WJEC EDUQAS A-LEVEL BIOLOGY · COMPONENT 1

BIOLOGY



EXAM QUESTION PACK

1.6 HUMAN IMPACT ON THE ENVIRONMENT

SCORE	PERCENTAGE
/53	%

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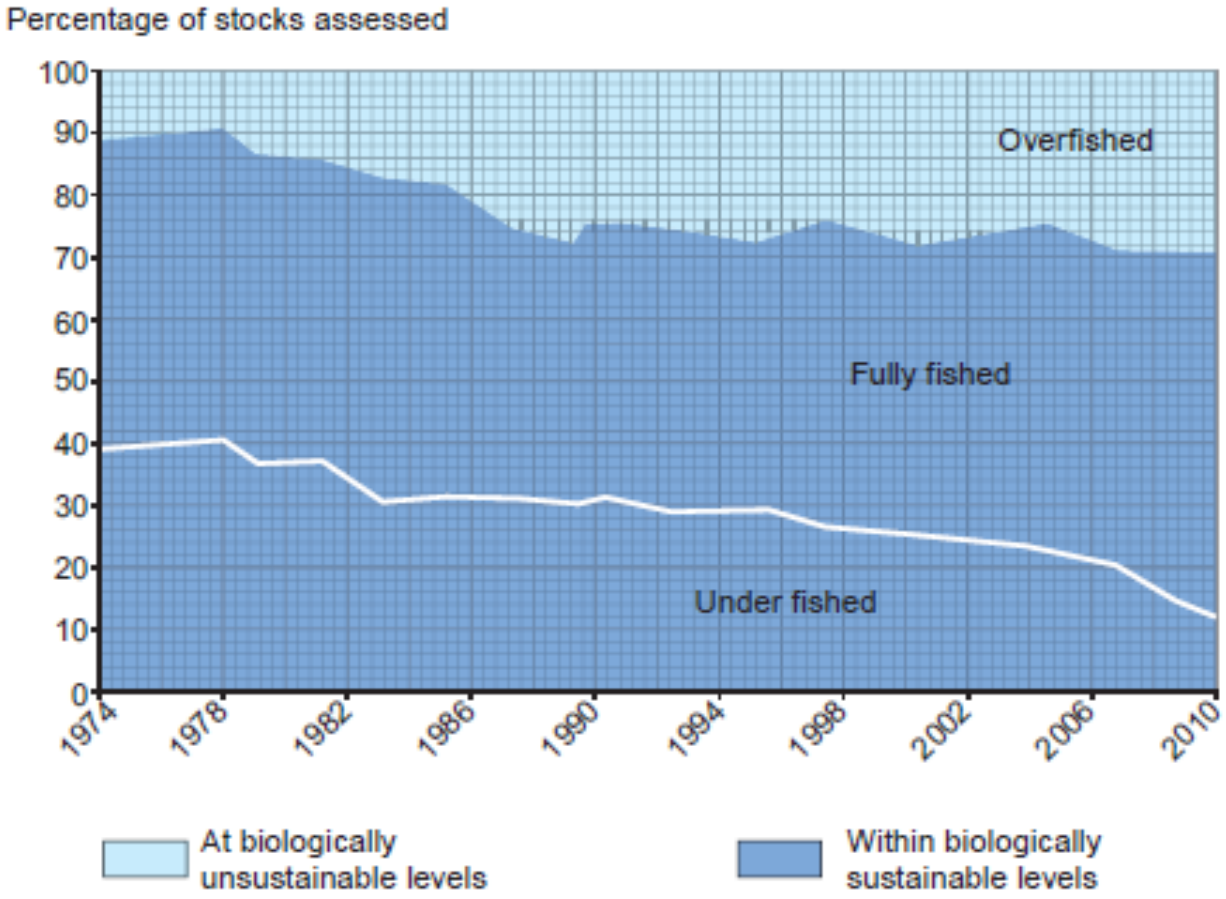
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1. The graph below shows the trends in the state of world stocks of marine fish from 1974 to 2010.



Fully fished = fished at maximum sustainable yield
Underfished = currently believed to be fished at below maximum sustainable yield

(a) Using the data, what conclusions can be drawn about the world fishing stocks since 1974. [4]

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(b) Describe **three** strategies, apart from aquaculture, which can be used to prevent overfishing and explain how each would help to conserve stocks. [3]

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(c) One method of decreasing demands on wild fish stocks is the use of aquaculture. The Scottish salmon industry is one such example. One problem with raising salmon this way is the high build up of parasites, such as lice, which feed on the blood and tissue of salmon.

