

SSC JE 2023



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CIVIL ENGINEERING

Complete Environmental Engineering

SERIES

4

> LIVE @ 5:00 PM

by Pramod Sir



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Air-binding in rapid sand filters is encountered when

- (a) There is excessive negative head**
- (b) The water is subjected to prolonged aeration**
- (c) The raw water contains dissolved gases**
- (d) The filter bed comprises largely of coarse sand**

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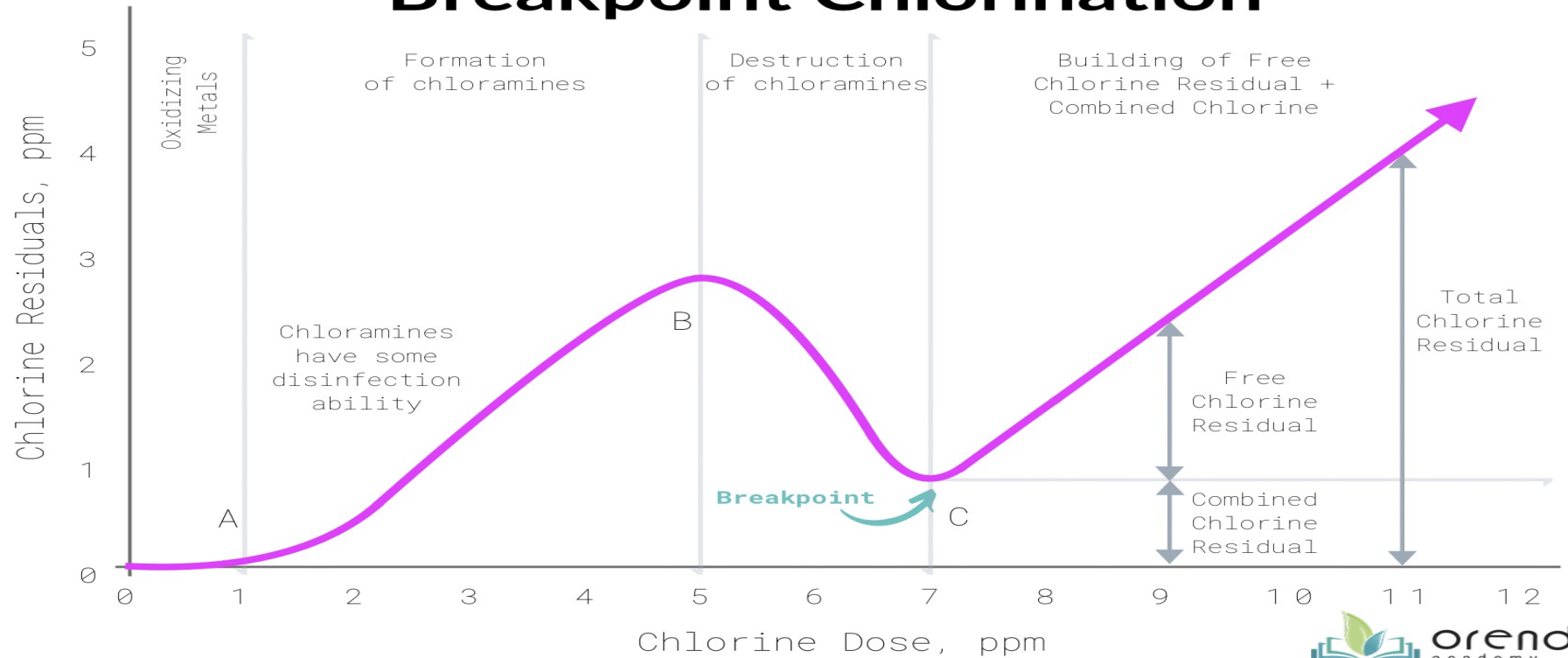
During the purification of water, if chlorine is applied beyond the stage of break-point, then the water is called as:

- (a) Double chlorinated
- (b) super-chlorinated
- (c) Post chlorinated
- (d) pre-chlorinated

