



Environmental systems and societies

Standard Level

Paper 2 — Mock Examination

Mock Exam 1

Calculator required

Time allowed: **2 hours**

Maximum mark: **65 marks**

Candidate information

Candidate name:

Session number:

Date:

Topic emphasis: foundations of environmental systems and societies (systems, environmental value systems, sustainability), ecosystems, energy flow and biodiversity, biogeochemical cycles, water systems and water pollution, land, soil and food production, the atmosphere, air pollution and climate change, natural resources and energy, human populations, urban systems and waste.

Instructions to candidates

- Write your session number in the box on the cover.
- Do not open this examination paper until you are told to do so.
- **Section A:** answer **all** questions.
- **Section B:** answer **two** questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[65 marks]**.

The mark allocation is shown in square brackets at the end of each question or part question. Where a calculation is required, you should show your working; credit may be given for a correct method even if the final answer is incorrect. Where a question asks for a *named* example, marks are reserved for the use of a specific, real example.

Mark allocation

Section A (questions 1–3), all questions	[25 marks]
Section B (questions 4–7), two questions only, 20 marks each	[40 marks]
Total	[65 marks]

Command terms used in this paper

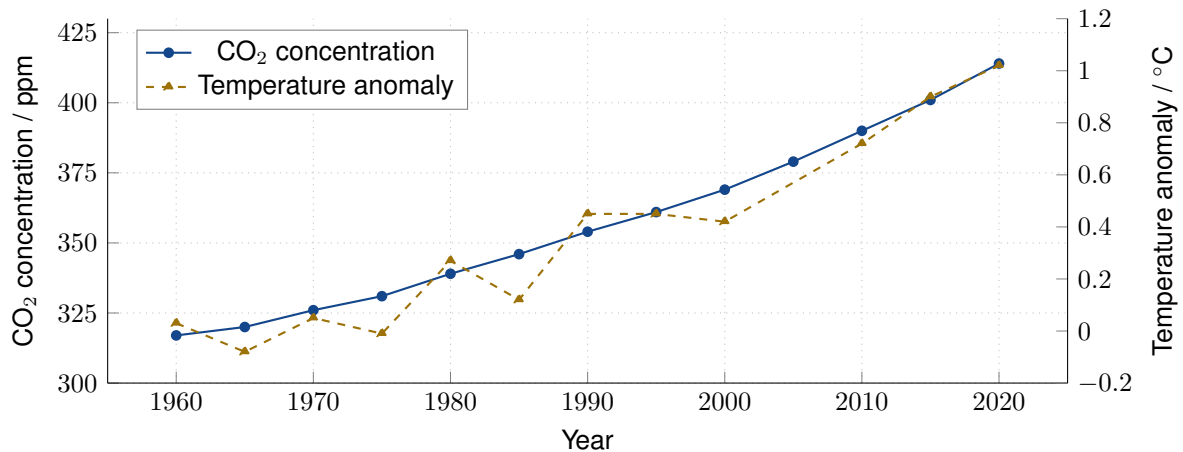
Identify / State	Give a brief answer; no explanation or supporting argument required.
Calculate	Obtain a numerical answer, showing the relevant working.
Describe	Give a detailed account of a pattern, trend or process.
Outline	Give a brief account or summary, with a little supporting detail.
Explain	Give a detailed account, including reasons or causes.
Evaluate	Make an appraisal by weighing up strengths and limitations.
Discuss	Offer a considered and balanced review including a range of arguments.
To what extent	Consider the merits or otherwise of an argument or concept.

All questions in this paper are original items written for revision purposes. They follow the style, structure and topic coverage of the Diploma Programme environmental systems and societies guide but are not reproduced from any past examination paper. All data presented in the figures are realistic but illustrative, and have been constructed for this mock examination.

Section A

Answer **all** questions. Answers must be written within the answer boxes provided.

