General Aptitude

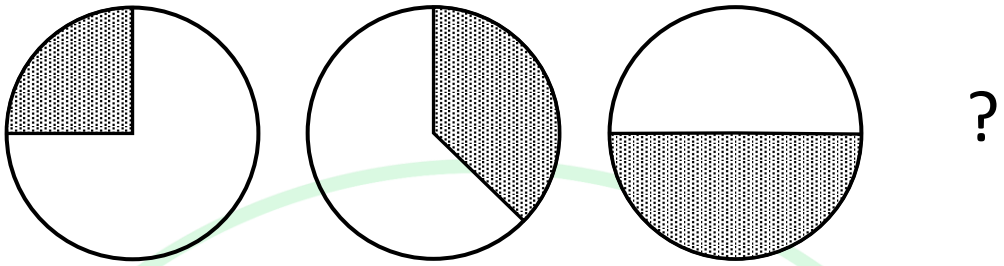
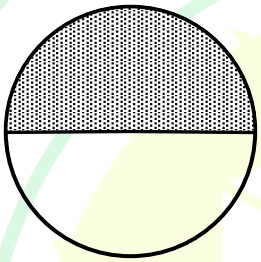
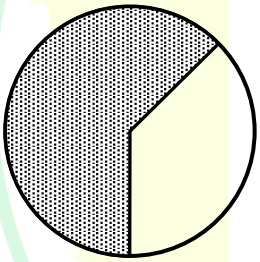
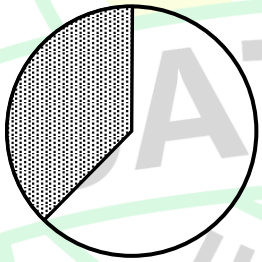
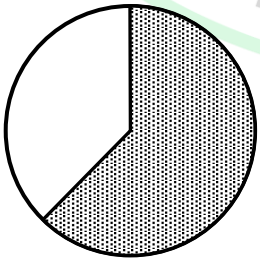
Q.1 – Q.5 Carry ONE mark Each

Q.1	Is there any good show _____ television tonight? Select the most appropriate option to complete the above sentence.
(A)	in
(B)	at
(C)	within
(D)	on

Q.2	As the police officer was found guilty of embezzlement, he was _____ dismissed from the service in accordance with the Service Rules. Select the most appropriate option to complete the above sentence.
(A)	sumptuously
(B)	brazenly
(C)	unintentionally
(D)	summarily

Q.3	The sum of the following infinite series is:
	$\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\frac{1}{4!}+\frac{1}{5!}+\cdots$
(A)	π
(B)	$1+e$
(C)	$e-1$
(D)	e

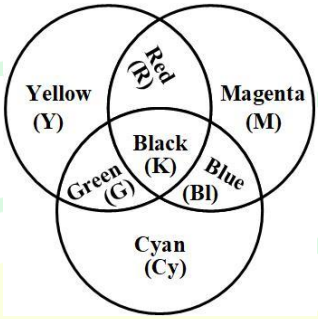
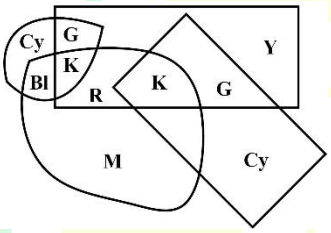
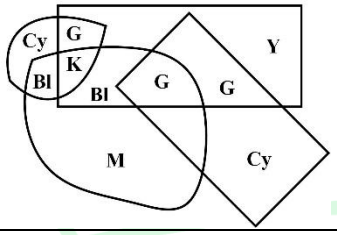
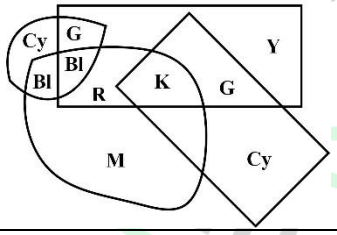
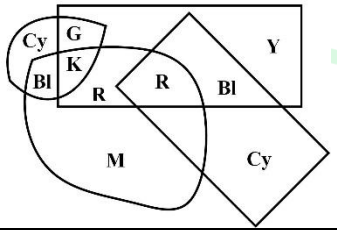
Q.4	A thin wire is used to construct all the edges of a cube of 1 m side by bending, cutting and soldering the wire. If the wire is 12 m long, what is the minimum number of cuts required to construct the wire frame to form the cube?
(A)	3
(B)	4
(C)	6
(D)	12

