

## Cfe Higher Biology Problem Solving Questions

### Marking Scheme

#### Section A

QUESTION	QUESTION USED	ANSWER
1	3 (RH 2013)	C
2	7 (RH 2013)	B
3	8 (RH 2013)	C
4	11 (RH 2013)	B
5	18 (RH 2013)	B
6	26 (RH 2013)	A
7	29 (RH 2013)	D
8	2 (RH 2012)	B
9	5 (RH 2012)	B
10	13 (RH 2012)	C
11	14 (RH 2012)	B
12	17 (RH 2012)	A
13	26 (RH 2012)	C
14	30 (RH 2012)	C
15	8 (Specimen Paper)	C
16	9 (Specimen Paper)	B
17	12 (Specimen Paper)	A
18	7 (Higher 2013)	D
19	6 (Higher 2013)	B
20	16 (Specimen Paper)	C
21	15 (Higher 2013)	A
22	24 (Higher 2013)	C
23	25 (Higher 2013)	B
24	8 (Higher 2012)	C
25	17 (Higher 2012)	B

Section B

Q1 (Q4 2013 RH)

4	a		Higher it/the carotenoid content concentration the darker it/the flesh <b>OR</b> converse	1	Less light transmitted alone  Darker flesh causes the higher carotenoid content	
4	b	i	1:2	1		
4	b	ii	0.35mg	1		
4	b	iii	T Triploids have more than diploids on average <b>OR</b> F tetraploids have less than diploids/ triploids <b>OR</b> example with correct figures	1		

Q2 (Q5a 2013 RH)

5	a	i	368	1		
5	a	ii	140	1		
5	a	iii	1974 - 1976	1		

Q3 (Q8 2013 RH)

8	a	i	Lead (nitrate/ion) concentration	1		
8	a	ii	Concentration of glucose (solution) <b>OR</b> pH <b>OR</b> strain / type / species / variety / age of yeast <b>OR</b> concentration of yeast	1	Size of flask Light intensity Oxygen concentration Same glucose solution Number of yeast cells	
8	a	iii	Allow the flasks/solution(s)/contents/them/glucose and lead solutions/mixtures to reach/heat up to/ cool down to/settle at/ be at an <u>even</u> temperature/correct temperature / required/specific temperature/ appropriate temperature /desired temperature / the same temperature / 20°C /the temperature of the water bath	1	Acclimatise Adapt to References to yeast Conditions <u>Constant</u> <u>temperature</u> Optimum	

8	a	iv	Allow the <u>lead</u> (nitrate) to diffuse into / be taken up by / have its effect on / inhibit /react with/ be absorbed by cells/yeast <b>OR</b> allows lead (nitrate) to have its effect on / inhibit respiration <b>OR</b> allows lead (nitrate) to have its effect on/inhibit/react with enzymes	1		
8	b		<p>Axes scales and labels with units = 1</p> <p>11 needed on Y axis OR 0 2 4 6 8 10 12 is OK Decimal points <b>not</b> needed on scale Zero(s) required Single zero allowed if obviously both scales Label must include oxygen concentration Mg/l is acceptable</p> <p>Plotting and joining as a straight line = 1 Points don't need to be visible Ignore Flask B if included but A must be labelled if both plotted Transposed axes -1</p>	2	Half scale on X axis Half scale on Y loses plot mark	
8	c		As the lead (concentration) increases respiration decreases <b>OR</b> (it) decreases/decreased/reduces <b>OR</b> inhibition was increased	1	Inhibition alone	
8	d		(Carbon dioxide / CO <sub>2</sub> is a product of)anaerobic respiration / fermentation	1	Anaerobic conditions	

Q4 (Q9a-c 2013 RH)

9	a	i	<p>1 Increases from 4.0 - 4.5g to beginning of September / end of August / during August/ in August / in the first month</p> <p>2 Falls from 4.5 - 1.5g from beginning of September / end of August until beginning of December / end of November.</p> <p>3 Remains constant (at 1.5g) from beginning of December / end of November to end of January</p> <p><b>All 3 = 2, 1 or 2= 1</b> <b>NB All correct but no units = 1</b> <b>Units only needed once</b> <b>At least one reference point needed</b> <b>Ignore data beyond end of January</b></p>	2		
9	a	ii	60%	1		

