

(To be filled up by the candidate by **blue/black ball-point pen**)

Roll No.

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Roll No. (Write the digits in words) .....

Serial No. of OMR Answer Sheet .....

Day and Date .....

(Signature of Invigilator)

**INSTRUCTIONS TO CANDIDATES**(Use only **blue/black ball-point pen** in the space above and on both sides of the **Answer Sheet**)

1. Within 10 minutes of the issue of the Question Booklet, Please ensure that you have got the correct booklet and it contains all the pages in correct sequence and no page/question is missing. In case of faulty Question Booklet, bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.
2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope*.
3. A separate Answer Sheet is given. It should not be folded or mutilated. A second Answer Sheet shall not be provided.
4. Write your Roll Number and Serial Number of the Answer Sheet by pen in the space provided above.
5. On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.
6. No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR sheet and Roll No. and OMR sheet No. on the Question Booklet.
7. Any changes in the aforesaid-entries is to be verified by the invigilator, otherwise it will be taken as unfair means.
8. This Booklet contains 40 multiple choice questions followed by 10 short answer questions. For each MCQ, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet. For answering any five short Answer Questions use five Blank pages attached at the end of this Question Booklet.
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit both OMR Answer Sheet and Question Booklet at the end of the Test.
13. You are not permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

Total No. of Printed Pages : 15

FOR ROUGH WORK

1. Neoprene is polymer of :  
 (1) Orlon                      (2) SAN                      (3) ABS                      (4) All of these
2. The reagent that can be used to distinguish between Glucose and Fructose is :  
 (1) Bromine water                      (2) Fehling's solution  
 (3) Tollen's reagent                      (4) Phenyl hydrazine
3. What will happen if a lysosome leaks inside the cell ?  
 (1) The lysosomal enzymes will digest cell organelles  
 (2) The lysosomal enzymes will become nonfunctional at pH 7.4 of the cytoplasm  
 (3) The lysosomal enzymes will be secreted out of the cell  
 (4) The leaked suicidal bag will make cell to commit suicide
4. Oxygen evolved during photosynthesis in plants comes from :  
 (1) Splitting of water molecules  
 (2) Breakdown of carbon dioxide  
 (3) Carbohydrates accumulated by plants  
 (4) Lipids
5. The contribution of Gregor Johann Mendel is related to the area of :  
 (1) Plant classification                      (2) Genetics  
 (3) Cell structure                      (4) Plant functions
6. Himalaya is :  
 (1) *Paleozoic* tectonic mountain                      (2) Recent Folded mountain  
 (3) Indian mountain                      (4) Eurasian mountain
7. A particle executes simple harmonic motion under the restoring force provided by a spring. The time period is T. If the spring is divided in two equal parts and one part is used to continue the simple harmonic motion, the time period will :  
 (1) remain T                      (2) become 2T                      (3) become T/2                      (4) become  $T/\sqrt{2}$
8. The efficiency of the Carnot's engine working between the steam point and the ice point is :  
 (1) 36.81%                      (2) 26.81%                      (3) 40%                      (4) 16.8%
9. If  $\vec{a} = 2\vec{i} - 3\vec{j} + 4\vec{k}$  and  $\vec{b} = 3\vec{i} + 2\vec{j}$ , then the angle between  $\vec{a}$  and  $\vec{b}$  is :  
 (1)  $45^\circ$                       (2)  $90^\circ$                       (3)  $180^\circ$                       (4)  $120^\circ$

# Research Entrance Test – 2015

No. of Questions : 50

Time : 2 Hours

Full Marks : 200

- Note :** (i) This Question Booklet contains **40** Multiple Choice Questions followed by **10** Short Answer Questions.
- (ii) Attempt as many MCQs as you can. Each MCQ carries **3 (Three)** marks. **1 (One)** mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question. If more than **one** alternative answers of MCQs seem to be approximate to the correct answer, choose the closest one.
- (iii) Answer only **5** Short Answer Questions. Each question carries **16 (Sixteen)** marks and should be answered in **150-200** words. Blank **5 (Five)** pages attached with this booklet shall only be used for the purpose. Answer each question on separate page, after writing Question No.