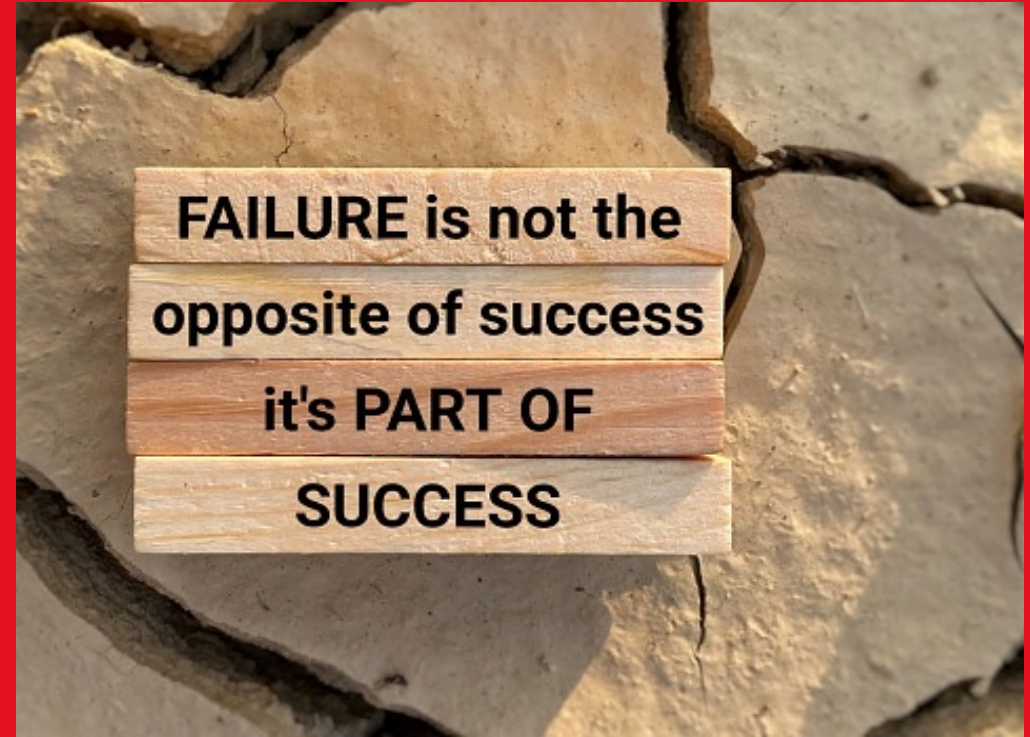
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Breakpoint Chlorination



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Rate of filtration (Ltr/hr/m²) for Rapid sand filter ranges from

