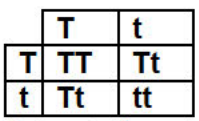
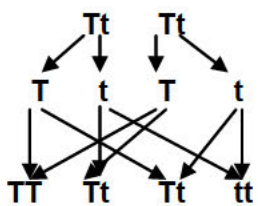
Question			Answer	Marks	Guidance
1	(a)		sweat **evaporates** (1) taking heat from the skin (1)	2	 **allow** heat is lost from the body **allow** takes heat from the body **ignore** cools body down as in stem of question
	(b)		50% / ½ / 1 in 2 (1) Gemma must be / heterozygous / (only) got one dominant allele and Leroy is / homozygous recessive / has no dominant allele (1)	2	**allow** 50/50 **allow** letters such as Hh and hh in a punnet square but must indicate which genotype belongs to who Look for correct labelling on diagram
	(c)	(i)	Gemma's phenotype but not her genotype (1) **last box**	1	
		(ii)	**any two from:** (antigens trigger) white blood cells release antibodies / antitoxins (1) antibodies / antitoxins lock on to antigens (and destroy them) (1) white blood cells engulf antigens (1)	2	 **allow** attach on to antigens **allow** phagocytosis / digest antigen **ignore** eaten **ignore** antibodies engulf antigens **ignore** pathogens
			Total	**7**	

Question			Answer	Marks	Guidance
2	(a)		nucleus from Rainbow / body cell put into (empty) egg cell (1) (cell given) electric shock / cell divides (1)	2	can credit both marks in same box reference to fertilising egg negates mark **allow** mitosis **allow** electric shock to fuse (nucleus and cell)
	(b)		body cells lose ability to differentiate / AW (1) **or** many / some genes switched off (1)	1	**allow** not a stem cell **ignore** body cells do not contain stem cells **allow** already specialised / differentiated **ignore** body cell already has a function
			Total	**3**	

Question			Answer	Marks	Guidance
3	(a)		X0 / 0X / X, male XX, female X0 / 0X / X, male at least one of the male boxes correct (1) **but** all correct (2)	2	 one male box correct and one male box incorrect (0)
	(b)	(i)	23 (1)	1	
		(ii)	11 / 12 / 11 or 12 (1)	1	
			Total	**4**	

Question	Answer	Marks	Guidance
4 a i	amino acids (1)	1	
ii	EAR = 7.2 (g) (1)	1	**allow** 0.0072 kg **allow** 7.20 (g)
iii	15 year olds body mass is larger (1) EAR is calculated using body mass (not age) (1)	2	**allow** 15 year olds are bigger / heavier ORA **allow** idea of growth spurts/adolescence/puberty(needing more protein) **ignore** just growth / growth stages **allow** weight for mass
b	parent genotypes/gametes (1) offspring genotypes (1) 0.25 / 25% / ¼ / 1 in 4 / 1 to 3 of having beta thalassaemia (1)	3	 Correct diagram = 2  **If no marks awarded allowed ecf for max 1 mark for either offspring genotypes or ratio** **allow** alternative letter code
	Total	**7**	

Question	Answer	Marks	Guidance
5 a	mitosis (1)	1	**allow** phonetic spelling
b	**[Level 3]** A correctly sequenced description of cloning technique including all 4 indicative points. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** A correctly sequenced partial description of cloning technique including 3 indicative points. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** A partial description of cloning technique including 2 indicative points. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A*** **Indicative scientific points may include:** • **nucleus** removed from an egg cell/enucleated egg (**ignore** DNA / genetic material) • **nucleus** from the udder / body cell is inserted into the egg cell **BUT** egg cell nucleus **replaced** with the nucleus from an udder / body cell (covers the first 2 indicative scientific points) (**allow** a correct example of a named body cell, **ignore** unqualified cell eg adult cell) • (egg cell) given an electric shock **to make it divide** / **multiply** (**ignore** just grow) • embryo /Dolly is genetically identical to / a clone of the sheep from which the udder/body cell came from or udder/body cell taken from the sheep they want to clone **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	7	

Question			Answer	Marks	Guidance
6	(a)		30 (1)	1	
	(b)		this is selective breeding / artificial selection (1) which leads to inbreeding (1) idea that lameness / diarrhoea are genetically controlled (1)	3	**ignore** just lameness / diarrhoea are passed down additional marking points: **allow** higher level response: reduced gene pool / reduction in variation / accumulation of harmful recessive characteristics (1) BUT there is no variation
	(c)	(i)	(most) animal (cells) lose the ability to **differentiate** (at an early age) OR (many) plant (cells) retain the ability to differentiate (throughout their lives) (1)	1	**allow** plants retain stem cells but animals do not
		(ii)	**any three from** other scientists can **build upon** their results (1) so can develop ideas **quicker** (1) other scientists can **repeat / test** the work (for validity) (1) different teams have **different** skills / resources / ideas / approaches (1) so that a broad **range of evidence** can be put together to develop the idea (1)	3	**allow** work continues even if some people are absent **allow** can share out work load **allow** can do more work **allow** can bounce ideas off each other **allow** able to get variety of results to solve a problem **allow** to gather more evidence to justify ideas
			Total	**8**	