Q.5	The figures I, II and III are parts of a sequence. Which one of the following options comes next in the sequence at IV?
	 I II III IV
(A)	
(B)	
(C)	
(D)	

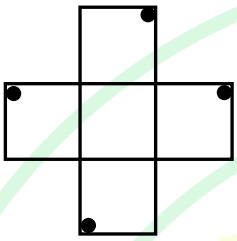
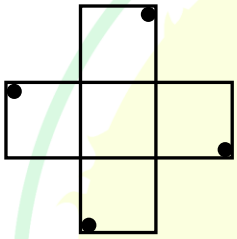
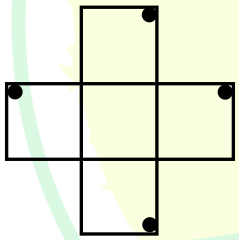
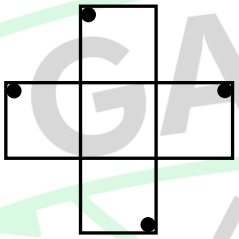
Q.6 – Q.10 Carry TWO marks Each

Q.6	"Why do they pull down and do away with crooked streets, I wonder, which are my delight, and hurt no man living? Every day the wealthier nations are pulling down one or another in their capitals and their great towns: they do not know why they do it; neither do I. It ought to be enough, surely, to drive the great broad ways which commerce needs and which are the life-channels of a modern city, without destroying all history and all the humanity in between: the islands of the past." (From Hilaire Belloc's "The Crooked Streets") Based only on the information provided in the above passage, which one of the following statements is true?
(A)	The author of the passage takes delight in wondering.
(B)	The wealthier nations are pulling down the crooked streets in their capitals.
(C)	In the past, crooked streets were only built on islands.
(D)	Great broad ways are needed to protect commerce and history.

Q.7	Rohit goes to a restaurant for lunch at about 1 PM. When he enters the restaurant, he notices that the hour and minute hands on the wall clock are exactly coinciding. After about an hour, when he leaves the restaurant, he notices that the clock hands are again exactly coinciding. How much time (in minutes) did Rohit spend at the restaurant?
(A)	$64\frac{6}{11}$
(B)	$66\frac{5}{13}$
(C)	$65\frac{5}{11}$
(D)	$66\frac{6}{13}$

Q.8	A color model is shown in the figure with color codes: Yellow (Y), Magenta (M), Cyan (Cy), Red (R), Blue (Bl), Green (G), and Black (K). Which one of the following options displays the color codes that are consistent with the color model?
	
(A)	
(B)	
(C)	
(D)	

Q.9	A circle with center at $(x, y) = (0.5,\ 0)$ and radius = 0.5 intersects with another circle with center at $(x, y) = (1, 1)$ and radius = 1 at two points. One of the points of intersection (x, y) is:
(A)	$(0, 0)$
(B)	$(0.2, 0.4)$
(C)	$(0.5, 0.5)$
(D)	$(1, 2)$

Q.10	An object is said to have an n-fold rotational symmetry if the object, rotated by an angle of $\frac{2\pi}{n}$, is identical to the original. Which one of the following objects exhibits 4-fold rotational symmetry about an axis perpendicular to the plane of the screen? Note: The figures shown are representative.
(A)	
(B)	
(C)	
(D)	

Q.11 – Q.35 Carry ONE mark Each

Q.11	Koch's postulate was established by Robert Koch while working on a disease caused by
(A)	*Mycobacterium tuberculosis*
(B)	*Bacillus anthracis*
(C)	*Streptococcus pneumoniae*
(D)	*Bacillus subtilis*
Q.12	*Corynebacterium diphtheriae* causes diphtheria in humans, only when this bacterium is infected by
(A)	phage β
(B)	epsilon phage
(C)	T4 phage
(D)	lambda phage