- (a) 10 to 100
- (b) 3000 to 60000
- (c) 8000 to 10000
- (d) 100 to 3000

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er ranges from

Item	Slow Sand Filter	Rapid Sand Filter
Pre treatment	Not required except plain sedimentation	Coagulation, Flocculation and Sedimentation
Base materials	Gravel base of 30 to 75 cm depth with 3 to 65mm size graded gravel.	Gravel base of 45 to 50 cm depth with gravel size varies from 3 to 50 mm in 4 or 5 layers
Filter sand <ul style="list-style-type: none"> ▪ Effective size ▪ Uniformity coefficient ▪ Thickness of sand bed 	<ul style="list-style-type: none"> ▪ 0.25 to 0.35 mm ▪ 3 to 5.0 ▪ 80 to 100 cm 	<ul style="list-style-type: none"> ▪ 0.45 to 0.70 mm ▪ 1.2 to 1.7 ▪ 60 to 75 cm
Under drainage system	Open jointed pipes or drains covered with perforated blocks	Perforated pipe laterals discharging into main header
Size of each unit	50 to 200 sq.m	10 to 100 sq.m
Rate of filtration	100 to 200 Lph/sq.m	4800 to 7200 Lph/sq.m
Cost <ul style="list-style-type: none"> ▪ Installation ▪ O&M 	<ul style="list-style-type: none"> ▪ High ▪ Low 	<ul style="list-style-type: none"> ▪ Low ▪ High
Efficiency <ul style="list-style-type: none"> ▪ Turbidity of feed water ▪ Removal of bacteria 	<p>Low; < 30 NTU</p> <p>98 to 99%</p>	<p>Any level of turbidity of feed water; (with pre-treatment)</p> <p>80 to 90%</p>
Suitability	For water supply to rural areas and small town	For public water supply to towns and cities
Post treatment	Slight disinfection	Complete disinfection is a must
Ease of construction	Simple	Complicated;
Skilled supervision	Not essential	Essential
Loss of head <ul style="list-style-type: none"> ▪ Initial ▪ Final 	<ul style="list-style-type: none"> ▪ 10c m ▪ 80 to 120 cm 	<ul style="list-style-type: none"> ▪ 30 cm ▪ 250 to 350 cm
Method of cleaning	<ul style="list-style-type: none"> ▪ Scrapping and removing Schmutzedecke and 1.5 to 3 cm thick sand layer ▪ Laborious 	<ul style="list-style-type: none"> ▪ Back washing with or without compressed air agitation ▪ Simple and easy
Quantity of wash water required	0.2 to 0.5% of total water filtered	1 to 5% of the total water filtered
Cleaning Interval	Three to four months	One to two days

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Which of the following is not a mechanism of coagulation?

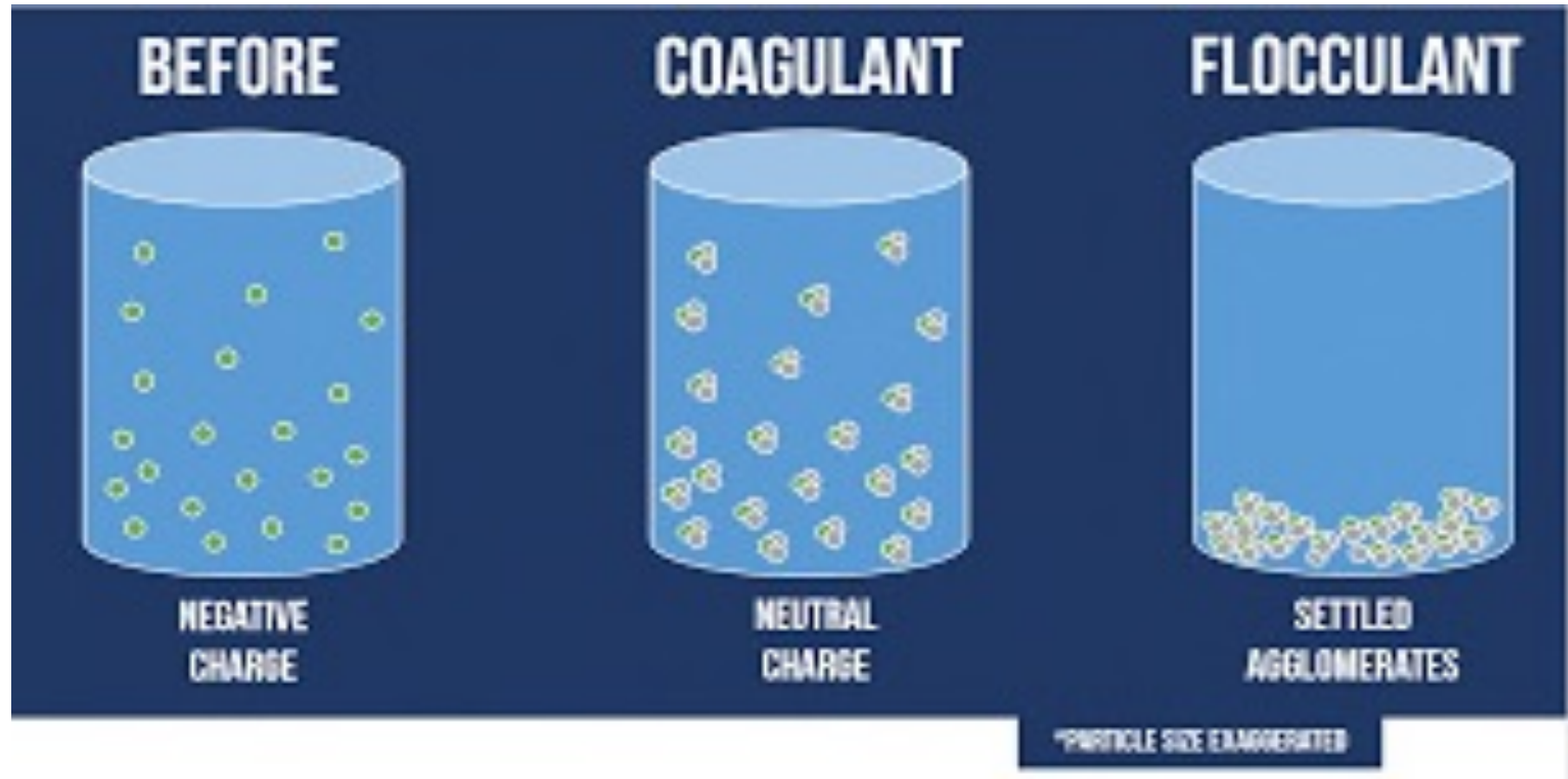
- (a) Ionic layer Compression
- (b) Absorption
- (c) Charge Neutralization
- (d) Sweep coagulation

