

GATE BT Previous Year Solved Question Papers

G.A.T.E. (BT) 2019 BIOTECHNOLOGY

Examination

(Original Question Paper with Answer Key)
GRADUATE APTITUDE TEST IN ENGINEERING



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(A) 2

(A) defeated

Q.5

(B) 4

Until Iran came along, India had never been

(B) defeating

Q. 1 – Q. 5 carry one mark each. The fishermen, the flood victims owed their lives, were rewarded by the Q.1 government. (B) to which (A) whom (C) to whom (D) that Some students were not involved in the strike. Q.2 If the above statement is true, which of the following conclusions is/are logically necessary? 1. Some who were involved in the strike were students. No student was involved in the strike. 3. At least one student was involved in the strike. 4. Some who were not involved in the strike were students. (D) 2 and 3 (C) 4 (A) 1 and 2 (B) 3 Q.3 The radius as well as the height of a circular cone increases by 10%. The percentage increase in its volume is _____. (B) 21.0 (A) 17.1 (C) 33.1 (D) 72.8 Q.4 Five numbers 10, 7, 5, 4 and 2 are to be arranged in a sequence from left to right following the directions given below: 1. No two odd or even numbers are next to each other. 2. The second number from the left is exactly half of the left-most number. 3. The middle number is exactly twice the right-most number. Which is the second number from the right?

GA 1/3

(C) 7

(C) defeat

(D) 10

in kabaddi.

(D) defeatist

Q. 6 - Q. 10 carry two marks each.

(A) 10.50

(A) dhrupad, baani(B) gayaki, vocal(C) baaj, institution(D) gharana, lineage

(A) 9

Q.6 Since the last one year, after a 125 basis point reduction in repo rate by the Reserve Bank of India, banking institutions have been making a demand to reduce interest rates on small saving schemes. Finally, the government announced yesterday a reduction in interest rates on small saving schemes to bring them on par with fixed deposit interest rates.

Which one of the following statements can be inferred from the given passage?

- (A) Whenever the Reserve Bank of India reduces the repo rate, the interest rates on small saving schemes are also reduced
- (B) Interest rates on small saving schemes are always maintained on par with fixed deposit interest rates
- (C) The government sometimes takes into consideration the demands of banking institutions before reducing the interest rates on small saving schemes
- (D) A reduction in interest rates on small saving schemes follow only after a reduction in repo rate by the Reserve Bank of India

(C) 15.00

(D) 50.00

(D) 11.30

Q.7	In a country of 1400 million population, 70% own mobile phones. Among the mobile
	phone owners, only 294 million access the Internet. Among these Internet users, only half
	buy goods from e-commerce portals. What is the percentage of these buyers in the country?

Q.8	The nomenclature of Hindustani music has changed over the centuries. Since the medieval
	period dhrupad styles were identified as baanis. Terms like gayaki and baaj were used to
	refer to vocal and instrumental styles, respectively. With the institutionalization of music
	education the term gharana became acceptable. Gharana originally referred to hereditary
	musicians from a particular lineage, including disciples and grand disciples

Which one of the following pairings is NOT correct?

(B) 10

(B) 14.70

Q.9	Two trains started at 7AM from the same point. The first train travelled north at a speed of 80km/h and the second train travelled south at a speed of 100 km/h. The time at which they were 540 km apart is AM.

GA 2/3

(C) 11

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Q.10	"I read somewhere that in ancient times the prestige of a kingdom depended upon the					
	number of taxes that it was able to levy on its people. It was very much like the prestige of					
	a head-hunter in his own community."					

Based on the paragraph above, the prestige of a head-hunter depended upon ___

- (A) the prestige of the kingdom
- (B) the prestige of the heads (C) the number of taxes he could levy
- (D) the number of heads he could gather

