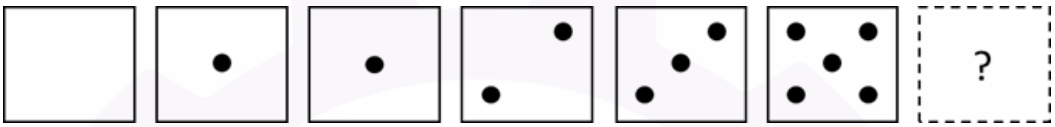
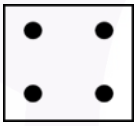
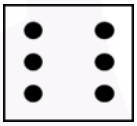
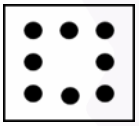
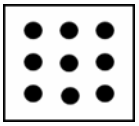
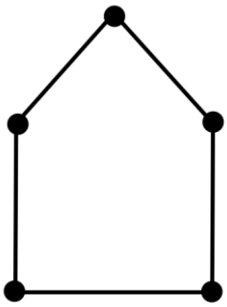
General Aptitude (GA)

Q.1 – Q.5 Carry ONE mark Each

Q.1	Suresh said, “I did it yesterday.” Which one of the following options is the correct form of this sentence in indirect speech?
(A)	Suresh said that I did it yesterday.
(B)	Suresh says I did it yesterday.
(C)	Suresh says that he did it the day before.
(D)	Suresh said that he had done it the day before.

Q.2	To continue the sequence of tiles shown, the tile indicated by the question mark should be 
(A)	
(B)	
(C)	
(D)	

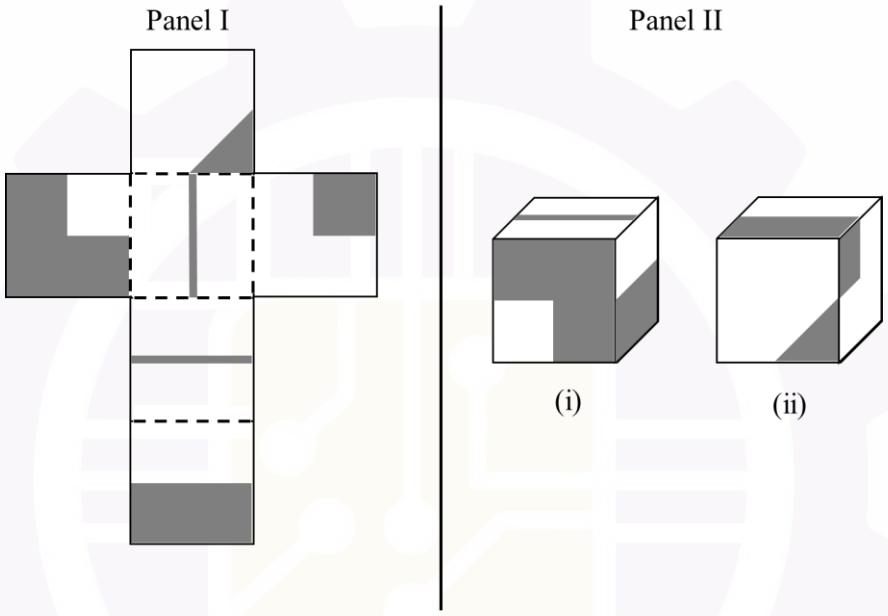
Q.3	Consider an art gallery whose walkways are shown as lines in the diagram. A black dot represents a junction of two walkways. A guard may be placed at a junction to watch over the walkways that join at that junction. The minimum number of guards needed to watch all the walkways is _____. 
(A)	2
(B)	3
(C)	4
(D)	5

Q.4	The 2nd of June is a Thursday in a certain year. Which day of the week is the 3rd of July in that year?
(A)	Thursday
(B)	Friday
(C)	Saturday
(D)	Sunday

Q.5	A coin with heads facing up is shown as (H) and a coin with tails facing up is shown as (T) . Six coins are placed in the Starting Arrangement, as shown in the figure below. A "step" is defined as interchanging a pair of adjacent coins without flipping them. The minimum number of steps needed to go from the Starting Arrangement to the Final Arrangement, as shown in the figure, is _____. Starting Arrangement  Final Arrangement 
(A)	3
(B)	6
(C)	9
(D)	12

