1. Sustainable Development Goals (SDGs) – 10 Marks

Introduction:

The **Sustainable Development Goals (SDGs)** were adopted by the **United Nations in 2015** as a global framework for achieving a **better and more sustainable future for all** by the year **2030**. They address the world's most pressing environmental, economic, and social challenges. The SDGs are a continuation and expansion of the earlier **Millennium Development Goals (MDGs)**, with a deeper emphasis on **environmental sustainability**, **climate action**, and **green practices**.

The PDF highlights that **green and sustainable chemistry** plays a significant role in fulfilling SDGs by minimizing pollution, reducing hazardous waste, and promoting the use of environmentally friendly materials and energy sources.

Detailed Explanation:

There are **17 Sustainable Development Goals (SDGs)**. Each goal is interlinked and aims to create a world where both people and the planet can thrive. The goals are:

1. **No Poverty:** End poverty in all its forms everywhere.
2. **Zero Hunger:** End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.
3. **Good Health and Well-being:** Ensure healthy lives and promote well-being for all at all ages.
4. **Quality Education:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities.
5. **Gender Equality:** Achieve gender equality and empower all women and girls.
6. **Clean Water and Sanitation:** Ensure availability and sustainable management of water and sanitation.
7. **Affordable and Clean Energy:** Ensure access to affordable, reliable, sustainable, and modern energy for all.
8. **Decent Work and Economic Growth:** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
9. **Industry, Innovation, and Infrastructure:** Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
10. **Reduced Inequalities:** Reduce inequality within and among countries.
11. **Sustainable Cities and Communities:** Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. **Responsible Consumption and Production:** Ensure sustainable consumption and production patterns.
13. **Climate Action:** Take urgent action to combat climate change and its impacts.
14. **Life Below Water:** Conserve and sustainably use the oceans, seas, and marine resources.
15. **Life on Land:** Protect, restore, and promote sustainable use of terrestrial ecosystems, forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.
16. **Peace, Justice, and Strong Institutions:** Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable institutions.
17. **Partnerships for the Goals:** Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Connection to Green and Sustainable Chemistry (as per PDF):

- SDGs align with the **principles of green chemistry**, such as reducing toxic substances, using renewable raw materials, and improving energy efficiency.
- Goals like **Goal 12 (Responsible Consumption and Production)** and **Goal 13**

(Climate Action) directly relate to sustainable chemical practices.

- **Life Cycle Assessment (LCA)**, mentioned in the PDF, helps assess environmental impacts at all stages of a product, supporting SDG 9 and SDG 12.
- **Clean technologies**, **non-toxic alternatives**, and **waste minimization** support the development of sustainable industrial processes.

Conclusion:

The **SDGs provide a comprehensive roadmap** for sustainable development by balancing social equity, economic growth, and environmental protection. Green and sustainable chemistry, as highlighted in the PDF, is essential for achieving these goals by encouraging cleaner production methods and eco-friendly innovations. Through international cooperation and commitment to sustainable practices, we can ensure a **healthier planet and a more equitable world for future generations**.

2. Millennium Development Goals (MDGs) – 10 Marks

Introduction: The Millennium Development Goals (MDGs) were launched by the United Nations in 2000 with the aim of addressing major global issues such as poverty, hunger, disease, illiteracy, and gender inequality. These **8 goals** targeted improvements in human welfare and were to be achieved by 2015.

Explanation: The MDGs were a landmark in global development strategy. However, as mentioned in the PDF, they had **limited focus on environmental issues**. The goals included:

1. Eradicating extreme poverty and hunger.
2. Achieving universal primary education.
3. Promoting gender equality.
4. Reducing child mortality.
5. Improving maternal health.
6. Combating HIV/AIDS and other diseases.
7. Ensuring environmental sustainability.
8. Developing global partnerships.

Goal 7—**ensuring environmental sustainability**—was the only one that emphasized ecological concerns. It included indicators such as access to safe drinking water and improving slum conditions, but did not delve deep into long-term environmental protection.

The PDF notes that the **MDGs laid the foundation for the broader and more inclusive SDGs**, which incorporate more environmental science and sustainable chemistry practices.

Conclusion: Although the MDGs were successful in raising awareness and mobilizing action, their limited scope on environmental sustainability led to the evolution of the SDGs. The shift from MDGs to SDGs represents the world's increasing recognition of the **importance of environmental protection** and **green technologies**, as emphasized in green and sustainable chemistry.

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3. Threats to Biodiversity – 10 Marks

Introduction: Biodiversity refers to the variety of life on Earth, including different species of plants, animals, and microorganisms. It plays a crucial role in maintaining **ecological balance**, supporting food chains, regulating climate, and sustaining human life. However, biodiversity is increasingly under threat due to human activities.

Explanation: As outlined in the PDF, the **major threats to biodiversity** include:

1. **Habitat Destruction:** Urbanization, deforestation, and agricultural expansion lead to the loss of natural habitats, affecting species survival.
2. **Pollution:** Industrial discharges, plastics, and chemical pollutants degrade the environment, making it uninhabitable for many species.
3. **Climate Change:** Rising temperatures, altered rainfall patterns, and extreme weather events are disrupting ecosystems.

4. **Overexploitation:** Overhunting, overfishing, and unsustainable logging reduce species populations.
5. **Invasive Species:** Non-native organisms outcompete or prey on indigenous species, disturbing local ecosystems.

The PDF links biodiversity preservation with **green chemistry**, which aims to reduce the generation of hazardous substances and encourage the use of **renewable feedstocks** and **biodegradable products**. This helps lower the impact on biodiversity.

Conclusion: Protecting biodiversity is essential for sustainable living. By integrating the **principles of green and sustainable chemistry**, industries and individuals can reduce their ecological footprint and preserve the planet's biological wealth for future generations.

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4. Clean Development Mechanism (CDM) – 10 Marks

Introduction: The **Clean Development Mechanism (CDM)** is one of the flexibility mechanisms defined under the **Kyoto Protocol** (1997), allowing industrialized countries to invest in emission-reduction projects in developing countries as part of their own efforts to meet emission targets.

Explanation: The PDF describes the CDM as a tool to promote both **sustainable development and emission reduction**. It works on the principle that reducing emissions in developing countries is often more cost-effective than doing so in developed countries.

Key features of CDM:

- Developed countries earn **Certified Emission Reduction (CER) credits** for investing in green projects.
- Projects include **renewable energy plants, energy-efficient technologies, and waste management**.
- These projects help developing nations access clean technology, **reduce poverty**, and create **employment opportunities**.
- It supports the **transfer of green chemistry knowledge** and environmentally sound technologies.

CDM also complements the principles of **green and sustainable chemistry** by encouraging cleaner production methods, reducing greenhouse gas emissions, and promoting the use of **renewable raw materials** and **non-toxic solvents**.

Conclusion: The CDM is a vital instrument that combines environmental responsibility with economic cooperation. It enables industrialized countries to meet climate goals while assisting developing countries in building a **sustainable, low-carbon future**, aligning perfectly with the goals of **green chemistry**.