



Question Booklet No. ....

(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 VO

# 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.

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  $\vec{a} = 2\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$  and  $\vec{b} = 3\mathbf{i} + 2\mathbf{j}$ , then the angle between  $\vec{a}$  and  $\vec{b}$  is :
- (1)  $45^\circ$                       (2)  $90^\circ$                       (3)  $180^\circ$                       (4)  $120^\circ$
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. Which RNA molecules have a cloverleaf structure :
- (1) Eukaryotic mRNAs                      (2) Prokaryotic mRNAs  
(3) Transfer RNAs                      (4) Ribosomal RNAs
12. Following DNA double strand break, the DNA repair mechanism is initiated by :
- (1) autophosphorylation of ATM  
(2) recruitment of ATM at the site of the damage  
(3) phosphorylation of H2A.X  
(4) recruitment of MRN complex to the site of the damage
13. Mini Chromosome Maintenance (MCM) helicases are components of :
- (1) proofreading machinery  
(2) replisome  
(3) pre-replication licensing factor  
(4) telomerase reverse transcriptase (TERT)
14. miRNA is :
- (1) fragmented mRNA that codes for incomplete protein  
(2) mRNA of microorganisms  
(3) non-coding RNA that binds to tRNA  
(4) non-coding RNA that binds to complementary mRNA
15. During eukaryotic recombination the pairing of the homologous DNAs and strand invasion are catalyzed by :
- (1) Rad51 and Dcm1                      (2) RecA protein  
(3) Rad52 and Rad59                      (4) MRX protein

16. Yeast two hybrid is used :
- (1) to study protein expression
  - (2) for physical mapping of a gene
  - (3) for identification of exons and introns
  - (4) to study protein-protein interaction
17. The extinction coefficient of a 1% solution of the enzyme phospholipase C at 280 nm in a 1.0 cm cuvette is 14.3. What is the concentration of a solution of phospholipase C that has an extinction of 1.5 in a 0.5 cm cuvette ?
- (1) 0.21%
  - (2) 10.73%
  - (3) 0.05%
  - (4) 4.77%
18. Which one of the following amino acids is the precursor of heme ?
- (1) Tyrosine
  - (2) Tryptophan
  - (3) Glutamate
  - (4) Glycine
19. Which enzymatic activity in the pentose phosphate pathway requires thiamine pyrophosphate as a cofactor ?
- (1) Glucose 6-phosphate dehydrogenase
  - (2) Transketolase
  - (3) Transaldolase
  - (4) Phosphopentose isomerase
20. What is meant by the steady-state assumption that underlies the Michaelis-Menten relationship between substrate concentration and reaction velocity ?
- (1) The reaction velocity is linearly related to substrate concentration
  - (2) The rate of breakdown of enzyme-substrate complex equals the rate of formation of the complex
  - (3) The rate of formation of product equals the rate of disappearance of substrate
  - (4) The reaction velocity is independent of substrate concentration
21. A protein treated with fluorodinitrobenzene (FDNB) and subjected to acid hydrolysis yielded two different amino acids with their  $\alpha$ -amino groups linked to dinitrophenyl (DNP). A reasonable explanation for this result is that :
- (1) the protein contained more than one free amino group
  - (2) the protein contained more than one N-terminal amino acid
  - (3) the protein contained two basic amino acid residues
  - (4) the protein contained amid group
22. Which of the following statements regarding vitamin A is true ?
- (1) It is related to tocoferol
  - (2) It is also known as opsin
  - (3) It is a component of rhodopsin
  - (4) It is not an essential vitamin