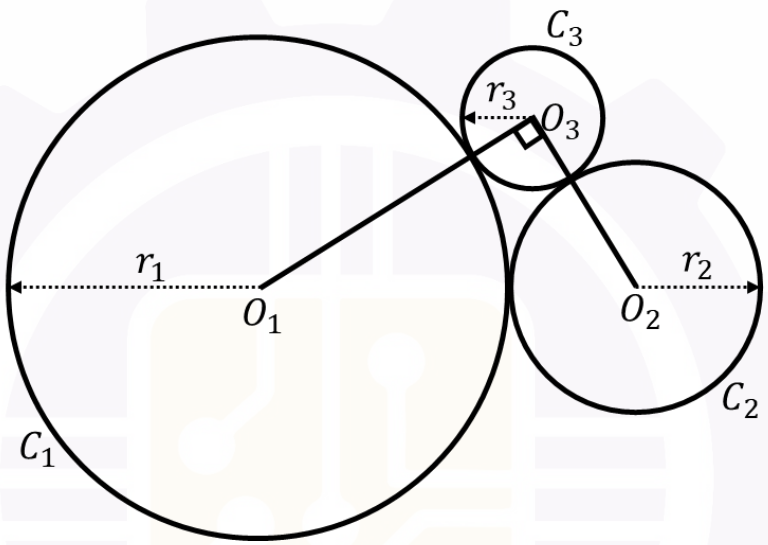
Q.6 – Q.10 Carry TWO marks Each

Q.6	Exacerbate : Mitigate :: _____ Choose the option with the correct pair of words to fill the blank.
(A)	Aggravate : Alleviate
(B)	Alleviate : Precipitate
(C)	Aggravate : Precipitate
(D)	Emancipate : Exonerate

Q.7	A paper shown in Panel I is folded along the dashed lines (- - -) to construct a cube. The shaded regions shown in Panel I appear on the outer surface of the cube. Referring to cubes shown in Panel II, which one of the options is correct? 
(A)	Only (i) can correspond to the unfolded cube in Panel I.
(B)	Only (ii) can correspond to the unfolded cube in Panel I.
(C)	Both (i) and (ii) can correspond to the unfolded cube in Panel I.
(D)	Neither (i) nor (ii) can correspond to the unfolded cube in Panel I.

Q.8	In a population, patients who have high cholesterol also have high blood-pressure (BP). Some patients with high BP also have diabetes. There are no patients who have both high cholesterol and diabetes. Furthermore, 1. the total number of patients with at least one of these conditions is 75, 2. the number of patients with high cholesterol is 10, 3. the number of patients with high BP is 45, and 4. the number of patients with only high BP and no other conditions is 20. Then the number of patients who have both diabetes and high BP is _____
(A)	0
(B)	15
(C)	20
(D)	10

Q.9	Four people P, Q, R, and S, of different ages, make the following observations. P – I am younger than S. Q – I am neither the youngest nor the oldest. R – P is older than me. Based on these observations, the youngest person is _____.
(A)	P
(B)	Q
(C)	R
(D)	S

Q.10	Circles C_1, C_2, and C_3, with centers O_1, O_2, and O_3 , and radii r_1 , r_2, and r_3, respectively, touch each other as shown in the following figure. Given $r_1 = 2$ cm, $r_2 = 1$ cm and the angle $\angle O_1O_3O_2$ is 90°, r_3 = _____ cm. 
(A)	$\frac{1}{2}(-3+\sqrt{17})$
(B)	$\frac{1}{2}(3+\sqrt{17})$
(C)	$\frac{1}{2}(-2+\sqrt{17})$
(D)	$\frac{1}{2}(-3+2\sqrt{17})$

