<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><td>Characteristics are passed on to the next generation</td><td>W</td><td>;</td></tr>
<tr><td>There is a struggle for existence</td><td>Y and Z</td><td>;</td></tr>
<tr><td>Individuals with beneficial characteristics are among the few who survive</td><td>X and Y and Z</td><td>;</td></tr>
</table>
</td><td>3</td><td>DO NOT CREDIT if letter is unclear

DO NOT CREDIT if more than one letter is given

DO NOT CREDIT if an incorrect letter is given

DO NOT CREDIT if an incorrect letter is given</td></tr>
<tr><td></td><td>(b)</td><td></td><td>MRSA / it, is harder to treat / may become untreatable ;

potential for, disease outbreak / epidemic / pandemic / killing many people ;

developing new / more powerful, <u>antibiotics</u>, is expensive / takes time ;</td><td>2 max</td><td>ACCEPT MRSA / it, can’t be killed (by antibiotics)
ACCEPT antibiotics will no longer work on, MRSA / it

IGNORE new antibiotics are hard to discover</td></tr>
</table>

Question			Answer		Marks	Guidance
1	(c)		1	fossils show that organisms have changed over time ;	3	**1 CREDIT** many fossil organisms dissimilar from modern organisms
			2	*idea that* fossils or rocks can be dated ;		**2 ACCEPT** idea of fossils in chronological order
			3	*idea of* fossils showing intermediate forms / sequences ;		**3** e.g. *Archaeopteryx* / *Tiktaalik* / horse **3** general trend from, small / simple, to, large / complex
				Total	8	

Question			Expected Answers	Mark	Additional Guidance
2	(a)	(i)	3 parts to body ; head + thorax + tail ; segmented ; lateral spines / spines from both sides of head ; thorax / tail , similar shape ;	3 max	**Mark the first answer on each numbered line.** **ACCEPT** wherever seen **ACCEPT** 'a lateral spine' **ACCEPT** description of thorax / tail shape
2	(a)	(ii)	anterior spine (from head) on A ; longer lateral spines on B ; less rounded / AW , head on B ; any other reasonable difference ; ;	2 max	**Mark the first answer on each numbered line.** Answers must state either species A or species B **ACCEPT** ora throughout e.g. (greater) fusion of tail segments in B grooves around edge of head in B outline of tail section (more) curved in A A has more segments **CREDIT** any clear description of a difference
2	(b)		***1*** *idea of* fossils show changes over time ; ***2*** *idea that* there are methods to date fossils ; ***3*** *idea of* simplest / most different from modern , species / AW , in oldest rocks ; ***4*** *idea of* showing , links / relationships , between , groups / species / organisms / taxa ; ***5*** many fossils organisms no longer exist ; ***6*** *idea of* compare DNA extracted from some fossils ;	2 max	**2** **ACCEPT** it is possible to date fossils **4** **ACCEPT** ref to common ancestor of two species Answers could refer to links between species A and species B
			Total	[7]	

Question			Expected Answer	Mark	Additional Guidance
3	(a)	(i)	genes / genetic / mutation ; environment(al) ;	2	**Mark the first answer on each line** **IGNORE** inherited / DNA
3	(a)	(ii) **1** **2** **3** **4**	no defined categories ; range of values / intermediate values ; influenced by, environment / many genes / genes and environment ; quantitative / has to be measured / cannot be counted ;	3 max	 **2 ACCEPT** ref to bell-shaped curve / binomial distribution **3 ACCEPT** any ref to 3 or more genes **4 ACCEPT** metric
3	(a)	(iii)	B ;	1	**DO NOT CREDIT** if more than one letter is given
3	(a)	(iv) **1** **2** **3** **4**	growth too rapid ; increased susceptibility to, disease / named abnormality ; inbreeding ; reduces gene pool / genetic variation / genetic diversity ;	2 max	 **2** e.g. bone / skeletal abnormalities or low immunity **3 DO NOT CREDIT** if implies inbreeding causes mutations **4 IGNORE** refs to biodiversity

Question			Expected Answer	Mark	Additional Guidance
3	(a)	(v)			
		1	maintain biodiversity ;		
		2	aesthetic (reasons) / tourism ;		
		3	ethical (reasons) ;		**3 ACCEPT** religious
		4	part of a food chain / web ;		**4 ACCEPT** food source for local population
		5	maintain / increase gene pool ;		
		6	genetic resource / availability to breed with domestic chickens ;		**6 CREDIT** description, e.g. 'source of desirable genes' or 'source of genetic variation' **6 ACCEPT** specific example of genetic resource e.g. disease resistance / strong bones / longevity / heat tolerance / idea of domesticating wild population
				2 max	

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(i)			**Mark the first two answers only**
		1	reduces / prevents (infectious) disease ;		**1 IGNORE** illness
		2	prevent, problems / named problem, with gut ;		**2** e.g. diarrhoea
		3	digest food more, efficiently / easily / quickly ;		
		4	greater proportion of, food / energy, can contribute to growth ;		**4 ACCEPT** faster growth as AW for contribute to growth **4 IGNORE** larger chickens
		5	reduce risk of transmitting, pathogens / named pathogen, to humans ;	**2 max**	**5 ACCEPT** 'meat less likely to be infected with bacteria'
3	(b)	(ii)			
		1	(antibiotic) resistant, pathogens / bacteria ;		**1 ACCEPT** microorganisms / microbes **1 IGNORE** germs **1 DO NOT CREDIT** immune
		2	antibiotics kill useful, bacteria ;		**2 DO NOT CREDIT** if any ref to viruses
		3	*idea of:* antibiotic passing into human food ;	**1 max**	
			Total	**13**	

