IB ESS Exam Review Guide

To Golz - See Subject Report Guide in ESS folder on your laptop - review Paper 1 and 2 common mistakes from last year.

Need to update - Paper 2 essay section seems to have changed slightly.

Paper 1 (1 hour) Students will be provided with a range of data in a variety of forms relating to a specific, previously unseen case study. Questions will be based on the analysis and evaluation of the data in the case study. All questions are compulsory. (35 marks)	**25%**
Paper 2 (2 hours) Section A (40 marks) is made up of short-answer and data-based questions. Section B (20 marks) requires students to answer one structured essay question from a choice of two. Each question is worth 20 marks. (60 marks)	**50%**
Internal assessment (10 hours)	**25%**

Before Exams - Need to collect any programmable calculators. (IB Office was given a box of 42 calculators to use each year. Email a reminder to the director).

- Paper 1 (1 hour) - Friday, May 2.
- Paper 2 (2 hours) - Monday, May 5

Part 1 - Vocabulary Review and the Paper 2 (Section B) long form questions.
Memorize - Command Terms - need to know when answering questions. Look at what command terms are commonly used on old exams. (Hand some out)

Vocabulary review (use this as a starting source and flip though the text book looking for bold words that are unfamiliar) - I recommend you write a list of the words you NEED to review. (backup)

Write your list of what you need to study in this box (or put a note if you wrote it elsewhere.

Gimkit - Created by a student for review - ESS Vocab and command terms

Example Question that require lots of vocabulary connections - Paper 2 - 9 point questions

Part 2 - Big Picture of the Course (some study ideas)

Use your textbook - Start with the chapter and section summaries. Rewrite the “big ideas” and look for connections between chapters. Get a text book to display this. I suggest you read and write any highlights on the summary page and “highlight” parts that you need to look at in more detail.

Use Chapter Quick Reviews in your Textbook.
The previous page also has good examples of possible “essay style” questions - p.54-55, p. 142-143, p. 196-197, p. 234-235, p. 272-273, p. 300-301, p. 348-349, p. 400-401. There are other diagrams and questions within chapters too that you could use for practice.
(Answer Keys - listed by chapter and page)

Grab an old IB ESS exam. Flip through it and write down the BIG Concepts it covers.

Concepts - use p. vi in your book for a broad list.

- Understand things at a system level - energy flow, ecosystem, resource use and management.
- Environmental Value Systems - know the range
- Review a named species so you can explain it in detail. Know the names of plants and animals and how it is connected in a system.
    - Idea - black footed ferret. Review your assignment for this topic.
- Biogeochemical cycle review - especially carbon cycle and water cycle.
- Biodiversity and Conservation - IUCN Redlist, what are the pros and cons of protecting a single species vs. a defined area?, What criteria are used to determine need for protection?

- Evolution from changes on Earth (Plate tectonics causes major changes to land features and climate, which impacts species adaptation, change, and survival) How the Himalayas Changed the World
- Food Webs - How do they show system connections?
- Feedback loops (positive and negative) - give an example with a question
- Tragedy of the commons - basically, human nature is often shown that in “common” public areas, people will use or take more resources individually, leading to the degradation of that area. Like using more water to keep my grass green even though we live in a dry area. We all are reducing the water supply.
- Gaia - The idea that the “Earth” is an organism with lots of parts that function together.
- Population Charts - Discuss/review p. 368
- Energy Concepts - Conservation of Energy (1st Law of Thermodynamics), Entropy (2nd Law - Energy transformations reduce energy density over time)
- EIA - Environmental Impact Assessment - Studies used to assess needs and concerns before major projects that may impact the environment in an area.
- Succession vs. Zonation
- Mitigation (reducing impacts of what we currently do - like driving electric cars) vs. Adaptation (changing how we do things - like using a bike). Know pros and cons of specific examples.
- Water use
- Pollution of water, soil, air
- Atmosphere - levels, general types of gases, examples of greenhouse gases, location of ozone layer (stratosphere) vs humans live in the troposphere.
- Governmental, Non-governmental (NGO), vs. International Organizations - How are they different in the ways they operate?
- Big events like - Montreal Protocol - addressed ozone layer depletion
- EIA (Environmental Impact Assessments) -

Big Misconceptions:

- Ozone (same substance, different impacts)
    - Troposphere (ozone harms living cells, especially when breathing) vs.
    - Stratosphere (ozone layer good) - good up high, bad nearby)

The ozone hole is NOT due to or causing climate change.