Q.11 – Q.35 Carry ONE mark Each

Q.11	If $2X + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$, then X is _____.
(A)	$\begin{bmatrix} 2 & 5 \\ 5 & 3 \end{bmatrix}$
(B)	$\begin{bmatrix} -1 & 3 \\ 2 & -1 \end{bmatrix}$
(C)	$\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$
(D)	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Q.12	The correct integral of $\int \frac{\sin x}{\sqrt{1+\cos x}} dx$ (assuming integral constant as c) is _____.
(A)	$-2\sqrt{2}\ \sin\frac{x}{2} + c$
(B)	$-2\sqrt{2}\cos\frac{x}{2} + c$
(C)	$-\frac{1}{\sqrt{2}}\cos\frac{x}{2} + c$
(D)	$-\frac{1}{\sqrt{2}}\sin\frac{x}{2} + c$
Q.13	Given $f(x) = 3x^4 + 4x^3 - 12x^2 + 6$, the minimum value of $f(x)$ is _____.
(A)	-6
(B)	-36
(C)	-26
(D)	-46

Q.14	A box contains 26 cards with all English alphabets from A to Z. The probability of randomly choosing the card with either ‘E’ or ‘S’ from this box is _____.
(A)	2/26
(B)	1/26
(C)	3/26
(D)	4/26

Q.15	Which ONE of the following options is the CORRECT formula for Chi-Square (χ^2) test? Given, $O_1, O_2, \ldots . O_n$ are the observed values, $E_1, E_2, \ldots . E_n$ are the corresponding expected values, $\bar{O}$ is the mean of observed values, , n is the number of observations, μ is the mean of $E_i, i = 1, \ldots, n$, σ_o is the standard deviation of observed values, and σ_E is the standard deviation of expected values $E_i, i = 1, \ldots, n$.
(A)	$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$
(B)	$\chi^2 = \sqrt{\frac{\sum_{i=1}^{n}(O_i - \bar{O})}{n-1}}$
(C)	$\chi^2 = \frac{\bar{O} - \mu}{\sigma_o \sqrt{n}}$
(D)	$\chi^2 = \frac{(\sigma_o)^2}{(\sigma_E)^2}$

Q.16	In the reversible reaction shown below, k_f is the forward reaction rate constant and k_r is the reverse reaction rate constant. The CORRECT expression representing the reaction equilibrium constant is _____. $A + B \underset{k_r}{\overset{k_f}{\rightleftharpoons}} C + D$
(A)	$k_f + k_r$
(B)	$k_f \times k_r$
(C)	$\frac{k_f}{k_r}$
(D)	$\frac{k_r}{k_f}$

Q.17	The major class of enzymes catalyzing the cleavage of $C-C$, $C-O$, $C-N$, or other bonds by elimination, leaving double bonds or rings, or addition of groups to double bonds in any biochemical reactions is _____.
(A)	lyases
(B)	transferases
(C)	oxidoreductases
(D)	hydrolases
Q.18	Malaria is caused by pathogenic _____.
(A)	bacteria
(B)	fungi
(C)	protozoa
(D)	viruses

Q.19	Consider the following statements regarding the pressure measured at a point in a fluid. S1: Absolute pressure is gauge pressure plus atmospheric pressure. S2: Gauge pressure is measured by considering absolute zero pressure as datum. S3: Absolute pressure is measured by considering atmospheric pressure as datum. S4: Vacuum pressure is negative pressure obtained by subtracting absolute pressure from atmospheric pressure. Which ONE of the following options lists all the TRUE statements?
(A)	S1 and S2
(B)	S2 and S3
(C)	S1 and S4
(D)	S1, S2, and S4

Q.20 Which ONE of the following options CORRECTLY matches the processes associated with the growth condition given in the table?

Process	Growth Condition
(P) Activated sludge process	(i) Anaerobic suspended growth
(Q) Anaerobic filter	(ii) Anaerobic attached growth
(R) Trickling filter	(iii) Aerobic suspended growth
(S) Anaerobic digestion	(iv) Aerobic attached growth

(A) (P) - (ii); (Q) - (iii); (R) - (iv); (S) - (i)

(B) (P) - (iii); (Q) - (ii); (R) - (iv); (S) - (i)

(C) (P) - (iii); (Q) - (i); (R) - (iv); (S) - (ii)

(D) (P) - (iv); (Q) - (iii); (R) - (ii); (S) - (i)