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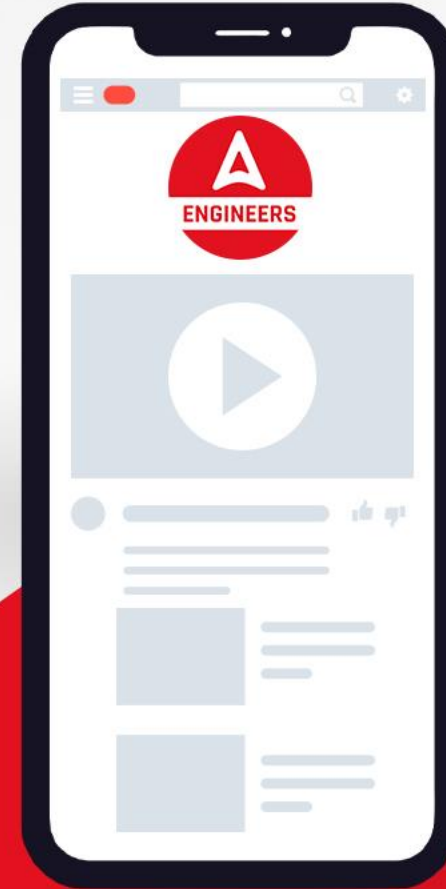
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Dechlorination of water is achieved by adding

- (a) Sodium hexametaphosphate
- (b) Sodium sulphate
- (c) Sodium thiosulphate
- (d) Sodium bisulphate

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Dechlorination: ï

The Process of removal of excess chlorine from the water is termed dechlorination.

it can be achieved by the addition of any of the following agents:

Sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$), activated carbon, sulfur dioxide, sodium bisulfate (NaHSO_3), ammonia as NH_4OH

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The best coagulant for removing the color of water is

- (a) Alum
- (b) Lime
- (c) Iron sulphate
- (d) Copper sulphate

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The spacing between two bars in medium size screen ranges from

- (a) 20-30 mm
- (b) 20-40 mm
- (c) 10-20 mm
- (d) 10-30 mm

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As per IS 10313: 1982, which of the following factors does NOT influence the sedimentation process in a sedimentation tank?

- (a) Surface overflow
- (b) Size, shape and weight of particle
- (c) Inlet and outlet arrangement
- (d) pH value of water

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From the list of treatments given below, which treatments reduce salinity of water?

- A. Flash mixing and sedimentation
- B. Electrodialysis
- C. Reverse osmosis
- D. Freezing
- E. Filtration

Choose the correct answer.