- Global warming is the idea of temperature increase over time. Climate change is how weather patterns change which could include warming, or cooling, or wetter or drying based on specific areas.

- Major events to us do NOT have big impacts on world population trends. Even when millions of people die from some events, the world human population trend is still currently increasing.

Part 3 - Math in ESS
On the exam, you are allowed a graphing calculator (like TI 83 or 84), but DO NOT store any "information" on it.

Math possibilities - some concepts you should know, like average, central tendency (mean, median, and mode), ratios, reciprocals, and percentage.

- Some other equations would be provided, like Simpson's Index and Lincoln Index. Know how to use them.
- Calculate natural increase rates and population doubling times from given data.
- ALWAYS use correct units (they are usually given in the question or graph).

Understand and Use Standard Notation (like 3.6×10^6)

Understand how to round to 2 decimal places.
Example 54.238219 should be written as: 54.24

Interpret graphs or other charts - get data from a graph to calculate something.
(See p. 8 example - look at other questions for practice if needed)

Average = Total of all samples/Number of trials

Percent = Result/Total

Difference = A - B

Percent Change = (Final Value-Initial Value)/Initial Value x 100

Productivity
NPP = GPP - R
GSP = food eaten - fecal loss
NSP = GSP - R

Simpson's Index (to estimate biodiversity in an area)
This is the **reciprocal** index. $D = \frac{N(N-1)}{}$, If using $D = \Sigma\, n(n-1)$

$\Sigma\, n(n-1)$ $N(N-1)$

Answer usually bigger is better. Then 0 is diverse while 1 is not.

Lincoln Index (to estimate a species population in an area)

Vs. Biotic Index (how living things show quality of an area - like how we used macroinvertebrates to determine if water was polluted or not)

Understand Units -
Biomass = g/m^2 (mass in an area)
Productivity = $g/m^2/yr$ OR $g\ m^{-2}\ yr^{-1}$ (mass in an area over time) - notice they might write it in a strange way with "negative powers" just showing the inverse.

Population Demographic Calculations: CBR, CDR, TFR, DT, and NIR

(CBR – CDR)/10 = % rate of population change

Doubling time = 70 / % rate of population increase

Part 4 - Exam Strategy

1. Planning for time. Don't get stuck on a question. If you feel like you don't know an answer, move on. Then come back to attempt that answer later.
    a. Pay attention to the time on the cover of the paper.
    b. Read questions carefully.
    c. Know what the command term is asking for as an answer. Often multiple viewpoints are required.
    d. Be sure to have **at least as many ideas as the "points" listed**.
    e. Keep your answers in the box, give detail, but stay concise. See example "answer key" below for the range of answers of a question. Note they say things that are "not accepted" - usually ideas that are too broad or not explained.
    f. Tie together big ideas if you get stuck - example - MEDCs consume more resources and therefore cause more greenhouse gas emissions per person, but they often outsource their resource needs to LEDCs which extracts natural resources from those countries while increasing pollution in those places too.
    g. Students should understand how to plan a 9-mark question with for and against arguments. They should be taught and be able to practice

how to write a well-balanced conclusion with a clear value judgement supported by evidence. Providing students with exemplars of good conclusions from the mark scheme and encouraging them to write further examples could be helpful. An introduction for the final 9 mark question is not required.

h. The test is taken in PEN. If you need to change an answer, you may request an additional booklet to update any answers.