END OF THE QUESTION PAPER

GA 3/3

O.	1 -	O.	25	carry	one	mark	each.
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Q.1	Q.1 The Bt toxin gene from <i>Bacillus thuringiensis</i> used to generate genetically modified is				
	(A) cry	(B) cro	(C) cdc	(D) cre	
Q.2	Which one of the	e following is used as a p	H indicator in a	nimal cell culture medium?	
	(A) Acridine ora (C) Bromopheno		(B) Phenol re (D) Coomass		
Q.3	Tetracycline inhi	bits the			
	(B) translocation (C) peptidyl tran	etween tRNA and mRNA of mRNA through ribos sferase activity nino-acyl tRNA to ribos	some		
Q.4	Which one of the	e following is a database	of protein seque	ence motifs?	
	(A) PROSITE	(B) TrEMBL	(C) SWISSE	PROT (D) PDB	
Q.5	Which one of the genome?	e following enzymes is e	ncoded by huma	an immunodeficiency virus (HIV)	
	(A) Reverse tran (C) Phosphatase	scriptase	(B) Phospho (D) ATP syn		
Q.6	DNA synthesis i	n eukaryotes occurs duri	ng which phase	of the mitotic cell cycle?	
	(A) M	(B) G ₁	(C) S	(D) G ₀	
Q.7	Match the human	n diseases in Group I wit	h the causative	agents in Group II.	
	Q. Af R. Ka	Group I noebiasis rican sleeping sickness la azar lagas' disease	2. 3.	Group II Leishmania donovani Trypanosoma cruzi Entamoeba histolytica Trypanosoma gambiense	
	(A) P-3, Q-4, R- (C) P-3, Q-4, R-		(B) P-3, Q-2 (D) P-4, Q-3		

BT 1/10

GA

ATE 2019				Biotechnology
Q.8			can be used to compare to bles in a single experimen	
	(A) Polymerase c (C) Northern hyb		(B) DNA microarra (D) Southern hybrid	
Q.9	Which of the foll	owing processes can in	ncrease genetic diversity	of bacteria in nature?
	P. ConjugationQ. TransformationR. TransductionS. Transfection			
	(A) P only	(B) P and Q only	(C) P, Q and R only	(D) P, Q, R and S
Q.10	Which one of the	following is NOT a pa	art of the human nonspec	ific defense system?
	(A) Interferon	(B) Mucous	(C) Saliva	(D) Antibody
Q.11	_	gene that codes for a po no acids. What type of		riant polypeptide that lacks
	(A) Synonymous (C) Missense mu		(B) Nonsense mutat(D) Silent mutation	ion
Q.12	Which one of the	following equations re	epresents a one-dimensio	nal wave equation?
	$(A)\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$	(B) $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x}$	$\frac{u}{2}$ (C) $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial u}{\partial x}$	(D) $\frac{\partial^2 u}{\partial t^2} + \frac{\partial^2 u}{\partial x^2} = 0$
Q.13	Which of the foll	owing are geometric se	eries?	
	P. 1, 6, 11, 16, 2 Q. 9, 6, 3, 0, -3, R. 1, 3, 9, 27, 81 S. 4, -8, 16, -32,	-6, l,		
	(A) P and Q only	(B) R and S only	(C) Q and S only	(D) P, Q and R only
Q.14		following statements gray change, K_{eq} is equal	_	e catalyzed reactions? (ΔG
	(B) Enzymes affe (C) Enzymes affe	ect ΔG , but not K_{eq} ect K_{eq} , but not ΔG ect both ΔG and K_{eq} not affect ΔG or K_{eq}		

BT 2/10 **GATE 2019**

Q.15	Which one of the following can NOT be a applicable?	limiting substrate if Monod's grow	th kinetics is
	(A) Extracellular carbon source(B) Extracellular nitrogen source(C) Dissolved oxygen		
	(D) Intracellular carbon source		
Q.16	Which one of the following is the unit of l	neat transfer coefficient?	
	(A) W $m^2 K^{-1}$ (B) W $m^{-2} K$	(C) $W m^{-2} K^{-1}$ (D) $W m^{2}$	K
Q.17	Which one of the following is catabolized bacterial cultivation?	during endogenous metabolism in a	a batch
	(A) internal reserves(C) extracellular products	(B) extracellular substrates(D) toxic substrates	
Q.18	Which one of the following need NOT be	conserved in a biochemical reaction	1?
	(A) Total mass(C) Number of atoms of each element	(B) Total moles(D) Total energy	
Q.19	The number of possible rooted trees in a p	hylogeny of three species is	<u></u> :
Q.20	Matrix $A = \begin{bmatrix} 0 & 6 \\ p & 0 \end{bmatrix}$ will be skew-symmetr	ic when $p = $	
Q.21	The solution of $\lim_{x\to 8} \left(\frac{x^2-64}{x-8}\right)$ is	<u></u> .	
Q.22	The median value for the dataset (12, 10,	16, 8, 90, 50, 30, 24) is	
Q.23	The degree of reduction for acetic acid (C	2H ₄ O ₂) is	
Q.24	The mass of 1 kmol of oxygen molecules	is g (rounded off to the nea	arest integer).

BT 3/10

Q.25 Protein concentration of a crude enzyme preparation was 10 mg mL^{-1} . $10 \mu\text{L}$ of this sample gave an activity of $5 \mu\text{mol min}^{-1}$ under standard assay conditions. The specific activity of this crude enzyme preparation is _____ units mg⁻¹.

