Booklet code:

B

ENTRANCE EXAMINATION, June 2010
PhD Biotechnology (B)

Time: 2 hours   Maximum Marks:75

INSTRUCTIONS: PLEASE READ THE FOLLOWING CAREFULLY BEFORE ANSWERING

1. Enter your hall ticket number on this sheet and the answer (OMR) sheet
2. Answers have to be marked on the OMR answer sheet with ball-point pen following the instructions provided there upon.
3. Hand over both the question paper booklet and OMR answer sheet at the end of the examination.
4. All questions carry one mark each.
5. 0.33 mark will be deducted for every wrong answer..
6. There are total 17 pages (including this page and one separate rough work sheet at the end) in this question paper. Check this before you start answering.
7. The question paper consists of Part "A" and Part "B". The marks obtained in Part "A" will be taken into consideration in case of tie i.e., when more than one student gets equal marks, to prepare the merit list.
8. Non-programmable scientific calculators are permitted.
9. Cell phones are not allowed

****

PART A
1 Genetic suppression involves   A. Two different phenotypes   B. Two different mutations in one gene   C. Mutation in two genes   D. Different forms of an enzyme
2 If for the biochemical reaction A $\longrightarrow$ B, $\Delta H < 0$ and $\Delta S > 0$, then   A. The reaction is spontaneous   B. The reaction is endothermic   C. $\Delta G = 0$ D. The disorder in the system will decrease if the reaction proceeds

1

U-62

3	An increase in entropy
	A. Is equivalent to an increase in the total bond energies of the reactant
	B. Is an increase in order
	C. Occurs when NaCl is diluted
	D. Occurs in a system when amino acids are linked to form protein
4	If the equilibrium constant for the reaction A↔B is 0.5 and the initial concentration of B is 10mM and of A is 20mM, then
	A. The reaction will proceed in the direction it is written, producing a net increase in concentration of B
	B. The reaction will produce energy which can be used to drive ATP synthesis
	C. The rate of the forward reaction equals the rate of the reverse reaction
	D. The reaction will proceed in the reverse direction producing a net increase in the concentration of A, if a catalyst is added to the reaction mixture
5	A typical prokaryotic gene encoding an enzyme
	A. Is located in an operon containing a single gene
	B. May be transcribed into the same mRNA as the genes for other enzymes in the same pathway
	C. Contains introns
	D. Must be transcribed completely before translation of the newly formed mRNA can begin
6	The base in the wobble position of a codon
	A. Is the 5' (first) base
	B. Is the 3' (third) base
	C. Is the second base
	D. Often contains inosine
7	Which amino acid(s) could substitute for tyrosine in a polypeptide without changing the overall charge of the polypeptide at neutral pH?
	A. Serine
	B. Asparagine
	C. Leucine