(i) Why are the farmed fish more susceptible to infection by lice than wild fish and why is eliminating the lice a problem for fish farms? [2]

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(ii) There are important environmental concerns that farmed fish can escape from their pens. Explain **three** reasons why it is important to the environment that the escape of farmed fish is prevented. [3]

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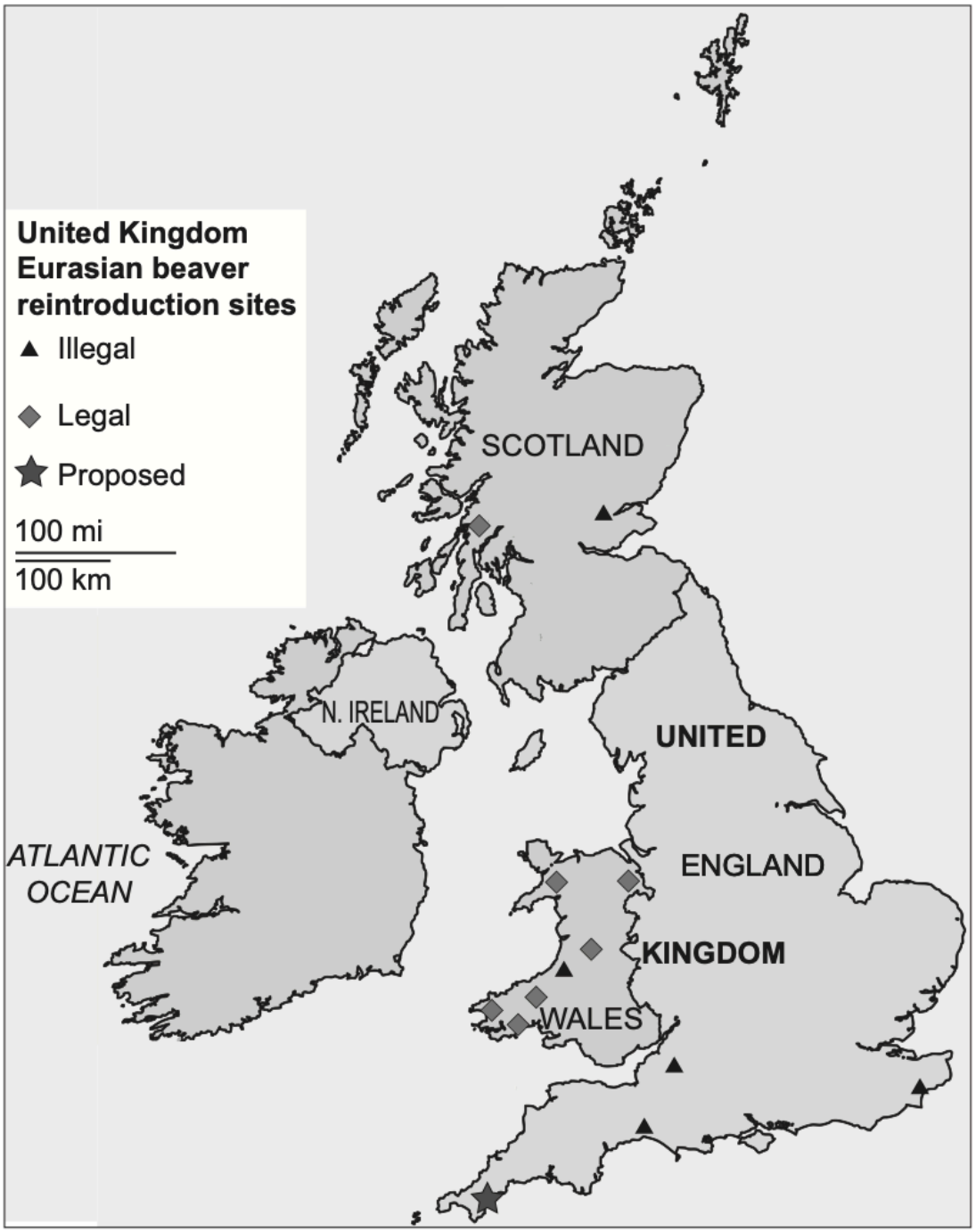
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2.

