INDIA METEOROLOGICAL DEPARTMENT

QUESTION BANK

OF

ADVANCED METEOROLOGICAL TRAINING COURSE (AMTC)

SEMESTER-I EXAMINATION

BASED ON 176-181 BATCHES

(2015-2021)

PAPER-V: ENVIRONMENTAL MET.

PART-A

India Meteorological Department
Meteorological Training Institute
Advanced Meteorological Training Course

Environmental Met.

SEMESTER-I (PAPER-V)

Q. 1 Fill in the blanks

1. _____ may have warming or cooling effects, depending on their characteristics. (Aerosols/GHGs)
2. _____ is a parameter used for estimating Ambient Air quality.
3. _____ is a source of Methane emission.
4. _____ is highly poisonous to humans and most animals: when inhaled, it attacks haemoglobin. (CO/NO_2)
5. _____ is a secondary pollutant.
6. _____ is fixed in the atmosphere by lightning.
7. _____ scattering phenomenon is responsible for the blue colour of sky.
8. 100 ppm of CO_2 is equal to ____$\mu g/m^3$
9. 390 ppm of Co_2 is equal to _____ µgm/cc at NTP.
10. Abssorption of shortwave radiation by the atmosphere will add to its _____.
11. Albedo of the soil depends on its ____ content.
12. All greenhouse gases are _____ pollutants.
13. An elevated source of pollution above the base of inversionwill cause _____ concentrations at ground, compared to the situation when it is below it.
14. As the temperature of the ocean surface increases it will dissolve _____ of atmospheric CO_2.

b) Bio aerosols are classified as 1. ---------- 2. ----------

15. Carbon Aerosol _____ absorbs shortwave radition.
16. Carbon mono oxide is present in _____ .
17. Carbon monoxide and_____aresome of the precursors of ozone in urban atmospheres.

18. Dimethyl Sulfide has a natural source in the _____.
19. Dynamic viscosity is _____ than the kinematic viscosity.
20. Greenhouse gases may cause an increase in near-surface temperatures but a decrease in ---------- temperatures.
21. If the height of the boundary layer increases then the pollutant concentrations_____.
22. Methane is a _____gas.
23. Mie scatterings consider the scatteres as a dipole, whereas Rayleigh scattering considers it to be _____.
24. Nitrogen dioxide is an acid precursor, which is one of the source of acid rain produced when it combines with water droplets to form _____acid. (Sulphuric Acid /Nitric Acid)
25. OH* radical is a strong _____ in the atmosphere.
26. Ozone in the Stratosphere is destroyed by _____.
27. Particles whose size is greater than 01 µm is _____ form of aerosols.
28. Particulates forming from vapor phase of a gas due to high concentrations is known as the process of _____nucleation.
29. PM10 is the aerosol of size _____ than 10 micrometer diameter. (More/Less)
30. Respirable aerosols are smaller than _____in size.
31. Sea salt is _____ form natural aerosols.
32. Sea water will hold more CO_2at _____ temperatures.
33. Size of the accumulation mode aerosols ranging from _____ to _____
34. Smog is a combination of_____
35. Sulphate aerosols cause _____Radiative Forcing at the top of the atmosphere
36. The ambient air quality value for ‘CO’ for residential area is _____.
37. The density changes from place to place but the composition remains roughly constant in the part of atmosphere termed as _____.
38. The earth remains in radiative balance at the _____ of the atmosphere.
39. The indirect forcing of aerosols considers cloud _____ interaction.

40. The major precursor of O_3 in the lower troposphere is _____.
41. Turbulent flow is common in the _____ layer .
42. Volcanic eruption emit ____ _____ which affect solar radiation.
43. When blowing air interacts with a rough surface it generates_____turbulence.