Q.21	In the design of air pollution control devices, size of the particles that are removed with 50% efficiency is termed as _____.
(A)	mean size
(B)	mode size
(C)	cut size
(D)	median size
Q.22	The general atmospheric composition of gases in the decreasing order is _____.
(A)	$N_2 > O_2 > CO > CO_2 > NH_3$
(B)	$N_2 > O_2 > CO_2 > CO > NH_3$
(C)	$N_2 > CO_2 > O_2 > NH_3 > CO$
(D)	$N_2 > CO_2 > NH_3 > CO > O_2$

Q.23	Which ONE of the following options is NOT a parameter as a part of proximate analysis of municipal solid waste?
(A)	Volatile matter
(B)	Ash content
(C)	Carbon to nitrogen ratio
(D)	Moisture content
Q.24	A species whose impact on an ecosystem is disproportionately large in comparison to its population is called _____ species.
(A)	dominant
(B)	keystone
(C)	apex predator
(D)	endemic

Q.25	Which ONE of the following principles is directly related to environmental compensation?
(A)	Intergenerational equity principle
(B)	Precautionary principle
(C)	Subsidiarity principle
(D)	Polluter-pay principle
Q.26	As per the United Nations General Assembly resolution adopted in 2015 “Transforming Our World: The 2030 Agenda for Sustainable Development”, the number of sustainable development goals (SDGs) is _____.
(A)	4
(B)	15
(C)	17
(D)	11

Q.27 Which ONE of the following options CORRECTLY matches the ISO series with their usages in environmental management system (EMS) given in the table?

ISO Series	Environmental Management System
(P) ISO 14001	(i) Environmental labeling
(Q) ISO 14020	(ii) Evaluation of environmental management system
(R) ISO 14040	(iii) Addressing environmental aspects of products
(S) ISO 14060	(iv) Life cycle assessment procedure

(A) (P) - (i); (Q) - (ii); (R) - (iii); (S) - (iv)

(B) (P) - (ii); (Q) - (i); (R) - (iv); (S) - (iii)

(C) (P) - (iii); (Q) - (iv); (R) - (i); (S) - (ii)

(D) (P) - (iv); (Q) - (iii); (R) - (ii); (S) - (i)

Q. 28	Which of the following chemical reactions is/are related to smog formation in the troposphere?
(A)	$CFCl_3 + h\upsilon \rightarrow CFCl_2 + Cl\cdot$
(B)	$CH_3O_2 + NO + O_2 \rightarrow HCHO + HO_2 + NO_2$
(C)	$NO_2 + O_2 + h\nu \overset{M}{\rightarrow} O_3 + NO$
(D)	$CH_4 + 8O_2 \rightarrow CO + H_2O + 2OH\cdot + 4O_3$
Q.29	Which of the following processes is/are primarily used to remove the organic matter in sludge?
(A)	Digestion
(B)	Incineration
(C)	Magnetic separation
(D)	Wet-oxidation

Q.30	Which of the following options is/are CORRECTLY listing the species included in Total Kjeldahl Nitrogen (TKN) estimation of an aqueous sample?
(A)	Ammoniacal $-$ N
(B)	Nitrite $-$ N
(C)	Nitrate $-$ N
(D)	Organic $-$ N
Q.31	Which of the following statements is/are CORRECT in the context of hazardous waste management and its risk assessment?
(A)	Risk is estimated based on the probability of an action occurring multiplied by the severity of damage.
(B)	High octanol water constant (K_{OW}) is indicative of lower accumulation of an organic chemical in body tissue.
(C)	Pump and treat is an example of contaminated groundwater remediation.
(D)	Biological treatment processes are never applied for hazardous waste management.

Q.32	Which of the following statements is/are TRUE about global warming?
(A)	Interception of incoming solar radiation by greenhouse gases in earth's atmosphere is responsible for global warming.
(B)	Interception of outgoing longwave radiation by greenhouse gases in earth's atmosphere is responsible for global warming.
(C)	Global warming can cause sea level rise.
(D)	Carbon dioxide is one of the major greenhouse gases in earth's atmosphere responsible for global warming.
Q.33	Which of the following options is/are directly associated with the steps involved in carrying out life cycle assessment (LCA)?
(A)	Determination of functional unit
(B)	Defining goal and scope
(C)	Defining technology readiness level
(D)	Listing out inventory of inputs and outputs

Q.34	A 6-hour rainfall of 6 cm at a station was found to have a return period of 40 years. The probability that a 6-hour rainfall of this or larger magnitude will occur at least once in 20 successive years at that station is _____ (*rounded off to three decimal places*).
Q.35	Water is flowing at the rate of 15 m^3/s through a rectangular channel of 5 m width. If the acceleration due to gravity (g) is 9.81 m/s^2, the critical velocity for the flow is _____m/s (*rounded off to three decimal places*).