The Eurasian beaver *(Castor fiber)*, a large, strictly herbivorous mammal, was formerly native to the UK. They played an important part in our landscape by felling trees to build dams. These dams block small streams, slowing their flow and forming small ponds and bogs. Beavers were hunted to extinction in the 16th century. The loss of this species led to the loss of many freshwater habitats.

The map below shows the sites where beavers from Northern Europe have been reintroduced into the wild in the UK together with some proposed sites.



(a) Beavers used to be an endangered species in Europe. Explain what is meant by an endangered species. [1]

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(b) Give **two** advantages of using re-introduction of beavers from northern Europe as a strategy for conservation in the UK. [2]

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(c) There has been some re-introduction of beavers into the UK, both legal and illegal. Give **two** reasons why people might be concerned about illegal, unregulated re-introduction of beavers. [2]

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(d) Environmental conservation decisions can only be made on the basis of sound scientific principles. Give **two** factors that scientists would have to consider when planning the successful re-introduction of beavers. [2]

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3.

The planetary boundaries framework was first introduced in 2009. A group of scientists identified nine planetary boundaries within which humanity can develop and thrive for generations to come. Crossing these boundaries could generate irreversible environmental changes.

The table below shows two planetary boundaries and their current values.

Planetary boundary	Variable(s)	Boundary	Current Value
Climate change	Atmospheric CO_2 concentration, ppm	350 ppm CO_2	396.5 ppm CO_2
Change in biosphere integrity	Genetic diversity: Extinction rate	less than 10 extinctions per million species per year	100-1000 extinctions per million species per year

ppm = parts per million

(a) Explain what the term "planetary boundary" means. [2]

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(b) Calculate the percentage by which the current atmospheric carbon dioxide concentration exceeds the boundary, giving your answer to one decimal place.
Show your working in full. [2]

Percentage = ... %

(c) Explain how deforestation can directly affect the planetary boundary for climate change. [3]

(d) Using your knowledge of natural selection, explain why more species have become extinct recently, compared to pre-industrial times. [3]

(e) Suggest how biodiversity loss may be delayed using conservation methods. [4]

4.

In the past, Red Kites *(Milvus milvus)* almost became extinct in the UK and by 1905 there were estimated to be only three breeding pairs in the UK, all of which were in West Wales.



It has taken a century for the UK Red Kite population to recover from the few remaining birds. In 1986 the recovery was helped by the re-introduction of some Red Kites from Wales to England and Scotland. Although they are still rare, between 2008 and 2011 they were found breeding in over 700 areas that were sampled across the UK.

The population recovery has involved keeping nest sites secret and round-the-clock protection by volunteers.

(a) In 1995 there were 284 Red Kites in the UK with numbers increasing to 1025 per cent of the original population between 1995 and 2017. Calculate the approximate **number of breeding pairs** of Red Kites present in 2017. [3]

..... breeding pairs

(b) In areas where Red Kites were absent and then re-introduced the numbers increased much more rapidly than in areas where they were already established. Explain the reasons for this. [3]

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(c) Explain why the location of nest sites needed to be kept secret with round-the-clock protection. [1]

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Many Red Kite chicks are tagged so that their survival and lifespan can be monitored. Survival rates in Northern Scotland are poorer than elsewhere, mainly because of illegal poisoning and shooting on grouse-shooting estates.

(d) Suggest **two** ways in which society could improve the survival rates of Red Kites. [2]

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Red Kites have often bred successfully in woodland SSSI's.

(e) State what is meant by an SSSI and why Red Kites may breed more successfully in these sites. [2]

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5.

Fish farming is an important industry in Scotland, producing almost 180 000 tonnes of fish in 2014. It provides employment and financial gain for the areas where it is carried out. The number and size of fish farms has increased as one way of preventing overfishing.

The table below shows the estimated use and loss of two elements during the production of fish in Scotland by fish farming.

Nutrient output per tonne of production	Nitrogen	Phosphorus
used in feed (kg)	86	18
lost as uneaten food (kg)	4	1
lost as organic matter in faeces (kg)	12	3
lost as inorganic products (e.g. ammonium ions and phosphate ions) (kg)	37	9

Adapted from "The Interaction between Fish Farming and Algal Communities of the Scottish Waters – A Review", Rydberg, Sjoberg and Stigebrandt. Research report 2003/04.