(a) A, C and E

(b) A, B and D

(c) A, B, C, D and E

(d) B, C, and D

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What is the range of soil particle size to apply stokes law?

- (a) Greater than 0.2 mm
- (b) Between 0.2 mm to 0.0002 mm
- (c) Both 1 and 3
- (d) Less than 0.0002 mm

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Which one of the following is not a chemical characteristic of solid waste?

- (a) PH
- (b) N-P-K
- (c) C/N ratio
- (d) Protiens

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While designing waste collection system for deciding the collection route which factor should not be considered?

- (a) Solid waste generation rates
- (b) Labour cost
- (c) Local topography
- (d) Direction of traffic flow

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Sludge bulking can be controlled by

- (a) Chlorination
- (b) Coagulation
- (c) Aeration
- (d) Denitrification

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The important method to control the production of leachate is

- (a) To construct intermediate berms
- (b) To provide an impervious clay layer over the top
- (c) To cultivate earth worms
- (d) To provide gas wells

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Anaerobic treatment is best suited for _____.

- (a) High efficiency
- (b) Toxic wastes
- (c) Dilute inorganic wastes
- (d) Strong organic wastes

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During processing of solid waste, partial combustion of carbonaceous material at high temperature is known as

- (a) Incineration
- (b) Gasification
- (c) Pyrolysis
- (d) None of these

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Which of the following statements related to C/N (Carbon/Nitrogen) ratio is not correct?

- (a) Higher initial C/N ratio leads to cell destruction to obtain nutrition.
- (b) Lower initial C/N ratio leads to loss of nitrogen and slows down the rate of decomposition.
- (c) Higher initial C/N ratio leads to lower conservation of nitrogen in the finished compost.
- (d) AN initial C/N ratio of 30 to 50 is optimal for composting

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The method of refuse disposal involving burial in trenches is called

- (a) Pulverisation
- (b) Composting
- (c) Shredding
- (d) Incineration

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The density of the garbage and rubbish varies in the range of _____ and _____ respectively (in kg/m^3).

- (a) 300-600 and 25-200
- (b) 50-400 and 450-900
- (c) 450-900 and 50-400
- (d) 25-200 and 300-600



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Rubbish: Rubbish is a general term applied to solid wastes originating in households, commercial establishments and institutions, excluding garbage and ashes.

- ▶ **Combustible (primary organic):** paper, cardboard, cartons wood, boxes, plastics, rags, cloth, bedding, leather, rubber, grass, leaves, yard trimmings
- ▶ **Noncombustible (primary inorganic):** metals, tin cans, metal foils dirt, stones, bricks, ceramics, crockery, glass bottles, other mineral refuse

The density of rubbish usually varies between 50 to 400 kg/m³.

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Which of the following is a secondary pollutant?

- (a) Soot
- (b) Fog
- (c) Smog
- (d) Bacteria

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Hairs of human nose can remove all the particles of size greater than