Q.13	Let $y(t)$ be a bacterial population whose growth is given by $$\frac{dy}{dt} = \lambda(y+2)$$ where λ is the growth rate constant. If $y(0) = 1$ and $y(1) = 4$, then the value of λ is
(A)	ln 2
(B)	ln 3
(C)	ln 4
(D)	ln 6
Q.14	The minimum value of the function $$f(x) = x + \frac{4}{x}$$ for $x > 0$ is
(A)	1
(B)	2
(C)	3
(D)	4

Q.15	The diversity in T-cell receptors is generated by
(A)	gene rearrangements
(B)	somatic hypermutation of rearranged V region
(C)	gene conversion
(D)	class switching
Q.16	Which one of the following is true for piRNAs?
(A)	piRNAs silence transposable elements in germ cells
(B)	piRNA is the abbreviation of P-element interacting RNA
(C)	piRNAs modify the 2′-OH of ribose with methyl group
(D)	piRNA is a long non-coding RNA

Q.17	Which one of the following coenzymes is utilised by alanine racemase for the conversion of L-Alanine to D-Alanine?
(A)	Pyridoxal phosphate
(B)	Thiamine pyrophosphate
(C)	Tetrahydrofolate
(D)	Flavin mononucleotide

<table>
<tr><td>Q.18</td><td>Correctly match the following Monosaccharides with their respective Epimers.
<table>
<tr><th>Monosaccharide</th><th>Epimer</th></tr>
<tr><td>P. D-mannose</td><td>1. C-3 epimer of D-glucose</td></tr>
<tr><td>Q. D-allose</td><td>2. C-4 epimer of D-glucose</td></tr>
<tr><td>R. D-galactose</td><td>3. C-4 epimer of D-mannose</td></tr>
<tr><td>S. D-talose</td><td>4. C-2 epimer of D-glucose</td></tr>
<tr><td></td><td>5. C-5 epimer of D-glucose</td></tr>
</table></td></tr>
<tr><td>(A)</td><td>P-4; Q-1; R-2; S-3</td></tr>
<tr><td>(B)</td><td>P-5; Q-1; R-2; S-3</td></tr>
<tr><td>(C)</td><td>P-4; Q-3; R-5; S-1</td></tr>
<tr><td>(D)</td><td>P-1; Q-5; R-3; S-2</td></tr>
<tr><td></td><td></td></tr>
</table>

Q.19 Correctly match the following **Product classes** with their representative **Products.**

Product class	Product
P. Biofuel	1. Cellulase
Q. Bioplastic	2. Cephalosporin
R. Industrial enzyme	3. Butanol
S. Antibiotic	4. Poly-lactic acid
	5. Rituximab

(A) P-1; Q-5; R-3; S-2

(B) P-3; Q-4; R-5; S-2

(C) P-3; Q-2; R-1; S-5

(D) P-3; Q-4; R-1; S-2

Q.20 Which one of the following hosts is used in mammalian cell culture for the production of glycosylated recombinant therapeutic proteins?

(A) *Pichia pastoris*

(B) Sf9 cells

(C) *Escherichia coli*

(D) Chinese hamster ovary cells

Q.21	Which of the following features is/are used to distinguish *Archaea* from *Bacteria*?
(A)	Gram-staining
(B)	Peptidoglycan in the cell wall
(C)	Presence of N-acetylglucosamine
(D)	16S rRNA sequences
Q.22	Which of the following enzymes is/are involved in the biogenesis of miRNA?
(A)	Drosha
(B)	Cas9
(C)	XRCC4
(D)	Dicer

Q.23	Which of the following separation processes is/are based on molecular size?
(A)	Size-exclusion chromatography
(B)	Ion exchange chromatography
(C)	Membrane ultrafiltration
(D)	Ultracentrifugation
Q.24	Which of the following show(s) optical activity at 100 mM concentration in water?
(A)	Solution of NaCl
(B)	Solution of D-Glucose
(C)	Solution of Glycine
(D)	Solution of L-Proline

Q.25	Which of the following fluids exhibit(s) non-Newtonian behaviour at 25 °C?
(A)	Toothpaste
(B)	Mercury
(C)	Brine
(D)	Blood plasma
Q.26	Which of the following compounds have the same degree of reduction per carbon-mole?
(A)	Glucose
(B)	Lactic acid
(C)	Acetic acid
(D)	Formic acid