With reference to the information provided in the table and your own knowledge, explain the possible ecological impacts of fish farming in the areas where it takes place. Describe other ways to overcome the problem of overfishing. Explain how these methods are used to prevent overfishing. [9 QER]

1.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1.	(a)			1. Overfished has increased **and** fully fished has increased **and** underfished has decreased (1) 2. fish stocks are decreasing/ some species could become extinct (1) 3. (because) increase in unsustainable fishing and a decrease in sustainable fishing (1) 4. Since 2007 overfished/biologically sustainable have stayed constant/ plateaus (1) 5. within sustainable fishing more fully fished and fewer underfished stocks (1) 6. Correct use of data in any mark point (1)			4	4		
	(b)			• Restricted/minimum net mesh size so don't catch {young/ smaller} fish (1) • Exclusion zones/Seasonal restrictions {so don't catch breeding fish/juveniles/ so stocks can recover}(1) • {Quotas/Smaller fleets} so less fish caught (1) Ignore ref to fishing for non-traditional species	3			3		
	(c)	(i)		Closely packed so {lice/ parasites/ infection} can easily spread from fish to fish (1) NOT disease Cannot be easily killed as resistant to pesticides (1)		2		2		
		(ii)		**Any three (x1) from:** • Foreign species into new areas/invasive species/ displace indigenous species / decrease biodiversity / reduce wild fish numbers/diversity of species (1) • Compete qualified (e.g. for food/ mates/ habitat)/affect food chains (1) • spread disease/ infection/ parasites to wild/ native fish (1) • Breed with the wild fish and reduce genetic diversity/ dilute the gene pool/ threaten the long-term survival of wild species/ cause wild species to go extinct (1)		3		3		
				Question 1 total	**3**	**5**	**4**	**12**	**0**	**0**

2.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			(A species that is seriously) at risk of extinction	1			1		
	(b)			**Any 2 (x1)from:** • {restores/ increases/ improves} biodiversity/ increases (fresh)water habitats (by pond formation)/ increases shrub growth/insect life (1) • Reduces flooding/ reduces damage to habitats/ slows water flow/ filters sediment from water (1) • Use of European beavers: maintains correct genetics of population/ well adapted to environment/ take up correct niche (1)		2		2		
	(c)			**Any 2 (x1) from:** • Introduction of {disease/TB} (1) • {Destruction/ loss} of {land/ habitat} due to {flooding/ bogs/ reduced flow of rivers (below the dams)/ deforestation} (1) • The wrong species would not be so well adapted/ inappropriate habitat for beavers (1)		2		2		
	(d)			• Habitat: The receiving habitat is suitable or example/ effect of beaver introduction on {habitat/ biodiversity} (1) **Any 1 (x1) from:** • Research: The resources and expertise are available for the establishment/ protection (1) • Consultation: with neighbouring landowners and local stakeholders indicates that the majority of those consulted do not oppose reintroduction/eq (1) • Correct beavers: A suitable disease free donor population of Eurasian beavers is identified/ correct species is re-introduced (1)		2		2		
				Question 2 total	**1**	**2**	**4**	**7**	**0**	**0**

3.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)		Safe operating level for humanity/ a threshold value for a global process that is affected by human activity/ limits that global processes or systems must stay within (1) Above this value, the global process will not be stable / below this value the global process will be stable /exceeding boundary leads to gross global environmental change/ irreversible damage if exceeded (1)	2			2		
	(b)		396.5 – 350 = 46.5 46.5 x 100 (1) 350 = 13.3 (1) Correct answer = 2 marks-+9 13.29/ 13.286/ 13 = 1 mark		2		2	2	
	(c)		• Deforestation reduces carbon dioxide uptake (1) • {Burning of felled trees/ transport of felled trees/ use of fuels in processing trees} puts carbon dioxide into the atmosphere/ (1) • Decay of waste tree material (1)		3		3		
	(d)		A. In a changing environment, some species' adaptation {became unsuitable/ they were selected against} (1) B. Cannot {adapt/ evolve} in a relatively short period of time/ {Animals cannot move fast enough/ seeds cannot disperse quickly enough} to another habitat where they were suitably adapted/ Correct reference to slow mutation rates(1) C. Increased {human population/ industry/ pollution} is causing environmental change (1)		3		3		

