedure small compared with cost of lifetime care • enables couple to make pragmatic choice about whether they will be able to financially support child effectively ethical: • risk of parents 'choosing' characteristics of their child • right to life of unborn fetus • enables implication that some conditions are not 'desirable' – may increase prejudice • could prevent a child being born who may suffer from pain / constant medical intervention	to award 6 marks, answers should include at least one relevant point for each of social, economic and ethical considerations allow other valid arguments	6	AO3 4.6.1.7
11.1	phosphate group		1	AO1 4.6.1.5

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11.2	GAACATCAGT	allow 1 mark for identifying one correct bond A–T G–C	2	AO2 4.6.1.5
11.3	every 3 bases / triplet code(s) for one amino acid specific order of amino acids results in a specific protein		1 1	AO1 4.6.1.5
11.4	any **six** from: • template of DNA / gene that codes for keratin is made • template is small enough to pass out of the nucleus / through the nuclear membrane • template binds to a ribosome • cytoplasm contains carrier molecules • each carrier molecule is attached a specific amino acid • the carrier molecules attach themselves to the template according to the code it contains • the amino acids join together in a specific order • protein molecule folds up to form keratin	credit higher-level knowledge of mRNA and tRNA	6	AO2 4.6.1.5
12.1	bind to / carry oxygen		1	AO1 4.2.2.3
12.2	shortness of breath / tiredness / anaemia		1	AO2 4.6.1.7

Question	Answers	Extra information	Mark	AO / Specification reference
12.3	every three bases code for a specific amino acid		1	AO2
	new sequence of bases would code for a different amino acid		1	4.6.1.7
	difference sequence of amino acids		1	
	protein / faulty haemoglobin would not fold / fold incorrectly		1	
	faulty haemoglobin would not be able to bind / bind as effectively to oxygen		1	
12.4	mutation may occur in the non-coding region of DNA	ignore references to gene expression as these may lead to phenotypic changes	1	AO1
	so will not affect the production of a protein		1	4.6.1.5
	mutation may only cause a slight change in the protein	accept base mutation may be 'silent', and cause no change in amino acid coded for	1	
	which doesn't affect the way it folds / its shape so function not affected		1	
13.1	homeostasis		1	AO1
				4.5.1
13.2	12.00 pm	accept answer between 12 pm and 12.30 pm	1	AO2
	just before blood glucose level started to rise / food taken in causes the blood glucose level to rise		1	4.5.3.2
				Ms 4a

Question	Answers	Extra information	Mark	AO / Specification reference
13.3	any **four** from: • blood glucose level rises as food is digested / absorbed into bloodstream • pancreas releases insulin • insulin causes glucose to be converted to glycogen • in the liver • glucose moves into body cells for respiration • blood sugar level decreases / returns to pre-meal level		4	AO2 4.5.3.2
13.4	42.9% increase	award 1 mark for change of 33 mg/100 cm^3 award 2 marks for $\dfrac{110 - 77}{77}$	3	AO2 4.5.3.2 Ms1c, 4a
13.5	after eating, blood glucose level will reach a higher level / peak level will remain high until volunteer injects insulin after which level will return to normal levels		1 1 1	AO3 4.5.3.2
14.1	differences in the characteristics within a species		1	AO1 4.6.2.1

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14.2	method – any **four** from: • place seeds of plant A <u>and</u> plant B • in different environmental conditions • condition suggested e.g. different temperatures / access to different volumes of water / different light intensity • allow time for plants to grow • suggestion of monitoring growth e.g. change in mass, change in height, number of leaves discussion of how to deduce whether effect is caused by genes or the environment – any **two** from: • compare growth (rate) of plants grown from seeds from sunflowers A and B • plants of sunflower A in all conditions will have grown more or less (rapidly) than sunflower B in the same conditions, as they have different genes • the plants in different conditions will grow to different heights, as they have different environmental factors supplied or removed	award 1 mark per marking point, up to 4 marks for an appropriate method award up to 2 marks for a discussion of genetic and environmental effects on growth rate	4 2	AO3 4.6.2.1