Q.27	A recombinant protein is secreted extracellularly in soluble form by an *E. coli* culture. Which of the following downstream processes is/are involved in the purification of the extracellular secreted protein?
(A)	Cell disruption
(B)	Membrane ultrafiltration
(C)	Solubilisation of inclusion bodies
(D)	Liquid chromatography
Q.28	If the doubling time of a bacterial population is 3 hours, then its average specific growth rate during this period is _____ h^{-1}. *(Round off to two decimal places)*
Q.29	For a mechanically reversible isobaric process taking place in a closed system involving 5 moles of an ideal gas, the temperature increases from an initial value of 300 K to a final value of 450 K. If the specific heat capacity at constant volume (C_v) is given as 12.5 J mol^{-1} K^{-1} and gas constant is 8.314 J mol^{-1} K^{-1}, the amount of heat transferred to the system will be _____ J. (*Round off to the nearest integer*)

Q.30	The allele associated with albinism in humans is recessive (*c*). The probability that an albino male (*cc*) and a carrier female (*Cc*) will have an offspring with normal skin pigmentation is _____ . *(Round off to one decimal place)*
Q.31	The contour length of a B-DNA molecule that encodes a bacterial protein of 33 kDa is _____ nm. Consider the average molecular weight of an amino acid as 110 Da and helix rise per base pair for B-DNA as 0.34 nm. (*Round off to the nearest integer*)
Q.32	Within the Michaelis-Menten framework, the ratio of $v_0/V_{\max}$ when [S] = 20 × K_m is _____. (*Round off to two decimal places*)
Q.33	Consider a nonlinear algebraic equation, $e^x - 2 = 0$. Using the Newton-Raphson method, with the initial guess of $x_0 = 1$, the approximated value of the root of the equation after one iteration is_____. (*Round off to two decimal places*)

Q.34	The value of k, for which the linear equations $2x + 3y = 6$ and $4x + 6y = 3k$ have at least one solution, is _____. (*Answer in integer*)
Q.35	Two fair six-sided dice, with sides numbered 1 to 6, are thrown once. The probability of getting 7 as the sum of the numbers on the top side of the dice is _____. (*Round off to two decimal places*)

Q.36 – Q.65 Carry TWO marks Each

<table>
<tr><td>Q.36</td><td>Correctly match the Microorganisms with their respective Nutrition and energy requirement.
<table>
<tr><th>Microorganisms</th><th>Nutrition and energy requirement</th></tr>
<tr><td>P. Photolithoautotrophs</td><td>1. Use organic compounds as a source of energy, hydrogen, electron and carbon</td></tr>
<tr><td>Q. Chemoorganoheterotrophs</td><td>2. Use light energy and use CO_2 as their carbon source</td></tr>
<tr><td>R. Chemolithoautotrophs</td><td>3. Use light energy and use organic compounds as electron donor and carbon source</td></tr>
<tr><td>S. Photoorganoheterotrophs</td><td>4. Oxidise reduced-inorganic molecules as energy and electron source but derive carbon from organic sources</td></tr>
</table></td></tr>
<tr><td>(A)</td><td>P-2; Q-1; R-4; S-3</td></tr>
<tr><td>(B)</td><td>P-2; Q-1; R-3; S-4</td></tr>
<tr><td>(C)</td><td>P-1; Q-2; R-4; S-3</td></tr>
<tr><td>(D)</td><td>P-4; Q-1; R-2; S-3</td></tr>
<tr><td></td><td></td></tr>
</table>

Q.37 Correctly match the **Inhibitor** with its respective **Function** in mitochondrial respiration.

Inhibitor	Function
P. FCCP	1. Inhibits cytochrome c oxidase
Q. Cyanide	2. Makes the membrane permeable to protons
R. Oligomycin A	3. Blocks mitochondrial uptake of succinate
S. Butyl malonate	4. Inhibits ATP synthase