Question			Marking details	Marks available					
3	(e)		Any 4 (x1) from: A. {Seed / sperm/ gene} banks/ rare breed societies (1) B. Breeding programmes (1) C. Fishing quota/ mesh size/ exclusion zone/ ref to seasons (1) D. Trade restrictions/ legislation/ CITES(1) E. Management {of wild populations/ practices} (1) F. Restrict habitat destruction / pollution / deforestation / other means of habitat destruction (1) G. SSSIs/ National parks/ conservation areas/ education/ ecotourism/ NGOs (1) education/ ecotourism and NGOs must be qualified m	4			4		
			Question 3	**6**	**8**	**0**	**14**	**2**	**0**

4.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4.	(a)			1 455/ 1 456/ 1 455.5 = 3 marks If incorrect award 1 mark for each of any number divided by 2 (to show breeding pairs) any number multiplied by 1 025/100 or 10.25		3		3	3	
	(b)			A. Fewer predators (1) B. Less intraspecific competition (1) C. for food/ nest sites/habitat (1) NOT space/ resources D. Less likely to pass on disease as fewer numbers (initially) (1)		3		3		
	(c)			Theft of {eggs/chicks}/ poachers/ hunting		1		1		
	(d)			Any **two** (×1) from A. Prosecution/ legislation/ ban hunting (1) B. Education/ increase awareness/ ecotourism (1) C. Making holding of poisons illegal/difficult to obtain (1) D. Feeding sites (1) E. Breeding programmes (1)		2		2		
	(e)			Site of Special Scientific Interest (1) SSSIs protected from development or other damage (1)	1	1		2		
				Question 4 total	**1**	**10**	**0**	**11**	**3**	**0**

5.

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths *	Prac **
5	**Indicative content** **Eutrophication** • The nitrogen in the food fed to the fish may be lost as uneaten food, in faeces and as ammonia. • The extra N and P in the water can be used by algae to grow. This algal bloom at the water surface can block light to the aquatic plants in the deeper water. • With no light, these plants cannot photosynthesise and so die. • Decomposers (bacteria and fungi) will then decompose the dead organic matter. They use (aerobic) respiration and so use up oxygen from the water. • The water becomes deoxygenated and fish and other oxygen requiring species die. • Anaerobic bacteria may start to reduce nitrates (denitrification) **Other impacts of fish farming** • The farmed fish tend to be packed tightly into a small area. • This can lead to diseases passing through the population quickly and these can spread to the local wild fish population. • To keep the stock healthy antibiotics are used. This can lead to antibiotic resistant bacteria developing. • Pesticides used to kill the parasites may also be toxic to some of the local marine invertebrates. • Farmed fish may have a selective advantage over wild species **Methods of preventing overfishing** • Net mesh sizes may be restricted. Larger mesh sizes allow immature fish to escape and they can go on to interbreed. • Closed seasons for fishing are also enforced. These will be at times of the year when fish are breeding so again the stocks are replenished. • Quotas - agreements which limit the catches brought ashore. • Around the coast there are exclusion zones where fishing is not allowed. These areas allow fish to reproduce without being caught. • Landing size regulations have been introduced which only allowing fish of a certain size to be caught. This allows some fish to return for breeding. Fishing of non-traditional varieties e.g. coalfish, has allowed stocks of other fish to recover.	5	4		9		
	7-9 marks Detailed explanation of eutrophication **and** Detailed explanation of other impacts of fish farming **and** Detailed explanation of methods of preventing overfishing *The candidate constructs an articulate, integrated account, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses scientific conventions and vocabulary appropriately and accurately.* **4-6 marks** Any two from Explanation of eutrophication Explanation of other impacts of fish farming Explanation of methods of preventing overfishing *The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate usually uses scientific conventions and vocabulary appropriately and accurately.* **1-3 marks** Brief explanation of eutrophication **or** Brief explanation of other impacts of fish farming **or** Brief explanation of methods of preventing overfishing *The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate has limited use of scientific conventions and vocabulary.* **0 marks** *The candidate does not make any attempt or give a relevant answer worthy of credit*						
	Question 5 total	**5**	**4**	**0**	**9**	**0**	**0**