23. Resazurin conversion to resorufin is used in animal cell culture technology for estimating :
- (1) metabolic activity (2) apoptosis  
(3) necrosis (4) lysosomal activity
24. The term somaclonal variations pertains to :
- (1) stem cell culture (2) callus culture  
(3) aneuploidy (4) Darwin's theory of evolution
25. Annexin V binds to the following in apoptotic cells :
- (1) phosphatidylethanolamine (2) phosphatidylcholine  
(3) phosphatidylserine (4) phosphatidylinositol
26. Selenium is a cofactor for the following enzyme :
- (1) glutathione peroxidase (2) lactate dehydrogenase  
(3) fatty acid synthase (4) nitric oxide synthase
27. Philadelphia chromosome is associated with :
- (1) leukemia (2) rheumatoid arthritis  
(3) severe combined immunodeficiency (4) Hashimoto's thyroiditis
28. Neutral red release assay helps in estimating :
- (1) nitric oxide production (2) reactive oxygen species  
(3) cytotoxicity (4) cell migration
29. Which one of the following viruses has naked capsid ?
- (1) TMV (2) Retroviruses  
(3) Myxoviruses (4) Herpes simplex virus
30. Of the following types of organisms, the one that is the least likely to have been the first living organism would be a :
- (1) Chemoorganotroph (2) Chemolithotroph  
(3) Anoxygenic phototroph (4) Oxygenic phototroph
31. Green fluorescent protein (GFP) was originally isolated from which of the following organism?
- (1) *Drosophila melanogaster* (2) *Anabaena doliolum*  
(3) *Aequorea victoria* (4) Yeast

32. *Sulfolobus acidocaldarius* is employed in metal extraction because it :
- (1) oxidizes sulphur and iron                      (2) oxidizes copper  
(3) oxidizes uranium                                      (4) oxidizes molybdenum
33. Trickling filter digesters are mainly used in the process of :
- (1) aerobic waste water treatment  
(2) anaerobic treatment of waste water  
(3) xenobiont degradation  
(4) bio-hydrogen production
34. 'Embryo rescue' is used for :
- (1) ovule culture    (2) anther culture  
(3) protoplast culture                                      (4) cell culture
35. In Golden rice which of the following genes have been added :
- (1)  $\beta$ -carotene pathway genes                      (2) RuBisco gene  
(3) *gdh* pathway genes                                      (4) *ntr* pathway genes
36. Which of the following is responsible for "Eat me not signal" ?
- (1) CD8                      (2) CD47                      (3) CD16                      (4) CD56
37. Non-peptide antigen presentation is done by :
- (1) CD1                      (2) MHC-I                      (3) MHC-II                      (4) CD19
38. NK cells differ from CTLs in :
- (1) the absence of TCRs or CD3  
(2) the presence of memory cells  
(3) the involvement of granzymes in killing mechanism  
(4) the involvement of perforin in killing mechanism
39.  $\text{Na}^+/\text{K}^+$ -ATPase is an example of a P-type ion pump in which "P" stands for :
- (1) sodium-potassium pump  
(2) name of the physiologist who discovered  
(3) phosphorylation of aspartic acid  
(4) named after enzyme ATPase
40. "RGD" present on the fibronectin provide site for binding with :
- (1) collagen                      (2) integrin                      (3) proteoglycans                      (4) laminin



*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. How possession of both innate and adaptive immunity enhances protection against infection?
2. Discuss the regulation of glucose uptake in the muscle and fat cells in response to insulin.
3. How ammonia is assimilated by GS-GOGAT pathway? Mention the importance of this pathway.
4. Define quorum sensing and write the name of common classes of signaling molecules reported in gram-positive and gram-negative bacteria.
5. Discuss the mechanism of operation of bio-safety class II cabinets with suitable diagrams.
6. How is tissue culture grade water obtained ?
7. Explain the molecular mechanism of transposition.
8. Outline the hormonal regulation of eukaryotic gene expression.
9. Identify regulatory steps in glycolytic pathway. Briefly explain the significance of phosphofructokinase in control of glycolysis.
10. You have to characterize a purified protein. How will you determine its subunit composition using polyacrylamide gel electrophoresis technique ?

Roll No. : .....

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Q. No. :

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Q. No. :

FOR ROUGH WORK

