Abbreviations, annotations and conventions used in the Mark Scheme	/	=	alternative and acceptable answers for the same marking point
	;	=	separates marking points
	NOT	=	answers which are not worthy of credit
	R	=	reject
	( )	=	words which are not essential to gain credit
	___	=	(underlining) key words which **must** be used to gain credit
	ecf	=	error carried forward
	AW	=	alternative wording
	A	=	accept
	ora	=	or reverse argument

Question	Expected Answers	Marks
1	**A** mitochondrion **;** **A** cristae / matrix **B** nuclear envelope / nuclear membrane **;** **A** nucleus **C** nucleolus **;** **A** heterochromatin **D** (cell) wall **;** **A** middle lamella	**4**
		[Total: 4]
2 (a)	*similar ~ allow valid similarities such as* same number **,** carbon / oxygen / hydrogen (atoms) / OH (groups) **;** **A** hexose same formula **;** **R** similar / molecule ring / ring with O (atom) in it **;** correct ref CH_2OH **;** contain C, H and O **;**	**1 max**
	different ~ assume candidate is writing about fructose unless told otherwise *allow valid differences such as* (fructose has) 5-membered ring / glucose has 6-membered ring **;** **R** pentose (*4 C in ring v. 5C in ring / furanose v. pyranose in glucose*) (in fructose) 2 CH_2OH side chains / 1 CH_2OH side chain in glucose **;** different angles between C atoms **;** ref alignment of H and OH groups (on carbon 3 / carbon 4) **;** (in fructose) carbon 1 not in ring / carbon 1 in ring in glucose **;**	**1 max**
(b) (i)	glycosidic **;** **NOT** *glucosidic*	**1**
(ii)	**1** carbon positions 1 and 2 on glucose and fructose **;** **2** formation of **,** water / H_2O **,** from 2 OH groups (plus separation) **;** **3** oxygen bridge / – O – **,** shown **;**	**2 max**
(c) (i)	add / use **,** Benedict's (reagent) **;** heat **;** **NOT** use water bath alone (blue to) green / yellow / orange / brown / red (precipitate) **;**	**3**
(ii)	hydrolysis **;** boil / heat **,** with (dilute) **,** acid / HCl **;** **A** (dil) NaOH (add) hydrolytic enzyme / sucrase / invertase **;**	**1 max**
		[Total: 9]

Question			Expected Answers	Marks
3	(a)		active site correctly labelled ;	1
	(b)		**C** ;	1
	(c)		shape of active site ; complementary ; correct shape / correct molecule / correct substrate / **C ,** will **,** fit / form ESC ; any other shape / any other molecule / any other substrate / **A** / **B** / **D** / **E ,** will not ; *award 2 marks if candidate writes 'only correct …..'*	3 max
	(d)		*look for points relating to the substrate changing shape* *ignore refs to enzyme changing shape* puts strain on the bonds in the substrate / bonds break more easily ; **A** weakens bonds lowers activation energy ; AVP ; e.g. referring to anabolic reaction	1 max
				[Total: 6]
4	(a)	(i)	fructose ;	1
		(ii)	glucose ;	1
		(iii)	(passive) diffusion ;	1
		(iv)	*ignore ref to, movement of sugars / solute potential* **1** surrounding solution higher concentration (of solutes) than cell contents ; *ora* **2** cell has higher water potential ; *ora* **3** water moves out of cell ; **4** (so) volume decreases ; **5** (water has moved) by osmosis ; *only award in relation to water* **6** down water potential gradient / from high Ψ to low Ψ ;	4 max
	(b)		active transport / facilitated diffusion / bulk transport / endocytosis / etc. ; **A** using channel proteins, etc **NOT** osmosis	1
				[Total: 8]

