PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



MARK SCHEME

TOPIC 4: NATURAL SELECTION AND GENETIC MODIFICATION (PACK 4)

SCORE	PERCENTAGE
/94	%

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Mark Scheme

Q1.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	**B** *Homo erectus*		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	any value between 0.7-0.9 million (years)	any value between 700 000-900 000 (years)	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description including two of the following structural features/shape of fossil (1) (age of the fossil from) location in rock layers (1) structure of stone tools (1)	 accept comparison to other fossils radioactive dating (of rocks) ignore references to carbon dating ignore references to DNA analysis ignore brain size	 **(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	A comparison including three of the following more abundant than nuclear DNA (1) higher mutation rates (1) less likely to degrade (1)	 accept {large supply/lots} of mitochondrial DNA only inherited down the female line/no crossing over/recombination (1)	 **(3)**

Question Number	Answer	Acceptable answers	Mark
(d)	An explanation linking the following: habituation / learned response (1) stop responding to {neutral signal /harmless signal} (1)	 accept become used to a harmless stimulus ignore references to getting used to the sound of the waterfall	 **(2)**

Q2.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	**B** *Homo erectus*		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	any value between 0.7-0.9 million (years)	any value between 700 000-900 000 (years)	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description including two of the following structural features/shape of fossil (1) (age of the fossil from) location in rock layers (1) structure of stone tools (1)	 accept comparison to other fossils radioactive dating (of rocks) ignore references to carbon dating ignore references to DNA analysis ignore brain size	**(2)**

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Question Number	Answer	Acceptable answers	Mark
(d)	An explanation linking the following: habituation / learned response (1) stop responding to {neutral signal /harmless signal} (1)	 accept become used to a harmless stimulus ignore references to getting used to the sound of the waterfall	**(2)**

Q3.

Question Number	Answer	Acceptable answers	Mark
(i)	**B** ☒ arrow head		**(1)**

Question Number	Answer	Acceptable answers	Mark
(ii)	**A suggestion including two of the following** hunting/fighting/defence (1) {preparing/ cooking/foraging for} food (1) making clothes (1) construction of {shelters/new tools/sharpening tools} (1) making fire (1)	 accept weapons accept skinning animals for food/scrapping bones accept skinning for clothes accept chopping wood	**(2)**

Q4.

Question Number	Answer	Acceptable answers	Mark
(i)	**B** ☒ arrow head		**(1)**

Question Number	Answer	Acceptable answers	Mark
(ii)	**A suggestion including two of the following** hunting/fighting/defence (1) {preparing/ cooking/foraging for} food (1) making clothes (1) construction of {shelters/new tools/sharpening tools} (1) making fire (1)	 accept weapons accept skinning animals for food/scrapping bones accept skinning for clothes accept chopping wood	**(2)**

Q5.

Question Number	Answer	Acceptable answers	Mark
	A description including two of the following show **changes** in body structure (1) **changes** in stone tools (1) a specific example eg Ardi/Lucy/*Homo erectus* (1)	 accept development of named structural changes	**(2)**

Q6.

Question Number	Answer	Acceptable answers	Mark
	A description including two of the following show **changes** in body structure (1) **changes** in stone tools (1) a specific example eg Ardi/Lucy/*Homo erectus* (1)	 accept development of named structural changes	**(2)**

Q7.

Question number	Answer	Mark
(i)	A Eukarya **i. The only correct answer is A** ***B*** *is not correct because plants are not single celled prokaryotic organisms* ***C*** *is not correct because plants are not single celled prokaryotic organisms and Monera is a kingdom* ***D*** *is not correct because Protista is a kingdom and not a domain*	**(1)** **comp** AO1 (1) 4.7, 1.1

Question number	Answer	Mark
(ii)	A oxygen produced sunlight absorbed by chlorophyll **ii. The only correct answer is A** ***B*** *is not correct because photosynthesis doesn't produce carbon dioxide and sunlight is not absorbed by mitochondria* ***C*** *is not correct because sunlight is absorbed by chlorophyll not mitochondria* ***D*** *is not correct because photosynthesis doesn't produce carbon dioxide it produces oxygen*	**(1)** AO1 (1)

Question number	Answer	Mark
(iii)	Any one from: • (improved) genetic analysis (1) • DNA/RNA {screening/sequencing} (1) • domain theory is based on genetics (1) • differences between coding and non-coding DNA (1)	**(1)** AO1 (1)

Q8.