Figure 1(a): Mean atmospheric carbon dioxide concentration and global mean surface temperature anomaly, 1960–2020



1. (a) Using **Figure 1(a)**, calculate the percentage increase in atmospheric carbon dioxide concentration between 1960 and 2020. Show your working. [2]

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- (b) Describe the relationship between atmospheric carbon dioxide concentration and global mean surface temperature anomaly shown in **Figure 1(a)**. [2]

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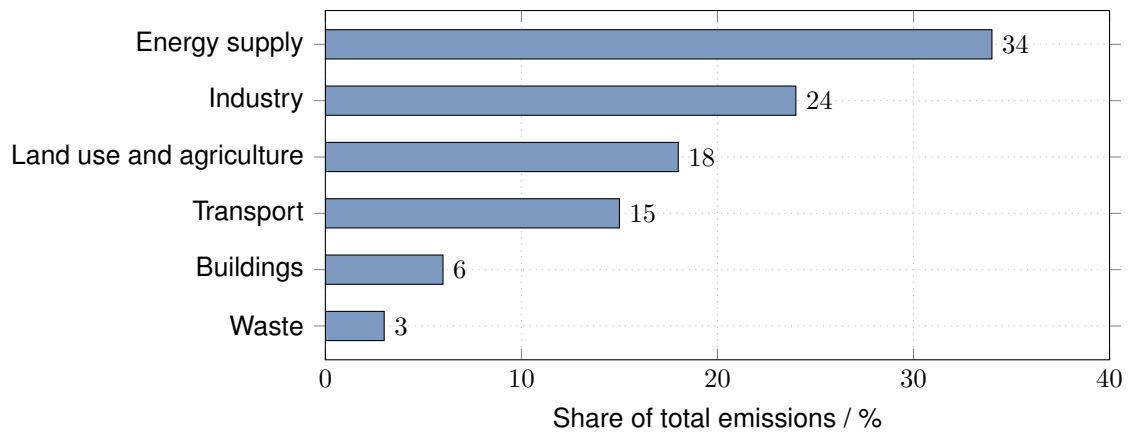
- (c) Outline **one** reason why the data in **Figure 1(a)** alone cannot establish that rising carbon dioxide concentration is the cause of the rise in temperature. [1]

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(Question 1 continued)**Figure 1(b): Share of global anthropogenic greenhouse gas emissions by sector**

- (d) Using **Figure 1(b)**, identify the **two** sectors that together account for more than half of global greenhouse gas emissions. **[1]**

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- (e) Explain how increasing atmospheric carbon dioxide concentrations may affect marine ecosystems. **[3]**

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Figure 2(a): Number of individuals of ground-flora species recorded in 20 quadrats at two woodland sites

Species	Site A	Site B
	(ancient woodland)	(20-year-old plantation)
Bluebell	42	4
Wood anemone	26	0
Bramble	18	68
Dog's mercury	9	0
Ivy	5	8
Stinging nettle	0	20
Total individuals (N)	100	100
Simpson's reciprocal index (D)	3.57	to be calculated

$$D = \frac{N(N-1)}{\sum n(n-1)}$$

where N = total number of individuals of all species
and n = number of individuals of each species

2. (a) Using **Figure 2(a)**, calculate the Simpson's reciprocal diversity index for **Site B**. [2]
Show your working.

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- (b) Compare **and** contrast the diversity of the two sites, using the data in **Figure 2(a)**. [2]

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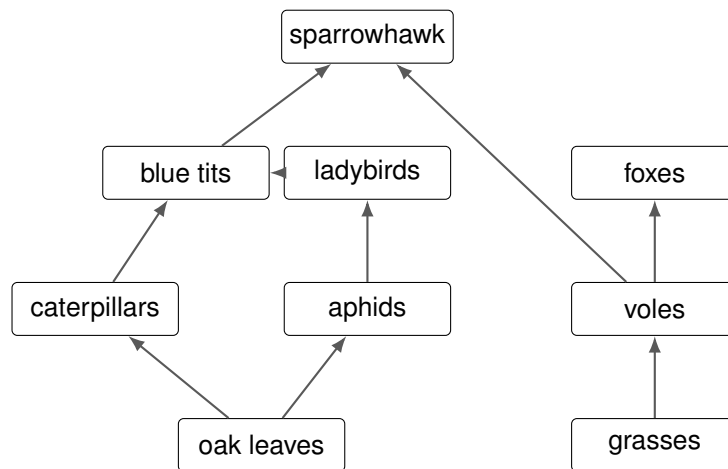
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- (c) Outline **one** limitation of using a diversity index to compare two ecosystems. [1]

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(Question 2 continued)**Figure 2(b): Simplified food web for a temperate deciduous woodland**

Arrows show the direction of energy flow.

