GATE Environmental Science and Engineering

Sample Paper – 8

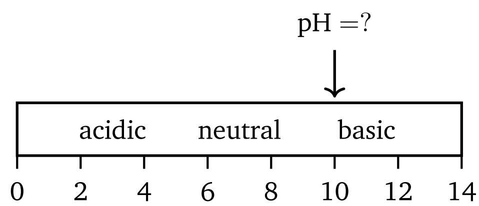
Duration: 128 Minutes **Maximum Marks: 72**

Instructions

- This paper contains **46 questions** covering the core **Environmental Science and Engineering** subject of the GATE paper conducted by the IITs and IISc (General Aptitude and Engineering Mathematics are provided as separate papers).
- **Q1–Q20 carry 1 mark each** and **Q21–Q46 carry 2 marks each**, for a total of **72 marks**.
- Each question carries **negative marking of one-third of its allotted marks**: a wrong 1-mark question costs **0.33** and a wrong 2-mark question costs **0.67**. Unattempted questions carry no penalty.
- Every question here is a single-correct **MCQ**. The real GATE paper also has Multiple Select (MSQ) and Numerical Answer Type (NAT) questions, and **those carry no negative marking**.
- Attempt this paper in one timed sitting of about **128 minutes**, the share this core subject earns at GATE's overall pace of 180 minutes for 65 questions. Unless stated otherwise take $g = 9.81$ m/s^2, unit weight of water $\gamma_w = 9.81$ kN/m^3, dynamic viscosity of water $\mu = 1.0 \times 10^{-3}$ Pa·s and $K_w = 1.0 \times 10^{-14}$ at $25°$C.

Environmental Chemistry and Microbiology

Q1. A water sample has a hydroxyl-ion concentration $[\text{OH}^-] = 1 \times 10^{-4}$ mol/L at $25°$C. On the scale shown, taking pOH $= -\log_{10}[\text{OH}^-]$ and pH+pOH $=$ 14, the pH of the water is: **[1 mark]**



(A) 10

(B) 4

(C) 7

(D) 14

Q2. A water sample contains magnesium ions at a concentration of 12 mg/L (atomic mass of Mg $= 24$). Expressed as an equivalent concentration of calcium carbonate, the magnesium hardness is: **[1 mark]**

(A) 24 mg/L as $CaCO_3$

(B) 100 mg/L as $CaCO_3$

(C) 12.5 mg/L as $CaCO_3$

(D) 50 mg/L as $CaCO_3$

Q3. In the biological nitrogen cycle, the two-step aerobic oxidation of ammonia first to nitrite and then to nitrate, carried out by autotrophic bacteria such as *Nitrosomonas* and *Nitrobacter*, is called: **[1 mark]**

(A) denitrification

(B) ammonification

(C) nitrification

(D) nitrogen fixation

Q4. As per the Indian drinking-water standard IS 10500:2012, the acceptable (desirable) range of pH for drinking water is: **[1 mark]**

(A) 6.5 to 8.5

(B) 5.0 to 6.0

(C) 8.5 to 10.0

(D) 4.0 to 5.5

Q5. A strong monoprotic acid is fully dissociated in water, giving a hydrogen-ion concentration $[H^+] = 1 \times 10^{-3}$ mol/L at 25°C. The pH of this solution is: **[1 mark]**

(A) 1

(B) 11

(C) 3

(D) 2

Q6. As per IS 10500:2012, in the routine bacteriological quality of drinking water the acceptable limit for *E. coli* or thermotolerant (faecal) coliform organisms in any 100 mL sample is: **[1 mark]**

(A) 10 per 100 mL

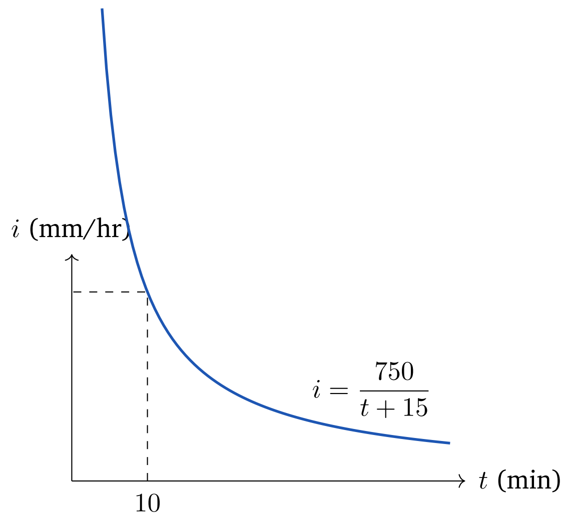
(B) 50 per 100 mL

(C) 100 per 100 mL

(D) nil (shall not be detectable)

Water Resources and Environmental Hydraulics

Q7. The rainfall intensity–duration relation for a station is given by the IDF curve $i = \dfrac{750}{t+15}$, with i in mm/hr and duration t in minutes. For a storm of duration $t = 10$ minutes, the design rainfall intensity is: **[1 mark]**



(A) 50 mm/hr

(B) 75 mm/hr

(C) 30 mm/hr

(D) 15 mm/hr

Q8. Using the rational formula $Q = \dfrac{C\,i\,A}{360}$ (with i in mm/hr and A in hectares giving Q in m^3/s), a catchment has runoff coefficient $C = 0.5$, rainfall intensity $i = 72$ mm/hr and area $A = 50$ ha. The peak runoff Q is: **[1 mark]**

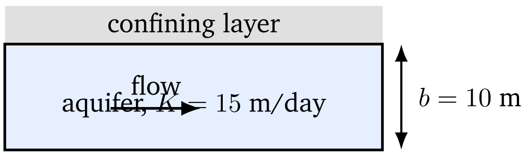
(A) 10 m^3/s

(B) 7.2 m^3/s

(C) 5 m^3/s

(D) 2.5 m^3/s

Q9. For the confined aquifer sketched, the transmissivity is defined as $T = K\,b$, the product of hydraulic conductivity and saturated thickness. With $K = 15$ m/day and $b = 10$ m, the transmissivity is: **[1 mark]**



(A) 1.5 m^2/day

(B) 150 m^2/day

(C) 25 m^2/day

(D) 15 m^2/day

Q10. Groundwater flows through an aquifer under a hydraulic gradient $i = 0.005$ with hydraulic conductivity $K = 20$ m/day and effective porosity $n = 0.25$. The seepage (actual pore) velocity, $v_s = \dfrac{K\,i}{n}$, is: **[1 mark]**

(A) 0.1 m/day

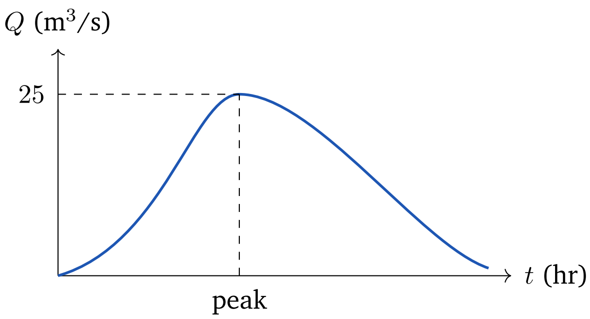
(B) 0.025 m/day

(C) 5 m/day

(D) 0.4 m/day

Q11. A 4-hour unit hydrograph of a catchment has a peak ordinate of 25 m^3/s, as shown. For a rainfall excess of 3 cm occurring uniformly over the same

