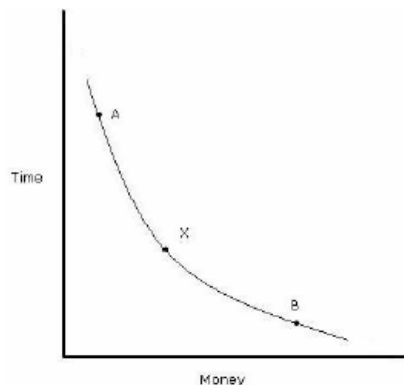


BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI CAMPUS
DEPARTMENT OF CHEMICAL ENGINEERING
I Semester – 2023 - 2024
Course Title: Environmental Management Systems (CHE G513)
Comprehensive Examination – Closed Book – 35 Marks + Open Book – 45 Marks
Date- 20.12.2023 **Time: 2:00 – 5:00 PM**

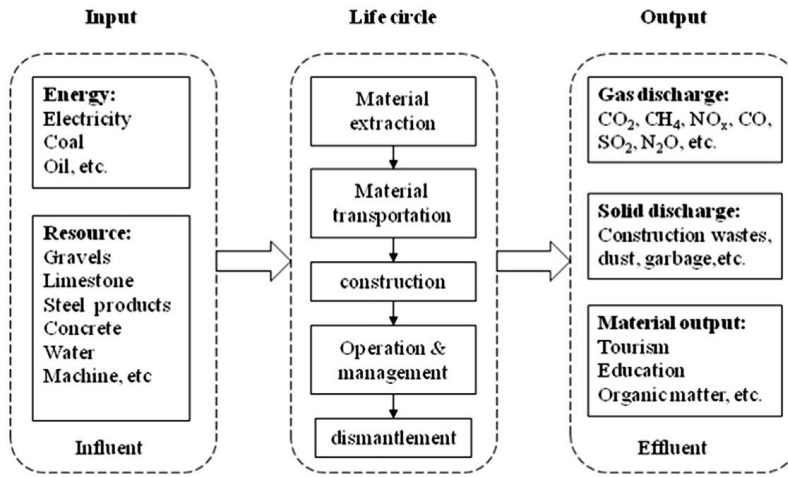
Instructions for Exam :

1. **Closed book - is comprised of 7 questions of total 35 Marks and Open Book is comprised of 5 Questions of 45 Marks.**
 2. **On returning CB Answer Script – Open book is to be answered in separate Answer Script.**
 3. **Make necessary assumptions where ever needed.**
1. **Answer the following questions.** **[3+3+2+2+3= 13]**
- a) ISO 14001 is organized around five basic principles or key elements which include:
 - b) MACT standard must achieve, throughout the industry, a level of emissions control that is at least equivalent to the MACT floor. Explain how the MACT floor differs both for the Major Sources and the Area Sources.
 - c) What are BMPs?
 - d) What kind of calculations are made during the TMDL analysis?
 - e) What is the concept of Incentives while framing the Environmental Policy?
2. To spearhead this strategic approach, ISO established a new technical committee, ISO/TC 207 in 1993, Environmental management articulated at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro. **Why is the concept of sustainability needs to be connected with engineering principles and engineering design to envisage the SDG goal of 2050 of Net Zero Carbon Emissions?** **[4]**
3. Which kind of information is needed for the determination of BACT? **[3]**
4. What are the 6 basic decisions at the beginning of the LCA to make use of time and resources? **[3]**
5. The economy and the environment are inextricably linked. Whether one is looking at daily life or natural resources and other environmental issues, because resources are scarce, choices have to be made about how to utilize them. Just like how we value regular goods, **the valuation of natural resources and the environment** is based on how we value their services and, for services that are consumed directly. **Explain the concept of Trade- offs in the environment.** **[4]**