Question			Answer	Marks	Guidance
7	(a)	(i)	**too** rounded (1) focuses light **before** the retina **or** bends / refracts light too much (1)	2	**allow too** powerful / **too** thick **ignore** long eyeball **not** reflects lights
		(ii)	concave (1)	1	**allow** diverging **allow** diagram: 
	(b)	(i)	(alternative / different) version of **a** gene (1)	1	**ignore** different types of gene **but allow** different types of a gene
		(ii)	both Seema and John do not have the disorder / condition / nanophthlamos (1) (**but**) they have children who have the disorder / condition / nanophthlamos **or** Kevin has the disorder (1)	2	**allow** Seema and John are carriers **allow** disorder appears in children whose parents do not have it (2) **allow** the disorder skips generations (2) **ignore** references simply to alleles, answer must refer to phenotype **ignore** idea that it is recessive because fewer people have the disorder than do not
		(iii)	parental genotypes Nn x nn offspring genotypes Nn, Nn, nn, n probability = 50(%) (1)	3	**allow** any clear genetic diagram **ignore** ½ / 0.5 / 1 in 2 **do not** award any ecf **allow** 50(%) (1) even if diagram incorrect
			Total	**9**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>8</td><td>(a)</td><td></td><td>
<table>
<tr><td></td><td>Haploid</td><td>Diploid</td></tr>
<tr><td>egg cell</td><td>✓</td><td></td></tr>
<tr><td>sperm cell</td><td>✓</td><td></td></tr>
<tr><td>zygote</td><td></td><td>✓</td></tr>
<tr><td>cells in embryo</td><td></td><td>✓</td></tr>
<tr><td>cells in twin embryos</td><td></td><td>✓</td></tr>
</table>
all correct (2)
at least three correct (1)
</td><td>2</td><td>more than one tick per line negates a correct tick</td></tr>
<tr><td></td><td>(b)</td><td></td><td>mitosis (1)</td><td>1</td><td>mark phonetically (look for a ‘t’)</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>higher pressure / greater rate of flow (1)</td><td>1</td><td>must be comparative
allow can have different pressures in lungs and body (1)
allow more efficient / more rapid transport of oxygen (1)
allow blood is pumped around faster
ignore blood is pumped fast</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>idea that oxygen travels from (blood of) mother / to (blood of) foetus (1)

but

idea that oxygen moved from mother’s haemoglobin to foetus’ haemoglobin (2)</td><td>2</td><td>allow maintains a concentration gradient across placenta (1)</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>energy (source) (1)</td><td>1</td><td>allow valid named process eg active transport / movement / protein synthesis / DNA synthesis (1)
ignore simply ‘for growth’ / ‘for development’
ignore store</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
9	(a)		(at high temperatures) **more** water is lost cooling down the insect (1)	1	**allow more** water is lost and evaporation takes heat from the insect **ignore** sweating
	(b)	(i)	parasite (1)	1	**mark the answer line first** **allow** correct answer circled, underlined or ticked more than one answer = 0

Question			Answer	Marks	Guidance
		(ii)	**Level 3 (5–6 marks)** Includes an explanation of natural selection with reference to the genetic basis of the variation of the cricket and the increase in the number of silent cricket **and** the mechanism for speciation is explained with correct reference to crickets because the two types of crickets are less likely to mate. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Includes an explanation of natural selection **or** the mechanism for speciation with correct reference to crickets. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Some use of natural selection **or** speciation to explain the changes. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A*.** **Indicative scientific points at level 3 may include:** • the existence of silent crickets is genetic / controlled by genes • the silent crickets are more likely to survive and pass on their genes as their larvae are less likely to be parasitized • the silent crickets are less likely to mate with the singing crickets • singing crickets get killed off so reduced chance of mating • as there is less mixing of genes, two different species may form **Indicative scientific points at level 2 may include:** • explanation of natural selection linked to crickets • variation in some crickets singing some not • silent crickets higher survival value • idea of isolation of cricket affecting reproduction leading to new species forming **Indicative scientific points at level 1 may include:** • idea of natural selection explaining the changes in generic terms • idea of isolation leading to new species forming in generic terms **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
			Total	**8**	