Diploma Programme
Programme du diplôme
Programa del Diploma

Environmental systems and societies
Standard level
Paper 1

Wednesday 18 November 2015 (afternoon)

1 hour

Candidate session number

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[45 marks]**.

8815–6301

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Answers written on this page will not be marked.

1. (a) Identify **two** features of a loam soil that make it suitable for crop growth. [2]

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(b) Describe how the biomass of a field of crops might be measured. [2]

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(c) Identify **two** reasons why a human vegetarian diet is considered to be more energy efficient than a diet containing meat. [2]

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2. **Figure 1:** The photographs (A, B, C, D and E) are of five different insect species found in the litter layer of a small area of a forest. The number of each species are shown below each photograph.

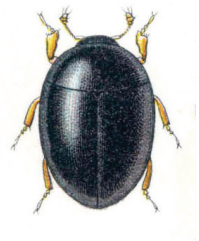
Figure 1

A **B** **C** **D** **E**

(5)

(2)

(6)



(1)

(22)

[Source: (A) "Clivina fossor bl" by Siga - Own work. Licensed under CC BY-SA 3.0 via Commons - https://commons.wikimedia.org/wiki/File:Clivina_fossor_bl.jpg#/media/File:Clivina_fossor_bl.jpg
(B) "Brachinus spPCCA20060328-2821B" by Patrick Coin (Patrick Coin) - Photograph taken by Patrick Coin. Licensed under CC BY-SA 2.5 via Commons – https://commons.wikimedia.org/wiki/File:Brachinus_spPCCA20060328-2821B.jpg#/media/File:Brachinus_spPCCA20060328-2821B.jpg
(C) "Trachypachus zetterstedtii" by M. Virtala - http://wibe.ath.cx/insectimages/file?dir=images&op=showSpecies&order=COL&family=Trachypachidae&genus=Trachypachus&species=zetterstedtii&photographer=. Licensed under Copyrighted free use via Commons - https://commons.wikimedia.org/wiki/File:Trachypachus_zetterstedtii.jpg#/media/File:Trachypachus_zetterstedtii.jpg
(D) "Sphaerius.acaroides.Reitter.tafel64" by cutted from Reitter (1845-1920): "Fauna Germanica: Die Käfer des deutschen Reiches". Licensed under Public Domain via Commons - https://commons.wikimedia.org/wiki/File:Sphaerius.acaroides.Reitter.tafel64.jpg#/media/File:Sphaerius.acaroides.Reitter.tafel64.jpg
(E) "Saphophagus" by S.E. Thorpe, courtesy of I. Stringer - photo of specimen. Licensed under Public Domain via Commons - https://commons.wikimedia.org/wiki/File:Saphophagus.jpg#/media/File:Saphophagus.jpg]

(a) (i) Calculate the Simpson's diversity index for the insect species found in **Figure 1**.

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

[2]

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(ii) Identify **two** possible reasons why species B and C were **not** present in the litter layer when it was resampled six months later. [2]

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(Question 2 continued)

(b) (i) Identify **one** abiotic factor which may affect the population of insects in a forest. [1]

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(ii) Describe a method measuring changes in the abiotic factor you have identified in 2(b)(i). [2]

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(c) Distinguish between a mutualistic relationship and a parasitic relationship. [2]

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(Question 2 continued)

Figure 2: Graph showing changes in the populations of two forest species over time.

Figure 2

Please go to: http://www.nature.com/scitable/knowledge/library/dynamics-of-predation-13229468
"Dynamics of Predation" © 2010 Nature Education
We use Figure 3.

(d) Explain the relationship between the prey and predators shown in **Figure 2**. [2]

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3. (a) (i) Draw a sketch graph showing a typical survivorship curve for a "K-strategist" species. [2]

(ii) Outline **one** reason for the shape of the curve from part 3(a)(i) above. [1]

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(b) (i) Define the term *density-dependent*. [1]

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(ii) Explain **two** ways in which humans can overcome density-dependent factors in their populations. [2]

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4. **Figure 3:** The world population pyramid for 1950, and the projected population pyramid for 2050.

Figure 3

Please go to this URL: http://www.economist.com/blogs/dailychart/2011/05/world_population
"The World in 2100" (13 May 2011)

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(Question 4 continued)

Describe how the structure of the world population is projected to change between 1950 and 2050. [4]

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5. (a) (i) Describe the role of stratospheric ozone. [2]

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(ii) Identify **one** method to reduce ozone-depleting substances. [1]

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(b) (i) Describe the formation of tropospheric ozone. [2]

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(ii) Evaluate **one** management strategy for urban air pollution. [3]

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(c) Apart from global warming and ozone-depletion, state **one** pollution problem that may affect a number of countries. [1]