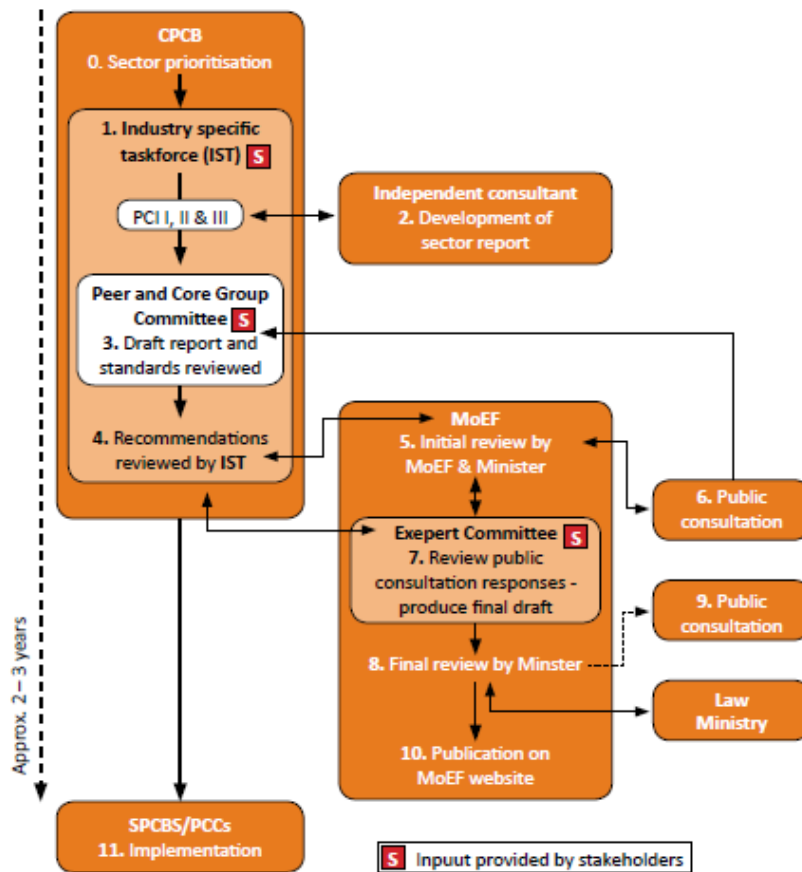
END 1

6. Given below flow chart, explain, which mid point & end point impact category would relate to pollutant stream from waste water treatment plant and why? [4]



7. The MoEFCC provides minimum national standards for emissions to air and water for over 100 industries/activities. Explain the flow chart for the process of emission standard development in India. [4]

Figure 1: Flow diagram of the process for emission standard development in India



Key: CPCB = Central Pollution Control Board / IST = Industry Specific Taskforce / PCI = Pollution Control Implementation (Division of CPCB) / MoEF = Ministry of Environment, Forest & Climate Change / SPCBs = State Pollution Control Boards / PCCs = Pollution Control Committees.

Make necessary assumptions where ever needed.

1. The atmospheric SO₂ is a long range transboundary air pollutant responsible for respiratory problems and acid rain. The uncontrolled release of SO₂ from coal-fueled power plants would raise the amount of anthropogenic SO₂ emission by about 150%, therefore, several attempts have been made on the regulation of the SO₂ emissions, i.e. the Helsinki Protocol (Protocol on the Reduction Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent). Two techniques for removal of flue gases (in particular SO_x) which **include Atmospheric Circulating fluidized bed combustor and Wet lime scrubbing process. Also input-output system is referred. [5+4+2 =11]**
 - a) Explain the working of both the Methods for the SO₂ removal.
 - b) Compare both the process via LCA method by choosing functional unit as 1 kg of SO₂ removal by each of these methods.
 - c) How do you conclude that Wet lime scrubbing process is widely installed Flue gas desulphurization (FGD) process in the Industries?

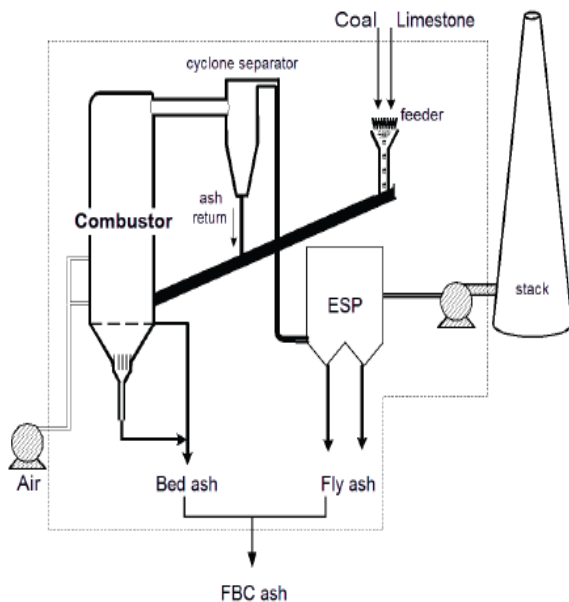


Fig. 1. Schematic diagram of the atmospheric circulating fluidised bed combustion