Some Test Taking Strategies - Mr. G Video

Paper 1 - Overview - Let's read the cover page over together so you are more efficient on test day.
https://docs.google.com/document/d/1Y_L5wtK0Jzm0bR4rZ1OVAVEKZRYOG1guH4MjPYEwpRc/edit?usp=sharing
Example - 2019 Paper 1 Exam
Example - 2019 Paper 1 Resource Booklet

Paper 2 - Overview

Environmental systems and societies
Standard level
Paper 2

Monday 8 May 2017 (morning)

2 hours

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.
- 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]**.

Reminders -

- Plan for at least 1 hour on **Section B**, longer form questions.
- Selecting and answering the group questions
- **You NEED to answer ALL of the statements for 2 of the question banks**
- You should read all of the statements and mark the ones you feel most confident with, giving priority to the (7) and (9) point questions if needed.
- PRACTICE - Give a page - have students read, decide, and plan how they would answer 2 sets of questions.
- You have many pages to write the answers, so be sure to have lots of details for each answer.
- From the ESS Guide - to earn top marks on the 9-point questions

7–9	The response contains: • substantial evidence of sound knowledge and understanding of ESS issues and concepts • a wide breadth of knowledge statements effectively linked with each other, and to the context of the question • consistently appropriate and precise use of ESS terminology • effective use of pertinent, well-explained examples, where required, showing some originality • thorough, well-balanced, insightful analysis • explicit judgments/conclusions that are well-supported by evidence/arguments and that include some critical reflection.

Practice Together - Paper 2 - 9 point questions

More Examples -

- Paper 2 - 2017 (full version - without extra long answer pages)
    - Some observations -
        - Must know “percent change”
        - Apply broad topics - like species interactions, water use, eco footprint, climate change, course vocabulary
        - Interterpret diagrams and data
- Paper 2 - Section B only - 2019 (which 2 options would you pick and why)
- Paper 2 Section B only - 2021 (which 2 options would you pick and why)

- 2024 Exams and Answer Keys
- 2023 Exams and Answer Keys
- 2021 - Exams and Answer Key
- 2019 Exams and Answer Keys

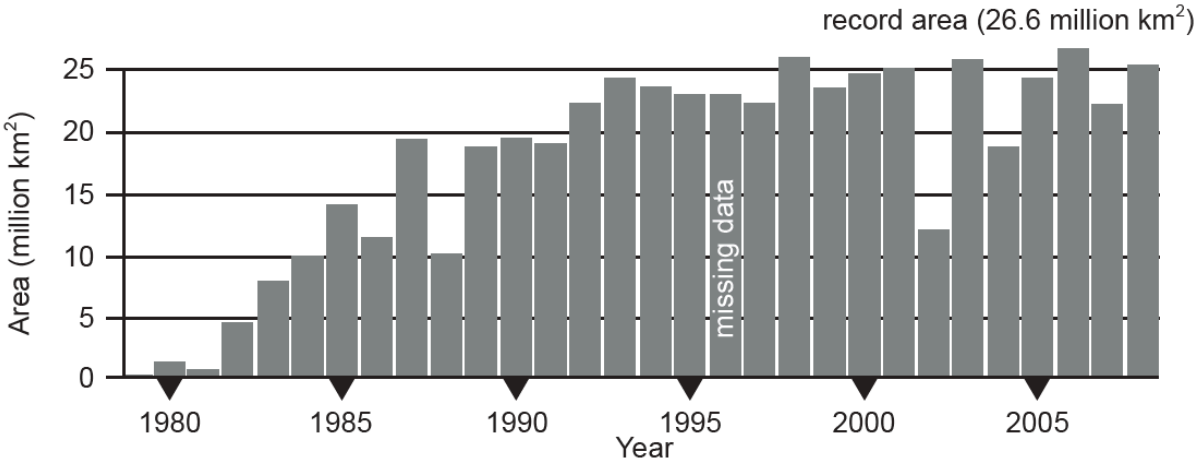
Practice test questions (example answer key below):

11. Human activities affect the concentration of both stratospheric and tropospheric ozone.

Outline the differences in these two effects by completing the following table. [4]

	Stratospheric ozone	**Tropospheric ozone**
Change in concentration	Increase	Increase
Cause of change in concentration:	. . . . .	. . . . .
Impact on humans:	. . . . .	. . . . .

