READING

READING PASSAGE 1

*You should spend about 20 minutes on **Questions 1 - 13**, which are based on Reading Passage 1 below.*

The Threats to Scottish Salmon

Paragraph A
Salmon have always had to cope with a variety of hazards in both freshwater and seawater environments in order to survive. Many threats are completely natural, like flash floods or predatory birds, larger fish and otters or seals. These threats have always existed, but it is the man-made dangers that have emerged over the last hundred years that are causing the real concern.

Paragraph B
One of the most significant threats to Scottish salmon comes from the Scottish salmon-farming industry. Farmed salmon production in the North Atlantic area has increased dramatically, particularly in Norway, but also on the west coasts of Ireland and in the sea lochs of the Scottish Highlands. This has led to various problems. The first is that fish farms have created high concentrations of sea lice, which multiply in the confined conditions of sea rearing cages. Wild migrating sea trout and salmon smolts can be very vulnerable to attack by these lice. In addition to the sea lice, there is an increase in the risk of the spread of salmon disease or parasitic infestation, such as infectious salmon anaemia and *Gyrodactylus salaris*. Another problem is that escapees of farmed fish are known to be able to interbreed with wild fish. Since stocks in individual rivers are locally adapted to optimise their survival, this interbreeding has been shown to reduce the fitness of wild stocks for their indigenous environment. Salmon farming also has led to pollution of the water environment through uneaten food, fish faeces, or medications used to treat farmed salmon in their cages.

Paragraph C
Pollution is a key factor in the survival of the Scottish Atlantic salmon. To be healthy, Atlantic salmon need cool, clean water that contains a lot of oxygen. Chemicals, oil and rubbish can all pollute a river and, if hot water is released into a stream, the water temperature may become too warm for the salmon and they will die. Problems with spawning can be caused by cattle walking in the river and stirring up mud, which can stick spawning gravels together and make it difficult for the salmon to make redds. Riverbank erosion, overgrazing and deforestation can likewise lead to mud being washed into streams and rivers, leading again to the gravel clogging. Afforestation can be another problem. If conifers are planted alongside rivers, the acidic needles can increase the acidity of the water, upsetting the natural balance. Conifers also block out light and prevent beneficial vegetation from growing alongside the rivers. Finally, organic pollution in the form of silage and slurry run off from farmland can cause problems in rivers. This increase in nutrients causes too many plants to grow in the water. Their subsequent decomposition leads to an excess of bacteria in the water, which uses up oxygen so that there is a fall in the amount of oxygen available for the Atlantic salmon.

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Paragraph D
In the sea, there are fisheries for lots of different kinds of fish. Sometimes, when a fishing boat is trying to catch one kind of fish, it will capture by-catch, which can include accidentally caught salmon smolts. Often, by the time a fishing boat realises it has caught the wrong type of fish, the fish are already dead. As salmon smolts move as a group in the sea, a fishing boat can sometimes catch (and kill) a lot of smolts all at once. Overfishing of fish that the salmon feed on also leads to depleted stocks of food for the salmon.

Paragraph E
Sometimes biologists call plants and animals aliens when they are found living somewhere where they would not occur naturally. One alien species that causes a problem for salmon is the American signal crayfish. This creature has been introduced to some rivers in Scotland, although it normally lives in North America. The crayfish is a predator, eating insects, fish eggs, fry and larger fish. The crayfish is not a normal part of the food chain in Scottish rivers and by eating these foods, it changes the way that energy moves through rivers. It also creates burrows in riverbanks, which make the banks weak and more likely to collapse.

Paragraph F
There are specific fisheries in the sea that target adult salmon returning from their feeding areas. Fishing here takes place in parts of the sea that do not belong to any one country and are called high seas fisheries. Adult salmon coming back to Scotland will tend to use the same general migration route across the sea, before choosing to go down either the west or east coast to return to their home river. It is when they are crossing the sea in a big group that they are vulnerable to high seas fisheries that track and plan the migration routes. In addition, once they follow the coast back to their home river, they can be caught in nets.

Paragraph G
Climate change is thought to have already had some effects upon Scottish Atlantic salmon and this may be partly to blame for decreasing numbers. There is also particular evidence that the temperature of the top of the sea may affect smolt survival. Climate change can affect salmon in different ways. It can alter their development rates and make their food less available. The numbers of fish and animals that hunt salmon may also be positively affected by temperature. Scientists do not know exactly what might happen if climate change continues and they are undertaking research to try and predict what might happen to Atlantic salmon under a variety of different climate conditions.