U-62

	D. All of the above

8	The K_m of an enzyme catalysed reaction
	
	    A. Is equal to the catalytic rate when all substrate sites are full
	
	    B. Describes the affinity of an enzyme for its substrate
	
	    C. Is dependent on the enzyme concentration
	
	    D. Is higher when the enzyme binds its substrate more tightly

9	Topoisomerase II activity
	
	    A. Cuts both strands of a DNA double helix
	
	    B. Changes the linking number by 2
	
	    C. Requires energy supplied by ATP
	
	    D. All of the above

10	DNA
	
	    A. Is more susceptible than RNA to degradation at high pH
	
	    B. Has catalytic activity
	
	    C. Can hybridize with other DNA molecules but not with RNA
	
	    D. Has fewer hydroxyl groups than RNA

11	The minimum component s of an artificial yeast chromosome include
	
	    A. An autonomously replicating sequence
	
	    B. A centromere sequence
	
	    C. A telomere sequence
	
	    D. All of the above

12	Mouse embryonic stem cells are used in gene inactivation experiments because they:
	
	    A. Can be cloned to give rise to a stable cell line
	
	    B. Are chimeric and will produce cells heterozygous for the gene
	
	    C. Are the only mouse cells that can be genetically engineered to inactivate genes
	
	    D. Are totipotent and can give rise to all types of differentiated cells

U - 62

13	Which of the following types of DNA damage can not be repaired by *E. coli* using a direct repair system?
	A. Alkylated bases
	B. AP sites
	C. Cyclobutyl dimmers
	D. Missing phosphodiester bonds
14	Which of the following statements about telomerase is true?
	A. Telomerase is an RNA dependent DNA polymerase
	B. Telomerase is an RNA dependent RNA polymerase
	C. Telomerase is an DNA dependent DNA polymerase
	D. Telomerase is an DNA dependent RNA polymerase
15	In bacteria which of the following enzymes removes the RNA primers present at the start of each Okazaki fragment on the lagging strand?
	A. DNA polymerase I
	B. DNA polymerase III
	C. DNA ligase
	D. RNase H
16	What is the role of the Rho protein in termination of transcription?
	A. It is a helicase that actively breaks base pairs between the template and transcript
	B. It is a DNA binding protein that blocks the movement of RNA polymerase down the template
	C. It is a subunit of RNA polymerase that binds to RNA hairpins and stalls transcription
	D. It is a nuclease that degrades the 3' ends of RNA transcripts
17	The specificity of bacterial RNA polymerases for their promoters is due to which subunit?
	A. α
	B. β

U - 62

	C. σ D. γ
18	How are proteins able to bind to DNA at specific sequences? A. By interacting with the sugar phosphate backbone B. By opening up the double helix and forming bonds with the bases C. By interacting with the bases through the histone proteins D. By interacting with the bases in the major and minor grooves of the double helix
19	Which of the following sequence modules is NOT a basal promoter element? A. CAAT box B. GC box C. Octamer module D. TATA box
20	What is the value of A_{260} of a DNA solution whose concentration is 32µg/ml? A. 1.0 B. 0.64 C. 1.56 D. 0.46
21	Which of the following is a true statement about DNA repair? A. Thymine dimers are usually formed between adjacent thymines in the same strand B. Thymine dimers are usually formed between two thymines in different strands C. The photoreactivation enzyme cleaves all thymine dimers in an ultraviolet irradiated cell D. All of the above
22	Which of the following amino acid substitutions would surely yield a mutant phenotype? A. Pro to His B. Tyr to His

5

U-62

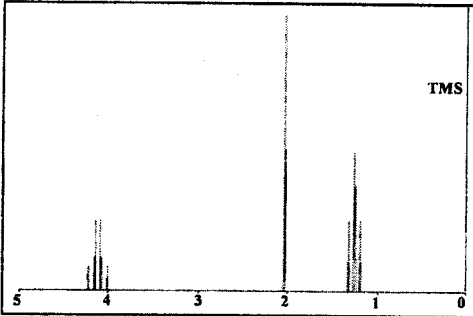|	C. Ile to Thr
	D. All of the above
23	Which of the following statements is correct? [Consider a rigid rod and a flexible rod, both having the same radius and same mass] A. The rigid rod should have a greater sedimentation coefficient B. The flexible rod should have a greater sedimentation coefficient C. both should have same sedimentation coefficient D. sedimentation coefficient is independent of size, shape and mass
24	The specific activity of a sample of [^{32}P] ATP is 5.3 Ci/mmol on January 23. What will be the specific activity on February 18 of the same year? A. 5.3 Ci/mmol B. 2.98 Ci/mmol C. 1.49 Ci/mmol D. 0.75 Ci/mmol
25	A pH meter is to be standardized with a pH 7 buffer. By accident a pH 8 standard buffer is used but the meter is adjusted to read pH 7. A sample is then tested and the meter indicates that its pH is 6.2. What is the actual pH of the sample? A. 5.2 B. 6.2 C. 7.2 D. Cannot be determined
	PART-B
26	. If one would like to identify the differences in a genetic loci which of the following technique should be used: A. Real time PCR B. Differential display C. Hybridization D. Restriction digestion

