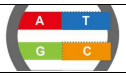
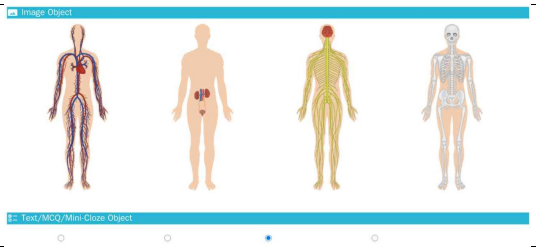
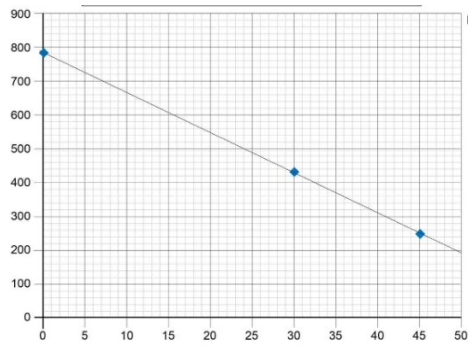
Question		Answers	Notes	Total	Crit
1	a	Nucleus		1	A
	b	A paired with T C paired with G		2	A
	c	Alleles are different forms of the same gene.		1	A
	d	Table Object Father: A, a Mother: A, a AA, Aa, Aa, aa	*Accept Aa or aA as heterozygous notation*	1	A
	e	50%	*Accept 0.5 or 1/2*	1	A
	f	Large surface area ***Accept any further point, for example [max 1]*** • Short diffusion distance or 1 cell thick • Good blood supply ***or*** capillary network • They are moist		2	A
	g	***Accept any reasonable suggestion of a symptom, for example [max 1]*** • Tiredness ***or*** shortness of breath • Cough • Low blood oxygen • Increased lung infections		1	A
	h	***Accept any reasonable benefit, for example [max 1]*** • Can cure untreatable diseases • Less medication is needed ***Accept any ethical consideration, for example [max 1]*** • Don't know the long-term effects • Can be used to make cosmetic rather than medical changes • Regulations may be different in different countries.	*Accept correctly named disease* *WTTE*	2	A

2	**a**			**1**	A
	b	Mitosis		**1**	A
	c	Maintenance of a constant internal environment	*WTTE* *Answers should be in general terms, do* ***not*** *accept a named example*	**1**	A
	d	Shivering ***or*** vasoconstriction	*Accept a description*	**1**	A
	e	***Accept any two correct responses to increased temperature, [max 2]*** • Sweating increases • Vasodilation / blood vessels widen • Hair lies flat ***Accept any two correctly linked explanations for each response [max 4]*** • (Sweat) evaporates • which has a cooling effect ***or*** heat is lost to the surroundings • Increased blood flow to surface • (so) more heat is lost to the surroundings • No trapped layer of air or insulation is reduced • More heat is lost to the surroundings	*WTTE* *Only award the second mark of each explanation if the first mark is awarded*	**6**	A
	f	***Accept any correct response, for example [max 1]*** • Blood glucose levels • Water • (Certain) hormones • CO_2 concentration ***or*** blood pH	*Accept sugar* *Accept named examples such as FSH*	**1**	A

3	**a**	Reproduction	*Do **not** accept any other characteristic of life*	**1**	A
	b	Sugar + oxygen → carbon dioxide + water + energy Reactants and products correct		**1**	A
	c	Independent variable: duration/time of exposure to UV Dependent variable: CO_2 concentration ***Accept any two reasonable control variables, for example [max 2]*** • temperature • concentration of sugar • type of sugar • concentration of yeast	*Accept ppm of CO_2, do **not** accept rate (of respiration)*	**4**	B
	d	***If:*** reference to increasing exposure time ***Then:*** the amount of CO_2 produced decreases ***or*** the rate of CO_2 production decreases ***or*** the rate of respiration decreases ***Because:*** link to UV affecting enzyme ***or*** DNA ***or*** structure of the enzyme	*ORA*	**3**	B
	e	To control the <u>temperature</u>		**1**	B
	f	***Accept any two weaknesses, for example [max 2]*** • Not enough increments • Not enough trials • Lack of (named) control variables • Inaccurate measuring equipment ***Accept any two correctly linked justifications, for example [max 2]*** • (enough increments needed) to observe a reliable trend • more trials yield more accurate data ***or*** reduce the effect of random errors ***or*** not enough data to calculate a valid average • (Lack of control variables) data are not reliable ***or*** not a fair test ***or*** different sugars respire at different rates • Imprecise data		**4**	C
	g	To ensure the results are due to UV exposure ***or*** It is a control experiment	*Accept to allow comparisons between UV exposure and no UV exposure*	**1**	B

