

Note: All the answers are to be written on question paper only

23.5

Question 1-5 carry 25% negative marking.

(1x5=5)

Q 1. Air (Prevention and Control of Pollution) act was laid down in?

- a) 1974 b) 1976 c) 1981 d) 1984

Q 2. In Bhopal gas tragedy (1984), major culprit was:

- a) Methyl isocyanate b) Phosphate carbaryl (c) Carbon monoxide (d) Mercuric Sulphate

Q 3. Pasquill- Gifford Stability Class "E" signifies:

- a) Very Unstable b) Unstable c) Stable d) Neutral

Q 4. Which is the major human health effect because of benzene air pollution:

- a) Cardiovascular b) Leukemia c) Respiratory d) Brain & Kidney

Q 5. For a completely unstable meteorological condition, which relationship holds true:

- a) $ELR = DALR$ b) $ELR > DALR$ c) $DALR > ELR$ d) $DALR \gg ELR$

Q6. Attempt only one out of 6(a) and 6(b)

6(a). Define air pollution definition based on system approach?

(1x5=5)

6(b). Write down the features/assumptions of Gaussian plume model?

~~Mixing of harmful or~~

- (b)
- (i) steady - state
 - (ii) ~~Causing~~ Normal distribution of pollutant in the plume
 - (iii) Passive pollutant
 - (iv) Pollutant coagulation with in the plume i.e. it is contained within the plume

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Q7. Give at least one effect of Ozone, Pan, Mercury and NOx on plants/vegetation? (1x4=4)

Ozone → depigmentation

PAN →

Mercury →

NOx →

Q8. Mention four indoor sources and corresponding pollutants in a typical household? (1x4=4)

Paints → VOCs ✓

Perfumes → Aerosols ✓

Carpets → VOCs ✓

Copier machine → Carbonyl

Q9. How marble is affected by SO₂? Briefly describe with chemistry reaction. (1x3=3)

When SO₂ trapped with rain or in the air comes in contact with the marble, it reacts with it.



It generally erodes the marble & make stuff sharp edges softer.

②

Q10. A parcel is at height of 2.2km and has a temperature of 17° C, if it rises vertically up till 4.6 Km. Calculate the temperature of parcel at that height, assuming parcel is rising under (a) dry adiabatic lapse rate and (b) saturated adiabatic lapse rate? (1x5=5)

~~Q10~~ ~~dry adiabatic lapse rate~~

$$dz = 4.6 - 2.2 = 2.4 \text{ km} = 2400 \text{ m}$$

$$dT = (T - 17)^\circ \text{C}$$

(5)

(a) for ~~DALR~~ DALR,

$$\frac{dT}{dz} = \frac{-1}{100} \text{ }^\circ\text{C/m} \Rightarrow \frac{(T-17)}{2400} = \frac{-1}{100} \Rightarrow T = -7^\circ \text{C}$$

(b) for SALR,

$$\frac{dT}{dz} = -\frac{0.6}{100} \text{ }^\circ\text{C/m} \Rightarrow \frac{T-17}{2400} = \frac{-0.6}{100} \Rightarrow T = 2.6^\circ \text{C}$$

Q11. a) Write down the Gaussian plume equation and define every parameter

b) What would be the maximum ground level concentration at centre line when emission rate from a stack is 20 g/s and average wind speed is 4 m/s. Consider horizontal and vertical dispersion coefficient to be 30 m and 50 m? (1x4=4)

$$(a) \quad \chi(x, y, z, H_s) = \frac{Q_m}{2\pi\sigma_z\sigma_y\bar{u}} \left[\exp\left(\frac{-y^2}{2\sigma_y^2}\right) \right] \left[\exp\left(\frac{-(z-H)^2}{2\sigma_z^2}\right) + \exp\left(\frac{-(z+H)^2}{2\sigma_z^2}\right) \right]$$

where $\chi \rightarrow \text{conc}^\circ (\text{g/m}^3)$

$Q_m \rightarrow$ strength of source (g/s), $\sigma_z =$ vertical dispersion coeff (m), $\sigma_y \rightarrow$ horizontal dispersion coeff (m)

$\bar{u} \rightarrow$ mean wind speed (m/s), $H \rightarrow$ stack height (m), $z \rightarrow$ height of plume (m)

$y \rightarrow$ distance in horizontal (m)

(2)

(b) $Q_m = 20 \text{ g/s}$ $\bar{u} = 4 \text{ m/s}$ $\sigma_z = 50 \text{ m}$ & $\sigma_y = 30 \text{ m}$

$$\text{Ground level conc}^\circ = \frac{Q_m}{2\pi\sigma_z\sigma_y\bar{u}} = \frac{20}{2\pi \times 50 \times 30 \times 4} = 5.305 \times 10^{-4} \text{ g/m}^3$$