4-hour duration, the peak of the resulting direct-runoff hydrograph is: **[1 mark]**



(A) $25\ m^3/s$

(B) $75\ m^3/s$

(C) $8.33\ m^3/s$

(D) $100\ m^3/s$

Q12. A rainfall event produces a uniform runoff depth of 5 cm over a catchment of area 10 km^2. The total volume of direct runoff generated is: **[1 mark]**

(A) $5 \times 10^5\ m^3$

(B) $5 \times 10^6\ m^3$

(C) $5 \times 10^4\ m^3$

(D) $5 \times 10^3\ m^3$

Water Supply and Water Treatment

Q13. A town has a population of 60,000 in the year 2020 and grows by a constant 20% every decade (geometric-increase method). The forecast population for the year 2030 is: **[1 mark]**

(A) 72,000

(B) 80,000

(C) 66,000

(D) 12,000

Q14. A city with a population of 200,000 has an average water demand of 150 litres per capita per day (lpcd). The average daily water demand of the city, expressed in million litres per day (MLD), is: **[1 mark]**

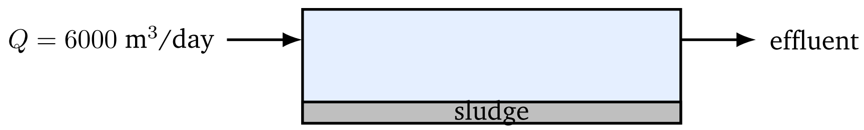
(A) 3 MLD

(B) 30 MLD

(C) 300 MLD

(D) 15 MLD

Q15. A circular sedimentation tank, shown, is to be designed for a flow of $Q = 6000$ m^3/day at a surface overflow rate (surface loading) of $SOR = 40$ m^3/m^2/day. The required plan (surface) area $A = Q/SOR$ is: **[1 mark]**



design $SOR = 40$ m^3/m^2/day

(A) 240,000 m^2

(B) 150 m^2

(C) 15 m^2

(D) 1500 m^2

Q16. A discrete spherical particle of diameter $d = 0.01$ mm $= 1 \times 10^{-5}$ m and submerged density $(\rho_s - \rho) = 1600$ kg/m^3 settles in still water. By Stokes' law $v_s = \dfrac{g(\rho_s - \rho)d^2}{18\mu}$ (with $\mu = 1.0 \times 10^{-3}$ Pa·s), the settling velocity is nearest to: **[1 mark]**

(A) 8.7×10^{-4} m/s

(B) 1.7×10^{-4} m/s

(C) 8.7×10^{-5} m/s

(D) 8.7×10^{-6} m/s

Q17. A sedimentation tank has a volume of $V = 900$ m^3 and receives a flow of $Q = 150$ m^3/hr. The theoretical hydraulic detention (retention) time $t_d = V/Q$ is: **[1 mark]**

(A) 0.167 hr

(B) 1.5 hr

(C) 3 hr

(D) 6 hr

Q18. A rapid gravity sand filter operates at a filtration rate of 5 $m^3/m^2/hr$ and has a plan area of 40 m^2. The volume of water it can filter per hour is: **[1 mark]**

(A) 8 m^3/hr

(B) 200 m^3/hr

(C) 45 m^3/hr

(D) 2000 m^3/hr

Wastewater Treatment and Disposal

Q19. The influent to a treatment unit has a BOD of 250 mg/L and the effluent leaving it has a BOD of 50 mg/L. The BOD-removal efficiency of the unit is: **[1 mark]**

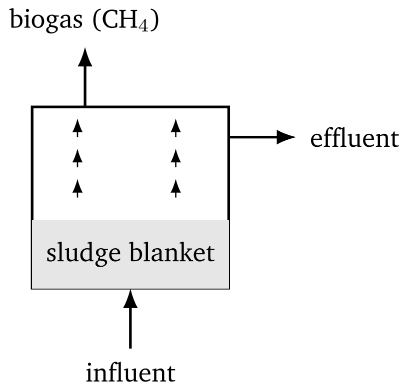
(A) 20%

(B) 50%

(C) 25%

(D) 80%

Q20. In the Upflow Anaerobic Sludge Blanket (UASB) reactor whose flow scheme is shown, the organic matter in the wastewater is stabilised and biogas is generated chiefly by the metabolic action of: **[1 mark]**



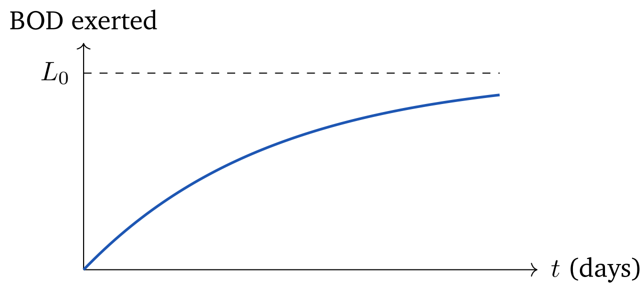
(A) aerobic bacteria only

(B) anaerobic methanogenic bacteria

(C) algae

(D) nitrifying bacteria

Q21. Wastewater has an ultimate (first-stage) BOD of $L_0 = 250$ mg/L and a deoxygenation rate constant $k = 0.20$ day^{-1} (base e). Following the first-order model of the BOD-exertion curve shown, the BOD exerted in 5 days, $y_5 = L_0\left(1 - e^{-kt}\right)$, is nearest to: **[2 marks]**



first-order, $k = 0.20$/day

(A) 158 mg/L

(B) 250 mg/L

(C) 92 mg/L

(D) 200 mg/L

Q22. An activated-sludge aeration tank of volume $V = 1000$ m^3 operates with a mixed-liquor suspended-solids concentration of $X = 2500$ mg/L. It receives $Q = 2000$ m^3/day of wastewater at an applied BOD of $S_0 = 250$ mg/L. The food-to-microorganism ratio $F/M = \dfrac{Q\,S_0}{V\,X}$ is: **[2 marks]**

(A) 2.0 per day

(B) 0.2 per day

(C) 0.02 per day

(D) 0.5 per day

Q23. A UASB reactor of liquid volume $V = 1200$ m^3 treats a wastewater flow of

$Q = 4800$ m^3/day. The hydraulic retention time $HRT = V/Q$, expressed in hours, is: **[2 marks]**

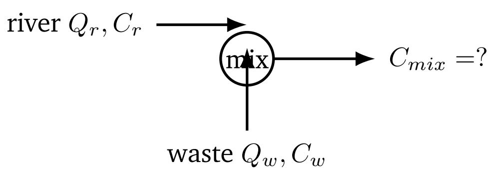
(A) 0.25 hr

(B) 4 hr

(C) 6 hr

(D) 12 hr

Q24. Treated wastewater is discharged into a stream, as sketched. The waste stream carries $Q_w = 2$ m^3/s at a BOD of 200 mg/L and the receiving river carries $Q_r = 8$ m^3/s at a BOD of 10 mg/L. Assuming complete mixing, the BOD just downstream of the outfall is nearest to: **[2 marks]**