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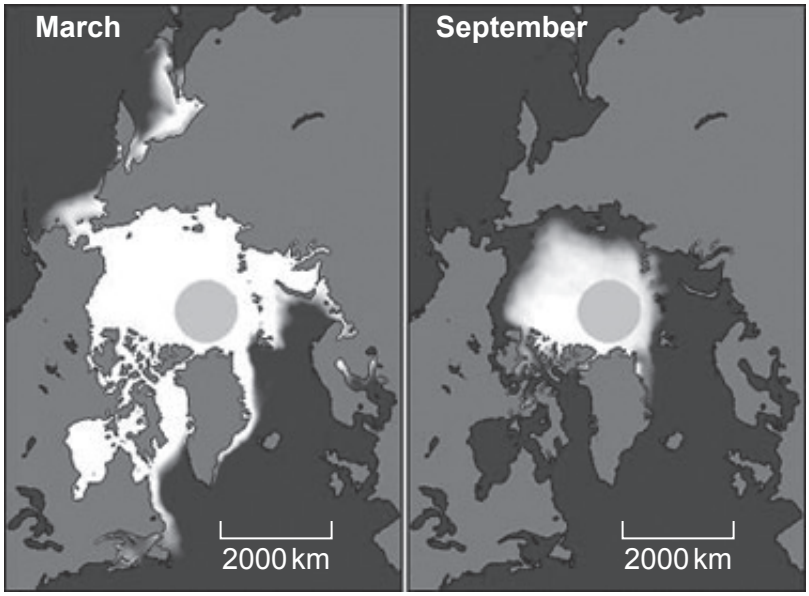
6. **Figure 4(a):** Changes in Arctic sea ice in a typical year.

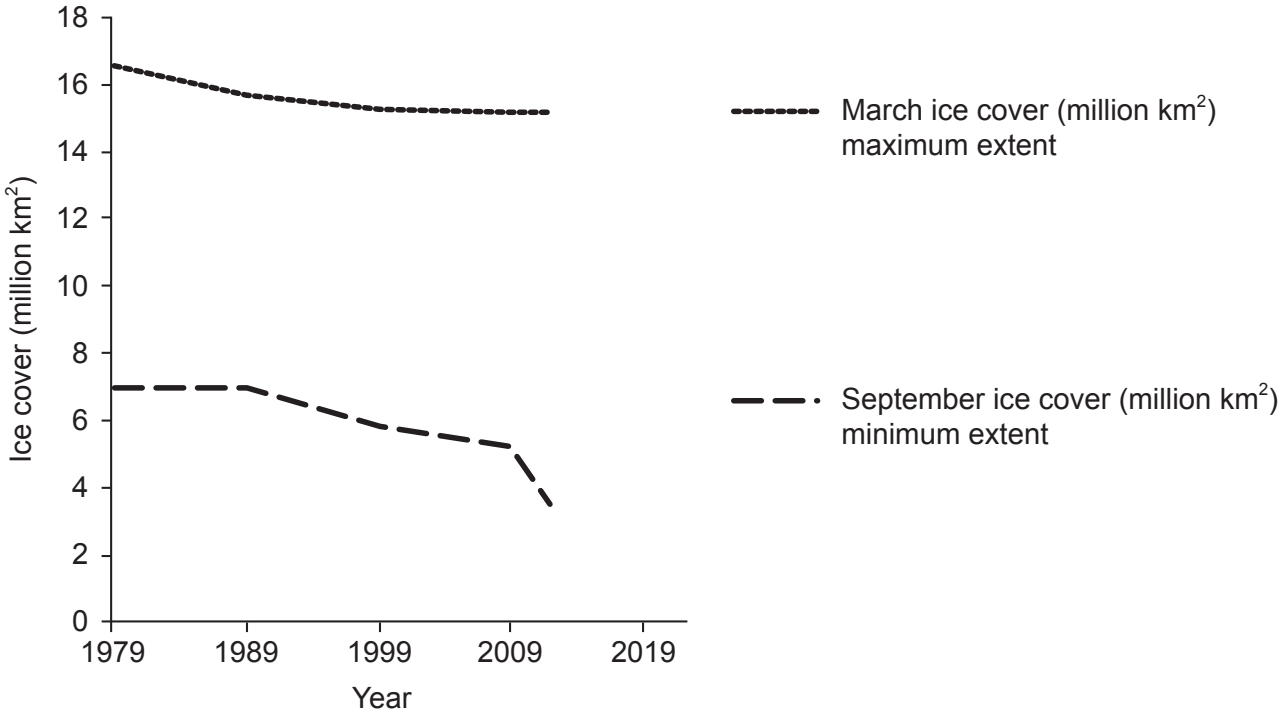
Figure 4(a)



[Source: Images courtesy of the National Snow and Ice Data Center, University of Colorado, Boulder]

Figure 4(b): Arctic sea ice extent.