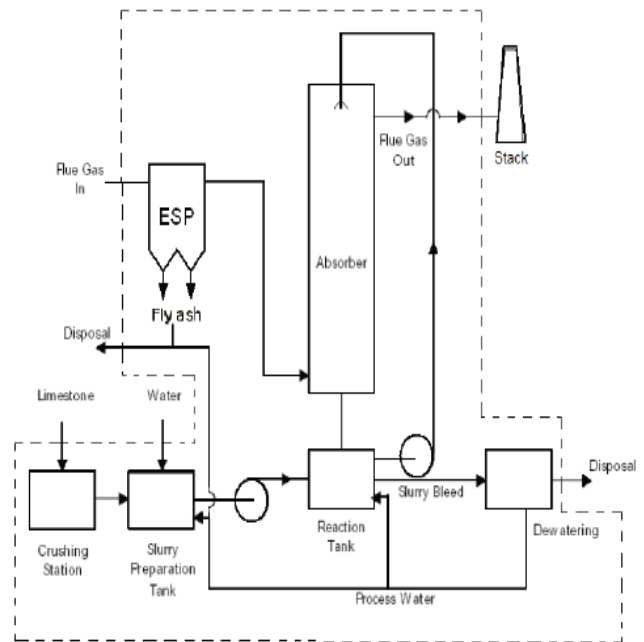


Fig. 2. Schematic diagram of the wet limestone scrubbing.

2. The study region is a 10 km radial area around the proposed industry to be set up in the industrial area developed by Maharashtra Industrial Development (MIDC) near town Mahad in Raigarh district. It is about 175 km from Mumbai, the business capital of India, on Mumbai-Goa Highway. The MIDC area is being developed in three phases, out of which work has already started in two phases. Phases 1 and 2 of the MIDC area are separated by a hilly configuration, and the terrain is undulated. **With the above description and the environmental impact table, develop the EIA methodology inclusive of significant environmental parameters. (Be more innovative in approach).** [10]

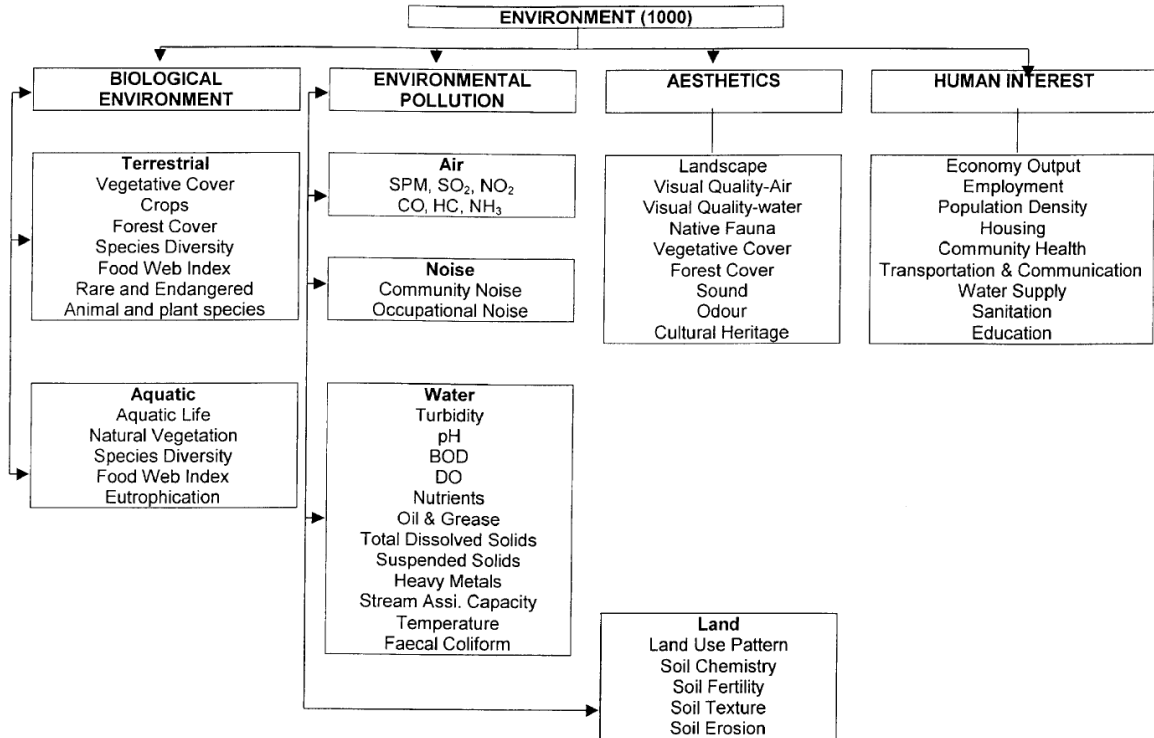
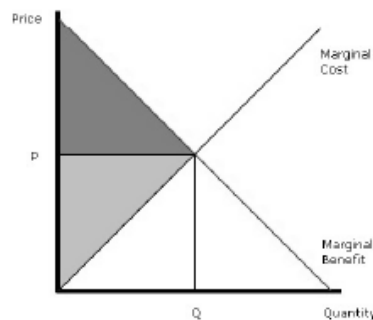


