

There are five questions on this examination. The first question is compulsory, and is worth 50% of the marks for this examination. Attempt answers to two of questions 2-5, each of which is worth 25% of the marks for this examination. Present your arguments clearly and concisely.

1. This question is compulsory, and requires short answers.
 - a. Briefly define the concept of the “tragedy of the commons”. **[5 marks]**
 - b. Briefly define the concept of negative externalities. **[5 marks]**
 - c. What are the pros and cons of nuclear power? **[5 marks]**
 - d. What are the core aspects of a detailed “Life Cycle Assessment”? You should not only list but also briefly explain each aspect. **[10 marks]**
 - e. What does the present administration mean by the “intensity of GHG emissions”? **[5 marks]**
 - f. From an environmental perspective, discuss the relative merits of hydro-electric, wind, and solar power for electricity generation. **[10 marks]**
 - g. Briefly define bio-accumulation and bio-magnification. **[5 marks]**
 - h. Briefly discuss technologies that can reduce the energy requirements of buildings. **[5 marks]**

2. Discuss the following statement from the World Bank:

“Without adequate protection of the environment, growth is undermined; but without growth it is not possible to support environmental protection.”

Your answer should consider the roles of technology, economics and government regulation in fostering sustainable development. **[25 marks]**

3. You work for a senator who sits on the U.S. Senate Committee on Commerce, Science and Transportation. Your first task is to prepare a brief on the overall life cycle environmental impact of electric, hybrid, diesel, and conventional gasoline powered vehicles, with a view to introducing new legislation to lower the environmental impact of personal transportation in the U.S. Discuss:
- the major areas of differing environmental impact that you might expect to identify;
 - possible changes in legislation to achieve the aim of your boss. **[25 marks]**

4. Discuss the following statement from The Economist:

“When it comes to clean technology, the most effective boost that bureaucrats can give to a sustainable energy future is to avoid picking winners. Instead, they would do better to provide a level playing field by scrapping the huge and usually hidden subsidies for fossil fuels, and by introducing measures such as carbon taxes so that the price of fossil fuels reflects the costs they impose on the environment and human health. Governments should also ensure that incumbents do not obstruct the entry of nimble newcomers, and keep open a range of options for producing energy, including running existing nuclear plants to the end of their useful life. They should provide strong incentives for firms to invest in today’s creaking electricity grids, but also remove barriers to the spread of distributed generation.”

Your answer should consider both renewable and non-renewable energy sources. **[25 marks]**

5. How could “Life Cycle Assessment” (LCA) have reduced the environmental impact of a product that is in common use in the United States? (You may select any product, other than consumer vehicles, that interests you.) You should:
- Identify possible alternative products that would reduce environmental impact while still satisfying consumer needs;
 - Consider why these more environmentally benign alternatives have not completely succeeded in the marketplace;
 - Suggest approaches to encourage adoption of low environmental impact products without loss of the functionality required of your chosen product. **[25 marks]**