BT 4/10

O. 20 - O. 33 carry two marks cath	Q. 26 - Q. 55 carry t	wo	marks	each
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- Q.26 In general, which one of the following statements is NOT CORRECT?
 - (A) Hydrogen bonds result from electrostatic interactions
 - (B) Hydrogen bonds contribute to the folding energy of proteins
 - (C) Hydrogen bonds are weaker than van der Waals interactions
 - (D) Hydrogen bonds are directional
- Q.27 For site-directed mutagenesis, which one of the following restriction enzymes is used to digest methylated DNA?
 - (A) KpnI
- (B) DpnI
- (C) XhoI
- (D) MluI
- Q.28 Match the organelles in Group I with their functions in Group II.

Group I	Group II
P. Lysosome	 Digestion of foreign substances
Q. Smooth ER	Protein targeting
R. Golgi apparatus	Lipid synthesis
S. Nucleolus	4. Protein synthesis
	rRNA synthesis
(A) P-1, Q-3, R-2, S-5	(B) P-1, Q-4, R-5, S-3
(C) P-2, Q-5, R-3, S-4	(D) P-1, Q-3, R-4, S-5

- Q.29 Which of the following statements are CORRECT when a protein sequence database is searched using the BLAST algorithm?
 - P. A larger E-value indicates higher sequence similarity
 - Q. E-value < 10⁻¹⁰ indicates sequence homology
 - R. A higher BLAST score indicates higher sequence similarity
 - S. E-value $> 10^{10}$ indicates sequence homology
 - (A) P, Q and R only

(B) Q and R only

(C) P, R and S only

- (D) P and S only
- Q.30 Which one of the following is coded by the ABO blood group locus in the human genome?
 - (A) Acyl transferase

(B) Galactosyltransferase

(C) Transposase

(D) β-Galactosidase

BT 5/10

Q.31	Which of the following factors affect the freaction?	idelity of DNA polymerase in polymerase chain
	 P. Mg²⁺ concentration Q. pH R. Annealing temperature 	
	(A) P and Q only (C) Q and R only	(B) P and R only (D) P, Q and R
Q.32	Group I lists spectroscopic methods and G methods. Match the methods in Group I w	roup II lists biomolecular applications of these ith the applications in Group II.
	Q. Circular DichroismR. Nuclear Magnetic Resonance	Group II 1. Identification of functional groups 2. Determination of secondary structure 3. Estimation of molecular weight 4. Determination of 3-D structure
	(A) P-4, Q-3, R-1 (C) P-1, Q-2, R-4	(B) P-2, Q-1, R-3 (D) P-3, Q-2, R-4
Q.33	contains valine instead of glutamate at pos	(pI) of 6.9. Hexapeptide Q is a variant of P that ition 3. The two peptides are analyzed by 8.0. Which one of the following statements is
	 (A) P will migrate faster than Q towards the (B) P will migrate faster than Q towards the (C) Both P and Q will migrate together (D) Q will migrate faster than P towards the (D) Q will migrate faster than (D) Q will	ne cathode
Q.34	Antibody-producing hybridoma cells are g	generated by the fusion of a
	(A) T cell with a myeloma cell(C) macrophage with a myeloma cell	(B) B cell with a myeloma cell (D) T cell and a B cell
Q.35	Which of the following statements are CO in animal cell culture?	RRECT about the function of fetal bovine serum
	P. It stimulates cell growthQ. It enhances cell attachmentR. It provides hormones and mineralsS. It maintains pH at 7.4	
	(A) P and Q only (B) P and S only	(C) P, Q and R only (D) P, Q, R and S

BT 6/10

Q.36	Which one of the following	covalent linkages	exists between	7-Methyl guanosine	(m^7G)
	and mRNAs?				

(A) 2'-3' triphosphate

(B) 3'-5' triphosphate

(C) 5'-5' triphosphate

- (D) 2'-5' triphosphate
- Q.37 Which one of the following amino acid residues will destabilize an α-helix when inserted in the middle of the helix?
 - (A) Pro
- (B) Val
- (C) Ile
- (D) Leu

Q.38 What is the solution of the differential equation
$$\frac{dy}{dx} = \frac{x}{y}$$
, with the initial condition, at $x = 0$, $y = 1$?