(A) 210 mg/L

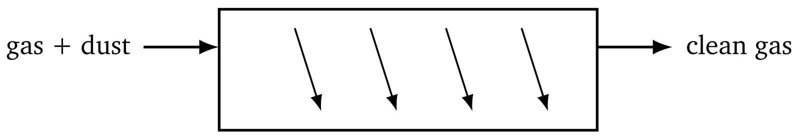
(B) 48 mg/L

(C) 105 mg/L

(D) 24 mg/L

Air Pollution and Control

Q25. In the gravity settling chamber shown, a spherical dust particle of diameter $d = 30\ \mu$m $= 3 \times 10^{-5}$ m and density $\rho_p = 2500$ kg/m^3 settles in air of viscosity $\mu = 1.8 \times 10^{-5}$ Pa·s. Neglecting the air density, the terminal settling velocity $v_t = \dfrac{g\,\rho_p\,d^2}{18\mu}$ is nearest to: **[2 marks]**



particle settles under gravity

(A) 0.68 m/s

(B) 0.068 m/s

(C) 0.0068 m/s

(D) 6.8 m/s

Q26. An electrostatic precipitator receives a gas carrying a particulate loading of 12 g/m^3 and discharges it at 0.24 g/m^3. The overall collection (removal) efficiency of the unit is: **[2 marks]**

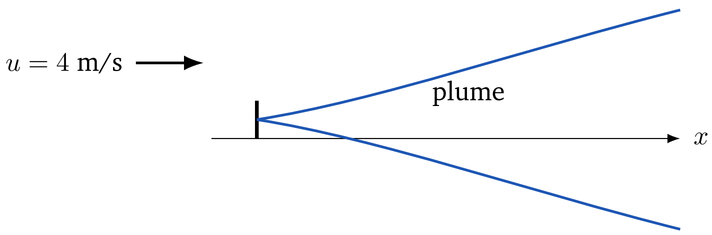
(A) 2%

(B) 90%

(C) 98%

(D) 80%

Q27. A continuous ground-level point source emits a pollutant at $Q = 80$ g/s into a wind of speed $u = 4$ m/s. For the Gaussian plume shown, the ground-level centre-line concentration is $C = \dfrac{Q}{\pi\,\sigma_y\,\sigma_z\,u}$; at the downwind location $\sigma_y = 20$ m and $\sigma_z = 10$ m, the concentration is nearest to: **[2 marks]**



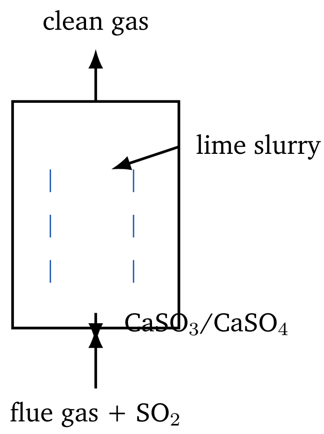
(A) 31.8 mg/m^3

(B) 15.9 mg/m^3

(C) 6.4 mg/m^3

(D) 3.18 mg/m^3

Q28. In a coal-fired power plant, sulphur dioxide in the flue gas is removed by flue-gas desulphurisation, in which the gas is contacted with an alkaline limestone/lime slurry. The principal mechanism by which the SO_2 is captured is: **[2 marks]**



(A) catalytic reduction of SO_2 to elemental nitrogen

(B) electrostatic charging of the SO_2 molecules

(C) absorption of SO_2 into the alkaline slurry, reacting to form calcium sulphite/sulphate

(D) condensation of SO_2 by cooling below its boiling point

Q29. In many power plants, oxides of nitrogen (NO_x) in the flue gas are controlled by Selective Catalytic Reduction (SCR), which converts NO_x to harmless nitrogen and water over a catalyst. The reagent injected to achieve this reduction is: **[2 marks]**

(A) ammonia (NH_3) or urea

(B) chlorine (Cl_2)

(C) ozone (O_3)

(D) methane (CH_4)

Q30. Ambient nitrogen dioxide is measured as 0.05 ppm by volume. At $25°$C (1 atm) the molar volume of a gas is 24.45 litres and the molecular mass of NO_2 is 46. Using $\mu g/m^3 = \text{ppm} \times \frac{M}{24.45} \times 1000$, the mass concentration is nearest to: **[2 marks]**

(A) $46\ \mu g/m^3$

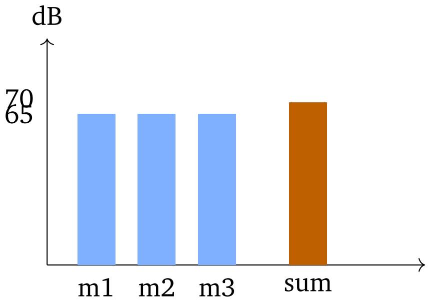
(B) $24.45\ \mu g/m^3$

(C) $50\ \mu g/m^3$

(D) $94\ \mu g/m^3$

Noise Pollution and Environmental Monitoring

Q31. Three identical machines each produce a sound-pressure level of 65 dB at a receiver. When all three operate together, the combined level $L = 10\log_{10}(n \times 10^{L_1/10})$ (with $n = 3$) is (as suggested by the energy addition shown): **[2 marks]**



(A) 69.8 dB

(B) 195 dB

(C) 65 dB

(D) 75 dB

Q32. At a receiver, one source produces 85 dB and a second produces 79 dB. The combined sound level, using $L = 10\log_{10}(10^{8.5} + 10^{7.9})$, is nearest to: **[2 marks]**

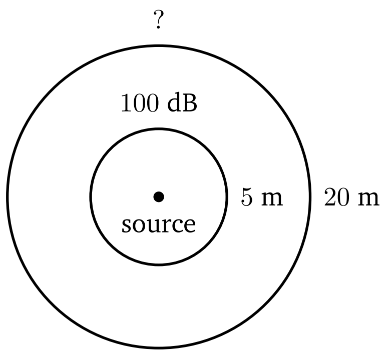
(A) 82 dB

(B) 164 dB

(C) 85 dB

(D) 86 dB

Q33. A point noise source produces 100 dB at a distance of 5 m. In a free field the level falls by 6 dB for every doubling of distance, as the contours below suggest. The sound level at 20 m from the source is: **[2 marks]**



(A) 94 dB

(B) 82 dB

(C) 100 dB

(D) 88 dB

Q34. Structure-borne noise inside a building, transmitted as mechanical vibration through floors, walls and structural connections from machinery, is most effectively reduced at the source by: **[2 marks]**

(A) increasing the acoustic power of the machine

(B) mounting the machine on resilient vibration-isolation pads/springs

(C) painting the structural surfaces

(D) raising the operating frequency of the machine

Solid and Hazardous Waste Management

Q35. A city has a population of 500,000 and a per-capita municipal solid-waste (MSW) generation rate of 0.4 kg/person/day. The total MSW generated per day, expressed in tonnes, is: **[2 marks]**

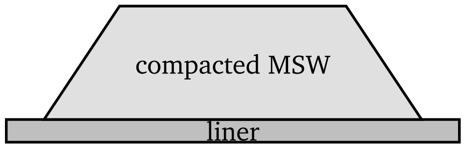
(A) 400 tonnes/day

(B) 50 tonnes/day

(C) 100 tonnes/day

(D) 200 tonnes/day

Q36. A sanitary landfill, shown in cross-section, receives 150 tonnes/day of MSW that is compacted to an in-place density of 600 kg/m^3. The landfill airspace (volume) needed for one year (365 days) of this waste is nearest to: **[2 marks]**



in-place density = 600 kg/m^3

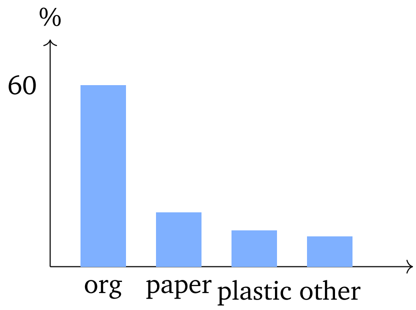
(A) 182,500 m^3

(B) 45,625 m^3

(C) 91,250 m^3

(D) 33,306 m^3

Q37. The bar chart shows the composition of a city's MSW: organic (compostable) 60%, paper 18%, plastic 12% and other 10%. If the total MSW is 200 tonnes/day, the mass of the compostable (organic) fraction is: **[2 marks]**



