Test Name: F215 Pt 4 Q

Marking Guides

Question: 1 (5415765)

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>(a)</td><td>
<table>
<tr><th>biological principle</th><th>letter</th></tr>
<tr><td>artificial selection</td><td>E ;</td></tr>
<tr><td>predator-prey interaction</td><td>G ;</td></tr>
<tr><td>apical dominance</td><td>B ;</td></tr>
<tr><td>nitrogen fixation and nitrification</td><td>D ;</td></tr>
<tr><td>reproductive cloning</td><td>A / F ;</td></tr>
<tr><td>positive chemotaxis</td><td>H ;</td></tr>
<tr><td>decomposition</td><td>C / D ;</td></tr>
<tr><td>commercial use of plant hormones</td><td>F ;</td></tr>
</table>
</td><td>8</td><td>Award 1 mark per row.

Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</td></tr>
<tr><td>(b)</td><td>respiration / decomposition / decay / ripening ;

interspecific competition ;

(positive) phototropism ;

succession ;</td><td>4</td><td>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks

ACCEPT metabolism / metabolic reactions

DO NOT CREDIT negative phototropism
DO NOT CREDIT trophism (as ambiguous with trophic)</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>(c)</td><td>animals = primary consumers

1 keep animals, warm / indoors ;

2 reduce animal movement ;

3 feed animals high, protein / energy, food ;

4 vaccination / (routine) antibiotics, for animals ;

5 selective breeding / genetic engineering, for improved animals ;

6 slaughter just before, mature / full size ;</td><td>3</td><td>2 ACCEPT zero grazing idea

3 ACCEPT growth-enhancing food additives

4 IGNORE hormones

5 ACCEPT description of improvement, e.g. disease resistant, faster-growing, higher yielding</td></tr>
<tr><td></td><td>Total</td><td>15</td><td></td></tr>
</table>

Question: 2 (5415775)

Question			Answer	Marks	Guidance
	(a)	(i)		2	**Mark the first 2 reasons**
			(both) to, avoid / counter, (abiotic) stress ;		CREDIT to avoid named stressors e.g. cold, heat, dryness, humidity or unfavourable conditions only CREDIT descriptions relevant to both animals (avoiding a stressor) and to plants (closing stomata, wintering underground, etc). IGNORE survival and dangers unqualified
			(both) to avoid, being eaten / predation ;		only CREDIT descriptions relevant to both animals (being consumed, being preyed upon) and to plants (being grazed, herbivory).
			(both) to access resources ;		only CREDIT descriptions relevant to both animals (get food) and plants (obtain light, minerals, water)
		(ii)	*all points must show a clear comparison between mammals (M) and plants (P)* **1** (M) made in endocrine glands **versus** (P) made in many plant tissues ;	3	
			2 (M) move in blood **versus** (P) move, in xylem / in phloem / from cell to cell ;		**2(P)** ACCEPT diffusion / through plasmodesmata, for 'from cell to cell'. ACCEPT by translocation / in transpiration stream IGNORE mass flow
			3 (M) act on, a few / specific / target, tissues **versus** (P) act on most tissues / can act in cells where produced ;		
			4 (M) act more rapidly ; ORA		**4** must be comparative e.g. respond faster in mammals
	(b)	(i)	inherited / passed to offspring / passed (down) from parents ;	2	ACCEPT in context of condition or gene
			(caused by) mutation / allele ;		

Question			Answer	Marks	Guidance
		(ii)		5	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
			gene / allele ;		
			(DNA) ligase ;		
			transgenic / transformed ;		ACCEPT recombinant / GE / GM
			antibiotic(s) ;		CREDIT named antibiotic e.g. ampicillin, tetracycline
			(gene / DNA / fluorescent / radioactive) probe ;		
	(c)		fat soluble / non-polar / uncharged / hydrophobic ;	2	
			(so can move directly through) phospholipid bilayer ;		ACCEPT through phospholipids / through phospholipid membrane DO NOT CREDIT through pores

Question			Answer	Marks	Guidance
	(d)		EITHER	4	**Mark the first example.**
			1 *(lac)* repressor protein ;		
			2 (repressor protein) changes shape when bound to lactose ;		
			3 (with lactose) lifts off operator allowing, transcription / gene expression / binding of RNA polymerase to promoter ; ORA		**3** ORA without lactose the protein binds to the operator stopping, transcription / gene expression / binding of RNA polymerase to promoter DO NOT CREDIT mp 3 if ref. made to DNA polymerase or DNA replication
			4 β-galactosidase / enzyme(s) / structural gene(s) ;		**4** CREDIT lactose permease
			OR		
			5 homeotic / homeobox / hox (genes) ;		
			6 gene product / protein / transcription factor, binds to DNA ;		**6** CREDIT homeobox domain / homeodomain, binds to DNA
			7 gene product / protein, starts transcription / is a transcription factor ;		**7** ACCEPT controls / regulates / stops, transcription
			8 many genes affected / controls body plan ;		**8** CREDIT controls, development / segmentation
			Total	18	