Question number	Answer	Mark
(i)	A Eukarya **i. The only correct answer is A** ***B*** *is not correct because plants are not single celled prokaryotic organisms* ***C*** *is not correct because plants are not single celled prokaryotic organisms and Monera is a kingdom* ***D*** *is not correct because Protista is a kingdom and not a domain*	**(1)** AO1 (1)

Question number	Answer	Mark
(ii)	A oxygen produced sunlight absorbed by chlorophyll **ii. The only correct answer is A** ***B*** *is not correct because photosynthesis doesn't produce carbon dioxide and sunlight is not absorbed by mitochondria* ***C*** *is not correct because sunlight is absorbed by chlorophyll not mitochondria* ***D*** *is not correct because photosynthesis doesn't produce carbon dioxide it produces oxygen*	**(1)** AO1 (1)

Question number	Answer	Mark
(iii)	Any one from: • (improved) genetic analysis (1) • DNA/RNA {screening/sequencing} (1) • domain theory is based on genetics (1) • differences between coding and non-coding DNA (1)	**(1)** AO1

Q9.

Question Number	Answer	additional guidance	Mark
(i)	differentiation (1)	accept specialisation	(1) AO 2 1

Question Number	Answer		Mark
(ii)	A logical description including two of the following: • many plants produced (1) • quicker than sexual reproduction (1) • genetically identical/ clones produced (1) • with the desired characteristics (1) • plants from {endangered/rare} plants (1)	accept gives more of that plant/higher yield of that plant ignore plants grow faster obtain plants difficult to grow from seed (1)	(2) AO 1 1

Question Number	Answer	Additional guidance	Mark
(iii)	Any two from: • sterilises agar growth medium (1) • destroys unwanted {bacteria /pathogens/fungi/microorganisms/viruses} /there is no contamination (1) • so microorganisms don't {affect growth of plantlets / don't compete with plantlets/ don't use nutrients needed by plantlets} (1)	ignore prevents microorganisms getting in accept only the plantlets grow	(2) AO 2 2

Question Number	Answer	Additional guidance	Mark
(iv)	• mutation / disease	accept different alleles/ genotypes/genetic variation	(1) AO 2 1

Q10.

Question number	Answer	Additional guidance	Mark
(i)	An explanation including **four** of the following: • by natural selection / evolution (1) • mutation in the bacterium /variation in the population (1) • only the resistant bacteria **survived treatment by antibiotics /** resistant bacteria survive when people **don't finish the course** (1) • the resistant bacteria {reproduce / divide} (1) • offspring inherit the resistance / resistance passed onto future generations / process repeats increasing level of resistance (1)	accept *Klebsiella* for bacteria accept they evolve accept some bacteria have a **{gene/allele}** for antibiotic resistance accept non-resistant bacteria killed **by antibiotics** ignore offspring are identical	**(4)** **A02 1**

Question number	Answer	Additional guidance	Mark
(ii)	people not completing their course of antibiotics/overuse of antibiotics	accept acted as a selection pressure accept being used to treat viruses/examples ignore misuse unqualified	**(1)** **AO1 1**

Question number	Answer	Mark
(iii)	B it does not have a nucleus **The only correct answer is B** ***A*** *is incorrect because prokaryotic cells do not have chloroplasts* ***C*** *is incorrect because prokaryotic cells have ribosomes* ***D*** *is incorrect because prokaryotic cells can reproduce without a host*	**(1)** **AO1 1**

Q11.

	Answer	Acceptable answers	Mark
	D ☒ speciation		**(1)**

Q12.

	Answer	Acceptable answers	Mark
	D ☒ speciation		**(1)**

Q13.

	Answer	Acceptable answers	Mark
(a)	**C** ☒ nitrification		**(1)**
a(ii)	an explanation to include the following points • used to make protein (1) • for growth (1)	**Ignore references to use as food (plants do not feed)** accept amino acids/ chlorophyll /DNA ignore references to photosynthesis / respiration	**(2)**
a(iii)	A description linking **four** of the		**(4)**

	following points (nitrates) leach/flow into water (1) algae and small plants grow **rapidly**/algal bloom (1) **underwater**plants cannot photosynthesise (1) (lack of photosynthesis / sunlight) causes plants to die (1) decomposers / (decomposing) bacteria break down the dead material / plants (1) these bacteria use up oxygen during respiration(1)	accept fertilisers for nitrates	
b	An explanation to include three of the following points bacteria use nitrogen / nitrogen fixing bacteria (1) make ammonia / ammonium / nitrogen compounds /nitrates for use by plants (1) bacteria protected (within the root nodule) (1) bacteria obtain chemical substances / glucose / sugar from the plant (1) this is called a mutualism / symbiosis(1)	**Ignore food/nutrients** **reject parasitism**	**(3)**

Total for question = 10 marks

Q14.