4	**a**	To increase the trials per exposure time Reduce random error ***or*** increase accuracy ***or*** calculate average		**2**	C
	b	Average concentration: 1301 Rate: 433.6666 Presentation with no dp: 434	*Accept any dp for 2nd mark*	**3**	C
	c	 Data points (0, 783) and (45, 250) plotted correctly Line of best fit: X: Time of UV exposure / min Y: Rate of CO_2 production / ppm min^{-1}	*Ignore data point at 30 mins* *Units must be included in marking points 3 and 4*	**4**	C
	d	550±5 (ppm min^{-1})	*ECF from part c – check the trend line in part c if necessary*	**1**	C
	e	***Accept any two reasonable suggestions, for example [max 2]*** • Sugar is a limiting factor • Yeast is dead (from ethanol poisoning) • No respiration is happening	*Do **not** accept lack of oxygen* *Accept two different ways for killing yeast for 2 marks* *Accept two valid explanations in one box*	**2**	C

	f	***Accept any two points from the following list [max 2]*** • A section of DNA • That leads to a heritable characteristic • That codes for a protein	*WTTE*	**2**	A
	g	As exposure time (to UV) increases, the number of changes in DNA increases	*Accept positive correlation*	**1**	C
	h	Cellular respiration is less for longer exposure Longer exposure time (to UV) causes more changes in DNA of enzymes ***Accept a further point from the list [max 1]*** • Change in enzyme active site • Can no longer bind to substrate • Enzyme is denatured	 *Accept mutations for changes*	**3**	C
	i	***Accept two reasonable suggestions, for example [max 2]*** • Yeast was killed after 60 mins • As UV killed yeast, it may also kill other microorganisms • (but) No evidence that other microorganisms are killed • May not be practical to use this method outside the lab • There is not sufficient detail about control variables/method		**2**	C

5						**19**	B

	1	**2**	**3**	**4**
Variables	Some variables implied	IV ***or*** DV ***and*** one CV identified explicitly	IV ***and*** DV ***and*** one CV identified explicitly	IV ***and*** DV ***and*** two CV identified explicitly
Hypothesis	simple RQ	A prediction linking IV to DV	A hypothesis linking IV to DV with attempt at a scientific explanation	
Equipment	Equipment to control the IV ***or*** measure the DV	Equipment to control the IV ***and*** measure the DV	Equipment to control the IV ***and*** measure the DV ***and*** monitor at least one CV	
Method	Partial method is described with detail sufficient for IV and DV only	Method is described with detail sufficient for manipulating IV, monitoring DV and controlling one CV	Method is complete and includes sufficient detail to replicate conditions of IV, DV and two CV	
Manipulation of IV / sufficient data	Ref to different increments ***or*** trials	At least five increments ***or*** three trials	At least five increments ***and*** three trials	At least five increments ***and*** three trials ***and*** plans to calculate mean
Justification of range	Temperature range is explicitly stated as being appropriate based on safety considerations ***or*** the active range of yeast	Temperature range is explicitly stated as being appropriate based on safety considerations ***and*** the active range of yeast		

6	**a**	Vaccination ***or*** killing of infected bats	*Do **not** accept use of fences* *Accept fewer bats*	**1**	D
	b	Starting with a producer and three organisms linked in the web Plants – insects – frog – eagle ***or*** Plants – insects – woodpecker – eagle		**2**	A
	c	A correct of use any of the terms: predator, prey, energy, trophic level, population, consumer ***Accept any two reasonable consequences, for example [max 2]*** • Cougar population decreases • Squirrel population increases • Frog population increases • Eagle would increase • Deer population would decrease • Cougars become infected with rabies ***Accept any correctly linked justification, for example [max 2]*** • Fewer raccoons to eat • Squirrels are not being eaten by raccoons • Frogs are not being eaten by raccoons • More squirrels and frogs resulting in more food for eagle • Cougars would eat deer to replace lost raccoons in their food supply • Scratched or bitten by racoons		**5**	D

<table>
<tr>
<td>7</td>
<td>a</td>
<td>
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1.Oral vaccines</td><td>An advantage or a disadvantage of oral vaccines is implied</td><td>An advantage and a disadvantage of oral vaccines is stated</td><td>An advantage and a disadvantage of oral vaccines with one of these with justification</td><td>An advantage and a disadvantage of oral vaccines with both justified</td></tr>
<tr><td>2.Contraceptive</td><td>A suggestion related to population control</td><td>A suggestion correctly linked to population control with justification</td><td></td><td></td></tr>
<tr><td>3.Ethics</td><td>Any reasonable statement relating to ethics</td><td>More than one reasonable statement relating to ethics
Or
Any reasonable statement relating to ethics with further justification</td><td>More than one reasonable statement relating to ethics
with at least one further justified</td><td></td></tr>
<tr><td>4.Collaboration</td><td>A statement of an economic or political consideration</td><td>More than one statement of an economic or political consideration</td><td>More than one statement of an economic or political consideration with further development of one statement</td><td>More than one statement of an economic or political consideration with further development of more than one statement</td></tr>
<tr><td>5.Conclusion</td><td>A concluding statement is given</td><td></td><td></td><td></td></tr>
</table>
</td>
<td>14</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td colspan="2">
Accept any reasonable advantage, for example [max 1]

Can be included in regular vaccination schedule
Correct dose is guaranteed
Develop immunity against the disease

Accept any reasonable disadvantage, for example [max 1]

Not all people can be vaccinated
Supply issues in remote areas
Doesn’t cure the disease or dogs will still suffer from the disease
May cause side effects

Do not accept idea that the vaccine may cause harm
</td>
<td>2</td>
<td>D</td>
</tr>
</table>