Figure 4(b)



[Source: National Snow and Ice Data Center. Arctic Sea Ice News & Analysis / Charctic Interactive Sea Ice Graph. http://nsidc.org/arcticseaicenews/charctic-interactive-sea-ice-graph/. Accessed November 18, 2015.]

(This question continues on the following page)

(Question 6 continued)

Figure 4(c): Arctic sea ice extent 1979–2012.

Year	March ice cover (million km^2) maximum extent month	September ice cover (million km^2) minimum extent month
1979	16.5	7.0
2012	15.2	3.5

[Source: Data source: http://nsidc.org]

(a) (i) Identify **one** factor that may be causing long-term changes in sea ice cover. [1]

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(ii) Calculate the percentage change in sea ice cover from March 1979 to March 2012 and from September 1979 to September 2012 in **Figure 4(c)**. [2]

March: . . . . . .
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September: . . . . . .
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(iii) Describe the trend seen in the sea ice cover data in **Figure 4(b)**. [2]

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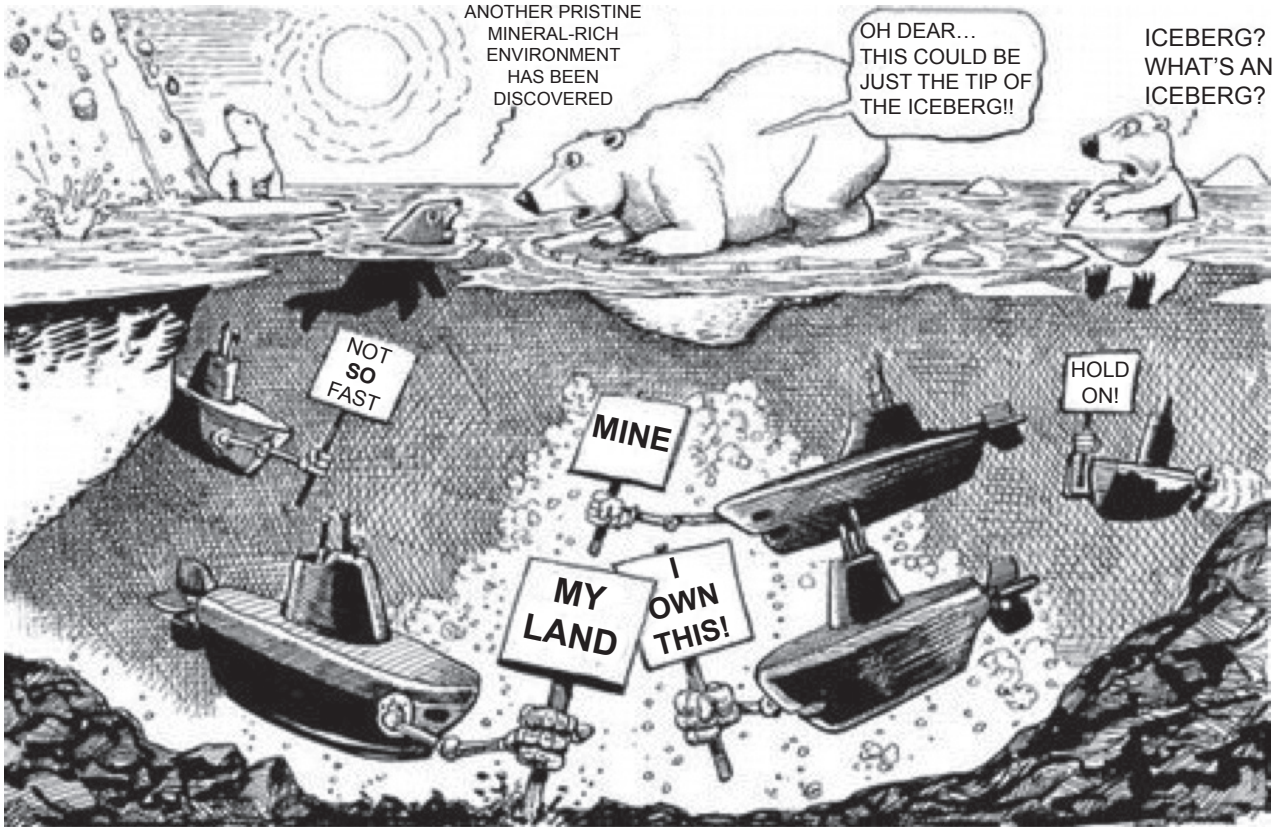
(Question 6 continued)

(b) **Figure 5:** The various countries that surround the Arctic Ocean have made claims to the ownership of the mineral resources that may lie beneath it, and which may become more accessible as the area covered by sea ice is reduced.

Figure 5



[Source: http://theglobaljournal.net]

Justify your personal viewpoint on resource extraction in the Arctic. [4]

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