U-62

27	Statistical mechanics based structure optimization method, A. Molecular dynamics B. Monte carlo C. Conjugated descent D. Steep descent
28	Tortional energy is contributed by which one of the following? A. CO_2 B. H_2 C. H_2O D. C_2H_4
29.	Which of the following motif has no functional significance? A. greek key B. helix-turn-helix C. helix-loop-helix D. zinc finger
30	How can one immobilize the antibody present in the sample? A. Protein A ---agarose B. activatred agarose C. Protein A D. Thiocynate
31	Which one of the following contributes pH maintenance in medium in presence of CO_2? A. Na_2CO_3 B. $NaHCO_3$ C. $NaHPO_4$ D. Na_2HPO_4

U-62

32	The primary target cells encountered during virus invasion through intra-vaginal route, A. T-cells B. Macrophages C. Epithelial cells D. B-cells
33	The primary receptor used for HIV-1 binding on non-CD4 cell is: A. CD 8 B. Galactocerebraoside C. CCR 5 D. CXCR4
34	A protein binds to phenyl sepharose and DEAE cellulose. What will be molecular nature of the protein? A. Hydrophobic and electro negative B. Hydrophobic and electro positive C. Hydrophilic and electro negative D. Hydrophilic and electropositive
35	If one would like to transfer a gene that does not carry a marker, how transformation efficiency can be estimated? A. Scoring the gene incorporation by PCR B. Co-transformation with a marker gene C. Over growing the transformed colony D. Colony cracking and hybridization
36	Which one of the following is frequently found intermediate in recombination? A. One way junction B. Two way junction C. Three way junction D. Four way junction

U-62

37	Which one of the following is correct structural match?
	A. RNA, A-DNA
	B. Z-DNA, C-DNA
	C. B-DNA, RNA
	D. B-DNA, Z-DNA
38	In Tm studies of DNA, the following analysis is useful for establishing if a molecule binding to DNA is an intercalator.
	A. curve width analysis
	B. magnitude of Tm increases
	C. magnitude of Tm decreases
	D. DNA precipitaton
39	A mixture of single strand cicular DNA, supercoiled DNA, linear DNA and relxed DNA were separated on agarose get, which one of them migrates fast?
	A. single stranded circular DNA
	B. linear double stranded DNA
	C. super coiled DNA
	D. relaxed DNA
40	Circular DNA molecules of equal molecular weight, when restriction digested with an endonuclease having single restriction site has yielded two DNA molecules. What could be the form of the DNA?
	A. knotted DNA
	B. catenane
	C. super coiled DNA
	D. linear DNA
41	Which one of the following is <u>correct</u> regarding chickenpox and smallpox
	A. Attenuated cowpox virus works as vaccine for both the viruses
	B. Attenuated cowpox virus works as vaccine for smallpox virus but not for chickenpox virus
	C. Attenuated cowpox virus works as vaccine for Chickenpox virus but

U - 6 ᄀ

	not for smallpox virus D. Both the viruses belong to the family poxviridae
42	Edward Jenner used Cowpox virus works as vaccine for smallpox which works because of A. Cross reactivity B. Same family of viruses C. Heterogeneity D. None
43	Which of the following cells contain or release histamine ? A. Neutrophils B. Basophils C. Platelets D. None of the above
44	The sensitivity of the immuno assays increases in the order of A. Precipitin tests, agglutination tests, Enzyme immuno assays B. Enzyme immuno assays, agglutination tests, Precipitin tests C. Agglutination tests, precipitin tests, Enzyme immuno assays D. Precipitin tests, enzyme immuno assays, Agglutination tests
45	Which one of the following is not a non specific defense mechanism A. Skin B. Mucous membrane C. Tears D. Cell mediated immunity
46	Phosphorescence involves the electronic transition between: A. singlet and doublet B. singlet and triplet C. doublet and triplet D. triplet and triplet

U-62

47	What is the ionic strength of 0.1 molal Na_2SO_4 solution, considering complete ionization? A. 0.15 B. 0.25 C. 0.3 D. 0.4
48	Half life time of a reaction is doubles as the initial concentration of the reaction is doubled. What is the order of the reaction? A. zeroth order B. First order C. Second order D. Pseudo first order
49	Half life time of a reaction is doubles as the initial concentration of the reaction is doubled. What is the order of the reaction? A. zeroth order B. First order C. Second order D. Pseudo first order
50	. An ideal gas expands isothermally against a constant external pressure. The work done by the gas is 500 J and the system absorbs 300 J of energy from the surroundings. What is the change in internal energy of the system? A. 200 J B. -200 J C. 800 J D. -800 J
51	When solvent polarity increases, the emission maximum of a fluorophore A. do not change B. shows blue shift C. shows red shift D. is quenched