- (a) 1 micron
- (b) 10 micron
- (c) 100 micron
- (d) None of these

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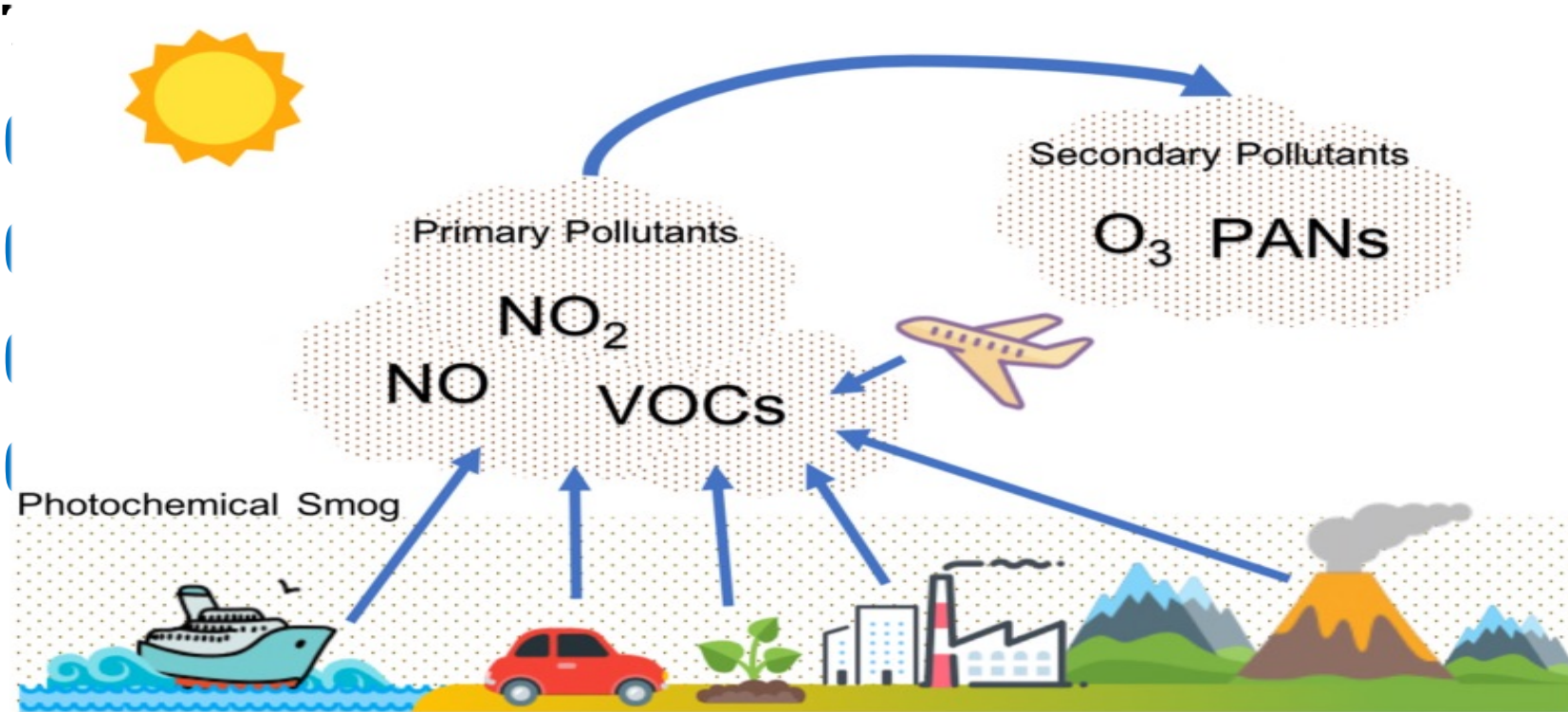
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The formation of photochemical smog is caused by

- (a) Nox, CO, HX, O₃
- (b) Nox, CO₂, HC, O₃
- (c) NOX, Pb, HC, O₃
- (d) NOX, SOX, HC, O₃

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Which of the following is used for the removal of particulates as well as gaseous pollutants

- (a) Catalytic converters
- (b) Wet scrubbers
- (c) Electrostatic precipitators
- (d) Fluidized bed adsorbers

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Electrostatic precipitators are used for removal of:

1. Gaseous contaminants
2. Liquid contaminants
3. Particulate contaminants

- (a) 1 only
- (b) 2 only
- (c) 3 only
- (d) 1, 2 and 3

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Electrostatic precipitators are used for removal of:

1. Gaseous contaminants
2. Liquid contaminants
3. Particulate contaminants

(a) 1 only

(b) 2 only

(c) 3 only

(d) 1, 2 and 3

Common particulate contaminants include dusts, fumes, mists, aerosols, and fibers. Dusts are solid particles generated by such processes as handling, crushing, and grinding. Fumes are formed when material from a volatilized solid condenses in cool air (e.g., welding fumes).