(A) P-2; Q-1; R-4; S-3

(B) P-2; Q-3; R-1; S-4

(C) P-2; Q-4; R-3; S-1

(D) P-3; Q-1; R-2; S-4

Q.38	An octapeptide composed of these L-amino acids – Lys, Thr, Ser, Met, Arg, Trp, Tyr, Glu – was subjected to analyses with the following outcomes: P. The N-terminal sequencing analysis by Sanger's method yielded 'Ser' at the N-terminus Q. Chymotrypsin treatment gave a pentapeptide, a 'Tyr' containing dipeptide and a free 'Glu' R. Cyanogen bromide treatment gave two tetrapeptides S. Trypsin treatment gave two tripeptides and a dipeptide Which one of the following is the correct octapeptide sequence?
(A)	Ser-Tyr-Arg-Met-Lys-Thr-Trp-Glu
(B)	Ser-Arg-Lys-Met-Tyr-Thr-Trp-Glu
(C)	Ser-Met-Lys-Arg-Thr-Tyr-Trp-Glu
(D)	Ser-Arg-Met-Lys-Trp-Thr-Tyr-Glu

<table>
<tr><td>Q.39</td><td>Correctly match the type of Hypersensitivity reaction with its respective Example.
<table>
<tr><th>Hypersensitivity reaction</th><th>Example</th></tr>
<tr><td>P. Type I</td><td>1. Tuberculin reaction</td></tr>
<tr><td>Q. Type II</td><td>2. Arthus reaction</td></tr>
<tr><td>R. Type III</td><td>3. Chronic urticaria</td></tr>
<tr><td>S. Type IV</td><td>4. Systemic anaphylaxis</td></tr>
</table></td></tr>
<tr><td>(A)</td><td>P-3; Q-4; R-2; S-1</td></tr>
<tr><td>(B)</td><td>P-4; Q-3; R-1; S-2</td></tr>
<tr><td>(C)</td><td>P-4; Q-3; R-2; S-1</td></tr>
<tr><td>(D)</td><td>P-2; Q-3; R-4; S-1</td></tr>
<tr><td></td><td></td></tr>
</table>

Q.40 Correctly match the **Enzyme** with its respective **Function**.

Enzyme	Function
P. Gyrase	1. Removes a damaged base by cleaving the bond between sugar and base
Q. Deadenylase	2. Provides a swivel allowing one DNA strand to rotate around the other
R. Glycosylase	3. Catalyses bond formation between 3′-OH and 5′-phosphate end of nucleotides in duplex DNA
S. DNA ligase	4. Is an exoribonuclease that removes the poly(A) tail

(A) P-2; Q-4; R-1; S-3

(B) P-1; Q-4; R-2; S-3

(C) P-2; Q-1; R-4; S-3

(D) P-3; Q-2; R-1; S-4

<table>
<tr><td>Q.41</td><td>Correctly match the Coenzyme with its respective involvement in a specific Reaction type.
<table>
<tr><th>Coenzyme</th><th>Reaction type</th></tr>
<tr><td>P. Thiamine pyrophosphate</td><td>1. Acyl group transfer</td></tr>
<tr><td>Q. Tetrahydrofolate</td><td>2. Transfer of one carbon group</td></tr>
<tr><td>R. Flavin adenine dinucleotide</td><td>3. Transfer of methyl group</td></tr>
<tr><td>S. 5′-Deoxyadenosyl cobalamin</td><td>4. Oxidation-reduction</td></tr>
<tr><td></td><td>5. Aldehyde transfer</td></tr>
</table></td></tr>
<tr><td>(A)</td><td>P-5; Q-2; R-4; S-3</td></tr>
<tr><td>(B)</td><td>P-5; Q-1; R-2; S-3</td></tr>
<tr><td>(C)</td><td>P-1; Q-2; R-4; S-5</td></tr>
<tr><td>(D)</td><td>P-5; Q-3; R-1; S-2</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Q.42</td><td>A thermometer measuring body temperature follows a first-order response with a time constant of 40 seconds. The instrument will reach 95% of its steady-state output at _____ seconds.

