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National Qualifications 2023

Mark

# X826/76/01

# Environmental Science Paper 1

TUESDAY, 30 MAY

9:00 AM – 9:45 AM

*X8267601*

**Fill in these boxes and read what is printed below.**

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day Month Year

Scottish candidate number

**Total marks — 20**

Attempt ALL questions.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers and rough work is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting. Any rough work must be written in this booklet. You should score through your rough work when you have written your final copy.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



*X8267601*

**Total marks — 20**

**Attempt ALL questions**

The Beatrice Oil Field complex includes four drilling and production platforms, forty-three oil wells, two wind turbines, plus pipelines and cables connecting with the mainland.

During the production phase, oil was exported onshore from the main production platform (Beatrice Alpha) via a pipeline to a terminal at Nigg, while surplus power from the wind turbines was transferred via a cable to Dunbeath.

Production from the oil field ceased in 2015 and the complex is now being decommissioned. The oil company will pay around half the decommissioning costs, with UK taxpayers covering the remainder.

Under the Petroleum Act 1998, the following steps must be followed:

- a permit must be obtained to allow decommissioning to commence
- oil wells must be cleaned to remove oil residues and other toxic compounds, then plugged to prevent further release
- structures sitting above water level must be dismantled and removed
- structures sitting below water level must be removed to at least 4.5 m below the seafloor
- pipelines and cables must be buried or laid in trenches
- surveys must be carried out to ensure no harmful debris is left behind.

To obtain the decommissioning permit, a proposal of how best to decommission the oil field complex must be prepared.

**1.** (a) (i) The Petroleum Act 1998 is an example of government legislation.

State one reason why legislation is necessary. **1**

(ii) Name the environmental agency with responsibility for the integrated management of Scotland's seas, including enforcement of legislation. **1**

(iii) A permit had to be obtained before decommissioning was started. This required submission of an Environmental Impact Assessment (EIA).

Describe the purpose of an EIA. **1**

(iv) As part of the EIA, bird counts were conducted in the area surrounding the oil field.

Boat-based surveys were carried out between October 2009 and September 2011. These surveys took place over two days in each month.

Due to poor sea conditions, a single aerial survey was undertaken in March 2011 instead of a boat-based survey.

Outline why the resulting bird count data might not be valid. **1**

**1. (continued)**

(b) Source B shows areas designated for marine conservation within the Moray Firth.

(i) State the role of a Marine Protected Area (MPA) designation. **1**

(ii) Originally the marine conservation areas in the Moray Firth were smaller than shown in Source B. In 2020 they were expanded.

Explain why the expansion of protected areas could impact on a named user of the marine environment from Source D. **1**

**2.** Oil field structures sitting above water level must be dismantled. The materials removed must then be treated as regulated waste.

MARKS | DO NOT WRITE IN THIS MARGIN

Waste regulations require that materials are removed and handled without endangering human health or harming the environment. The best option available under the waste hierarchy should be followed for each type of material.

(a) Describe what is meant by the *waste hierarchy*. **1**

(b) The table shows the percentage of each type of waste material present in the structures.

| Waste material type | % of waste | |
|---|---|---|
| | Platforms and wind turbines | Pipelines |
| Steel | 81.17 | 55.46 |
| Concrete | 8.73 | 35.07 |
| Plastic | 0.51 | 2.76 |
| Non-ferrous metal | 8.08 | 0.89 |
| Radioactive/hazardous waste | 0.03 | 0 |
| Other waste | 0.48 | 5.82 |
| Marine growth | 1.00 | 0 |

The total mass of waste material is

- 39 408 tonnes from the platforms and wind turbines
- 30 850 tonnes from the pipelines.

Calculate the total mass of steel waste material. **2**

*Space for working*

**3.** Source E shows an image of drill cuttings under a microscope.

Describe two impacts on the marine environment around the oil field that could result from disturbing the drill cuttings. **2**

**4.** It is estimated that environmental monitoring of the oil field will continue for up to 12 years after oil production stopped.

Explain why there is a need for such long-term monitoring. **1**

**5.** Commercial fishing and fish processing are important sources of income and employment for rural coastal fishing communities around the inner Moray Firth.

**MARKS** DO NOT WRITE IN THIS MARGIN

The table shows the value by mass of shellfish landed in ports close to the oil field in 2014 and 2015.

| 2014 | | 2015 | |
|---|---|---|---|
| **Mass (tonnes)** | **Value (£)** | **Mass (tonnes)** | **Value (£)** |
| 542.6 | 1,222,466 | 418.9 | 893,889 |

Shellfish are the highest value species landed in these ports.

(a) Calculate the % change in the value of 1 tonne of shellfish between 2014 and 2015. **2**

*Space for working*

(b) Quotas are in place to limit the amount of shellfish harvested per year.

Explain why there is a need for sustainable harvesting practices. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

**6.** The Petroleum Act 1988 requires structures sitting below water level to be dismantled to at least 4.5 m below the seafloor. This can be done by using either explosives or mechanical methods, as detailed in Source F.

Using the evidence from the sources and your knowledge of environmental science, decide which **one** of these methods would be most appropriate for dismantling the Beatrice platforms.

Justify your decision. **5**

Method

**[END OF QUESTION PAPER]**

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## ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

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## ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

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