Q.36 – Q.65 Carry TWO marks Each

Q.36	A first-order ordinary differential equation is given as follows: $$\frac{dy}{dx} + x^2 y = 0$$ Which ONE of the following options CORRECTLY represents the characteristics of this equation?
(A)	Linear, homogeneous, and exact
(B)	Nonlinear, nonhomogeneous, and exact
(C)	Linear, homogeneous, and non-exact
(D)	Nonlinear, nonhomogeneous, and non-exact

Q.37	Consider the matrix $A = \begin{bmatrix} 2 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & 4 & 10 \end{bmatrix}$. Which ONE of the following options CORRECTLY lists the eigenvalues of A?
(A)	$1;\ 8-\sqrt{37};\ -8+\sqrt{37}$
(B)	$2;\ 8-\sqrt{37};\ -8+\sqrt{37}$
(C)	$1;\ 8+\sqrt{37};\ 8-\sqrt{37}$
(D)	$2;\ 8+\sqrt{37};\ 8+\sqrt{37}$
Q.38	Which ONE of the following options is CORRECT with respect to sequential breakdown of deoxyribonucleic acid (DNA) into lower-molecular weight compounds?
(A)	Deoxyribonucleic acid → 2-deoxyribose → Nucleosides → Nucleotides
(B)	Deoxyribonucleic acid → 2-deoxyribose → Nucleotides → Nucleosides
(C)	Deoxyribonucleic acid → Nucleotides → Nucleosides → 2-deoxyribose
(D)	Deoxyribonucleic acid → Nucleosides → Nucleotides → 2-deoxyribose

Q.39 Which ONE of the following options CORRECTLY matches the Criteria Air Pollutants with measurement methods used in Continuous Ambient Air Quality Monitoring Stations (CAAQMS) operated by Central Pollution Control Board (CPCB) given in the table?

Criteria Air Pollutants	Measurement Methods
(P) Sulphur Dioxide (SO_2, in $\mu g/m^3$)	(i) Chemiluminescence
(Q) Nitrogen Dioxide (NO_2, in $\mu g/m^3$)	(ii) Non Dispersive Infra Red (NDIR) spectroscopy
(R) Particulate Matter ($PM_{2.5}$, in $\mu g/m^3$)	(iii) Ultraviolet fluorescence
(S) Carbon Monoxide (CO, in mg/m^3)	(iv) Beta attenuation

(A) (P) - (i); (Q) - (ii); (R) - (iii); (S) - (iv)

(B) (P) - (iv); (Q) - (iii); (R) - (ii); (S) - (i)

(C) (P) - (iii); (Q) - (i); (R) - (iv); (S) - (ii)

(D) (P) - (ii); (Q) - (iii); (R) - (i); (S) - (iv)

Q.40 Which ONE of the following options CORRECTLY matches the atmospheric stability conditions with plume conditions/ behaviours given in the table?

Atmospheric Stability Conditions	**Plume Conditions/ Behaviours**
(P) Strong instability	(i) Fanning plume
(Q) Neutral stability	(ii) Fumigation
(R) Surface inversion	(iii) Coning plume
(S) Aloft inversion	(iv) Looping plume

(A) (P) - (i); (Q) - (ii); (R) - (iii); (S) - (iv)

(B) (P) - (iv); (Q) - (iii); (R) - (i); (S) - (ii)

(C) (P) - (iii); (Q) - (iv); (R) - (ii); (S) - (i)

(D) (P) - (ii); (Q) - (i); (R) - (iv); (S) - (iii)

Q.41 The analysis of a water sample is shown in the table. The hardness of the water sample is _____ mg/L as $CaCO_3$.