(Round off to the nearest integer)</td></tr>
<tr><td>(A)</td><td>60</td></tr>
<tr><td>(B)</td><td>80</td></tr>
<tr><td>(C)</td><td>120</td></tr>
<tr><td>(D)</td><td>160</td></tr>
</table>

Q.43	The output $y(t)$ of a first-order process is governed by the following differential equation $$\tau_p \frac{dy}{dt} + y = K_p f(t)$$ where τ_p is a non-zero time constant, K_p is the gain and $f(t)$ is the input with $f(0) = 0$. Assume $y(0) = 0$. The transfer function for this process is (consider s as the independent variable in the Laplace domain)
(A)	$\frac{K_p}{\tau_p s + 1}$
(B)	$\frac{\tau_p}{K_p s + 1}$
(C)	$\frac{\tau_p}{K_p(s + 1)}$
(D)	$\frac{K_p}{\tau_p(s + 1)}$
Q.44	For a specific bioreactor configuration, the power requirement for a Rushton-turbine impeller agitating an unaerated Newtonian fluid in the turbulent regime will be
(A)	proportional to the stirring speed of the impeller
(B)	proportional to the square of the stirring speed of the impeller
(C)	proportional to the cube of the stirring speed of the impeller
(D)	inversely proportional of the stirring speed of the impeller

Q.45	Let m and n be fixed real numbers. If the function $y(t) = C_1 e^{t} + C_2 e^{-t}$ is a solution of $$\frac{d^2y}{dt^2} + m\frac{dy}{dt} + ny = 0$$ for any constants C_1 and C_2, then $m + n$ is equal to
(A)	-2
(B)	-1
(C)	0
(D)	1
Q.46	If the function $$f(x) = \begin{cases} \sin 2x, & \text{for } x > 0, \\ a + bx, & \text{for } x \leq 0, \end{cases}$$ where a and b are constants, is differentiable at $x = 0$, then $a + b$ is equal to
(A)	0
(B)	1
(C)	2
(D)	3

Q.47 Correctly match the following **Bioinformatic tool/Database** with its respective **Utility.**

Bioinformatic tool/Database	Utility
P. BLAST	1. Database for 3D protein structures
Q. Bowtie	2. Tool to identify similarity of a query sequence to existing sequences available in databanks
R. AlphaFold	3. Tool to align short read DNA sequences obtained from Next-generation sequencing to a reference genome
S. PDB	4. AI tool to predict protein structures

(A) P-2; Q-3; R-1; S-4

(B) P-2; Q-3; R-4; S-1

(C) P-3; Q-2; R-4; S-1

(D) P-4; Q-1; R-2; S-3

Q.48 Correctly match the **herbicide** with its **mode of development of resistance** in plants.

Herbicide	Mode of development of resistance
P. Imidazolinones	1. Transformation of bacterial nitrilase gene
Q. Bromoxynil	2. Transformation of resistant version of acetolactate synthetase
R. Glufosinate	3. Transformation of *tfdA* gene from *Alcaligenes*, which encodes a dioxygenase
	4. Transformation of *bar* gene from *Streptomyces hygroscopicus* which encodes phosphinothricin acetyltransferase

(A) P-2; Q-1; R-4

(B) P-2; Q-1; R-3

(C) P-1; Q-2; R-3

(D) P-4; Q-1; R-3

Q.49 Which of the following statements is/are true regarding the effect of the concentration of metabolic intermediates on glycolysis in erythrocytes?

(A) Increased AMP levels stimulate glycolysis

(B) Increased citrate inhibits glycolysis

(C) Increased glucose 6-phosphate inhibits glycolysis

(D) Increased fructose 1,6-bisphosphate stimulates glycolysis

Q.50	Which of the following statements about initiation of DNA replication in eukaryotes is/are true?
(A)	DNA replication is initiated at the origin of replication licensed by loading of Mcm helicase complex
(B)	Loading of Mcm helicase complex takes place in S phase
(C)	Mcm helicase complex are activated by S-Cdks
(D)	Mcm helicase complex is responsible for loading of origin recognition complex
Q.51	Which of the following proteins is/are involved in intraflagellar transport?
(A)	Microtubules
(B)	Myosin
(C)	Actin
(D)	Kinesin

Q.52	Which of the following statements is/are true about telomerase?
(A)	Telomerase has 5′-3′ DNA-dependent DNA polymerisation activity
(B)	Telomerase has 5′-3′ RNA-dependent DNA polymerisation activity
(C)	Telomerase contains an RNA subunit
(D)	Telomerase has 3′-5′ DNA-dependent DNA polymerisation activity
Q.53	The blood group of the mother is A^+ and that of the father is AB^+. Which of the following statements is/are correct?
(A)	Probability of the offspring with A^+ blood group is 0.5
(B)	Probability of the offspring with AB^+ blood group is 0.125
(C)	Probability of the offspring with B^+ blood group is 0.125
(D)	Probability of the offspring with O^+ blood group is 0.375