Question number	Answer	Additional guidance	Mark
(i)	A comparison including **three** of the following: • the number of transplants needed increased rapidly but the number of donors {only increased slightly /remained low} (1) • from {2014 / 2015} the numbers of transplants required decreased (1) • the number of donors available was always lower than the number of transplants needed (1) • comparison of figures from the graph of the number of people needing an organ and donating an organ (1)	accept peaked in {2014 / 2015} accept there are not enough donors for the transplants needed accept a comparative mathematical manipulation of the data	**(3)** **AO3 2ab**

Question number	Answer	Mark
(ii)	not enough donors are available / to increase the number of organs for donation / to meet the demand for organ transplants	**(1)** **AO3 2b**

Q15.

	Answer	Acceptable answers	Mark
	A description including **three** of the following points: • all have digits/fingers (1) • all have { similar bones /radius / ulna / carpals}(1) • all have a humerus bone (1) • <u>pentadactyl</u> limb (1)	accept: phalanges for fingers accept: same bone structure	**(3)**

Q16.

	Answer	Acceptable answers	Mark
	A description including **three** of the following points: • all have digits/fingers (1) • all have { similar bones /radius / ulna / carpals}(1) • all have a humerus bone (1) • pentadactyl limb (1)	accept: phalanges for fingers accept: same bone structure	**(3)**

Q17.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	8-10 (hours)	accept any value between 8 and 10	**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	(85/100) x 500 (1) Or (500/100) x 85 (1) 425 (plants)	award two marks for correct bald answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(iii)	plant can flower all year round/flowering not limited to one period of the year/plant can flower for longer/flower at any time.	ignore references to growing accept pollination for flowering	**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(iv)	**C** photoperiodism		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	less likely to be eaten (by animals / herbivores)	accept kills pests/reduces damage done by pests reject predators	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	An explanation linking **two** of the following: the bamboo **mutated** to produce cyanide (1) or bamboo plants that produced cyanide survived to reproduce/ increase in numbers/increase in size (1) **and** **mutation** in greater bamboo lemur allowed them to tolerate cyanide (1) or greater bamboo lemurs get more food so survive to breed/reproduce (more) (1)	accept some bamboo plants have the {**gene/allele**} to produce cyanide ignore bamboo plants not eaten accept lemurs have {**gene/allele**} to tolerate cyanide ignore {adapted to tolerate/resistant to} cyanide accept lemurs have less **competition** for food	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	**A** aggression		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	An explanation linking two of the following: sounds can be heard over a long distance /heard in the dark (1) do not need to have visual contact/allows communication with more animals (1) or more different types of sound (1) more {emotions/ behaviour/ information} can be conveyed (1)	accept quicker communication method accept doesn't require good vision	**(2)**

Q18.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	8-10 (hours)	accept any value between 8 and 10	**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	(85/100) x 500 (1) Or (500/100) x 85 (1) 425 (plants)	award two marks for correct bald answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(iii)	plant can flower all year round/flowering not limited to one period of the year/plant can flower for longer/flower at any time.	ignore references to growing accept pollination for flowering	**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(iv)	**C** photoperiodism		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	less likely to be eaten (by animals / herbivores)	accept kills pests/reduces damage done by pests reject predators	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	An explanation linking **two** of the following: the bamboo **mutated** to produce cyanide (1) or bamboo plants that produced cyanide survived to reproduce/ increase in numbers/increase in size (1) **and** **mutation** in greater bamboo lemur allowed them to tolerate cyanide (1) or greater bamboo lemurs get more food so survive to breed/reproduce (more) (1)	accept some bamboo plants have the {**gene/allele**} to produce cyanide ignore bamboo plants not eaten accept lemurs have {**gene/allele**} to tolerate cyanide ignore {adapted to tolerate/resistant to} cyanide accept lemurs have less **competition** for food	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	**A** aggression		**(1)**

Question Number	Answer	Acceptable answers	Mark
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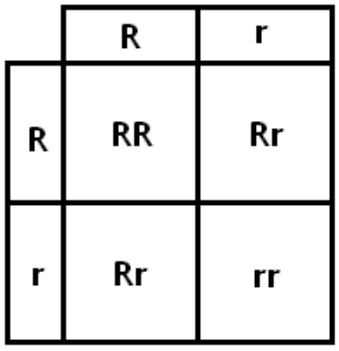
Q19.