Atomic weight (g/mol): Ca = 40; Mg = 24; Na = 23; Cl = 35.5; S = 32; O = 16; N = 14

Species	Concentration (mg/L)
Na^+	30
Ca^{2+}	10
Mg^{2+}	15
Cl^-	30
SO_4^{2-}	60
NO_3^-	5

(A) 87.5

(B) 62.5

(C) 25.5

(D) 47.5

Q.42	A system of linear equations is given as $AX = B$, where $A = \begin{bmatrix} 2 & 5 \\ 5 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 7 \\ 3 \end{bmatrix}$, and X is the solution vector. Which of the following statements is/are TRUE for this system?
(A)	Matrix A is skew-symmetric.
(B)	Eigenvalues of matrix A are real.
(C)	The system is homogeneous.
(D)	The system is singular.

Q.43	Which of the following statements is/are CORRECT based on the electron donor (ED) and electron acceptor (EA) used in various bacterial mediated reactions in wastewater treatment?
(A)	In anaerobic heterotrophic acid fermentation, organic compounds are used as both ED and EA.
(B)	In anaerobic heterotrophic methanogenesis, volatile fatty acids and CO_2 are used as ED and EA, respectively.
(C)	In denitrification process by denitrifiers, organic compounds and CO_2 are used as ED and EA, respectively.
(D)	In aerobic autotrophic iron oxidation, Fe(II) and O_2 are used as ED and EA, respectively.
Q.44	Which of the following options is/are TRUE about reverse osmosis process?
(A)	Reverse osmosis is used as a pretreatment for microfiltration process.
(B)	Ultrafiltration is used as a pretreatment for reverse osmosis process.
(C)	Membrane fouling occurs in microfiltration and reverse osmosis processes.
(D)	Concentration polarization does not occur in reverse osmosis process.

Q.45	Which of the following options is/are TRUE about coagulation-flocculation process?
(A)	Collision of colloidal particles due to their Brownian motion results in orthokinetic flocculation.
(B)	Collision of colloidal particles due to the external mixing of bulk medium results only in perikinetic flocculation.
(C)	In an electric double layer model of a colloidal particle, Stern layer is more compact than the diffuse layer.
(D)	The zeta potential is also called Stern potential.
Q.46	Which of the following options is/are CORRECT assumption(s) in the Gaussian plume dispersion model?
(A)	The concentration of pollutants emitting from stack is continuous.
(B)	The process is under steady state.
(C)	The pollutants emitted are non-conservative.
(D)	The diffusion of pollutants is dominant in comparison with advection in the direction of wind.

Q.47 The sound level measured at various locations in an urban area is given in the table.

The average sound level for that area is _____ dBA (*rounded off to two decimal places*).

Location	A	B	C	D
Sound level (dBA)	40	55	65	75

Q.48 Standard deviation for the particulate matter (PM) concentrations listed in the table is _____ $\mu g/m^3$ (*rounded off to one decimal place*).

Location No.	1	2	3	4	5	6	7
PM concentration ($\mu g/m^3$)	45	40	55	65	60	35	50

Q.49 The mixing ratio of CO_2 at a pressure of 1 atm and at 300K is reported as 340 ppmv.

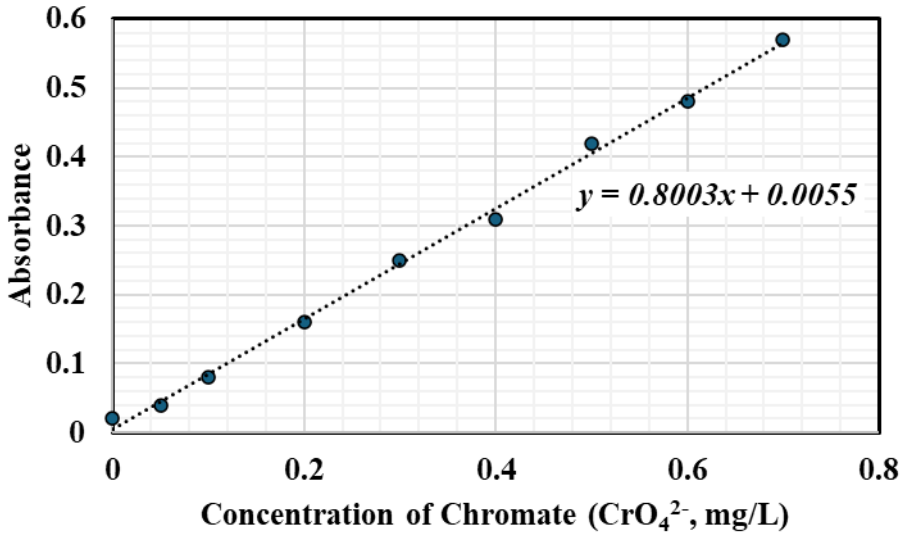
Considering ideal gas conditions, the equivalent concentration of CO_2 in air is _____ mg/m^3 (*rounded off to two decimal places*).