(A) 60 tonnes/day

(B) 80 tonnes/day

(C) 200 tonnes/day

(D) 120 tonnes/day

Q38. Under the RCRA framework, a waste is a "characteristic hazardous waste" if it exhibits any of the four defining characteristics. Which one of the following is NOT one of those four characteristics? **[2 marks]**

(A) ignitability

(B) biodegradability

(C) reactivity

(D) toxicity

Q39. A mass-burn incinerator receives 200 tonnes/day of MSW and leaves an ash residue equal to 25% of the input mass. The mass of ash (bottom + fly ash) produced per day is: **[2 marks]**

(A) 150 tonnes/day

(B) 50 tonnes/day

(C) 200 tonnes/day

(D) 25 tonnes/day

Q40. To contain leachate and protect groundwater, a RCRA Subtitle C hazardous-waste landfill must be built with an engineered base barrier consisting of: **[2 marks]**

(A) a double composite liner together with a leachate collection and removal system

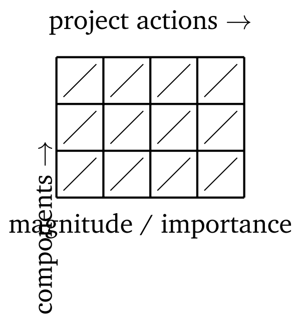
(B) no liner, relying only on natural soil

(C) a single thin clay layer with no drainage

(D) an open unlined pit for free infiltration

Environmental Management, Sustainability and Climate

Q41. The Environmental Impact Assessment method that uses a two-dimensional grid cross-listing project actions (columns) against environmental components (rows), with each interaction cell scored for magnitude and importance, is the: **[2 marks]**



(A) simple checklist method

(B) map-overlay (GIS) method

(C) Leopold (interaction) matrix

(D) network (cause-effect) method

Q42. In the EIA process followed under India's EIA Notification 2006, the stage at which the draft EIA report is placed before the affected public, who may then raise their concerns and objections, is called: **[2 marks]**

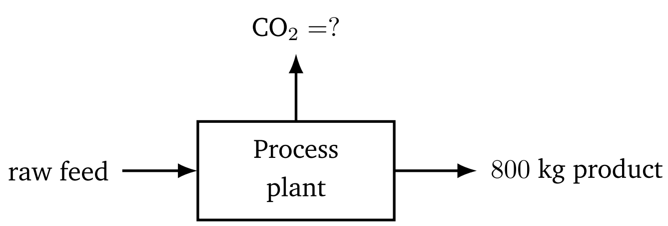
(A) public hearing (public consultation)

(B) screening

(C) scoping

(D) post-project monitoring

Q43. For the process shown, a plant emits 1.5 kg of CO_2 for every kilogram of product and manufactures 800 kg of product each day. The daily CO_2 emission, obtained from the mass balance, is: **[2 marks]**



(A) 1.2 tonnes/day

(B) 800 kg/day

(C) 0.53 tonne/day

(D) 2.4 tonnes/day

Q44. In the EIA cycle, the early step that determines which impacts and issues are significant enough to be studied in detail, thereby setting the terms of reference for the assessment, is called: **[2 marks]**

(A) screening

(B) public hearing

(C) scoping

(D) environmental auditing

Q45. The international climate agreement adopted in 2015 that aims to hold the rise in global average temperature to well below 2°C above pre-industrial levels, and to pursue efforts to limit it to 1.5°C, is the: **[2 marks]**

(A) Paris Agreement

(B) Montreal Protocol

(C) Ramsar Convention

(D) Basel Convention

Q46. The systematic study carried out after a project is commissioned, which checks whether the actual environmental impacts match those predicted in the EIA and whether mitigation measures are working, is called environmental: **[2 marks]**

(A) screening

(B) scoping

(C) impact prediction

(D) monitoring and auditing

Detailed Solutions

Q1.

Solution

Concept – pH from hydroxyl-ion concentration: At $25°$C the pOH is the negative logarithm of the hydroxyl-ion concentration, and pH and pOH sum to 14.

Step 1 – write the given concentration: $[OH^-] = 1 \times 10^{-4}$ mol/L

Step 2 – compute the pOH: $\text{pOH} = -\log_{10}(1 \times 10^{-4})$

Step 3 – apply the logarithm: $\log_{10}(10^{-4}) = -4$, so $\text{pOH} = 4$

Step 4 – use the water relation at $25°$C: $\text{pH} + \text{pOH} = 14$

Step 5 – solve for pH: $\text{pH} = 14 - 4$

$\text{pH} = 10$

Step 6 – interpret: A pH of 10 is greater than 7, so the water is basic, consistent with a relatively high $[OH^-]$.

Final Answer: $\text{pH} = 10 \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q1

Q2.

Solution

Concept – expressing hardness as $CaCO_3$: The hardness contributed by an ion equals its concentration multiplied by the ratio of the equivalent weight of $CaCO_3$ (50) to the equivalent weight of that ion.

Step 1 – equivalent weight of magnesium: Magnesium has valency 2, so its equivalent weight is $\frac{24}{2} = 12$

Step 2 – form the conversion factor: $\text{factor} = \frac{50}{12}$

Step 3 – multiply the magnesium concentration by the factor: $\text{Hardness} = 12 \times \frac{50}{12}$

Step 4 – cancel and evaluate: Hardness $= 50$ mg/L as $CaCO_3$

Final Answer: 50 mg/L as $CaCO_3 \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q2

Q3.

Solution

Concept – nitrification: Nitrification is the aerobic, two-step microbial oxidation that converts ammonia nitrogen into nitrate nitrogen.

Step 1 – first oxidation step: *Nitrosomonas* oxidises ammonia (NH_4^+) to nitrite (NO_2^-).

Step 2 – second oxidation step: *Nitrobacter* oxidises nitrite (NO_2^-) to nitrate (NO_3^-).

Step 3 – name the overall process: This sequential oxidation is called nitrification.

Why the other options are wrong:

- A, denitrification: is the anaerobic reduction of nitrate to nitrogen gas, the reverse direction.
- B, ammonification: is the release of ammonia from organic nitrogen.
- D, nitrogen fixation: converts atmospheric N_2 to ammonia, not ammonia to nitrate.

Final Answer: nitrification $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q3

Q4.

Solution

Concept – drinking-water pH standard: IS 10500:2012 prescribes a permissible pH band for potable water to keep it neither too corrosive nor too scale-forming.

Step 1 – recall the acceptable range: The desirable (acceptable) limit of pH is 6.5 to 8.5.

Step 2 – note there is no relaxation: For pH, unlike many chemical parameters, no relaxation beyond this band is allowed in the absence of an alternative source.