Question: 3 (5468597)

Question Number	Answer	Max Mark
(a)(i)	*gene* length of DNA; codes for a (specific), polypeptide / protein / RNA; *max 1* *allele* alternative form of a gene; found at a, locus / particular position on, a chromosome; *max 1*	[2]
(a)(ii)	*assume allele refers to coat colour allele* (coat colour) gene / alleles, only on X chromosome; **A** *no (coat colour), gene / allele, on Y chromosome* male cats, XY / only have one X chromosome; males have only one (coat colour) allele / cannot have two (coat colour) alleles; need black and orange alleles for tortoiseshell colour;	[2]
(b)	parental genotypes $C^{r}C^{r} \times C^{w}C^{w}$; gametes C^{r} , C^{w} ; *F_1 genotypes and phenotypes 1 mark:* F_1 genotypes (all) $C^{r}C^{w}$ F_1 phenotypes (all) pink; *F_2 genotypes and phenotypes 1 mark:* gametes C^{r} , C^{w} C^{r} , C^{w} ; F_2 genotypes $C^{r}C^{r}$ $C^{r}C^{w}$ $C^{r}C^{w}$ $C^{w}C^{w}$ F_2 phenotypes red pink (pink) white; F_2 ratio 1:2:1; *accept other symbols if key given.* *accept r and w as symbols without key.*	[6]
(c) (i)	65; 130; 65;	[3]

(c) (ii)	0.138 + 0.007 + 0.061; *(or other suitable working)* 0.206 – 0.208; *2 marks for correct value if no working shown* *ecf for both marks but calculated value must be to three decimal places*	**[2]**
(c)(iii)	support, figure lower than 5.991 / figure lower than critical value; ***R** 'support' on its own.* *ecf applies if value in (ii) is incorrect*	**[1]**
(d)	named characteristic; named environmental factor; *(mark first answer only)*	**[2]**
(e)	1 ref to operon; 2 normally repressor substance bound to operator; 3 prevents RNA polymerase binding (at promoter) / prevents transcription; 4 lactose binds to repressor; 5 changes shape of protein molecule; 6 unable to bind (to operator); 7 RNA polymerase binds (at promoter) / transcription occurs / genes switched on; 8 AVP; e.g. production of lactose permease / production of beta-galactosidase;	**max[5]**
	Total:	**[23]**

Question: 4 (5468601)

(a)(i)	*award both marks for correct answer* 10 000 / 800 000 (x 100); 1.25 / 1.3 / 1(%);	**[2]**
(ii)	**R** *any reference to energy / light missing the plant* reflected (off plant) / only certain wavelengths of light can be, absorbed / used; ora absorbed by / hits, non-photosynthetic parts; e.g. bark passes through leaf / misses chlorophyll / misses chloroplasts; some is heat that is used in evaporation / respiration;	**max[2]**
(iii)	bacteria / named bacterium decomposer; (*Nitrobacter* , *Nitrosomonas*)	**[1]**

(iv)	*take the first 2 answers:* death / dead remains; excretion; **R** *waste products* egestion; other suitable method; e.g. insects moulting hatched eggs moulting (fur / feathers) **R** *leaves*	**[2]**
(b)	*Primary consumers are eating and…* producers have, cell walls / cellulose; ora difficult to digest / much material, wasted / egested; energy used by gut microorganisms; ora much material cannot be eaten (by primary consumer); ora	**[3]**
	Total:	**[10]**

Question: 5 (5468603)

(a)(i)	plasmid cut by restriction enzyme; at specific sequence; same enzyme as used to cut (insulin) gene; sticky ends / described; ref. complementary sticky ends; ligase seals (sugar-phosphate) backbone / AW;	**max[4]**
(ii)	*credit any two from the following:* 1 antibiotic resistance (gene) introduced and survivors have plasmid; 2 fluorescent marker (gene) introduced and glowing bacteria have plasmid; 3 identify bacteria producing insulin using antibodies;	**[2]**