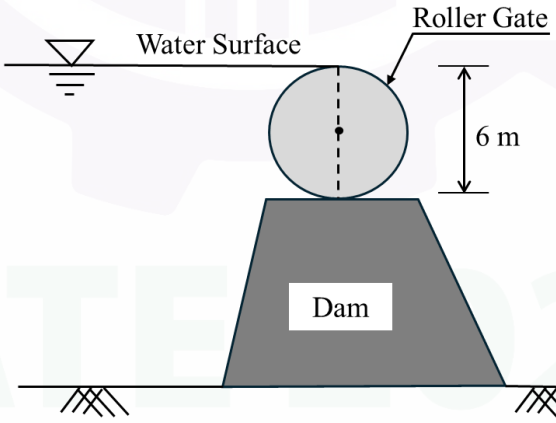
The molecular weight of CO_2 = 44 g/mol

Universal gas constant = 8.314 J/mol-K

Q.50 Reaction A → B follows first-order elementary kinetics and the reaction rate constant for A is 0.01 per min.

The time taken to reduce the concentration of A from 100 M to 10 M in a batch reactor is _____min (*rounded off to one decimal place*).

Q.51	The following two reactions describe the chemistry of S(IV) in an aquatic system. Under ideal conditions, the equilibrium constants for reactions (i) and (ii) are 1.3×10^{-2} M (K_{S1}) and 6.6×10^{-8} M (K_{S2}), respectively. If the pH of the system is 4.0 and the equilibrium concentration of $SO_{2(aq)}$ is 1.0 M, the equilibrium concentration of SO_3^{2-} is _____ mM (*rounded off to one decimal place*). $$SO_{2(aq)} \rightleftharpoons H^+ + HSO_3^- \quad \text{(i)}$$ $$HSO_3^- \rightleftharpoons H^+ + SO_3^{2-} \quad \text{(ii)}$$
Q.52	The calibration graph between absorbance and the concentration of chromate (CrO_4^{2-}) in a water sample is shown in the figure. For an absorbance of 0.35 in a water sample, the estimated Cr(VI) concentration is _____ mg/L (*rounded off to two decimal places*). Use the atomic weight (g/mol) of Cr and O as 52 and 16, respectively. 

Q.53	In a batch culture experiment, 2 cells of a microorganism were added to a growth medium. During the experiment, a lag phase of 1 hour was first experienced by the added cells, in which no cell multiplication occurred. Afterwards, cells started multiplying exponentially with a doubling time of 1 hour. After total 8 hours of experiment, the number of cells present in the growth medium was _____ (*answer in integer*).
Q.54	A thermal process, at a specific temperature, results in 2-$\log_{10}$ removal of non-thermotolerant pathogenic microorganisms from a water sample in 20 min. The time needed to achieve 99.999% removal of these microorganisms under similar condition is _____ min (*answer in integer*).
Q.55	A cylindrical roller gate of diameter 6.0 m and length 10.0 m is placed on a dam to store water behind it, as shown in figure. The magnitude of the resultant force due to water acting on that gate when the water is about to spill is _____ $\times 10^6$ N (*rounded off to two decimal places*). Consider acceleration due to gravity (g) = 9.81 m/s^2; density of water (ρ) = 1000 kg/m^3; and π = 3.14.  Dimensions are NOT TO SCALE

Q.56

The mass curve of a rainfall event of 100 min duration over a catchment is given in the table.