(i)Stratospheric (ii) Ionospheric (iii) Mesospheric

Q.2 Indicate whether the following are true or false with short reasoning

1. Ultra trace quantities of Hydroxyl radical (*OH) can significantly determine the nature and quantity of secondary pollutants.
2. The sea breeze in coastal cities causes enhanced pollution.
3. Urban heat island alters pollution patterns in large cities during the night.
4. The oceans would absorb more and more of atmospheric CO_2 as its temperature rises.
5. Nitrogen fixing bacteria in the soil oxidize atmospheric Nitrogen.
6. Presence of higher amounts of atmospheric moisture in GHG induced global warming constitutes of a negative feedback.
7. The isotopic composition of carbon in atmospheric CO_2 helps in the identification of anthropogenic origins of the gas.
8. Ozone in the stratosphere has an opposite role to play in biological systems than ozone in the surface layer of atmosphere.
9. NO_x is produced by vehicular emission which is an air pollutant.
10. Methane emission from Municipal waste cannot be used for anything other than composting
11. Increased load of dust decreases the incoming solar radiation.
12. Low value of Reynolds Number indicates that the flow is turbulent.
13. Roughness parameter in the urban areas is smaller than over grass field.
14. Visibility is affected primarily by particles with diameter close to the wavelength of visible light, 0.5 µm.
15. Air pollution and temperature inversions seem to go hand in hand
16. A light wind, rather than a strong wind, more conducive to high concentrations of air pollution.
17. Sulphur di oxide is produced in burning of coal.
18. Richardson number depends upon stability and horizontal wind shear.
19. Roughness parameter varies from place to place

20. Rossby number is not a measure of turbulent flow.
21. The absorbing aerosol stabilizers the lower troposphere.
22. In Mie scattering the forward scatter is equal to the backward scatter.
23. Volcanic eruptions are source of anthropogenic pollutants.
24. All greenhouse gases are atmospheric pollutants.
25. The plume exhibits "Fanning" in an unstable atmosphere.
26. The "time of residence" of a pollutant species does not depend on its chemical reactivity.
27. Life time of aerosols decreases with altitude.
28. Aerosol particles are removed from atmosphere only through volatilisation.
29. Ozone is a pollutant at ground level.
30. SO_2 gas causes acid rain
31. Aerosols may have warming or cooling effects, depending on their characteristics.
32. Nitrogen Oxides emissions occur principally from motor traffic.
33. Rain water with a pH of 6.0 will have more CO_3^{-2}ions than HCO_3^{-1}.
34. Acid rain has a pH less than 5.6 .

Q. 3 Answer the following (in 120-150 words)

1. Describe the salient features of the Nitrogen Cycle.
2. Write a short note on origins of ozone gas in the earth's atmosphere.
3. Explain the radiative balance for long wave radiation on the earth's surface, atmosphere and outside the atmosphere.
4. How does Mie scattering explain the difference in brightness in different parts of the sky?
5. State the equation of Gaussian Plume Model for dispersion of pollution from a tall stack and explain its terms
6. Draw the terrestrial C-Cycle and explain it.

Q. 4 Write a short note on the following

1. Bio geo Chemical cycles and the climate system
2. The role of aerosols in climate
3. Ozone as a pollutant
4. Indoor Pollution
5. Primary pollutants
6. Natural sources of Carbon dioxide

7. Logarithmic wind profile
8. Climatic impact of volcanic eruptions.
9. Role of stability in vertical wind variation in lower most 100 m of atmosphere
10. Turbidity and radiation from the Sun
11. Volcanic eruption and its radiative role
12. Explain the pattern of scattered radiation intensity as a function of scattering angle.
13. The primary forcing due to scattering and absorbing aerosols.
14. Mention the additional (other than primary) forcing's of aerosols giving their basic significance.
15. Types of pollutants
16. Ambient air quality (AAQ)
17. Explain in detail about gas-to-particle conversion.
18. Explain any three of the following: (i) direct, (ii) first indirect, (iii) second indirect or (iv) semi-direct effect of aerosols.
19. Primary and Secondary pollutants.
20. Ambient air pollution and health effects
21. Atmospheric Aerosol
22. Define Atmospheric Aerosols. Write a note on its classification based on size, chemical composition and optical properties