Why the other options are wrong:

- B and D: fall on the acidic side, which is corrosive and outside the standard.
- C: extends into the strongly alkaline region, which promotes scaling and taste problems.

Final Answer: 6.5 to $8.5 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q4

Q5.

Solution

Concept – pH of a strong acid: For a fully dissociated strong monoprotic acid, the hydrogen-ion concentration equals the acid concentration, and $\mathrm{pH} = -\log_{10}[\mathrm{H}^+]$.

Step 1 – write the given concentration: $[\mathrm{H}^+] = 1 \times 10^{-3}$ mol/L

Step 2 – substitute into the pH definition: $\mathrm{pH} = -\log_{10}(1 \times 10^{-3})$

Step 3 – apply the logarithm: $\log_{10}(10^{-3}) = -3$

Step 4 – take the negative: $\mathrm{pH} = -(-3) = 3$

Step 5 – interpret: A pH of 3 is well below 7, confirming a strongly acidic solution.

Final Answer: $\mathrm{pH} = 3 \Rightarrow \boxed{\mathrm{C}}$

Answer: (C) Go Back to Q5

Q6.

Solution

Concept – bacteriological standard for drinking water: Because coliforms indicate faecal contamination, treated drinking water must be essentially free of them.

Step 1 – recall the IS 10500 requirement: *E. coli* and thermotolerant (faecal) coliform organisms shall not be detectable in any 100 mL sample.

Step 2 – express this numerically: The acceptable limit is therefore nil, i.e. zero organisms per 100 mL.

Why the other options are wrong:

- A, B, C: any non-zero count of faecal coliforms signals contamination and renders the water unsafe, so none of these are acceptable.

Final Answer: nil (shall not be detectable) $\Rightarrow \boxed{\mathrm{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept – intensity from an IDF relation: An intensity–duration–frequency (IDF) curve gives the design rainfall intensity for a chosen storm duration.

Step 1 – write the IDF relation: $i = \dfrac{750}{t+15}$, with t in minutes.

Step 2 – substitute the duration: $i = \dfrac{750}{10+15}$

Step 3 – add the terms in the denominator: $i = \dfrac{750}{25}$

Step 4 – divide: $i = 30$ mm/hr

Final Answer: $i = 30$ mm/hr $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q7

Q8.

Solution

Concept – rational formula for peak runoff: $Q = \dfrac{C\,i\,A}{360}$ gives Q in m^3/s when i is in mm/hr and A in hectares.

Step 1 – list the data: $C = 0.5$, $i = 72$ mm/hr, $A = 50$ ha.

Step 2 – form the numerator: $C\,i\,A = 0.5 \times 72 \times 50$

Step 3 – multiply step by step: $0.5 \times 72 = 36$

$36 \times 50 = 1800$

Step 4 – divide by 360**:** $Q = \dfrac{1800}{360}$

$Q = 5\ \text{m}^3/\text{s}$

Final Answer: $Q = 5\ \text{m}^3/\text{s} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q8

Q9.

Solution

Concept – aquifer transmissivity: Transmissivity is the rate at which water is transmitted through the full saturated thickness per unit width, $T = K\,b$.

Step 1 – list the data: $K = 15$ m/day, $b = 10$ m.

Step 2 – substitute into $T = K\,b$**:** $T = 15 \times 10$

Step 3 – evaluate: $T = 150\ \text{m}^2/\text{day}$

Step 4 – check the units: $(\mathrm{m/day}) \times (\mathrm{m}) = \mathrm{m^2/day}$, the correct unit for transmissivity.

Final Answer: $T = 150\ \mathrm{m^2/day} \Rightarrow \boxed{\mathrm{B}}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept – seepage (pore) velocity: The Darcy velocity is an apparent velocity over the whole cross-section; the actual velocity through the pores is larger by the factor $1/n$, so $v_s = \dfrac{K\,i}{n}$.

Step 1 – list the data: $K = 20$ m/day, $i = 0.005$, $n = 0.25$.

Step 2 – compute the Darcy velocity: $v = K\,i = 20 \times 0.005 = 0.1$ m/day

Step 3 – divide by the porosity: $v_s = \dfrac{0.1}{0.25}$

Step 4 – evaluate: $v_s = 0.4$ m/day

Final Answer: $v_s = 0.4\ \mathrm{m/day} \Rightarrow \boxed{\mathrm{D}}$

Answer: (D) Go Back to Q10

Q11.

Solution

Concept – linearity of the unit hydrograph: A unit hydrograph corresponds to 1 cm of rainfall excess. For P cm of excess over the same duration, every ordinate is multiplied by P (principle of proportionality).

Step 1 – list the data: Unit-hydrograph peak $= 25\ \mathrm{m^3/s}$, rainfall excess $P = 3$ cm.

Step 2 – apply the scaling factor: $Q_{peak} = P \times$ (unit peak)

Step 3 – substitute: $Q_{peak} = 3 \times 25$

Step 4 – evaluate: $Q_{peak} = 75\ \mathrm{m^3/s}$

Final Answer: $Q_{peak} = 75\ \mathrm{m^3/s} \Rightarrow \boxed{\mathrm{B}}$

Answer: (B) Go Back to Q11

Q12.

Solution

Concept – runoff volume from runoff depth: The volume of runoff equals the runoff depth spread uniformly over the catchment area, $V = \text{depth} \times \text{area}$.

Step 1 – convert the runoff depth to metres: $5 \text{ cm} = 0.05 \text{ m}$

Step 2 – convert the area to square metres: $10 \text{ km}^2 = 10 \times 10^6 = 1 \times 10^7 \text{ m}^2$

Step 3 – multiply depth by area: $V = 0.05 \times 1 \times 10^7$

Step 4 – evaluate: $V = 5 \times 10^5 \text{ m}^3$

Final Answer: $V = 5 \times 10^5 \text{ m}^3 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q12

Q13.

Solution

Concept – geometric-increase method of population forecast: In the geometric method the population grows by a constant percentage each decade, so $P_n = P_0 (1 + r)^n$.

Step 1 – list the data: $P_0 = 60000$, $r = 20\% = 0.20$, one decade ahead so $n = 1$.

Step 2 – write the growth factor: $1 + r = 1 + 0.20 = 1.20$

Step 3 – apply the formula for one decade: $P = 60000 \times 1.20$

Step 4 – evaluate: $P = 72000$

Final Answer: $P = 72{,}000 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept – average daily water demand: Total demand equals per-capita demand times population.

Step 1 – list the data: Per-capita demand $= 150$ L/person/day, population $= 200000$.

Step 2 – multiply: Demand $= 150 \times 200000$

Step 3 – evaluate in litres per day: Demand $= 30{,}000{,}000$ L/day

Step 4 – convert to million litres per day: Demand $= \dfrac{30{,}000{,}000}{10^6} = 30 \text{ MLD}$

Final Answer: 30 MLD $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept – surface overflow rate governs tank area: The plan area of a sedimentation tank is set by the design surface overflow rate, $A = \dfrac{Q}{SOR}$.

Step 1 – list the data: $Q = 6000$ m^3/day, $SOR = 40$ m^3/m^2/day.

Step 2 – write the design relation: $A = \dfrac{Q}{SOR}$

Step 3 – substitute the values: $A = \dfrac{6000}{40}$

Step 4 – evaluate: $A = 150$ m^2

Final Answer: $A = 150$ m$^2 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q15

Q16.