(b)	*referring to pig insulin:* ethical / religious, reasons; incompatibility / lack of tolerance / immune response; ora not exactly the same as / less effective than, human insulin; ora *referring to human insulin from bacteria:* engineered insulin is cheaper; ora greater supply of engineered insulin; ora	**[1]**
(c)	*allow max 5 for following:* <u>transcription</u>; DNA unzips / H bonds break; exposing required, gene / sequence of bases; RNA nucleotides align with DNA; U with A, A with T, C with G, **and** G with C; RNA polymerase; mRNA formed (using DNA strand as template); leaves nucleus through pore; *allow max 5 for following:* <u>translation</u>; mRNA attaches to ribosome; tRNA brings amino acid (to, ribosome / mRNA); each tRNA attached to specific amino acid; tRNA binds to mRNA using complementary, base triplet / anticodon; peptide bond formed between amino acids; DNA / mRNA, (nucleotide / base) sequence determines sequence of amino acids; AVP; e.g. 2, base triplets / codons, in ribosome **AVP;** **e**.g. ref. to : start / stop, codons polysomes large and small subunit in ribosome Mg^{2+}	**[10]**
	Total	**[17]**

Question: 6 (5468607)

(a)	from below / ventral / AW; **A** *idea of brain being seen from below* **R** *upside down, looking upwards*	**[1]**

(b)(i)	*reject choice of answers, accept any reasonable spelling* **A** cerebrum / cerebral hemisphere / cerebral cortex / frontal lobe; ignore refs to right or left **R** *incorrect lobe* **B** pituitary (gland); **R** *hypothalamus* **C** cerebellum; **D** medulla (oblongata)	**[4]**
(b)(ii)	control of breathing; control of heart rate; control of circulation; control of swallowing / salivation / vomiting reflex;	**[2]**
(c)	*If blood hormone concentration rises* inhibits output of trophic hormones by pituitary gland; which inhibits output of hormones by endocrine glands; blood hormone concentration falls to normal levels; ref. negative feedback; *ORA*	**max[2]**
	Total:	**[9]**

Question: 7 (5468617)

(a)	(apical / terminal) bud is source of auxin; auxin inhibits growth of side shoot / ora; remove bud and auxin concentration drops; (this allows) cell division / elongation to take place; *ecf – marking points 2 and 3 if growth regulator or hormone used instead of auxin*	**max[3]**
(b)	*award two marks if correct answer (80%) is given* *award one mark for calculation if answer is not correct* (90 – 50 = 40) 40 / 50 x 100; 80%;;	**[2]**
(c)	no growth until day, 8 / 10; auxin moves out of paste / AW; inhibits growth; growth occurs after, 8 / 10, days; because auxin, levels fall / 'used up';	**[3]**
	Total:	**[8]**

Question: 8 (5468625)

Question Number	Answer	Max Mark
(a)	starts with previously uncolonised area / bare ground / bare rock / AW; ref to pioneer species / named pioneer; series of recognisable, seres / stages; progresses to, climax / final equilibrium stage;	max[2]
(b)	stabilise environment; soil development / increase humus / organic material; change soil pH; hold more water; release more minerals or nutrients / increase N content or fix N / hold ions; form microhabitat / reduce exposure / provide shelter / reduce erosion;	max[3]
(c)	*any two from following:* grazing; burning; mowing / application of fertilizer / application of selective herbicide; exposure to wind; grass able to continue to grow (linked to a statement above);	[2]
(d)	increases; plants at later stages are large / plants in early stages are small; trees / shrubs. are woody, appear later in succession;	[2]

(e)	*max 1 mark from following:* **1** economic definition of sustainable; e.g. similar quantities of timber can be harvested year on year **2** grants for planting forests / management schemes ; **3** planting to ensure sustainable harvest rate; *max 3 marks for planting strategy:* **4** trees not planted too closely together; **5** support young trees to prevent damage e.g. from grazing animals; **6** species planted that are suitable for prevailing conditions / native spp; **7** softwood sp. / conifers / named conifer / fast growing sp. planted; **8** deciduous broadleaved species around edges for aesthetic reasons; **9** creates different habitats / named habitat / protected habitats/ some fallen trees left to rot; *max 3 marks for felling/cropping strategy:* **10** ref. to clear felling having negative effects e.g. soil erosion; **11** only mature trees removed / selective felling / individual trees; **12** some clearings / rides / glades in woodland / strip felling; **13** control of, pests / diseases / fire prevention; **14** ref to coppicing / pollarding; **15** (deciduous trees) regrow from base/ idea of rotation/ cycle; **16** standards / large trees not coppiced, as encourages biodiversity;	**[7]**
	Total:	**[16]**

Question: 9 (6815870)