- (A) $x^2 = y^2 + 1$ (B) $y^2 = x^2 + 1$ (C) $y^2 = 2x^2 + 1$ (D) $x^2 y^2 = 0$

Q.39 The Laplace transform of the function
$$f(t) = t^2 + 2t + 1$$
 is

- (A) $\frac{1}{s^3} + \frac{3}{s^2} + \frac{1}{s}$ (B) $\frac{4}{s^3} + \frac{4}{s^2} + \frac{1}{s}$ (C) $\frac{1}{s^3} + \frac{2}{s^2} + \frac{1}{s}$ (D) $\frac{2}{s^3} + \frac{2}{s^2} + \frac{1}{s}$
- Q.40 Which of the following factors can influence the lag phase of a microbial culture in a batch fermentor?
 - P. Inoculum size
 - Q. Inoculum age
 - R. Medium composition
 - (A) P and Q only
- (B) Q and R only
- (C) P and R only
- (D) P, Q and R
- Q.41 Which one of the following statements is CORRECT about proportional controllers?
 - (A) The initial change in control output signal is relatively slow
 - (B) The initial corrective action is greater for larger error
 - (C) They have no offset
 - (D) There is no corrective action if the error is a constant
- Q.42 Match the instruments in Group I with their corresponding measurements in Group II.

Group	Ι
01040	

Group II

- P. Manometer
- 1. Agitator speed 2. Pressure difference
- O. Rotameter R. Tachometer

3. Cell number

S. Haemocytometer

4. Air flow rate

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Q.43	Which of the following statements is ALWAYS CORRECT about an ideal chemostat?				
	 P. Substrate concentration inside the chemostat is equal to that in the exit stream Q. Optimal dilution rate is lower than critical dilution rate R. Biomass concentration increases with increase in dilution rate S. Cell recirculation facilitates operation beyond critical dilution rate 				
	(A) P and Q only (B) P, R and S only (C) P and S only (D) P, Q and S only				
Q.44	Determine the correctness or otherwise of the following Assertion [a] and the Reason [r]				
	Assertion [a]: It is possible to regenerate a whole plant from a single plant cell. Reason [r]: It is easier to introduce transgenes in to plants than animals.				
	 (A) Both [a] and [r] are true and [r] is the correct reason for [a] (B) Both [a] and [r] are true but [r] is not the correct reason for [a] (C) Both [a] and [r] are false (D) [a] is true but [r] is false 				
Q.45	A UV-visible spectrophotometer has a minimum detectable absorbance of 0.02. The minimum concentration of a protein sample that can be measured reliably in this instrument with a cuvette of 1 cm path length is μM . The molar extinction coefficient of the protein is 10,000 L mol $^{-1}$ cm $^{-1}$.				
Q.46	The difference in concentrations of an uncharged solute between two compartments is 1.6-fold. The energy required for active transport of the solute across the membrane separating the two compartments is cal $\mathrm{mol^{-1}}$ (rounded off to the nearest integer). (R = 1.987 cal $\mathrm{mol^{-1}}$ K ⁻¹ , T = 37 °C)				
Q.47	In pea plants, purple color of flowers is determined by the dominant allele while white color is determined by the recessive allele. A genetic cross between two purple flower-bearing plants results in an offspring with white flowers. The probability that the third offspring from these parents will have purple flowers is (rounded off to 2 decimal places).				
Q.48	The molecular mass of a protein is 22 kDa. The size of the cDNA (excluding the untranslated regions) that codes for this protein is kb (rounded off to 1 decimal place).				

BT 8/10

Q.49 A new game is being introduced in a casino. A player can lose Rs. 100, break even, win Rs. 100, or win Rs. 500. The probabilities (P(X)) of each of these outcomes (X) are given in the following table:

X (in Rs.)	-100	0	100	500
P(X)	0.25	0.5	0.2	0.05

The standard deviation (σ) for the casino payout is Rs. _____ (rounded off to the nearest integer).

Q.50 $\int_{-1}^{1} f(x)dx$ calculated using trapezoidal rule for the values given in the table is _____ (rounded off to 2 decimal places).

x	-1	$^{-2}/_{3}$	$-1/_{3}$	0	1/3	2/3	1
f(x)	0.37	0.51	0.71	1.0	1.40	1.95	2.71

Q.51 Yeast biomass (C₆H₁₀O₃N) grown on glucose is described by the stoichiometric equation given below:

$$C_6H_{12}O_6 + 0.48 \text{ NH}_3 + 3 O_2 \rightarrow 0.48 C_6H_{10}O_3N + 3.12 CO_2 + 4.32 H_2O_3$$

The amount of glucose needed for the production of 50 g L⁻¹ of yeast biomass in a batch reactor with a working volume of 1,00,000 L is _____ kg (rounded off to the nearest integer).