Solution

Concept – Stokes' settling velocity: For a small discrete particle in the laminar range, $v_s = \dfrac{g(\rho_s - \rho)d^2}{18\mu}$.

Step 1 – list the data: $g = 9.81$ m/s^2, $(\rho_s - \rho) = 1600$ kg/m^3, $d = 1 \times 10^{-5}$ m, $\mu = 1.0 \times 10^{-3}$ Pa·s.

Step 2 – square the diameter: $d^2 = (1 \times 10^{-5})^2 = 1 \times 10^{-10}$ m^2

Step 3 – form the numerator: $g(\rho_s - \rho)d^2 = 9.81 \times 1600 \times 1 \times 10^{-10}$

$= 15696 \times 10^{-10} = 1.5696 \times 10^{-6}$

Step 4 – form the denominator: $18\mu = 18 \times 1.0 \times 10^{-3} = 1.8 \times 10^{-2}$

Step 5 – divide: $v_s = \dfrac{1.5696 \times 10^{-6}}{1.8 \times 10^{-2}}$

$v_s = 8.72 \times 10^{-5}$ m/s

Final Answer: $v_s \approx 8.7 \times 10^{-5}$ m/s $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q16

Q17.

Solution

Concept – hydraulic detention time: The detention time is the average period a parcel of water spends in the tank, $t_d = \frac{V}{Q}$.

Step 1 – list the data: $V = 900$ m^3, $Q = 150$ m^3/hr.

Step 2 – substitute into $t_d = V/Q$: $t_d = \frac{900}{150}$

Step 3 – evaluate: $t_d = 6$ hr

Final Answer: $t_d = 6$ hr $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q17

Q18.

Solution

Concept – filter throughput from filtration rate: The flow a filter can treat equals the filtration rate multiplied by the filter plan area, $Q = (\text{rate}) \times A$.

Step 1 – list the data: Filtration rate $= 5$ m^3/m^2/hr, area $A = 40$ m^2.

Step 2 – multiply: $Q = 5 \times 40$

Step 3 – evaluate: $Q = 200$ m^3/hr

Step 4 – check the units: $(\text{m}^3/\text{m}^2/\text{hr}) \times (\text{m}^2) = \text{m}^3/\text{hr}$, a volumetric flow.

Final Answer: $Q = 200$ m^3/hr $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept – BOD-removal efficiency: The removal efficiency is the fraction of the incoming BOD that the unit removes, $\eta = \frac{S_0 - S_e}{S_0} \times 100$.

Step 1 – list the data: Influent BOD $S_0 = 250$ mg/L, effluent BOD $S_e = 50$ mg/L.

Step 2 – compute the BOD removed: $S_0 - S_e = 250 - 50 = 200$ mg/L

Step 3 – divide by the influent BOD: $\eta = \frac{200}{250}$

Step 4 – convert to a percentage: $\eta = 0.8 \times 100 = 80\%$

Final Answer: $\eta = 80\% \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q19

Q20.

Solution

Concept – microbiology of the UASB reactor: A UASB reactor is an anaerobic treatment system in which wastewater flows upward through a dense blanket of sludge granules.

Step 1 – identify the environment: The reactor is sealed and oxygen-free, so only anaerobic organisms thrive.

Step 2 – identify the key organisms: Methanogenic (anaerobic) bacteria break down the organics and release methane-rich biogas that is collected at the top.

Why the other options are wrong:

- A, aerobic bacteria: need dissolved oxygen, which is absent here.
- C, algae: require light and are irrelevant to a covered reactor.
- D, nitrifying bacteria: are aerobic autotrophs, not the agents of anaerobic digestion.

Final Answer: anaerobic methanogenic bacteria $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q20

Q21.

Solution

Concept – first-order BOD exertion: The BOD exerted up to time t follows $y_t = L_0\left(1 - e^{-kt}\right)$.

Step 1 – list the data: $L_0 = 250$ mg/L, $k = 0.20$ day^{-1}, $t = 5$ days.

Step 2 – form the exponent: $kt = 0.20 \times 5 = 1.0$

Step 3 – evaluate the exponential: $e^{-1.0} = 0.3679$

Step 4 – form the bracket: $1 - 0.3679 = 0.6321$

Step 5 – multiply by the ultimate BOD: $y_5 = 250 \times 0.6321$

$y_5 = 158.0$ mg/L

Final Answer: $y_5 \approx 158$ mg/L $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept – food-to-microorganism ratio: The F/M ratio compares the applied organic load with the mass of microorganisms in the tank, $F/M = \dfrac{Q\,S_0}{V\,X}$.

Step 1 – list the data: $Q = 2000$ m^3/day, $S_0 = 250$ mg/L, $V = 1000$ m^3, $X = 2500$ mg/L.

Step 2 – form the numerator: $Q\,S_0 = 2000 \times 250 = 500000$

Step 3 – form the denominator: $V\,X = 1000 \times 2500 = 2500000$

Step 4 – divide: $F/M = \dfrac{500000}{2500000}$

Step 5 – evaluate: $F/M = 0.2$ per day

Final Answer: $F/M = 0.2$ per day $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q22

Q23.

Solution

Concept – hydraulic retention time: The HRT is the average time the liquid stays in the reactor, $HRT = \dfrac{V}{Q}$.

Step 1 – list the data: $V = 1200$ m^3, $Q = 4800$ m^3/day.

Step 2 – compute the HRT in days: $HRT = \dfrac{1200}{4800} = 0.25$ day

Step 3 – convert to hours: $HRT = 0.25 \times 24$

Step 4 – evaluate: $HRT = 6$ hr

Final Answer: $HRT = 6$ hr $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q23

Q24.

Solution

Concept – complete-mixing mass balance: When two streams mix completely, the resulting concentration is the flow-weighted average, $C_{mix} = \dfrac{Q_w C_w + Q_r C_r}{Q_w + Q_r}$.

Step 1 – list the data: $Q_w = 2$ m^3/s, $C_w = 200$ mg/L, $Q_r = 8$ m^3/s, $C_r = 10$ mg/L.

Step 2 – compute the waste load: $Q_w C_w = 2 \times 200 = 400$

Step 3 – compute the river load: $Q_r C_r = 8 \times 10 = 80$

Step 4 – add the loads: $400 + 80 = 480$

Step 5 – add the flows: $Q_w + Q_r = 2 + 8 = 10$

Step 6 – divide: $C_{mix} = \frac{480}{10} = 48$ mg/L

Final Answer: $C_{mix} = 48$ mg/L $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q24

Q25.

Solution

Concept – terminal settling velocity in air: Neglecting the air density, a dust particle in the laminar regime settles at $v_t = \frac{g\,\rho_p\,d^2}{18\mu}$.

Step 1 – list the data: $g = 9.81$ m/s^2, $\rho_p = 2500$ kg/m^3, $d = 3 \times 10^{-5}$ m, $\mu = 1.8 \times 10^{-5}$ Pa·s.

Step 2 – square the diameter: $d^2 = (3 \times 10^{-5})^2 = 9 \times 10^{-10}$ m^2

Step 3 – form the numerator: $g\,\rho_p\,d^2 = 9.81 \times 2500 \times 9 \times 10^{-10}$

$= 24525 \times 9 \times 10^{-10} = 2.207 \times 10^{-5}$

Step 4 – form the denominator: $18\mu = 18 \times 1.8 \times 10^{-5} = 3.24 \times 10^{-4}$

Step 5 – divide: $v_t = \frac{2.207 \times 10^{-5}}{3.24 \times 10^{-4}}$

$v_t = 0.0681$ m/s

Final Answer: $v_t \approx 0.068$ m/s $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q25

Q26.