Question			Expected Answers	Marks
5	(a)	(i)	niche ;	1
		(ii)	population ;	1
		(iii)	community ;	1
	(b)	1	sun is the energy source (for the system) ;	
		2	producers / (green) plants , trap / use / absorb (sun's energy) ;	
		3	photosynthesis ;	
		4	not all energy trapped and reason ;	
		5	energy used for , plant metabolism / plant processes / e.g. ; **A** respiration	
		6	so this energy not , passed on / available , to consumer ;	
		7	(some energy) used for , growth / storage ;	
		8	so this energy is , passed on / available , to consumer ;	
		9	1^{o} consumer / herbivore , eats , producer / plant ;	
		10	some producer , not edible / not accessible / e.g. ;	
		11	some , not digested / egested / lost as faeces ;	
		12	2^{o} consumer / carnivore / omnivore , eats , 1^{o} consumer / herbivore ;	
		13	some parts of animal not edible / e.g. ;	
		14	energy used by animal in moving (to feed) ;	
		15	energy , used / lost , in , digestion / excretion / sweating / e.g. ; **A** respiration	
		16	transfer / loss , to , decomposers / bacteria / fungi / saprotrophs ;	
		17	energy lost as heat from respiration ;	
		18	net productivity = gross productivity – respiration ;	
		19	some ref to estimate of efficiency of transfer (a general statement) ;	
		20	quote of (comparative) figures from diagram ;	
		21	manipulation of figures to illustrate a point ; **NOT** 6612 and 14198	
		22	AVP ;	
		23	AVP ; e.g. loss out of ecosystem another manipulation of figures available energy limiting length of chain	**max 9**
			QWC – legible text with accurate spelling, punctuation and grammar ;	1

[Total: 13]

Question		Expected Answers	Marks
6	(a)	*mark first two answers unless neutral* *e.g. cell division / cell replication / produces identical cells* produces **,** genetically identical cells / clones **;** **A** same genes asexual reproduction **;** maintains **,** chromosome number / ploidy / AW **;** growth (of organism) **;** **NOT** 'of cells' replacement of cells / repair (of tissues) **;** **NOT** 'repair of cells'	**2 max**
	(b)	*ignore refs to early and late stages* **NOT** *ref to I and II*	**1**
	(i)	telophase **;**	
	(ii)	metaphase **;**	**1**
	(iii)	prophase **;**	**1**
	(iv)	anaphase **;**	**1**
	(v)	anaphase **;**	**1**
	(c) **(i)**	one set of (parental) chromosomes / one copy of each chromosome **;** **A** half the diploid number / half of 2n / one chromosome from each pair **NOT** half chromosomes / half the number number of chromosomes in a gamete **;** **A** 23 <u>chromosomes</u>	**1 max**
	(ii)	maintain / restore **,** same chromosome number / ploidy / 46 chromosomes / diploid number **;** ref to **,** fusion / fertilisation **;** prevents **,** doubling / increase **,** of the chromosome number (each generation) **;** **R** just 'too many' combining two (single) sets (will restore correct number) **;** not just n	**2 max**
			[Total: 10]

Question			Expected Answers	Marks
7	(a)		cheaper ; ref to compatibility / less chance of rejection / fewer side effects ; stated ethical issue ; e.g. don't need to kill animals / removes religious objections ref to contamination / easier to purify / ref to disease ; consistent quality ; more effective (as human in origin) ; production level can meet demand / reliability of supply / faster production ; *ignore greater production*	**2 max**
	(b)	**(i)**	glycoprotein ;	**1**
		(ii)	(cell) recognition / antigen ; attachment / receptor ; **NOT** carrier holds enzymes ; AVP ; e.g. stabilises membrane in aqueous environment	**1 max**
	(c)	**(i)**	restriction (enzyme) / endonuclease ;	**1**
		(ii)	*this may be answered in the context of inserting into a plasmid.* cut DNA with restriction enzyme ; ref to sticky ends ; complementary ; base pairs / CCC and GGG / C pairing with G / alternative ; (DNA) ligase / ligation ; ref to bonding / AW ; e.g. hydrogen *or* phosphodiester / sugar-phosphate AVP ; e.g. add sticky ends to blunt ends cut both at the same place	**3 max**
		(iii)	codes for , protein / polypeptide / enzyme ; **A** ref to, protein synthesis / transcription / translation (enzyme) catalyses / causes , condensation / formation of glycosidic bonds / reaction (between , mannose / sugars) ;	**2**

[Total: 10]