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Which of the following is correct in respect of ozone layer:

- (a) The ozone layer is being highest at equator and lowest at poles
- (b) The ozone layer is being highest at poles and lowest at equator
- (c) The ozone layer is being uniform thickness throughout the layer
- (d) The ozone layer is being uniform at equator but non-uniforms at poles

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As per IS: 4954-1968, the acceptable outdoor noise level for residential and business urban area is

- (a) 30-40 dB
- (b) 35-45 dB
- (c) 40-50 dB
- (d) 50-60 dB

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When the Adiabatic Lapse Rate (ALR) is less than the Environmental Lapse Rate (ELR), then the prevailing environmental lapse rate is called as

- (a) Inversion Lapse rate
- (b) Super-Adiabatic Lapse rate
- (c) Sub-Adiabatic Lapse rate
- (d) Negative Lapse rate

$ELR > ALR \Rightarrow$ Super-adiabatic lapse rate \Rightarrow Unstable Environment

$ELR < ALR \Rightarrow$ Sub-adiabatic lapse rate \Rightarrow Stable Environment

$ELR = ALR \Rightarrow$ Neutral Condition

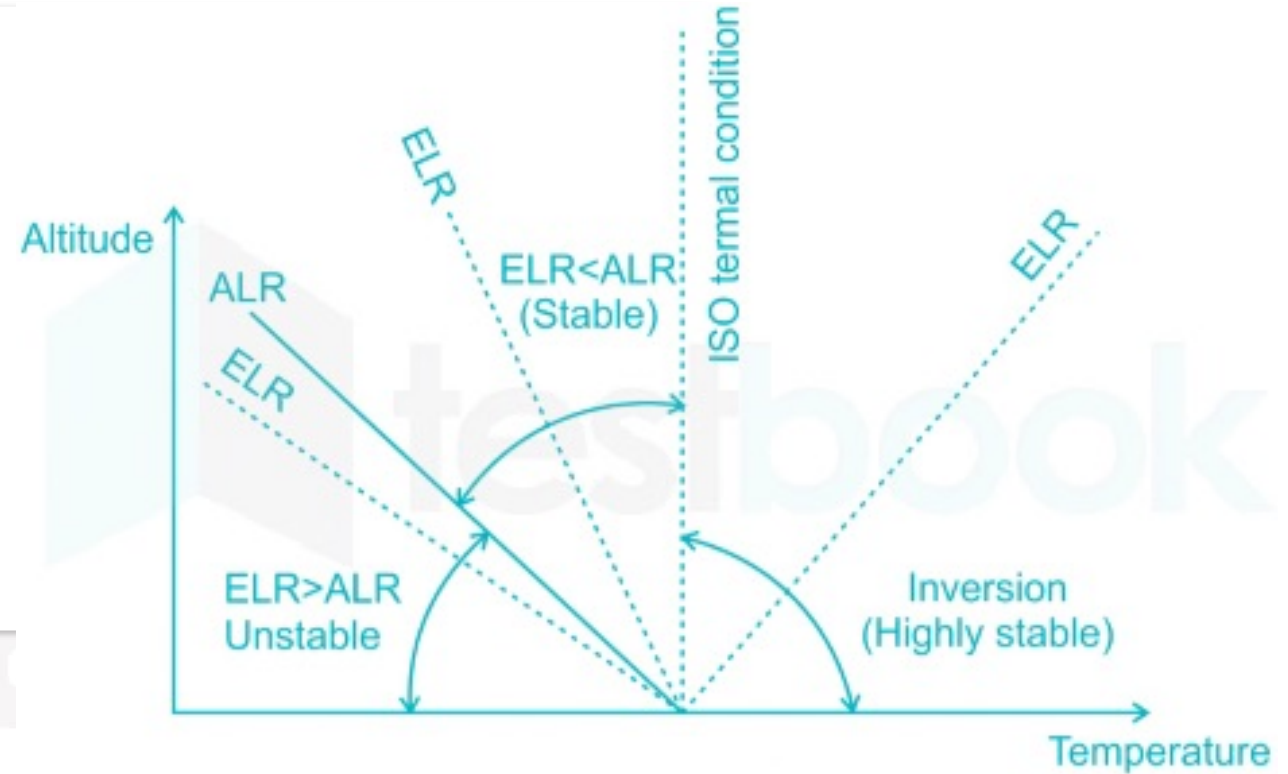
ELR is negative \Rightarrow Inversion

Adiabatic Lapse Rate (ALR) is - 9.8oC per 1000 m rise

$ELR =$ Environment lapse rate

$ALR =$ Adiabatic lapse rate

(d) Negative Lapse rate



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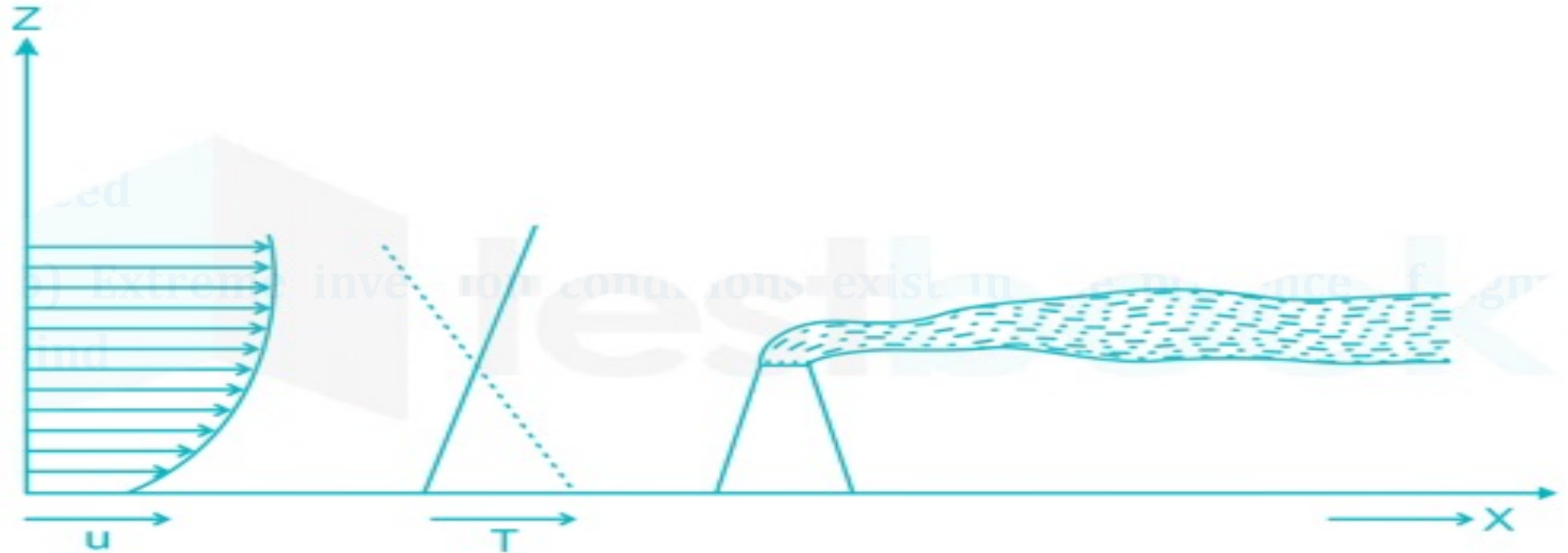
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Fanning type of plume behaviour takes place when

- (a) Super adiabatic lapse rate prevails with light to moderate wind speed
- (b) Extreme inversion conditions exist in the presence of light wind
- (c) There exists a strong super-adiabatic lapse rate above a surface of inversion
- (d) Plume is caught between two inversion layers

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4) Fanning Plume: Under extreme inversion conditions. Emission will spread only horizontally.

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Which of the following air pollution control devices has maximum efficiency?

- (a) Dynamic precipitator
- (b) Spray tower
- (c) Wet cyclonic scrubber
- (d) Electrostatic precipitator



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