Solution

Concept – collection efficiency: The removal efficiency of a control device is the fraction of the inlet loading it captures, $\eta = \frac{C_{in} - C_{out}}{C_{in}} \times 100$.

Step 1 – list the data: $C_{in} = 12$ g/m^3, $C_{out} = 0.24$ g/m^3.

Step 2 – compute the loading removed: $C_{in} - C_{out} = 12 - 0.24 = 11.76$ g/m^3

Step 3 – divide by the inlet loading: $\eta = \frac{11.76}{12}$

Step 4 – convert to a percentage: $\eta = 0.98 \times 100 = 98\%$

Final Answer: $\eta = 98\% \Rightarrow \boxed{\text{C}}$

$\boxed{\text{Answer: (C)}}$ Go Back to Q26

Q27.

Solution

Concept – Gaussian plume, ground-level centre-line: For a continuous ground-level source, the centre-line concentration is $C = \dfrac{Q}{\pi\, \sigma_y\, \sigma_z\, u}$.

Step 1 – list the data: $Q = 80$ g/s, $u = 4$ m/s, $\sigma_y = 20$ m, $\sigma_z = 10$ m.

Step 2 – form the denominator: $\pi\, \sigma_y\, \sigma_z\, u = \pi \times 20 \times 10 \times 4$

Step 3 – multiply the numbers: $20 \times 10 \times 4 = 800$, and $\pi \times 800 = 2513.3$

Step 4 – divide: $C = \dfrac{80}{2513.3} = 0.03183$ g/m^3

Step 5 – convert to mg/m^3: $C = 0.03183 \times 1000 = 31.8$ mg/m^3

Final Answer: $C \approx 31.8$ mg/m^3 $\Rightarrow \boxed{\text{A}}$

$\boxed{\text{Answer: (A)}}$ Go Back to Q27

Q28.

Solution

Concept – wet flue-gas desulphurisation (FGD): In wet FGD the SO_2-laden gas is scrubbed with an alkaline limestone or lime slurry.

Step 1 – identify the transfer step: SO_2 is a soluble acidic gas, so it is absorbed from the gas into the alkaline liquid.

Step 2 – identify the reaction: The dissolved SO_2 reacts with the calcium base to form insoluble calcium sulphite ($CaSO_3$), which is oxidised to calcium sulphate ($CaSO_4$, gypsum) and removed as sludge.

Why the other options are wrong:

- A, catalytic reduction to nitrogen: describes NO_x control (SCR), not SO_2 capture.
- B, electrostatic charging: is how an ESP captures particulates, not a gas.
- D, condensation: is impractical for a dilute gaseous pollutant at stack temperatures.

Final Answer: absorption in the alkaline slurry forming $CaSO_3/CaSO_4$ $\Rightarrow \boxed{\text{C}}$

$\boxed{\text{Answer: (C)}}$ Go Back to Q28

Q29.

Solution

Concept – Selective Catalytic Reduction of NO_x: SCR chemically reduces oxides of nitrogen to nitrogen and water over a catalyst using an injected reducing agent.

Step 1 – identify the reagent: Ammonia (NH_3), often supplied as aqueous ammonia or generated from urea, is injected into the flue gas.

Step 2 – state the overall reaction idea: $4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$, converting NO_x to harmless nitrogen and water.

Why the other options are wrong:

- B, chlorine and C, ozone: are oxidants, not the reductant used in SCR.
- D, methane: is used in some high-temperature reburning schemes, not in catalytic SCR, which relies on ammonia.

Final Answer: ammonia (NH_3) or urea $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q29

Q30.

Solution

Concept – converting ppm by volume to mass concentration: At the stated conditions, $\mu g/m^3 = \text{ppm} \times \dfrac{M}{24.45} \times 1000$.

Step 1 – list the data: ppm $= 0.05$, $M = 46$, molar volume $= 24.45$ L.

Step 2 – substitute: $\mu g/m^3 = 0.05 \times \dfrac{46}{24.45} \times 1000$

Step 3 – form the numerator ppm $\times M \times 1000$: $0.05 \times 46 \times 1000 = 2300$

Step 4 – divide by 24.45: $\dfrac{2300}{24.45} = 94.07$

Step 5 – round: $\approx 94\ \mu g/m^3$

Final Answer: $\approx 94\ \mu g/m^3 \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q30

Q31.

Solution

Concept – adding equal decibel sources: Decibels add on an energy basis; for n equal sources of level L_1, the total is $L = L_1 + 10\log_{10}(n)$.

Step 1 – list the data: $L_1 = 65$ dB, $n = 3$.

Step 2 – compute the addition term: $10\log_{10}(3) = 10 \times 0.4771 = 4.77$ dB

Step 3 – add to the single-source level: $L = 65 + 4.77$

Step 4 – evaluate: $L = 69.8$ dB

Step 5 – note the reason it is not 195: Levels are logarithmic, so they are combined by energy addition, never by simple arithmetic (3×65).

Final Answer: $L \approx 69.8$ dB $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q31

Q32.

Solution

Concept – combining two unequal decibel levels: $L = 10\log_{10}\left(10^{L_1/10} + 10^{L_2/10}\right)$.

Step 1 – list the data: $L_1 = 85$ dB, $L_2 = 79$ dB.

Step 2 – convert each level to relative energy: $10^{8.5} = 3.162 \times 10^8$

$10^{7.9} = 0.794 \times 10^8$

Step 3 – add the energies: $3.162 \times 10^8 + 0.794 \times 10^8 = 3.956 \times 10^8$

Step 4 – take the logarithm: $\log_{10}(3.956 \times 10^8) = 8.597$

Step 5 – multiply by 10: $L = 85.97 \approx 86$ dB

Final Answer: $L \approx 86$ dB $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q32

Q33.

Solution

Concept – inverse-square attenuation of a point source: In a free field the level drops by 6 dB each time the distance from a point source doubles.

Step 1 – count the doublings from 5 m to 20 m: $5 \to 10$ m is one doubling; $10 \to 20$ m is a second doubling, so two doublings in all.

Step 2 – compute the total reduction: $2 \times 6 = 12$ dB

Step 3 – subtract from the reference level: $L = 100 - 12$

Step 4 – evaluate: $L = 88$ dB

Final Answer: $L = 88$ dB $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q33

Q34.

Solution

Concept – controlling structure-borne (vibration) noise: Structure-borne sound is carried as mechanical vibration through the building fabric, so it is cut by breaking the vibration path at the source.

Step 1 – identify the transmission path: Vibration passes from the machine into the floor and structural connections.

Step 2 – interrupt that path: Mounting the machine on resilient isolators (springs, rubber/elastomeric pads) decouples it from the structure, so far less vibration is transmitted.

Why the other options are wrong:

- A: raising the acoustic power makes the problem worse.
- C: surface paint has negligible effect on vibration transmission.
- D: changing frequency alone does not isolate the vibration and may worsen resonance.

Final Answer: resilient vibration-isolation mounts $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept – total MSW generation: Total daily waste equals the per-capita generation rate times the population.

Step 1 – list the data: Population $= 500000$, rate $= 0.4$ kg/person/day.