Glossary

Smolt – Young salmon over three years' old

Lice – A type of parasite that feeds on salmon

Spawning – The release of eggs by fish

Redd – A small depression in a riverbed in which salmon will lay their eggs

Fry – Young fish

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Questions 1 –7

*The text on the previous pages has 7 paragraphs **A - G**.*

Which paragraph contains the following information?

*Write your answers in boxes **1 – 7** on your answer sheet.*

1 Too many trees next to a river can have a negative effect on the river's environment.

2 Non native animal species can damage riverbanks.

3 Scottish salmon have always had a dangerous environment in which to live.

4 Studies are being done to see how ocean warming may affect Scottish salmon.

5 Young wild salmon are very susceptible to the parasites that are encouraged by salmon farming.

6 Young salmon can sometimes be caught by mistake.

7 Commercial fishermen's knowledge of Scottish salmon's migration patterns allows them to plan their fishing strategies.

Questions 8 – 10

Answer the questions below.

*Write **NO MORE THAN TWO WORDS** from the text for each answer.*

*Write your answers in boxes **8 - 10** on your answer sheet.*

8 What does the decay of increased plant growth in river water generate more of?

9 What are fish accidentally caught known as?

10 What threatens salmon that follow the shore to their river of birth?

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Questions 11 – 13

Complete the summary using the words in the box below.

*Write your answers in boxes **11 - 13** on your answer sheet.*

Climate Change and the Scottish Atlantic Salmon

Climate change has also been blamed for Scottish Atlantic salmon problems, as temperature increases at the ocean's (**11**) _____ may affect salmon mortality. Higher temperatures may also affect salmon (**12**) _____ and food as well as (**13**) _____ numbers. Studies are being done to investigate this.

fishermen		growth	immunity
predator	quota	surface	bottom

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READING PASSAGE 2

*You should spend about 20 minutes on **Questions 14 - 26**, which are based on Reading Passage 2 below.*

Aluminium

Aluminium is the most plentiful metallic element in the Earth's crust. Combined with oxygen and hydrogen, it forms bauxite, the ore most commonly mined in order to obtain aluminium. Metallic aluminium was first isolated in 1829 from aluminium chloride, but it was not commercially produced until 1886.

Aluminium is a silvery-white, tough, but lightweight metal. It is a good conductor of electricity as well as being very resistant to atmospheric corrosion and, because of these properties, it has become an important metal. In addition, aluminium alloys combine lightness with strength and, as a result, are used in a great variety of industries. In most countries, the construction industry is the most important consumer, though the car industry is also a major user.

Named after the French district of Les Baux, where it was first discovered in 1821, bauxite is produced by tropical or semitropical weathering of alumina-bearing rocks. It occurs over a variety of rocks as a weathered cover or blanket known as laterite. Because of the way it forms, bauxite deposits are generally very extensive. Bauxite is found on almost every continent, with the largest known economic resources being in Australia and the Republic of Guinea. In terms of ranking, these countries are followed by Brazil, Jamaica, and India. Although the USA, Japan, and Germany are the world's largest consumers of aluminium, they possess little or no bauxite deposits of their own.

Extraction of aluminium metal takes place in three main stages - the mining of bauxite ore, refining the ore to recover alumina and the smelting of alumina to produce aluminium. Bauxite is mined by surface methods, in which the topsoil and overburden are removed by bulldozers and scrapers. This is then usually used for re-vegetating the area and returning it to a sometimes better than original condition or converting it to agricultural land. The underlying bauxite is mined by front-end loaders, power shovels or hydraulic excavators. Sometimes, the bauxite is crushed and washed to remove some of the clay and sand waste and then dried in rotary kilns. Other bauxite may just be crushed or dried. The ore is then loaded into trucks, railway cars or onto conveyor belts and transported to refineries.

In almost all commercial refineries, alumina is extracted from bauxite by the Bayer refining process. The process, devised by Karl Bayer in 1888, consists of four stages: digestion, clarification, precipitation and calcination. All commercial production of aluminium from alumina is based on the Hall-Heroult smelting process, in which the aluminium and oxygen in the alumina are separated. This is done by passing an electric current through a molten solution of alumina and natural or synthetic cryolite. An inexpensive source of electricity is essential for the economic production of aluminium with this process.