Fig. 1. Environmental impact education: major categories, compounds, and parameters.

3. Climate change causes a number of environmental mechanisms that affect both the endpoint human health and ecosystem health. Climate change models are in general developed to assess the future environmental impact of different policy scenarios. With no models readily available, we use a simplified approach based on already available literature. The benefit of this approach is that we can rely on well-established and widely accepted studies. The disadvantage was that we had to accept many assumptions made in these studies. **Explain the structure and steps of the environmental mechanism with regard to the climate change inclusive the development of at least one empirical equation.** [7]

4. **Explain the concept of Marginal Cost and Marginal Benefit for the Environmental Economics.** [7]



5. Impact category in a technical way, either to midpoint categories that are modelled with midpoint indicators, or to endpoint categories that are modelled with endpoint indicators. Climate change causes a number of environmental mechanisms that affect both the endpoint human health and

ecosystem health. Climate change models are in general developed to assess the future environmental impact of different policy scenarios. **Explain the concept of Climate change linking with the GWP equation and discussing the factors and steps in terms of Radiative forcing, Temperature effect, Damage to human health, and Damage to ecosystem diversity.** [10]

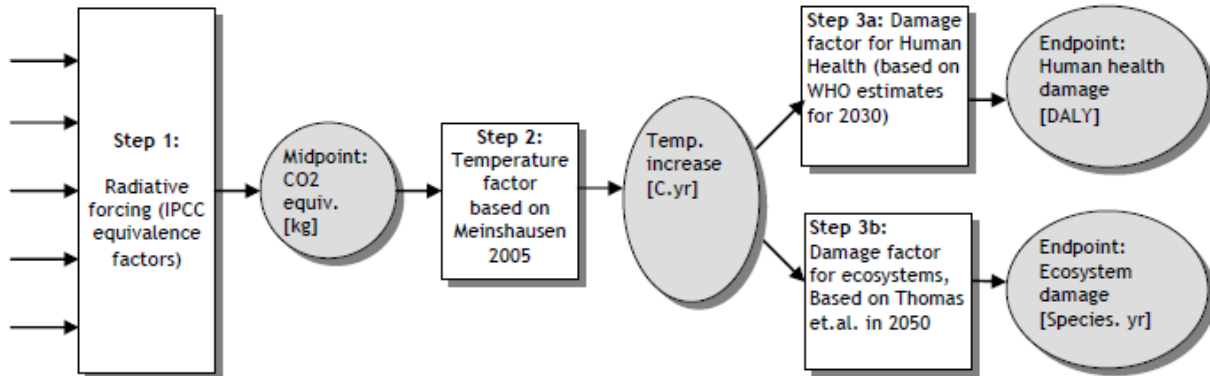


Figure 3.1: Overview of the steps in modelling effects of greenhouse gases with respect to climate change.