Step 2 – multiply: Mass $= 500000 \times 0.4 = 200000$ kg/day

Step 3 – convert kilograms to tonnes: Mass $= \dfrac{200000}{1000} = 200$ tonnes/day

Final Answer: 200 tonnes/day $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q35

Q36.

Solution

Concept – landfill airspace from compacted density: The volume occupied equals the mass of waste divided by its in-place (compacted) density, $V = \frac{M}{\rho}$.

Step 1 – find the annual mass of waste: $M = 150 \times 365 = 54750$ tonnes/year

Step 2 – convert to kilograms: $M = 54750 \times 1000 = 5.475 \times 10^7$ kg

Step 3 – divide by the in-place density: $V = \frac{5.475 \times 10^7}{600}$

Step 4 – evaluate: $V = 91250 \text{ m}^3$

Final Answer: $V \approx 91{,}250 \text{ m}^3 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q36

Q37.

Solution

Concept – mass of a composition fraction: The mass of any component equals its percentage share times the total waste mass.

Step 1 – list the data: Total MSW $= 200$ tonnes/day, organic fraction $= 60\%$.

Step 2 – convert the percentage to a fraction: $60\% = 0.60$

Step 3 – multiply by the total: Organic mass $= 0.60 \times 200$

Step 4 – evaluate: Organic mass $= 120$ tonnes/day

Final Answer: 120 tonnes/day $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q37

Q38.

Solution

Concept – RCRA characteristic hazardous waste: Under RCRA, a waste is hazardous by characteristic if it shows any of four properties: ignitability, corrosivity, reactivity or toxicity.

Step 1 – list the four defining characteristics: Ignitability, corrosivity, reactivity, toxicity.

Step 2 – check each option against the list: Ignitability (A), reactivity (C) and toxicity (D) are all on the list.

Step 3 – identify the outlier: Biodegradability is not a hazardous-waste characteristic; in fact readily biodegradable material is generally desirable, not hazardous.

Final Answer: biodegradability $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q38

Q39.

Solution

Concept – ash residue from incineration: The ash produced equals the stated percentage of the input mass.

Step 1 – list the data: Input MSW $= 200$ tonnes/day, ash fraction $= 25\%$.

Step 2 – convert the percentage to a fraction: $25\% = 0.25$

Step 3 – multiply by the input mass: Ash $= 0.25 \times 200$

Step 4 – evaluate: Ash $= 50$ tonnes/day

Final Answer: 50 tonnes/day $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q39

Q40.

Solution

Concept – RCRA Subtitle C landfill base barrier: A hazardous-waste landfill must both stop leachate escaping and collect the leachate that forms.

Step 1 – recall the containment requirement: The base uses a double liner, with two low-permeability composite barriers, so that any leak through the top liner is caught by the bottom liner.

Step 2 – recall the drainage requirement: A leachate collection and removal system sits above and between the liners to drain the accumulated leachate for treatment.

Why the other options are wrong:

- B, C, D: an unlined or single thin-clay base allows leachate to migrate to groundwater and is not permitted for hazardous waste.

Final Answer: double composite liner with a leachate collection and removal system $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q40

Q41.

Solution

Concept – Leopold interaction matrix: The Leopold matrix is a classic EIA tool that arrays project actions against environmental components in a grid.

Step 1 – recall its structure: Columns list the proposed actions and rows list the affected environmental factors, giving a cell for every possible interaction.

Step 2 – recall how cells are scored: Each significant interaction cell is split diagonally and scored for magnitude and importance of the impact.

Why the other options are wrong:

- A, checklist: simply lists items to consider, with no action-versus-factor grid.
- B, overlay/GIS: uses superimposed maps for spatial impacts.
- D, network method: traces cause-effect chains, not a scored grid.

Final Answer: Leopold (interaction) matrix $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q41

Q42.

Solution

Concept – public consultation in EIA: The EIA Notification 2006 requires that affected people be consulted on the draft EIA before clearance.

Step 1 – identify the stage: The public hearing (public consultation) is where the draft EIA report and executive summary are presented and the public can raise concerns.

Step 2 – note its place in the sequence: It comes after screening and scoping and before the appraisal and final decision.

Why the other options are wrong:

- B, screening: decides whether a full EIA is needed.
- C, scoping: fixes the terms of reference and issues to study.
- D, monitoring: happens after the project is operational.

Final Answer: public hearing (public consultation) $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q42

Q43.

Solution

Concept – emission from an emission factor: The daily emission equals the emission factor (mass of pollutant per unit product) times the daily production.

Step 1 – list the data: Emission factor $= 1.5$ kg CO_2/kg product, production $= 800$ kg/day.

Step 2 – multiply: $CO_2 = 1.5 \times 800$

Step 3 – evaluate in kilograms: $CO_2 = 1200$ kg/day

Step 4 – convert to tonnes: $CO_2 = \frac{1200}{1000} = 1.2$ tonnes/day

Final Answer: 1.2 tonnes/day $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q43

Q44.

Solution

Concept – scoping in EIA: Scoping is the stage that decides which impacts matter enough to be assessed in detail.

Step 1 – recall the purpose: It identifies the key issues and significant impacts and sets the terms of reference (ToR) that the EIA study must address.

Step 2 – note the benefit: By focusing effort on the important impacts, scoping avoids wasting resources on trivial ones.

Why the other options are wrong:

- A, screening: only decides whether an EIA is required at all.
- B, public hearing: gathers public views on the draft report, later in the cycle.
- D, auditing: is a post-project check of performance.

Final Answer: scoping $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q44

Q45.

Solution

Concept – the Paris Agreement: The Paris Agreement is the 2015 climate treaty adopted under the UNFCCC.

Step 1 – recall its central goal: To hold the increase in global average temperature to well below $2°C$ above pre-industrial levels and to pursue efforts to limit it to $1.5°C$.

Step 2 – recall its mechanism: Countries submit Nationally Determined Contributions (NDCs) to cut greenhouse-gas emissions.

Why the other options are wrong:

- B, Montreal Protocol: protects the ozone layer by phasing out CFCs.
- C, Ramsar Convention: protects wetlands.
- D, Basel Convention: controls transboundary movement of hazardous wastes.

Final Answer: Paris Agreement $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q45

Q46.

Solution

Concept – post-project monitoring and auditing: After a project is commissioned, its actual environmental performance must be tracked and compared with predictions.

Step 1 – recall the purpose of monitoring: Environmental monitoring measures the real impacts once the project operates.

Step 2 – recall the purpose of auditing: Environmental auditing compares those measured impacts with the ones predicted in the EIA and checks that mitigation measures are effective.

Why the other options are wrong:

- A, screening and B, scoping: are early, pre-project steps.
- C, impact prediction: is a forecasting step done during the EIA study, before the project is built.

Final Answer: monitoring and auditing $\Rightarrow \boxed{D}$

$\boxed{\text{Answer: (D)}}$ Go Back to Q46

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	D	3	C	4	A	5	C
6	D	7	C	8	C	9	B	10	D
11	B	12	A	13	A	14	B	15	B
16	C	17	D	18	B	19	D	20	B
21	A	22	B	23	C	24	B	25	B
26	C	27	A	28	C	29	A	30	D
31	A	32	D	33	D	34	B	35	D
36	C	37	D	38	B	39	B	40	A
41	C	42	A	43	A	44	C	45	A
46	D								