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The aluminium industry initiated the development of technology for recycling aluminium-containing material and for setting up drink can collection centres. One of the industry's main incentives has been the reduced amount of energy it takes to produce one tonne of secondary aluminium compared with one tonne of primary aluminium. This involves a saving of ninety-five per cent of the energy required to produce molten aluminium from bauxite.

Cans are probably the most common aluminium consumer items to be recycled. The life cycle of an aluminium beverage can is just sixty days from "can to can." In this short time, a beverage can goes from the grocery store shelf to the consumer, and then on to a recycling facility where it can be re-melted into can sheet and reformed into another aluminium beverage can with exactly the same physical characteristics as the original can. Because aluminium can be recycled with no degradation in quality, aluminium cans are the ideal product for a closed-loop approach to recycling.

In the first step of recycling, bales of aluminium cans are shredded into pieces the size of a walnut in a 1,000-horsepower shredder. The shreds are then passed through a separator to remove any steel using magnetism that may have been mixed into the bale. Following the can shredding process, any lacquer or paint on the aluminium is removed by blowing hot air at around 550 degrees Celsius through the shreds on a slowly moving insulated conveyor. The exhaust gases from this process are first passed through an afterburner and are then used to heat incoming process air via a heat exchanger, minimising the energy requirements of the system. After being de-coated, the aluminium shreds are then fed into melting furnaces containing submerged stirrers that create a vortex in the pool of molten aluminium and drag the shreds quickly down into the melt. This process realises rapid melting rates and high yields. The molten metal is then transferred into a holding furnace, where it is treated to remove impurities before casting the aluminium. Ingots are cast by tilting the holding furnace and pouring the molten metal into a casting unit. The metal is treated in a two-stage process to remove any remaining microscopic non-metallic particles and gases, with chemical composition and metal cleanliness tested on each cast. As the metal flows into the moulds, it is chilled by jets of cool water pumped around and through the base of the mould. The aluminium ingot solidifies gradually during the casting process, which takes approximately three hours. The finished 18-ton ingots, each containing approximately 1.5 million used cans, are shipped to a mill for rolling into the sheet from which aluminium can makers subsequently produce new cans. Then the whole process begins again.

Glossary

Overburden - any soil or rock that covers a mineral deposit

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Questions 14 – 19

Do the following statements agree with the information given in the text?

*In boxes **14 – 19** on your answer sheet write:*

TRUE	*if the statement agrees with the information*
FALSE	*if the statement contradicts the information*
NOT GIVEN	*if there is no information on this*

14 The commercial exploitation of aluminium began almost immediately after it was first isolated.

15 The building industry only uses a small proportion of commercially created aluminium.

16 French scientists were the first to produce aluminium in a commercially successful way.

17 Japan does not mine much of its own bauxite.

18 Bauxite mines are sometimes used for farming after the mining operations have finished.

19 Bauxite often contains other valuable minerals that can be removed before the alumina is extracted.

Questions 20 – 22

Complete the notes below.

*Write **NO MORE THAN THREE WORDS** for each answer.*

*Write your answers in boxes **20 - 22** on your answer sheet.*

The Production of Aluminium

- Alumina is commercially extracted from bauxite within (**20**) _____ and is usually done with the four-stage Bayer process.
- The creation of aluminium from alumina is usually done through the Hall-Heroult process, which uses (**21**) _____ to separate the oxygen and aluminium in alumina; a cheap (**22**) _____ is therefore needed to use this process.

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Questions 23 – 26

Complete the flow chart below.

*Write **NO MORE THAN TWO WORDS** from the text for each answer.*

*Write your answers in boxes **23 – 26** on your answer sheet.*

The Aluminium Can Recycling Process

Cans are shredded and put in a (**23**) _____ to extract any steel.

↓

Extremely (**24**) _____ then removes any lacquer or paint on the aluminium.

↓

Melting furnaces with submerged stirrers then melt the aluminium – this is a fast process and achieves (**25**) _____.

↓

Impurities are removed before the aluminium is cast into ingots; the metal is further purified and then chilled.

↓

The ingots are then turned into sheet aluminium in a (**26**) _____, so that the aluminium can again become cans.

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