Answers to examination-style questions

Answers			Marks	Examiner's tips
1	**a)**	populations of different species; living in the same environment / habitat	2 max.	One mark for principle: all species living in the same place.
	b)	more species / diversity (in the field); more niches / habitats; more feeding opportunities (range of types available)	3	Succession results in an increase in species diversity and therefore a greater variety of niches and food sources are present.
	c)	mark, release, recapture	1	Insects are mobile species so the use of quadrats is not acceptable.
2	**a)**	*diagram shows:* narrower base; increase in numbers of older age groups / straighter sides	2	
	b)	**i)** high fertility rate; higher than replacement of 2.0; not balanced by under-5 mortality; reference to life expectancy greater than reproductive life	2	When the fertility rate is above 2.0 there should be an increase in the population with all other factors being equal.
		ii) disease / AIDS – affecting people of reproductive age / increasing child mortality; shortage of resources / starvation – increasing as population rises; improved standard of living / contraception, so fewer children born; effects of war reducing number of parents, or causing starvation / shortage of resources	2	The question states 'Suggest and explain' however you usually would obtain one mark for describing two factors, without explanations.

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3	**a)**	**i)** RuBP – 5; GP – 3; TP – 3; glucose – 6	2	All correct = 2 marks, 2 or 3 correct = 1 mark.
		ii) stroma	1	
		iii) light-independent reaction / photophosphorylation	1	
		iv) 5 out of 6 / 83%	1	
	b)	enzymes involved / not a photochemical reaction; slow rate of enzyme / chemical reaction at low temperature / less kinetic energy / fewer collisions	2	The effect of temperature on the rate of photosynthesis is always linked to the light-independent reaction.
4	**a)**	more cristae / larger surface area for electron transport chain / more enzymes for ATP production / oxidative phosphorylation; muscle cells use more ATP than skin cells	2	You will not obtain a mark for simply stating that muscle cells are involved in more respiration. You should really link the requirement of ATP to muscle contraction.
	b)	**i)** pyruvate	1	
		ii) carbon dioxide formed / decarboxylation; hydrogen released / reduced NAD formed; acetyl coenzyme A produced	2	In fact acetyl coenzyme A has more than two carbon atoms. However, it is often referred to as a two-carbon molecule due to the two carbons in the acetyl group.
	c)	NAD / FAD reduced / hydrogen attached to NAD / FAD; electrons transferred from coenzyme to coenzyme / carrier to carrier / series of redox reactions; energy made available as electrons passed on to carrier at lower energy level; energy used to synthesize ATP from ADP and P / using ATPase; H^+ / protons passed into intermembrane space; H^+ / protons flow back through stalked particles / enzyme	4 max.	Apart from NAD and FAD you don't need to know the names of the electron carriers so don't waste time learning them. It is far more important to understand that energy is released during the transfer of electrons and this energy is used to form ATP.

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5 a)	**i)**	increases, then levels; idea that nitrogen needed for proteins / nucleic acids in plants / explanation of constant yield at higher concentrations / idea that nitrogen is a limiting factor	2	Usually you would have to specify at what concentration of fertiliser levelling of the yield of spinach occurs to gain a mark.
	ii)	composition known / composition can be varied; cleaner to apply less smelly; concentrated / less needed / more compact to transport / lighter machinery; spread evenly / control the amount you can apply; no seeds / pests; immediate release of nutrients	2 max.	Inorganic fertilisers are artificial fertilisers, manure is a natural fertiliser. You should learn the advantages and disadvantages of using natural and artificial fertilisers.
b)		more growth of algae / surface plants; blocks light; plants lower down unable to photosynthesise; dead (plant) material present; broken down by bacteria / decomposers; respiration uses oxygen in water; aerobic organisms decrease	6 max.	The rapid growth of surface algae and plants blocks the light to submerged plants which then die. As oxygen levels decrease, due to decomposition by microbes, species' diversity will also decrease.
c)	**i)**	parasite / wasp numbers low, so whitefly can increase; more food / egg-laying sites for wasp, so wasp increases; increase in wasps causes fall in whitefly population; decrease in whiteflies causes fall in wasp population	3	The question asks you to explain the changes in population, describing how the populations change is not sufficient.
	ii)	use of predator / parasite / pathogen; to control pest	2	

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6	**a)**	species present change the habitat / named change; other species able to colonise; new species better competitors;	3	
	b)	D – as more species present; more complex food webs; change in one species will have little effect on others; as alternative food sources;	2	Remember the greater the species diversity the greater is the stability of an ecosystem due to more complex food webs.
	c)	sand drains easily / low water retention; sunken stomata reduce transpiration; as pockets of saturated air trapped near stomatal pore; this reduces diffusion / water potential gradient;	3	Transpiration is reduced not stopped! Don't write about 'water being trapped', you should refer to water vapour or saturated air. Always refer to the water potential gradient in your explanation.
	d)	series of changes over a distance; gradient of environmental factor / named environmental factor / cline present; ensures sampling of each community;	1	
7	**a)**	**i)** paternal grandmother X^GX^G or X^GX^g	1	
		ii) grandparent genotypes: $[X^gY]$ $[X^gX^g]$ $[X^gY]$; gametes: $[X^G$ and X^g, or X^G only] $[X^g$ and Y] $[X^g]$ $[X^g$ and Y]; parents genotypes: $[X^GY]$ $[X^gX^g]$ gametes: $[X^G$ and Y] $[X^g]$ daughter: $[X^GX^g]$;	3	All correct = 3 marks. Max. 2 marks if no distinction between pairs of gamete genotypes. Allow omission of gametes clearly not involved in next generation. All males XY and females XX = 1 mark.
		iii) nil; X chromosome, without G allele, inherited from mother / Y must be inherited from father, not X^G;	2	
	b)	X and Y chromosomes are different sizes /shapes; chromatids unable to line up and form bivalent / only short pairing region / most of length not homologous;	2	A common error made by candidates is to state that the Y chromosome does not have any genes. It has fewer genes than the X chromosome.

Answers			Marks	Examiner's tips
8	**a)**	variation between members of population / species; predation / disease / competition results in differential survival; some have adaptations that favour survival; survive to reproduce / have more offspring / pass on their alleles / genes; produces changes in frequency of alleles / gene pool / genotypes / phenotypes;	4 max.	This is a general question about natural selection and the mark scheme contains the generic features of natural selection. However, you must be able to apply these general points to whatever context an examiner might use to test your understanding of this topic. For example, more melanic than non-melanic moths survive predation in polluted habitats and survive to breed, increasing the frequency of the melanic allele in future generations.
	b) **i)**	reduces it; homozygous much more; correct use of figures, hetero by 29/30% and homozygous by 92/94%;	2 max.	
	ii)	people without Hb^C lower survival rate, so less likely to pass on Hb^A allele; increasing chance of children where both parents carry Hb^C; homozygous Hb^C most likely to survive and pass on allele;	2 max.	This is an example of natural selection as referred to in part (a).