Question number	Answer	Additional guidance	Mark
	• to produce more food (1) • to improve quality of food (1)	bigger plants , produce more kernels, more sweet/juicy, pest resistant,	(2)

Q20.

Question Number	Answer	Acceptable answers	Mark
(a)	Genus; Species;	Must be in the correct order	(2)

Question Number	Answer	Acceptable answers	Mark
(b)	A suggestion including the following points: • rats with the mutation survive to reproduce (1) • pass on the allele which makes the offspring resistant to warfarin (1)	accept breed / produce offspring etc for reproduce accept gene / mutation for allele	(2)

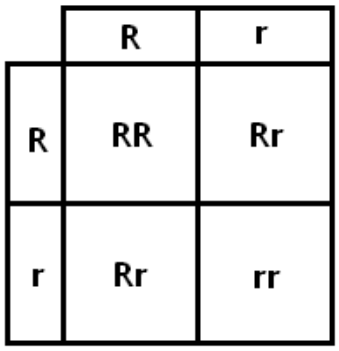
Question Number	Answer	Acceptable answers	Mark
(c)	 Correct gametes (1) Correct offspring (1)	If incorrect gametes are entered into the Punnett square but the offspring for those gametes are correct 1 mark can be awarded as an error carried forward	(2)

Question Number		Indicative Content	Mark
QWC	* **(d)**	A explanation to include some of the following points • MRSA is a bacterial infection • number of cases increased from 1995 to 2006 • MRSA is resistant to antibiotics • so MRSA infection not easy to treat • number of cases were similar between 2005 and 2007 • antiseptics killed the bacteria • less bacteria were transferred from person to person • number of cases decreased from 2007 • antiseptics kill bacteria on surfaces • causing less infections from MRSA	**(6)**
Level	**0**	No rewardable content	
1	**1 – 2**	• a limited explanation of the graph including correct data reading or the use of antiseptics or antibiotics to kill bacteria/treat MRSA • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 – 4**	• a simple explanation of one trend of the graph including correct data reading and the effect of the use of antiseptics or antibiotics to kill bacteria/treat MRSA • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 – 6**	• a detailed explanation of at least two trends of the graph linking it to antibiotic resistance and antiseptic programme • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q21.

Question Number	Answer	Acceptable answers	Mark
(a)	Genus; Species;	Must be in the correct order	**(2)**

Question Number	Answer	Acceptable answers	Mark
(b)	A suggestion including the following points: • rats with the mutation survive to reproduce (1) • pass on the allele which makes the offspring resistant to warfarin (1)	accept breed / produce offspring etc for reproduce accept gene / mutation for allele	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	 Correct gametes (1) Correct offspring (1)	If incorrect gametes are entered into the Punnett square but the offspring for those gametes are correct 1 mark can be awarded as an error carried forward	**(2)**

Question Number		Indicative Content	Mark
QWC	* **(d)**	A explanation to include some of the following points • MRSA is a bacterial infection • number of cases increased from 1995 to 2006 • MRSA is resistant to antibiotics • so MRSA infection not easy to treat • number of cases were similar between 2005 and 2007 • antiseptics killed the bacteria • less bacteria were transferred from person to person • number of cases decreased from 2007 • antiseptics kill bacteria on surfaces • causing less infections from MRSA	**(6)**
Level	**0**	No rewardable content	
1	**1 – 2**	• a limited explanation of the graph including correct data reading or the use of antiseptics or antibiotics to kill bacteria/treat MRSA • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 – 4**	• a simple explanation of one trend of the graph including correct data reading and the effect of the use of antiseptics or antibiotics to kill bacteria/treat MRSA • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 – 6**	• a detailed explanation of at least two trends of the graph linking it to antibiotic resistance and antiseptic programme • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q22.

Question Number	Answer	Additional guidance	Mark
(i)	• same structure of bones/examples of bone structure (1) • (structure is) unlikely to have occurred more than once during evolution / common ancestor had {the pentadactyl limb structure /similar limb structure} (1)	accept unlikely that different ancestors would have had the same structures	**(2)** AO 2 1

Question Number	Answer	Additional guidance	Mark
(ii)	• compare the {genes/sequence of genes} from different organisms (1) • closely related organisms have {more similar/identical} sequences /differences in sequence can show evolution (1)	accept idea of identifying similarities and differences in the {genes/sequences} accept organisms with similar gene sequences share a common ancestor	(2) AO 1 1

Q23.