12. Images from space and measurements have allowed scientists to estimate changes in the size of the ozone hole. Including reference to this data, **evaluate** the effectiveness of the Montreal Protocol (1987) in managing ozone depletion. [5]



[Source: http://earthobservatory.nasa.gov/Features/EarthPerspectives/page3.php]

……
……
……
……
……
……
……

Example - IB Answer Key

11. Human activities affect the concentration of both stratospheric and tropospheric ozone.

Outline the differences in these two effects by completing the following table.

	Stratospheric ozone	***Tropospheric ozone***
Change in concentration	*Increase*	*Increase*
Cause of change in concentration:	ban of ozone depleting substances (ODS)/CFCs; Montreal protocol;	increased number of vehicles; increase in combustion of fossil fuels; increase in concentration of populations in urban areas/activities that produce air pollution; formation of photochemical smog; increase in release of hydrocarbons/VOCs and NOx (from burning of fossil fuels) that react in sunlight to form ozone;
Impact on humans:	less UV exposure / less biological damaging effects (e.g skin cancer and cataracts);	irritating/destroys living tissues/materials / damage to crops or forests/ irritates the eyes/ respiratory problems /cancer;

One mark for two or three correct responses and two marks for four correct responses.
No marks for only one correct response.
Do not accept only ‘health problems’.

12. Images from space and measurements have allowed scientists to estimate changes in the size of the ozone hole. Including reference to this data, **evaluate** the effectiveness of the Montreal Protocol (1987) in managing ozone depletion.

Weaknesses [3 max]

- after Montreal Protocol entered in effect ozone levels continued decreasing /stabilized for a few years before declining again;
- agreement of Montreal Protocol was not followed by an immediate response / thebanning of ODS occurred in stages / not all countries initially participated in theMontreal Protocol;
- enforcing/policing implementation of the Montreal Protocol across all nations is difficult;
- following banning of ODS/Montreal Protocol a black market trade continued in these substances;
- Montreal Protocol did not stop further destruction of stratospheric ozone due to the long life spans of ODS;
- the effects of the Montreal Protocol will take a long time to occur and for the ozone hole to reduce;

Strengths [3 max]

- the ozone hole stabilized between around 1993 and 2008;
- in 1988 ozone hole showed a significant decline/ results for 1988 are anomaly;
- in 2002 ozone hole showed a significant decline/ results for 2002 are anomaly;
- without the Montreal Protocol the ozone hole may have continued to increase at a faster rate/indefinitely/beyond 26.6 million km2;
- Protocol has led to reduction in production/use of ODS (eg.CFCs);
- due to reduction in ODS, ozone levels are expected to recover in the future (eg some scientist predict that by 2080 ozone levels will return to 1950 levels/ by 2014 there were signs the ozone hole was starting to recover);
- referred to as the most successful international environmental agreement /first universally agreed Protocol /agreed by all nations;
- it provides a model/example for other global environmental protection initiatives;
- Credit quantification of data eg: ozone hole increased by around 5 million km2 between 1987 and 2008 compared to about 10 million km2 between 1980 and 1986;

Appraisal / Conclusion [1 max] - clear statement which adequately considers both strengths and weaknesses of the Montreal Protocol and implies which side is stronger based on evidence provided.

An isolated statement eg “the Montreal Protocol has been successful” or an unjustified opinion eg “I think the Montreal Protocol has been successful” should not be considered as a valid appraisal/conclusion. The appraisal/conclusion must be supported/justified by points raised that have addressed both sides of the argument.

Award max of 4 marks for responses that do not refer to the data.