Question Number	Answer	Max Mark
(a)(i)	*max 1 for meaning of term* attached to an insoluble material / AW; *max 2 for description* (micro)encapsulation / (trapped) in alginate beads; adsorption / stuck onto, collagen / clays / resin / (porous) glass; cross linkage / covalent / chemical, bonding to, cellulose / collagen fibres; gel entrapment / trapped inside gel e.g. silica (lattice / matrix); partially permeable membrane (polymer) microspheres;	[3]
(ii)	*any three from the following:* urine can be processed / no problem of removing urine / AW; pure / drinkable / useable, water produced; **A** water recycled space saving / less water needs to be taken into space; payload limit / weight reduction / AW; no problem in separating enzyme from products / product not contaminated; ref. to longer shelf-life of enzyme; no need to take more enzymes into space / enzymes reusable ; **A** enzymes recoverable AVP; e.g. larger surface area of enzyme exposed, more stable at extremes, ref. to ease of use (of bioreactor)	[3]
(b)(i)	adding / using, water to break, bond / ester bond, (in molecule); **A** breakdown into smaller molecules	[1]
(ii)	matrix, protects / stabilises, enzyme / lipase; functions, at optimal rate / more efficiently, at higher temperature / 45 °C; **A** *greater activity / AW* ref. to soluble lipase begins to denature (reducing activity); ora functions, at optimal rate / more efficiently, at lower pH; ref. to presence of fatty acids changing pH; ref. to ionic bonds breaking (in soluble lipase) ; ora AVP ; e.g. ref to industrial uses ref to effect on R groups	max[4]
	Total:	[11]

Question: 10 (2272167)

Question			Answer	Marks	Guidance
	(a)	(i)	<table><tr><th></th><th>Discontinuous</th><th>Continuous</th></tr><tr><td>Species identified by letter</td><td>S and T ;</td><td>R ;</td></tr></table>	2	
		(ii)	statement 1 in S and T only ; statement 8 in S and T only ; statements 2 and 3 in R only ; statement 5 in R only ; statements 4 and 7 in T only ; statement 6 in S only ;	6	<table><tr><th>Species</th><th>Statement number(s)</th></tr><tr><td>R</td><td>2 3 5</td></tr><tr><td>S</td><td>1 6 8</td></tr><tr><td>T</td><td>1 4 7 8</td></tr></table>

Question			Answer	Marks	Guidance
	(b)		*collection* 1. named equipment for collecting from, dogs / fields ; 2. get, large number / over 100 (fleas) ; 3. use several, dogs / fields ; 4. *idea of* random sampling (dogs / field) ; *testing* 5. (named) container ; 6. correct dose / range (of concentrations), tested ; 7. control without flea killer ; 8. delivery method described ; *processing* 9. leave for set time ; 10. count number of, dead / live, fleas (after testing) ; 11. calculate percentage (frequency) of, alive / dead / resistant / non-resistant ;	6	1 CREDIT pooter, forceps, tweezers, pipette, (flea) comb, sweep net, sticky traps, light traps (in correct context) 5 CREDIT tank, jam jar, boiling tube, petri dish. 6 ACCEPT 'dose according to manufacturer's instructions' IGNORE same, volume / concentration 8 e.g. flea-killer sprayed / left to evaporate from cotton wool / fed in blood or food 9 ACCEPT leave for same amount of time 10 IGNORE how many were left, how many were resistant IGNORE identify – must be counting number
			QWC ;	1	Award if the **first mark point awarded in each section** is ***in the correct section order***. collection **1 to 4** **then** testing **5 to 8** **then** obtaining and processing results **9 to 11** *e.g. if the first mark of each section is awarded in the wrong order (such as mp 1, then mp 10, with nothing from the testing section inbetween)* ***then do not award QWC***
			Total	15	

Question: 11 (5468928)

	a change in the genetic material; unpredictable / AW; extra detail; e.g. addition / substitution / deletion / frame shift / small part of chromosome / may code for different protein / may code for no protein	**[2]**

	1 mark max for general effect of mutations: mutation may give different, amino acid / primary structure; **A** *ref stop codon* some mutations alter, molecular shape / tertiary structure / binding; *max 3 for explaining data in Table:* so unable to, accept / transport, HCO_3^-; unable to bind ATP; so increase in acidity / decrease in pH; effect on mucus; effect on enzyme(s) /ref pH optimum of enzyme(s); poor digestion of, protein / lipid / starch; AVP; e.g. some mutations, give some transport / have less effect. >33% (of norm) allows normal digestive function / < 6% [**A** *very low*] does not.	**max[4]**