Q.54	An enzyme immobilised in a porous spherical pellet, catalyses a strongly mass-transfer limited first-order reaction. The effectiveness factor for the immobilised enzyme reaction increases with the
(A)	decrease in the size of the pellet
(B)	increase in the pore diffusivity within the pellet
(C)	decrease in the enzyme turnover number
(D)	increase in the enzyme concentration within the pellet
Q.55	Which of the following methods is/are used for identifying histone modifications?
(A)	ChIP-seq
(B)	Mass spectrometry
(C)	Immunofluorescence
(D)	Patch-clamp electrophysiology

Q.56	Which of the following amino acids contain(s) two chiral carbons?
(A)	L-Leucine
(B)	L-Threonine
(C)	L-Isoleucine
(D)	L-Asparagine
Q.57	A binary mixture of benzene and toluene under vapour-liquid equilibrium at 80 °C follows ideal Raoult's law. At this condition, the saturation pressures of benzene and toluene are 101 kPa and 40 kPa, respectively. If the mole fraction of benzene in the liquid phase is 0.6, the corresponding mole fraction of benzene in the vapour phase will be _____. (*Round off to two decimal places*)
Q.58	In a fermentation process, each mole of glucose is converted to biomass ($CH_{1.8}O_{0.5}N_{0.2}$), with a biomass yield coefficient of 0.4 C-mol/C-mol, according to the unbalanced equation given below. $$C_6H_{12}O_6 + NH_3 + O_2 \rightarrow CH_{1.8}O_{0.5}N_{0.2} + CO_2 + H_2O$$ The moles of oxygen consumption per mole of glucose consumed during fermentation is _____. (*Round off to two decimal places*)

Q.59	Let $a_0 = 0$ and define $a_n = \frac{1}{2}(1 + a_{n-1})$ for all positive integers $n \geq 1$. The least value of n for which $\lvert 1 - a_n \rvert < \frac{1}{2^{10}}$ is _____. (*Answer in integer*)
Q.60	The percentage of light that would pass through a sample with an absorbance of 2 would be _____% . (*Round off to the nearest integer*)
Q.61	A hot, freshly-sterilised fermentation medium is cooled in a double-pipe heat-exchanger. The medium enters the inner pipe of the exchanger at 95 °C and leaves the exchanger at 40 °C. Cooling water, flowing counter-currently to the medium, enters the annulus of the exchanger at 15 °C and leaves the exchanger at 45 °C. The overall heat transfer coefficient is 1350 W m^{-2} $°C^{-1}$. The rate of heat transfer per unit area will be _____ W/m^2. (*Round off to the nearest integer*)
Q.62	A 2 L bioreactor is being operated as a chemostat, at a flow rate of 0.8 L/h and sterile feed of 10 g/L substrate. The bacterial growth follows Monod kinetics at a maximum specific growth rate of 0.6 h^{-1} with a Monod constant of 0.5 g/L and a biomass yield coefficient of 0.4 g/g. The exit biomass concentration is _____ g/L. (*Round off to one decimal place*)

Q.63	Let $A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & k & 0 \\ 3 & 0 & -1 \end{pmatrix}$. If the eigenvalues of A are -2, 1, and 2, then the value of k is _____. (*Answer in integer*)
Q.64	An NMR spectrometer operating at proton resonance frequency (ν) of 1 GHz will have a magnetic field strength of _____ Tesla (T). The gyromagnetic ratio for proton, $\gamma = 2.675 \times 10^8\ T^{-1}\ s^{-1}$ (*Round off to one decimal place*)

Q.65	For the coupled reactions given below Glucose 6-phosphate + H_2O → Glucose + Pi **(Reaction 1)** ATP + Glucose → ADP + Glucose 6-phosphate **(Reaction 2)** the standard free energy change of ATP hydrolysis at 25 °C is ____ kJ/mol. The equilibrium constants for **Reaction 1** and **Reaction 2** are 360 and 800, respectively; Gas constant R = 8.314 J mol^{-1} K^{-1}. (*Round off to two decimal places*)