Forensics - Mark Scheme

Q1.

Question Number	Answer	Mark
(a)	**C** hydrolysis	(1)

Question Number	Answer	Mark
(b)(i)	**B** to give a range of values for the independent variable	(1)

Question Number	Answer	Mark
(b)(ii)	**B** one	(1)

Question Number	Answer	Additional Guidance	Mark
(b)(iii)	1. idea that {bacteria / fungi / decomposers / eq} release enzymes (for decomposition) ; 2. idea of the formation of {monomers / glucose / amino acids / small molecules} / eq ; 3. that {are soluble / dissolve} ; 4. idea that some (soluble) molecules {soak into the ground / taken up (by organisms) ; 5. idea of {respiration / fermentation} of {glucose / eq} (by decomposers); 6. carbon dioxide (released) / eq ; 7. idea of water loss ; 8. idea of {worm / appropriate named organism} activity;	1. ACCEPT external digestion / extracellular digestion 7. e.g. evaporation of water / leaves drying out 8. e.g. animals eat the leaves, leaves pulled into soil	(4)

Question Number	Answer	Additional Guidance	Mark
(b)(iv)	1. idea that an increase in temperature would increase the rate of decomposition (up to an optimum temperature) ; 2. reference to enzymes (in decomposition) ; 3. idea that increased {heat / kinetic} energy results increase in {number of collisions / energy of collisions (between enzymes and substrate) / enzyme-substrate complexes} ; 4. idea that increased temperature increases rate at which bacteria increase ; 5. idea that above a certain temperature rate of decomposition would {decrease / stop} ; 6. idea that at higher temperatures enzymes become denatured OR bacteria killed ;	6. NOT enzymes start to denature NB need the term 'denaturing' or its derivative	**(4)**

Q2.

Question Number	Answer	Additional Guidance	Mark
	A description that makes reference to two of the following: • decomposers break down organic material (from the dead body) • (decomposers) respire • releasing carbon dioxide (into the atmosphere)	ALLOW organic molecules / named organic molecule / organic compounds ALLOW respiration takes place ALLOW methane in context of anaerobic respiration	**(2)**

Q3.

Question Number	Answer	Additional Guidance	Mark
* (a)(i)	(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. multiple copies of DNA made / eq ; 2. using {PCR / *polymerase chain reaction*} ; 3. credit any correct detail of PCR ; 4. reference to *restriction {enzymes / endonucleases}* to produce DNA {*fragments* / eq} ; 5. reference to *(gel) electrophoresis* ; 6. idea of {loading / eq} the DNA onto the {*gel* / named *gel*} ; 7. idea that an {*electric current* / charge} is applied ; 8. reference to use of {*dye / fluorescent tag / UV light / Southern blotting / gene probes / radioactive labelling* / eq};	QWC emphasis on **spelling** 1. IGNORE refs to amplification, large amounts 3. e.g. step 1: 90 to 95 °C, step 2: 50 to 65 °C, step 3: 70 to 80 °C, use of {*primers* / DNA *polymerase / nucleotides*}, many repetitions 6. e.g. *agarose, agar* 7. ACCEPT apply *potential difference*	**(6)**

Question Number	Answer	Additional Guidance	Mark
(a)(ii)	1. idea of comparing total number of {bands / eq} ; 2. idea of comparing position of {bands / eq} ; 3. idea of comparing {size / width} of {bands / eq} ;	ACCEPT idea of comparing bands for 1 mark if mps 1, 2 or 3 cannot be awarded ACCEPT bars / blocks	(3)

Question Number	Answer	Additional Guidance	Mark
(b)	1. {scientific / peer reviewed} {papers / journals / magazines / article} ; 2. (scientific) {conferences / lecture / forums} ; 3. media reports ;	3. e.g. TV, radio, newspaper, internet	(2)

Q4.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to five of the following: • detail of loading of electrophoresis tank (1) • { current / potential difference } applied across the gel (1) • use { gene probe / DNA stain} (1) • use of { STRs / DNA } of black panther (1) • compare { bands / DNA profiles } (1) • a match would indicate that (DNA from) a black panther was present (1)	e.g. use of agarose gel, use of a buffer, sample placed in wells ALLOW voltage e.g. fluorescent dye, methylene blue, iodine or ethidium bromide ALLOW reference to Southern blot technique ALLOW compare lines	**(5)**

Q5.

Question Number	Acceptable Answer	Additional Guidance	Mark
(a)	• correct reading of temperatures (1) • after 24 hours, lowest body temperature 22 minus 5.6^{0}C (1)	22 ±5.6 Accept calculation of maximum ambient temperature Example of calculation 22 – 5.6 = (lower than / equal to) 16.4^{o}C	**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(b)	An answer that makes reference to the following: (1) • range smaller at higher temps (1) • only the highest temperature shows no overlap		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(c)	An answer that makes reference to two of the following: • body size (1) • fat level (1) • position of body i.e. in fetal position or not (1)		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(d)	An explanation that makes reference to the following: • rectal temperature is core temperature / it would be 37°C at time of death (1) • skin surface temperature would be more variable (1)		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(e)	An answer that makes reference to two of the following: • rigor mortis (1) • degree of decomposition (1) • forensic entomology (1)		**(2)**

Q6.

Question Number	Acceptable Answer	Additional guidance	Mark
(a)	A description that makes reference to the following: • reference to PCR to include reference to {primers / DNA polymerase / nucleotides} (1) • procedure repeated {multiple times / 20 to 40 times} (1) • temperature requirements to denature and anneal (1)		**(3)**

Question Number	Acceptable Answer	Additional guidance	Mark
(b)(i)	C		**(1)**

Question Number	Acceptable Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to: • pattern of bands different between 1 and 3 and 2 and 4 (1) • so *Allolobophora chlorotica* not all one species (1)		**(2)**