- (d) Using **Figure 2(b)**, state the trophic levels occupied by the blue tit. **[1]**

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- (e) Explain how the removal of the sparrowhawk could affect the populations of other organisms shown in **Figure 2(b)**. **[3]**

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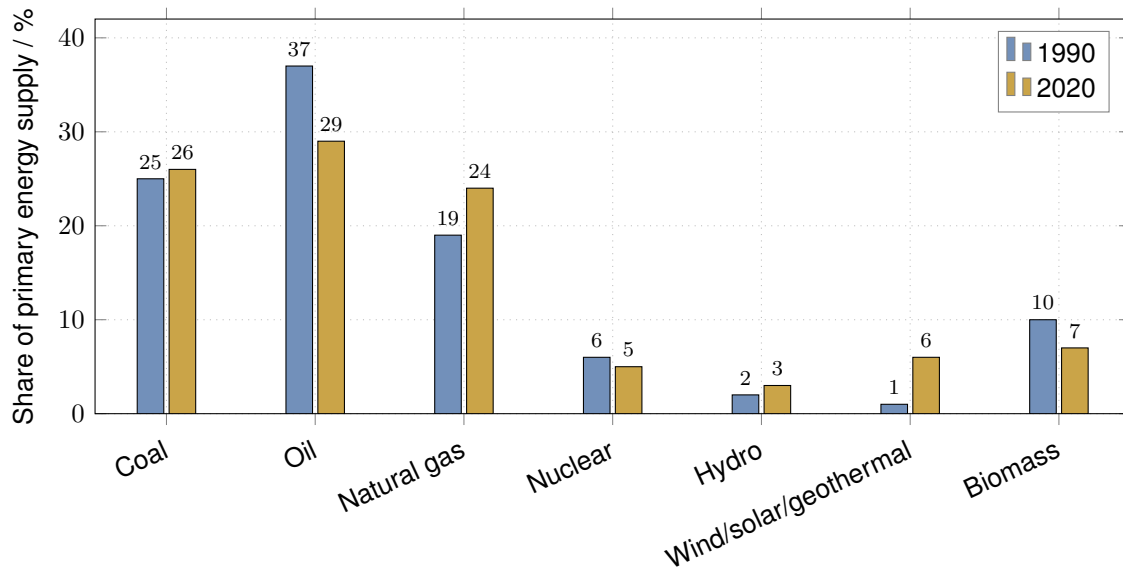
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Figure 3: Percentage contribution of different sources to global primary energy supply in 1990 and 2020



3. (a) Using **Figure 3**, calculate the percentage of the global primary energy supply provided by fossil fuels in 2020. **[1]**

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- (b) Outline **two** factors that influence the choice of energy sources used by a society. **[2]**

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- (c) Evaluate **one** strategy that a society could use to reduce its dependence on fossil fuels. **[4]**

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Section B

Answer **two** questions. Answers must be written within the answer boxes provided.

4. (a) Outline **two** causes and **two** consequences of eutrophication in a freshwater lake. [4]
- (b) Explain how the physical, chemical and biological characteristics of a river change downstream of a sewage outfall. [7]
- (c) With reference to **named** examples, evaluate the strategies used by different societies to manage water pollution. [9]
5. (a) Outline **four** factors that make a species more vulnerable to extinction. [4]
- (b) Explain how the size, shape and location of a protected area may influence its success in conserving biodiversity. [7]
- (c) To what extent do different environmental value systems influence the approaches that societies take to conserving biodiversity? [9]
6. (a) Outline **two** natural and **two** anthropogenic sources of greenhouse gases. [4]
- (b) Explain how feedback mechanisms may increase or reduce the rate of global warming. [7]
- (c) Evaluate mitigation and adaptation as responses to climate change. [9]
7. (a) Outline **two** strengths and **two** weaknesses of the ecological footprint as a measure of sustainability. [4]
- (b) Explain how an ecosystem changes during succession from a bare rock surface to a climax community. [7]
- (c) “Moving towards a circular economy is the most effective way for a society to reduce its environmental impact.” Discuss this statement. [9]

Question numbers answered:

[illegible]

[illegible]

[illegible]

End of examination

Total: 65 marks