	Answer	Acceptable answers	Mark	
(I)	An explanation including **two** of the following: the dodo was multicellular (1) the dodo fed on other organisms /fed heterotrophically (1) the dodo did not have chlorophyll / cell walls (1)	Accept animals can't make food for themselves by photosynthesis Accept chloroplasts for chlorophyll Ignore references to legs /backbone etc	(2)	
(ii)	has a (supporting) rod / spinal cord	**Accept** backbone / spine / vertebrate	(1)	
(iii)	**B** ☒ genus		(1)	

Q24.

	Answer	Acceptable answers	Mark	
(I)	An explanation including **two** of the following: the dodo was multicellular (1)	Accept animals can't make food for themselves by photosynthesis Accept chloroplasts for chlorophyll	(2)	

	the dodo fed on other organisms /fed heterotrophically (1) the dodo did not have chlorophyll / cell walls (1)	Ignore references to legs /backbone etc		
(ii)	has a (supporting) rod / spinal cord	**Accept** backbone / spine / vertebrate	**(1)**	
(iii)	**B** ☒ genus		**(1)**	

Q25.

	Answer	**Acceptable answers**	**Mark**
(i)	**C** ☒ nitrification		**(1)**
(ii)	an explanation to include the following points • used to make protein (1) • for growth (1)	**Ignore references to use as food (plants do not feed)** accept amino acids/ chlorophyll /DNA ignore references to photosynthesis / respiration	**(2)**
(iii)	A description linking **four** of the following points (nitrates) leach/flow into water (1) algae and small plants grow **rapidly**/algal bloom (1) **underwater** plants cannot photosynthesise (1) (lack of photosynthesis / sunlight) causes plants to die (1) decomposers / (decomposing) bacteria break down the dead material / plants (1) these bacteria use up oxygen during respiration(1)	accept fertilisers for nitrates	**(4)**

Q26.

	Answer	Acceptable answers	Mark
(i)	flavonoids / bioflavonoids	anthocyanins antioxidants	**(1)**
(ii)	**A** ☒ a gene from another species		**(1)**

Q27.

	Answer	Acceptable answers	Mark
(a)(I)	An explanation including **two** of the following: the dodo was multicellular (1) the dodo fed on other organisms /fed heterotrophically (1) the dodo did not have chlorophyll / cell walls (1)	Accept animals can't make food for themselves by photosynthesis Accept chloroplasts for chlorophyll Ignore references to legs /backbone etc	**(2)**
(a)(ii)	has a (supporting) rod / spinal cord	**Accept** backbone / spine / vertebrate	**(1)**
(a)(iii)	**B** ☒ genus		**(1)**
(b)	A suggestion including 3 of the following: • Predation / disease (1) • change in environmental conditions (1) • loss of food source / reduced food source (1) • increased competition (1) • limited adaptations / survival of the fittest (1) • unable to reproduce / reproduce less	Accept named environmental change / climate change Accept food source eaten by other animals / humans Accept unable to fly so cannot escape	**(3)**

	(1)		
(c)	**D** ☒ speciation		**(1)**
(d)	A description to include two of the following: genetic (variation) (1) due to mutation (1) due to sexual reproduction / interbreeding / hybridisation (1) environmental (variation) (1)	Accept references to different genes/DNA Accept named environmental change e.g.change in climate	**(2)**

Q28.

	Answer	Acceptable answers	Mark
(a)(I)	An explanation including **two** of the following: the dodo was multicellular (1) the dodo fed on other organisms /fed heterotrophically (1) the dodo did not have chlorophyll / cell walls (1)	Accept animals can't make food for themselves by photosynthesis Accept chloroplasts for chlorophyll Ignore references to legs /backbone etc	**(2)**
(a)(ii)	has a (supporting) rod / spinal cord	**Accept** backbone / spine / vertebrate	**(1)**
(a)(iii)	**B** ☒ genus		**(1)**
(b)	A suggestion including 3 of the following: • Predation / disease (1) • change in environmental conditions (1) • loss of food	Accept named environmental change / climate change Accept food source eaten by other animals / humans Accept unable to fly so cannot escape	**(3)**

	source / reduced food source (1) • increased competition (1) • limited adaptations / survival of the fittest (1) • unable to reproduce / reproduce less (1)			
(c)	**D** ☒ speciation		**(1)**	
(d)	A description to include two of the following: genetic (variation) (1) due to mutation (1) due to sexual reproduction / interbreeding / hybridisation (1) environmental (variation) (1)	Accept references to different genes/DNA Accept named environmental change e.g.change in climate	**(2)**	

Q29.

Question number	Answer	Mark
	An explanation that combines identification - knowledge (1 mark) and reasoning/justification - understanding (1mark): • cut DNA at recognition sites (1) • to create areas called sticky ends (1)	(2)