U- 62

52	Which one of the following compound shows this ^{1}H-NMR spectrum?
	A. Propanoic acid B. phenyl methyl ketone C. diethyl ether D. ethyl acetate

53	Number of steroisomers formed by tartaric acid is
	A. 2 B. 3 C. 4 D. 5

54	Which of the following is NOT correct, for mixing two ideal gases at constant temperature and pressure
	A. $\Delta G_{mix} = 0$ B. $\Delta S_{mix} = 0$ C. $\Delta H_{mix} = 0$ D. $\Delta V_{mix} = 0$

55	Which of the following is the condition for, $\Delta S = \Delta H / T$
	A. $K_{eq} = 1$ B. $K_{eq} = 0$ C. $\Delta C_p = 0$ D. $\Delta C_p = \Delta C_v$

56	Which one the following mapping technique is commonly used for identification of commercial varieties of plants
	A. RAPD B. RFLP C. AFLP D. DNA fingerprinting

U - 62

57	In the light reactions of photosynthesis, the absorption of 8 photons yields
	A. one O_2 , two NADPH and three ATP
	B. one O_2, three NADPH and two ATP
	C. three O_2, three NADPH and three ATP
	D. 4 O_2, two NADPH and three ATP

58	Light absorbing antennas of the blue and red algae living at a depth of a meter or more in sea water are called as
	A. Phycobilisomes
	B. Phycocyanobilin
	C. Phycoerythrobilin
	D. All of the above

59	Arbuscular mycorrhiza are formed by fungi of the division:
	A. Basidiomycota
	B. Ascomycota
	C. Zygomycota
	D. (D)Glomeromycota
	A.

60	Which one the following is the example of fruticose lichen:
	A. *Ephebe lanata*
	B. *Usnea australis*
	C. *Normandina pulchella*
	D. All of the above

61	Taxol is an important anticancer drug widely used in the clinic.It is mainly produced by:
	A. *Antrodiella zonata*
	B. *Hericium erinaceus*
	C. *Mutinus borneensis*
	D. *Bartalinia robillardoides*

U- 62

	C. EVOLUTION D. CLUSTAL
67	In order to calculate the linear gap penalty, one needs to know only A. Gap open penalty and the gap length B .Gap open penalty, gap extension penalty and the gap length C. Gap open penalty, terminal gap penalty and the gap length D. Gap extension penalty, terminal gap penalty and gap length
68	Reciprocal Best BLAST Hit method is associated with A. Protein domain analysis B. Protein family identification C. Local alignment D. Ortholog analyses
69	Which of the following is to search protein databases using a translated nucleotide query? A. BLASTp B. BLASTx C. tBLASTn D. tBLASTx
70	Among the following which one is the basic and simple way of visualizing regions of similarity between two sequences? A. Dot Matrix B. Smith and Waterman C. Needleman and Wunsch D. FASTA
71	1PAM is a unit of A. sequence similarity B. sequence identity C. evolutionary divergence

U-62

	D. None of the above
72	Which of the following BLOSUM or PAM matrix would you choose to compare two distantly related proteins? A. BLOSUM45 or PAM250 B. BLOSUM60 or PAM1 C. BLOSUM80 or PAM120 D. BLOSUM80 or PAM1
73	Pair-wise alignment of sequences is not carried out using A. Dynamic Programming B. Hidden marcov model C. Dot matrix D. K-tuple method
74	Gap in a sequence alignment characterizes A. an indel B. A substitution C. the conservation D. Any of the above
75	In Smith-Waterman algorithm the traceback of the alignment score matrix begins from A. the last cell B. any cell having the highest alignment score C. any cell having the minimum alignment score D. The cell having zero alignment scor

U - 6 2