9	a	iii	More/plentiful/good food/nectar available OR less energy needed to keep warm OR more torpor than in winter OR using less energy because not migrating	1	Eat more food	
9	b	i	Energy conserved/ saved for flying / migration / flight  OR energy not wasted so more energy for flying/migration/flight  OR less energy used in keeping warm so more available for flight	1	Energy stored Enough/more energy available for flight Movement/big journeys/ travel More energy needed for migration	
9	b	ii	0.5 / half / ½	1		
9	c		45cm <sup>3</sup>	1		

Q5 (Q13a-c(i) 2013 RH)

13	a		B A C  (all 3 = 2, 1 = 1)	2		
13	b		Same age / stage of plant used OR planting density /initial number / mass of seeds planted the same / temperature/ sunlight / CO <sub>2</sub> concentration OR same fertilizer / pesticide treatment OR same irrigation / soil factors / pH / volume of water / fertility of soil etc = 1  Valid reason = 1 Must state the effect on growth/yield/photosynthesis	2		
13	c	i	0.6	1		

Q6 (Q15a-c 2013 RH)

15	a	5 minutes	1		
15	b	4:1:2	1		
15	c	Increase number of pigs observed <b>OR</b> repeat with different groups/sets of pigs <b>OR</b> increase number / length of observations <b>OR</b> more frequent observations <b>OR</b> repeat at different times of day <b>OR</b> repeat using different/ more enclosures	1	Repeat the whole experiment Repeat observations made Increase the time Compare to other groups	

Q7 (Q5 2012 RH)

4	(a)	(i)	To allow the apparatus to reach 20°C/pressure to equalise/liquid level to settle/become zero <b>OR</b> snail to acclimatise/get used to temperature/surroundings/environment/respiration to become steady	1	control	
		(ii)	(Proves that it is) the snail which causes the changes/ coloured liquid to rise/takes up oxygen/affects the outcome	1		
	(b)	(i)	Oxygen uptake/volume of oxygen taken in	1		
		(ii)	Mass/species of snail <b>OR</b> the snail <b>OR</b> volume/concentration of solution to absorb carbon dioxide <b>OR</b> diameter/width of glass tube/scale	1	thickness of tube	
	(c)		Scales and labels = 1 Points and lines = 1	2		
	(d)		0.004 <b>OR</b> $4 \times 10^{-3}$ <b>OR</b> 1/250	1		
	(e)		Increase (in uptake of oxygen) Enzymes working faster	1		
	(f)		Snail/respiration consumes/uses up oxygen/causes liquid to rise = 1 Solution absorbs any CO <sub>2</sub> made by snail = 1 <b>OR</b> oxygen taken in by snail and CO <sub>2</sub> made absorbed by solution = 1 Causes gas volume/pressure in/of gas to decrease and liquid rises = 1	2		

Q8 (Q9 2012 RH)

<b>9</b>	<b>(a)</b>	<b>(i)</b>	1. Rises from 2.45 tonnes per hectare to 3.60 tonnes per hectare at 60kg 2. Remains level at 3.60 tonnes between 60kg and 80kg 3. Falls to 3.20 between 80kg and 120kg  <b>All 3 = 2, any 2/1 = 1</b>	<b>2</b>		
		<b>(ii)</b>	0.025 tonnes	<b>1</b>		
	<b>(b)</b>	<b>(i)</b>	9:11	<b>1</b>		
		<b>(ii)</b>	25%	<b>1</b>		
	<b>(c)</b>		80kg	<b>1</b>		
	<b>(d)</b>	<b>(i)</b>	Biological yield	<b>1</b>		
		<b>(ii)</b>	50	<b>1</b>		
		<b>(iii)</b>	0.8	<b>1</b>		
	<b>(e)</b>	<b>(i)</b>	Gives maximum/highest/greatest/biggest yield	<b>1</b>		
		<b>(ii)</b>	Lowest level needed to give maximum yield <b>OR</b> any further increase does not increase yield further <b>OR</b> reduces pollution/environmental impact compared with 80kg	<b>1</b>		

Q9 (Q2b(ii) Specimen Paper)

<b>2</b>	<b>b</b>	<b>ii</b>	<b>95</b>	<b>1</b>	
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Q10 (Q4c(i) Specimen Paper)

<b>4</b>	<b>c</b>	<b>i</b>	<b>25</b>	<b>1</b>	
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Q11 (Q6 Specimen Paper)

6	a		20	1	
6	b		<p>increase - people becoming complacent about hand washing or bacteria becoming resistant</p> <p><b>or</b></p> <p>no change - everyone now using procedure</p> <p><b>or</b></p> <p>decrease - increased uptake of procedure</p>	1	
6	c		<i>Clostridium</i> increases, <i>Staphylococcus</i> remains fairly constant	2	
6	d		<p>Conclusion - effective</p> <p>Justification - although percentage of cases remains similar number of cases falls</p>	2	
6	e		<p>Type - <i>Clostridium</i></p> <p>Reason - percentage of cases due to <i>Clostridium</i> increased</p>	1	