Question			Expected Answer	Mark	Additional Guidance
4	(a)		placing, living things / organisms / named organisms, into, groups / categories / taxa / named taxonomic groups ; based on / AW, similarity / difference ;	2	**ACCEPT** 'grouping living things' Look for the idea of similar organisms being placed in the same group or different organisms being placed in different groups
4	(b)	(i)		3 max	**ACCEPT suitable examples for mps 1 to 4**
		1	morphology / anatomy / (observable / physical) features / appearance / AW ;		***1*** **CREDIT** cell features e.g. nucleus / membrane-bound organelles / cell wall / prokaryotic-eukaryotic features / unicellular
		2	biochemistry / cytochrome C ;		***2*** **CREDIT** component of cell wall
		3	genes / DNA / genetics / RNA ;		***3*** **IGNORE** chromosomes
		4	behaviour / physiology / embryology ;		***4*** **ACCEPT** 'how they feed' / nutrition / 'how they reproduce'
		5	idea of shared, evolutionary past / phylogeny ;		***5*** **ACCEPT** 'how closely related' **IGNORE** refs to interbreeding / fertile offspring
4	(b)	(ii)	T S R W U Q ; ; ;	3	**Mark the order of letters** (ignoring the dotted lines) All 6 in correct order = 3 marks If any incorrect, then credit T S in order at beginning = 1 mark U Q in order at end = 1 mark R before W anywhere in the sequence = 1 mark

Question			Expected Answer	Mark	Additional Guidance
4	(c)				**ACCEPT phonetic spellings throughout** **ACCEPT** alternative terms for names of kingdoms and domains throughout (e.g. plants / plantae)
		1	3 domains **AND** 5 kingdoms ;		
		2	domains are, bacteria / eubacteria, **AND**, archaea / archaebacteria, **AND**, eukarya / eukaryotes ;		*2* **ACCEPT** 'eukaryota'
		3	kingdoms are prokaryotes **AND** protoctists **AND** fungi **AND** plants **AND** animals ;		*3* **DO NOT CREDIT** protists / protozoa
		4	eukaryotes split into different kingdoms / all eukaryotes are in the same domain ;		
		5	all prokaryotes are in the same kingdom / prokaryotes split into different domains ;		
		6	domain classification based on, rRNA / ribosomes / RNA polymerase / protein synthesis / enzymes / flagella / membrane structure ;	4 max	*6* **IGNORE** RNA unqualified **DO NOT CREDIT** other forms of RNA **ACCEPT** any detail of protein synthesis
			Total	**12**	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	nucleus / nuclei **;**	**1**	*If more than 1 answer given = 0*
5	(a)	(ii)	*mildew ...* (usually) chitin / not cellulose (cell) **,** wall **;** external digestion / secretes enzymes externally **;** heterotrophic / saprophytic / saprotrophic / saprobiont **;** no **,** plastids / chloroplasts / amyloplasts **;** spores **;** hyphae / mycelium **;** multi-nucleate / coenocytic / aseptate **;**	**2 max**	*If 1st statement INCORRECT, max 1* Must be external or outside or equivalent **CREDIT** syncytium / syncytial
5	(a)	(iii)	*pear tree ...* cellulose cell walls **;** multicellular **;** has **,** chloroplasts / plastids / chlorophyll / photosynthetic pigment **;** (photo)autotrophic / performs photosynthesis **;**	**2 max**	*If 1st statement INCORRECT, max 1* **IGNORE** any references to vacuoles or other organelles 'makes its own food' is not enough
5	(a)	(iv)	Prot**oct**ista / Prot**oct**ist(s) **;** Animalia / animal(s) **;**	**2**	**CREDIT** in either order **DO NOT CREDIT** Protista / Protist *look for the **'c'***

Question			Expected Answers	Marks	Additional Guidance
5	(b)	(i)	discontinuous ; single / few , genes ; qualitative ; discrete categories / either low or high resistance / no intermediates ; no / small / little , environmental effects ;	1 2 max	**CREDIT** at any point in the answer **IGNORE** genetic **CREDIT** a description of **discontinuous** variation (to max 2) even if the type of variation given is incorrect. **CREDIT** 'large / only , genetic effect'
5	(b)	(ii)	artificial selection / selective breeding ; cross / breed , Iranian / resistant , wheat with , high yield / UK , wheat ; method to prevent self , pollination / fertilisation ; select , best offspring / offspring with good yield and resistant ; (back) cross to high yield (UK) wheat / interbreed best offspring / interbreed offspring with both characteristics ; idea of breeding (and selecting) for many generations ;	3 max	**IGNORE** country incorrectly linked to characteristic as long as the correct cross has been described e.g. removing anthers / bag stigma

Question			Expected Answers	Marks	Additional Guidance
5	(c)		genetic variation ; (due to) mutation ; (mutation is) spontaneous / random / pre-existing ; (due to) sexual reproduction ; mildew fungus produces large numbers of , spores / gametes / offspring ; wheat resistance acts as a selection pressure ; (individuals that overcome resistance) have selective advantage / are more likely to survive ; pass on , mutation / (mutated) allele (to offspring) ; increase in allele frequency (of allele to overcome resistance) ;	4 max	**IGNORE** 'survival of the fittest' as this is not an explanation **CREDIT ora** for those with selective disadvantage **ALLOW** gene **DO NOT CREDIT** characteristic / ability
			Total	**17**	