If the initial loss is 0.6 cm and ϕ-index is 0.6 cm/hour, the total surface runoff from the catchment is _____ cm (*rounded off to one decimal place*).

Time from start of rainfall (min)	0	20	40	60	80	100
Cumulative rainfall (cm)	0	0.5	1.2	2.6	3.3	3.5

Q.57

A well penetrates an unconfined aquifer. The water level (i.e., head) in the well prior to pumping is 25 m. After a long period of pumping at a constant rate of 0.05 m^3/s, the drawdowns at distances of 50 m and 150 m from the well are observed to be 3 m and 1.2 m, respectively.

The hydraulic conductivity of the unconfined aquifer is _____ $\times 10^{-4}$ m/s (*rounded off to two decimal places*).

Consider $\pi = 3.14$.

Q.58

A sewage treatment plant employing activated sludge process is operated under the following conditions:

Wastewater flow rate into the aeration tank = 0.150 m^3/s

Soluble BOD_5 in the influent = 84 mg/L

Soluble BOD_5 in the effluent = 11 mg/L

Mean cell residence time = 5 days

Total yield co-efficient = 0.5 kg of MLVSS/kg BOD_5 removed

Decay rate of microorganism = 0.050/day

The net waste activated sludge produced in the plant is _____ kg of VSS/day (*rounded off to two decimal places*).

Q.59

A continuous flow stirred tank reactor (CSTR) operates under a steady-state condition with a flow rate of 300 L per hour. The influent concentration of a substrate entering the reactor is 150 mg/L.

To give a treatment efficiency of 76% for the substrate that decays according to half-order kinetics with a rate constant of 0.05 $(mg/L)^{1/2}$ per hour, the required volume of the reactor is _____ m^3 (*answer in integer*).

Q.60

In a stack emission measurement at an industry, the stack cross-sectional area at 30 m height was divided into four equal sectors. The measured velocities and SO_2 concentrations through these sectors at this height are given in the table.

The mean SO_2 concentration from the stack is _____ mg/m^3 (*rounded off to two decimal places*).

Sector Number	Velocity (m/s)	SO_2 Concentration (mg/m^3)
1	15	1000
2	17	1150
3	19	1250
4	21	1275

Q.61

An anaerobic digestion system is operated for methane gas generation from organic fraction of municipal solid waste (OFMSW). The moisture content and volatile solids (VS) content of OFMSW are 20% and 90%, respectively. The biodegradable volatile solids (BVS) in the VS is 70%, and the BVS conversion efficiency to methane gas is 85%.

If the methane gas generation in the system is 12 m^3 per kg of BVS converted, the total volume of gas produced from one kilogram of OFMSW is _____ m^3 (*rounded off to two decimal places*).

Q.62

The characteristics of two types of solid waste are given in the table.

The quantity of sludge to be added to leaves to achieve a C/N ratio of 25 (on dry basis) for the mixed waste is _____ kg of sludge/kg of leaves (*rounded off to three decimal places*).

Type of solid waste	Characteristics of the solid waste (weight/weight)		
	Moisture content (%)	Nitrogen content (%)	Carbon to Nitrogen (C/N) ratio
Leaves	50	0.7	50
Sludge	75	5.6	6.3

Q.63

The concentration of chemical A in ambient air is 50 µg/m^3 and the toxicological index limit for a threshold health effect for this chemical is 5 mg.

If the average breathing rate is 4 L/min, the minimum time of exposure that can lead to any health effect is _____ days (*rounded off to one decimal place*).

Q.64

The area in the first quadrant bounded by the function $y = (8 - x)$ and the coordinate axes is _____ square units (*answer in integer*).

Q.65

An agricultural land can support energy crops yield to produce 7000 L of bioethanol per hectare and energy content of bioethanol is 21 MJ/L. This bioethanol displaces fossil-based petrol.

The CO_2 offset potential of land used for growing energy crops as a bioethanol feedstock is _____ $\times 10^6$ g of CO_2 /hectare (*rounded off to one decimal place*).

Consider CO_2 footprints of 10 g and 80 g of CO_2 per MJ for bioethanol and petrol, respectively.