Q12 (Q9a&b Specimen Paper)

9	a		15	1	
9	b		413.44	1	

Q13 (Q10 Specimen Paper)

10	a		rate of photosynthesis	1	
10	b		use a water bath	1	
10	c		easier to separate algae from solution <b>or</b> easier to control algae concentration	1	
10	d		repeat at each distance/light intensity	1	
10	e		axes and labels plotting and joined with a ruler	2	
10	f		as light intensity increases rate increases at higher light intensities rate remains constant	2	

Q14 (Q11b Specimen Paper)

11	b	i	increase from 4.2 million (in 1980) to 4.4 million (in 1985) then decrease to 2.8 million (in 1995)	1	
11	b	ii	2 : 1	1	

Q15 (Q2aiii & iv 2013 Higher)

2	a	iii	0.4	1		
2	a	iv	0.33	1		

Q16 (Q4a-c 2013 Higher)

4	a	i	Concentration of glucose (solution) <b>OR</b> pH <b>OR</b> strain / type / species / variety /age of yeast <b>OR</b> concentration of yeast	1	Size of flask Light intensity Oxygen concentration	
	a	ii	Allow the flasks/solutions/glucose and lead to reach/heat up to/cool down to/settle at/ an even/ the correct/the required/the specific/ the appropriate temperature <b>OR</b> 20°C /the temperature of the water bath	1	Acclimatise Adapt	
4	a	iii	Allow the lead (nitrate) to diffuse into/be taken up by/have its effect on/inhibit/react with/be absorbed by cells/yeast <b>OR</b> allows lead (nitrate) to have its effect on/ inhibit respiration <b>OR</b> allows lead (nitrate) to have its effect on/ inhibit/react with enzymes	1		
4	b		Axes scales and labels with units = 1 11 needed on Y axis  decimal points <b>not</b> needed on scale zero(s) required  Plotting and joining as a straight line = 1	2	Half scales	
4	c		As the lead (concentration) increases respiration decreases <b>OR</b> inhibition was increased	1		

Q17 (Q10ai & ii 2013 Higher)

10	a	i	1 Increases from 4.0 - 4.5g to beginning of September / end of August / during August/ in August  2 Falls from 4.5 - 1.5g from beginning of September / end of August until beginning of December / end of November.  3 Remains constant (at 1.5g) from beginning of December / end of November to end of January  <b>All 3 = 2, 1 or 2 = 1</b> <b>All correct but no units = 1</b>	2		
10	a	ii	60%	1		

Q18 (Q11 a&b 2013 Higher)

11	a		2:3	1		
11	b		3·5 / 3½ hours	1		

Q19 (Q12a 2013 Higher)

12	a	i	0 – 2 years	1		
12	a	ii	X	1		
12	a	iii	(Body) mass rises/increases when GH level falls/ remains constant/remains steady	1		

Q20 (Q20 2012 Higher)

4	(a)	Allow respiration of snail to become steady <b>OR</b> Allow snail to adjust/get used to conditions/temperature/surroundings/environment <b>OR</b> allow snail to acclimatise <b>OR</b> Allow pressures to equalise <b>OR</b> Allow liquid levels to settle/become zero (at 20°C) <b>OR</b> Allow apparatus/fit to reach equilibrium	1	Allow normal respiration Set-up/apparatus for snail Snail to adapt	
	(b)	Same apparatus/experiment/set-up/procedure but with no snail/glass beads/dead snail <b>OR</b> Exactly the same but with no snail etc	1	Repeat with no snail	
	(c)	Volume/concentration of solution (to absorb carbon dioxide) <b>OR</b> Diameter/width of glass tube/scale <b>OR</b> (Same) snail/mass of snail/species/type of snail/size of snail/number of snails/one snail	1	Amount/pH of solution Volume of coloured liquid Viscosity of coloured liquid Light intensity Volume/size of test tube	
	(d)	Enclosed scales with 0s and labels as on table and graph fills graph paper [two possibilities – 0-0.04 or 0-0.05 on Y] 0 instead of 0.00 OK on Y = 1 Plots and lines with ruler = 1 Reversed scales – lose 1mark	2		
	(e)	0.004 <b>OR</b> $4 \times 10^{-3}$	1		