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**ESL330 ENERGY, ECOLOGY AND ENVIRONMENT**

**Major Test**

**28<sup>th</sup> November 2006 (8.00 to 10.00 pm)**

**Answer the following questions in the space provided. Use the blank space on the reverse side of the paper if required.**

**Max. Marks: 80**

1. (A) Indicate if the following statements are true (T) or false (F) **Marks (1 ×10)**

- a. Nitrogen Dioxide (NO<sub>2</sub>) is the predominant Oxide of Nitrogen produced during vehicular operation ( )
- b. CaCO<sub>3</sub> does not fall into the category of VOCs ( )
- c. Total vehicular population of Delhi is close to 30 Lakhs ( )
- d. As far oxides of Nitrogen are concerned, power plant are the major source and motor vehicles are a secondary one ( )
- e. A good fuel for a petrol engine is usually a bad fuel for diesel engine ( )
- f. Oceans play a major role in regulating the level of carbon dioxide in the atmosphere ( )
- g. Chlorine atoms are constantly regenerated as they react with ozone. Thus they act as catalysts ( )
- h. Tail pipe exhaust is not always the greatest source of vehicle emissions ( )
- i. 20% ethanol by volume has been recommended for use in transportation sector in India ( )
- j. The major combustible component of CNG is propane. ( )

(B) Amplify the terms

**Marks (1×10)**

- a. CDM----
- b. THC---
- c. ZEV-----
- d. RSPM----
- e. CAA---
- f. ODS---
- g. CARB---
- h. NMVOC---
- i. NESHAP----
- j. AQI---

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(C) Fill in the Blanks

Marks (1×5)

- Measurement of glacial ice over the past 200 years suggests that the concentration of carbon dioxide at the beginning of nineteenth century was about \_\_\_\_\_ ppm.
- \_\_\_\_\_ is a common VOC often used in fire extinguishers.
- FID is used for the measurement of the concentration level of \_\_\_\_\_.
- About -----% of the solar energy reaching the atmosphere is reflected back into the space by clouds, chemicals, dust.
- One Dobson Unit (DU) is defined to be ----- mm thickness at STP - ( $^{\circ}\text{C}$  and 1 atmospheric pressure).

(D) Fill in the blanks in column 'B' and 'C' in response to the question in column 'A' as far as green house effect and ozone shield is concerned.

Marks (5)

Sr. No.	column 'A'	column 'B'	column 'C'
		Greenhouse Effect	Ozone Shield
1.	Where in the atmosphere dose this occurs?		
2.	What process occurs?		
3.	What natural gases are involved?		
4.	What are important human inputs?		

(E) Match the class of pollutant in column 'A' with the given example in column 'B'

Marks (8)

A	B
Class	Example
1. Carbon oxide	a. $\text{CCl}_4$ and $\text{CH}_3\text{Cl}$
2. Sulfur oxides	b. $\text{O}_3$ and PANs
3. Nitrogen oxides	c. CO and $\text{CO}_2$
4. VOCs	d. $\text{SO}_2$ and $\text{SO}_3$
5. SPM	e. Soot and sulfuric acid
6. Photochemical oxidants	f. Iodine-131 and radon-222
7. Radioactive substances	g. Methane and propane
8. HAPs	h. $\text{N}_2\text{O}$ and NO

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(F) List out five steps introduced during last five years in Delhi for vehicular emission control

**Marks (1/2×5)**

a.

b.

c.

d.

e.

(G) List out three factors which influence the formation of photochemical and industrial smog.

**Marks (1/2×3)**

a.

b.

c.

(J) List six ozone layer depleting substances

**Marks (1/2×6)**

(i)

(ii)

(iii)

(iv)

(V)

(vi)

(L) Years ago when smokestacks were only a few stories high, pollution from smokestacks usually stayed near the ground and settled on land nearby. To reduce this pollution government passed a law permitting construction of very tall smokestacks so that sending pollution high into air would be a problem. The scientists now feel that this was a wrong approach? What are your comments on this?

**Marks (2)**

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## 2. Explain in brief

**Marks (2×8)**

- Why concentration of Nitric oxide and Nitrogen dioxide are clubbed together and reported as oxides of nitrogen
- Carbon dioxide in the atmosphere fluctuates significantly on a daily and seasonal basis. Why are the  $\text{CO}_2$  levels higher during the day than at night?
- Between the two terms “acid rain” and “acid deposition”, (which are quite liberally interchanged) the latter is technically more well-defined why?
- Despite having the world’s toughest air pollution control programs, Los Angeles has severe air pollution why?

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e. A group of environment researchers have warned that Delhi is heading for a “smoggy winter” in 2006/early 2007. Do you agree with this view? Justify your answer.

f. It has been observed that the Antarctic ozone hole has not become more severe since 1990s. Do you feel that the ozone layer can be recovered and the hole over the Antarctic will be closed? Justify your answer.

g. Write down the emission norms for vehicles in Delhi since 1998 till today. What is the fuel quality improvement suggested for petrol and diesel vehicles?

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h. Explain how CO is harmful to human health.

3. Estimate the average temperature of the earth would have if it had no atmosphere. Assume earth's diameter as  $12.75 \times 10^6$  m and that the total radiant energy flux from the Sun, just outside the earth's atmosphere is  $1.353 \text{ kW/m}^2$ . **Marks (5)**

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4. Explain the implication of climate sensitivity parameter.

**Marks (6)**

Suppose glacial melting causes the earth's albedo to change from 0.31 to 0.30. Estimate the resulting radiative forcing. If the climate sensitivity factor is somewhere between 0.34 and  $1.03^{\circ}\text{C W}^{-1}\text{m}^2$ , estimate the change in surface temperature.

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5. Indicate through schematic diagrams

**Marks (2×3)**

i) Energy Flow Pyramid

ii) Tolerance range of same species in an abiotic environment

iii) Energy flow through ecosystem by two interconnected food webs