10. The value of the integral  $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$  is
- (1)  $\pi$                       (2)  $\frac{\pi}{2}$                       (3)  $\frac{\pi}{4}$                       (4)  $-\frac{\pi}{4}$
11. The smooth ER is especially abundant in cells that synthesize extensive amounts of :
- (1) Toxins                      (2) Proteins                      (3) Enzymes                      (4) Lipids
12. The cytoskeleton includes all of the following except :
- (1) Microtubules                      (2) Actin filaments  
(3) Myosin filaments                      (4) Intermediate filaments
13. Which of the following microscopy techniques relies on the specimen interfering with the wavelength of light to produce a high contrast image without the need for dyes or any damage to the sample ?
- (1) Phase contrast microscopy                      (2) Bright field microscopy  
(3) Fluorescence microscopy                      (4) Electron microscopy
14. Which of the following substances will not stimulate an immune response unless they are bound to a larger molecule?
- (1) Antigen                      (2) Virus                      (3) Hapten                      (4) Antibody
15. Monoclonal antibodies recognize a single :
- (1) Antigen                      (2) Bacterium                      (3) Epitope                      (4) Virus
16. The initial complement component that is bound by complement-fixing antibodies is :
- (1) C1q                      (2) C1s                      (3) C3b                      (4) C5a
17. The first production of live but non-virulent forms of chicken cholera bacillus was achieved by :
- (1) Salk                      (2) Pasteur                      (3) Jenner                      (4) Montague

18. What is the test used to verify HIV -positive test results obtained by ELISA ?
  - (1) Ouchterlony test
  - (2) Immuno-electrophoresis
  - (3) Southern blot
  - (4) Western blot
19. What type of immunologic reaction occurs when specific antibodies are mixed with whole cell antigens ?
  - (1) Agglutination
  - (2) Precipitation
  - (3) Immunodiffusion
  - (4) Complement fixation
20. mt DNA is :
  - (1) Simple, double stranded linear DNA molecule
  - (2) Simple, single stranded linear DNA molecule
  - (3) Simple, single stranded circular DNA molecule
  - (4) Simple, double stranded circular DNA molecule
21. When the amino acid alanine (R-group is  $\text{CH}_3$ ) is added to a solution with a pH of 7.3, alanine becomes :
  - (1) a cation
  - (2) nonpolar
  - (3) a zwitter ion
  - (4) an isotope
22. Which of the following is an example of tertiary structure in a protein ?
  - (1) Multimeric protein
  - (2)  $\alpha$ -helix
  - (3)  $\beta$ -pleated sheet
  - (4) Globular domain
23. If the egg white protein, ovalbumin, is denatured in a hard-boiled egg, then which of the following is least affected ?
  - (1) The primary structure of ovalbumin
  - (2) The secondary structure of ovalbumin
  - (3) The tertiary structure of ovalbumin
  - (4) The quaternary structure of ovalbumin
24. Saliva contains all of the following except :
  - (1) hormones
  - (2) amylase
  - (3) bacteria-killing enzymes
  - (4) antibodies