Q.52 Phenolic wastewater discharged from an industry was treated with *Pseudomonas* sp. in an aerobic bioreactor. The influent and effluent concentrations of phenol were 10,000 and 10 ppm, respectively. The inlet feed rate of wastewater was 80 L h⁻¹. The kinetic properties of the organism are as follows:

Maximum specific growth rate $(\mu_m) = 1 \text{ h}^{-1}$

Saturation constant $(K_s) = 100 \text{ mg L}^{-1}$

Cell death rate $(k_d) = 0.01 \text{ h}^{-1}$

Assuming that the bioreactor operates under 'chemostat' mode, the working volume required for this process is

L (rounded off to the nearest integer).

Q.53 In a cross-flow filtration process, the pressure drop (ΔP) driving the fluid flow is 2 atm, inlet feed pressure (P_i) is 3 atm and filtrate pressure (P_f) is equal to atmospheric pressure. The average transmembrane pressure drop (ΔP_m) is ______ atm.

Q.54 An industrial fermentor containing 10,000 L of medium needs to be sterilized. The initial spore concentration in the medium is 10⁶ spores mL⁻¹. The desired probability of contamination after sterilization is 10⁻³. The death rate of spores at 121 °C is 4 min⁻¹. Assume that there is no cell death during heating and cooling phases. The holding time of the sterilization process is ______ min (rounded off to the nearest integer).

BT 9/10

Q.55 The dimensions and operating condition of a lab-scale fermentor are as follows:

Volume = 1 L

Diameter = 20 cm

Agitator speed = 600 rpm

Ratio of impeller diameter to fermentor diameter = 0.3

This fermentor needs to be scaled up to 8,000 L for a large scale industrial application. If the scale-up is based on constant impeller tip speed, the speed of the agitator in the larger reactor is ______ rpm. Assume that the scale-up factor is the cube root of the ratio of fermentor volumes.

END OF THE QUESTION PAPER

BT 10/10

Q.No.	Туре	Section	Кеу	Marks
1	MCQ	GA	С	1
2	MCQ	GA	С	1
3	MCQ	GA	С	1
4	MCQ	GA	С	1
5	MCQ	GA	Α	1
6	MCQ	GA	С	2
7	MCQ	GA	Α	2
8	MCQ	GA	С	2
9	MCQ	GA	В	2
10	MCQ	GA	D	2
1	MCQ	ВТ	Α	1
2	MCQ	ВТ	В	1
3	MCQ	ВТ	D	1
4	MCQ	ВТ	Α	1
5	MCQ	ВТ	Α	1
6	MCQ	ВТ	С	1
7	MCQ	ВТ	С	1
8	MCQ	ВТ	В	1
9	MCQ	ВТ	C OR B	1
10	MCQ	ВТ	D	1
11	MCQ	ВТ	В	1
12	MCQ	ВТ	В	1

Q.No.	Туре	Section	Кеу	Marks
13	MCQ	ВТ	В	1
14	MCQ	ВТ	D	1
15	MCQ	ВТ	D	1
16	MCQ	ВТ	С	1
17	MCQ	ВТ	А	1
18	MCQ	ВТ	В	1
19	NAT	ВТ	3 to 3	1
20	NAT	ВТ	-6 to -6	1
21	NAT	ВТ	16 to 16	1
22	NAT	ВТ	20 to 20	1
23	NAT	ВТ	4 to 4	1
24	NAT	ВТ	31800 to 32000	1
25	NAT	ВТ	50 to 50	1
26	MCQ	ВТ	С	2
27	MCQ	ВТ	В	2
28	MCQ	ВТ	А	2
29	MCQ	ВТ	В	2
30	MCQ	ВТ	В	2
31	MCQ	ВТ	А	2
32	MCQ	ВТ	С	2
33	MCQ	ВТ	А	2
34	MCQ	ВТ	В	2

Q.No.	Туре	Section	Кеу	Marks
35	MCQ	ВТ	С	2
36	MCQ	ВТ	С	2
37	MCQ	ВТ	Α	2
38	MCQ	ВТ	В	2
39	MCQ	ВТ	D	2
40	MCQ	ВТ	D	2
41	MCQ	ВТ	В	2
42	MCQ	ВТ	С	2
43	MCQ	ВТ	D	2
44	MCQ	ВТ	В	2
45	NAT	ВТ	2 to 2	2
46	NAT	ВТ	280 to 295	2
47	NAT	ВТ	0.75 to 0.75	2
48	NAT	ВТ	0.6 to 0.6	2
49	NAT	ВТ	128 to 130	2
50	NAT	ВТ	2.20 to 2.50	2
51	NAT	ВТ	12500 to 14500	2
52	NAT	ВТ	970 to 1010	2
53	NAT	ВТ	1 to 1	2
54	NAT	ВТ	9 to 10	2
55	NAT	ВТ	30 to 30	2

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