25. Which cells of the brain are called first line of defence ?  
 (1) Bipolar cells (2) Purkinjee cells  
 (3) Glial cells (4) Pyramidal cells
26. Mylenation of Peripheral nervous system is done by which of the following :  
 (1) Oligodendrocytes (2) Astroglia  
 (3) Microglia (4) Schwan cells
27. If a plasmid (size = 5 kb ) is having one BamH1 and one EcoR1 site 2 kb apart and it is digested by the above two enzymes, then how many fragments will be generated and what will be their size :  
 (1) One fragment of 5 kb (2) Two fragments of 2 kb  
 (3) Two fragments of 2 kb & 3 kb. (4) One fragments of 4 kb
28. Which chemical is used to visualize DNA in agarose gel under UV light ?  
 (1) Cynogen bromide (2) Ethidium bromide  
 (3) Ethyl methane sulphonate (4) Hydrazine
29. Termination step of E.coli replication requires the following DNA binding protein :  
 (1) Helicase (2) Dna B protein  
 (3) TUS (4) Dna G protein
30. Transcription and translation occur in the following stage of the eukaryotic cell cycle :  
 (1) M phase (2) G1 phase (3) S phase (4) G2 phase
31. Transcription factor TFIIIA has following DNA binding motif :  
 (1) Helix-turn-helix (2) Helix-loope-helix  
 (3) Zinc finger (4) Leucine zipper
32. Which of the following is the catalytic amino acid residue of Lysozyme ?  
 (1) Tryptophan 62 (2) Glutamic acid 35  
 (3) Serine 57 (4) Histidine 24

33. Allosteric effect of CTP on ACTase is called :
- (1) Homotropic activation
  - (2) Homotropic inhibition
  - (3) Heterotropic activation
  - (4) Heterotropic inhibition
34. Protein kinases :
- (1) Transfer a phosphoryl group from one protein to another
  - (2) Use AMP as a substrate
  - (3) Use Thr, Ser or Tyr as acceptor group for phosphoryl transfer
  - (4) Transfer the  $\alpha$ -phosphorous atom of ATP
35. Fumarase belongs to which major class according to enzyme commission ?
- (1) Transferase
  - (2) Hydrolase
  - (3) Lyase
  - (4) Isomerase
36. Protamine sulphate treatment is used to remove :
- (1) Lipids
  - (2) Nucleic acids
  - (3) Bile pigment
  - (4) Protein
37. Estimate  $k$ , the first order rate constant for an enzyme preparation with  $V_{max}$  of 4.6 micromoles/liter/min and  $K_m = 2 \times 10^{-6}$  M.
- (1) 2.3/min
  - (2) 0.23/min
  - (3) 9.2/min
  - (4) 3.8/sec
38. Which active site group of enzyme is modified by diethyl pyrocarbonate ?
- (1) -SH group
  - (2) -OH group
  - (3) Guanidino group
  - (4) Imidazole group
39. If I binds only after S, I will be ?
- (1) Non-competitive
  - (2) Competitive
  - (3) Uncompetitive
  - (4) Linear mix type
40. Upon immobilization of enzyme what changes occur in the kinetic behavior ?
- (1)  $K_m$  increases
  - (2)  $K_m$  decreases &  $V_{max}$  unchanged
  - (3) Both  $K_m$  &  $V_{max}$  decrease
  - (4) Both  $K_m$  &  $V_{max}$  increase



*Attempt any five questions. Write answer in 150-200 words. Each question carries 16 marks. Answer each question on separate page, after writing Question Number.*

1. Describe briefly the role of nuclear membrane in maintenance and transport of the nucleoprotein complexes with suitable examples.
2. Explain how the DNA transposon and retrotransposon differ in their mechanism of mutagenesis ?
3. Explain a technique for determining for Protein DNA binding site.
4. Explain the role of cAMP in the control of expression of lac operon.
5. Write some of the characteristic reaction of monosaccharide.
6. What is the structure of different types of phospholipids ? Which one is characteristically found in the inner wall of mitochondria ?
7. What is chemical triad ? Illustrate your answer with suitable example.
8. Draw the structure of vitamin B<sub>12</sub> as a coenzyme.
9. Derive Scatchard plot to study the degree of cooperativity.
10. Deduce an equation for linear mixed type of enzyme inhibition.

Roll No. : .....

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Q. No. :

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Roll No. : .....

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Q. No. :

Roll No. : .....

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Q. No. :

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Q. No. :

**FOR ROUGH WORK**

