

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 : 19

FOR ROUGH WORK

Research Entrance Test – 2013

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. Most of the land precipitation and evaporation on earth takes place over the :
 - (1) land masses
 - (2) oceans and seas
 - (3) poles of the planet
 - (4) subtropical latitudes

2. The downstream portion of a river :
 - (1) generally becomes more sluggish
 - (2) usually has turbulent flows
 - (3) generally is of higher velocity, which is marked by reduced turbulence
 - (4) has lower discharges than do upstream portions

3. Which of the following is not a fatty acid ?
 - (1) Stearic acid
 - (2) Palmitic acid
 - (3) Oleic acid
 - (4) Phenyl acetic acid

4. Which of the following compounds is not an antibiotic ?
 - (1) Penicillin
 - (2) Chloramine-T
 - (3) Streptomycin
 - (4) Chloramphenicol

5. The acceleration with which a particle moves in a straight line, according to the law $v^2 = 4a(x \sin x + \cos x)$, v being the velocity of the particle at a distance x from a fixed point, is :
 - (1) 0
 - (2) $2ax \cos x$
 - (3) $4ax \cos x$
 - (4) $2ax \sin x$

6. If $\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix} A \begin{bmatrix} 0 & 2 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the matrix A is :

(1) $\begin{bmatrix} 3 & -4 \\ 3/4 & -1 \end{bmatrix}$

(2) $\begin{bmatrix} -13/4 & 3/2 \\ 5/4 & -1/2 \end{bmatrix}$

(3) $\begin{bmatrix} -17/4 & 3/4 \\ -7/4 & -1/4 \end{bmatrix}$

(4) $\begin{bmatrix} 5/4 & 11/4 \\ 3 & -9/4 \end{bmatrix}$

7. If the error in the measurement of radius of sphere is 0.3%, then the percentage error in the measurement of its volume is :

(1) 0.15%

(2) 0.6%

(3) 0.9%

(4) 0.03%

8. The resistance of series combination of two resistances is S. When they are joined in parallel, the total resistance is P. If $S = nP$, then the minimum possible value of n is :

(1) 3

(2) 4

(3) 2.1

(4) 0.89

9. Mitochondria are associated with the function of :

(1) cellular digestion

(2) circulation

(3) protein synthesis

(4) cellular respiration

10. In which parts of eyes, rods and cones are present ?

(1) Retina

(2) Iris

(3) Cornea

(4) Lens

11. Which of the following group of organisms does not have bilateral symmetry?
- (1) Platyhelminthes (2) Mollusca
(3) Cnideria (4) Echinodermata
12. Which of the following groups of animals does not come under deuterostomes ?
- (1) Chordata (2) Arthropoda
(3) Protochordata (4) Echinodermata
13. In most reptiles the opisthotics fuses with
- (1) basioccipital (2) exoccipital
(3) supraoccipital (4) basisphenoid
14. In which of the following vertebrates the oviduct on right side is absent?
- (1) Sarcopterygian (2) Urodeles
(3) Birds (4) Lacertalia
15. An animal will be known as an insect if it has
- (1) 3 pairs of thoracic legs (2) 3 pairs of wings
(3) Body divisible into head and thorax (4) Jointed appendages
16. Ecdysone in insects is secreted by
- (1) neurosecretary cells of the brain (2) corpora cardiaca
(3) corpora allata (4) prothoracic gland

17. Infectious dropsy in fishes is caused by

- (1) *Pseudomonas punctata* (2) *Aeromonas salmonicida*
(3) *Flexibacteria* (4) *Myxobacteria*

18. Intracellular thyroid hormone synthesis is the characteristics of

- (1) actinopterygian (2) anurans
(3) agnathans (4) reptilians

19. Which of the following increases the uptake of sodium ions and water in the kidney with simultaneous elimination of potassium ions?

- (1) Vasopressin (2) Aldosterone
(3) Renin (4) Parathormone

20. Which one of the following is not under the direct control of pituitary ?

- (1) Adrenal medulla (2) Adrenal cortex
(3) Thyroid (4) Testis

21. If you need to prepare 5M NaCl (MW 58.5), you will dissolve

- (1) 5 gm of NaCl in a total volume of 100 ml of water
(2) 5 gm of NaCl in a total volume of 1000 ml of water
(3) 58.5 gm of NaCl in a total volume of 200 ml of water
(4) 5.85 gm of NaCl in a total volume of 200 ml of water

22. Electrophoretic mobility shift assay is a technique to study

- (1) DNA-protein interaction
- (2) Protein-protein interaction
- (3) DNA-RNA interaction
- (4) RNA-RNA interaction

23. If an object is viewed under a compound microscope in the following conditions :

Wavelength of light used = 400 nm; Refractive index of medium = 1.5; Angular aperture $\sin 70^\circ = 0.94$, the limit of resolution will be approximately

- (1) 100 nm
- (2) 175 nm
- (3) 250 nm
- (4) 300 nm

24. A nucleosome is made up of

- (1) histones (H2A, H2B, H3, H4) and 146 bp of DNA
- (2) histones (H1, 2 molecules each of H2A, H2B, H3, H4) and 146 bp of DNA
- (3) histones (H1, 2 molecules each of H2A, H2B, H3, H4) and 200 bp of DNA
- (4) histones (H2A, H2B, H3, H4) and linker DNA

25. If a *Drosophila* species has 4 pairs of metacentric chromosomes and 1 pair of telocentric chromosome, then this species will have

- (1) 5 arms in polytene chromosomes
- (2) 6 arms in polytene chromosomes
- (3) 7 arms in polytene chromosomes
- (4) 9 arms in polytene chromosomes

26. A strain of *E. coli* has following genotype with reference to *lac* operon:
 $i^- o^+ z^- y^- a^+$

This strain will show

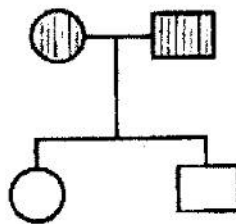
- A. permease activity after induction
- B. absence of beta-galactosidase activity with or without induction
- C. binding of RNA polymerase only after induction
- D. trans-acetylase activity with or without induction

Which of the following combination of answers is correct?

- (1) A and B
- (2) A and C
- (3) B and C
- (4) B and D

27. Following are four considerable modes of inheritance for the given pedigree:

- A. X-linked recessive
- B. X-linked dominant
- C. Autosomal recessive
- D. Autosomal dominant



Which of the above modes of inheritance can explain the pedigree shown below?

- (1) A and C
- (2) B and D
- (3) C
- (4) D

28. Citrate is an allosteric effector that inhibits phosphofructokinase, which catalyzes the reaction: Fructose 6 -phosphate + ATP \rightarrow Fructose 1,6-bisphosphate + ADP + H⁺.

What specific effect does citrate have on the activity of phosphofructokinase?

- (1) Citrate reduces the K_m with no effect on the V_{max}
 - (2) Citrate irreversibly binds to the enzyme
 - (3) Citrate competes with Fructose 6 -phosphate/ATP for binding at the active site
 - (4) The ratio of V_{max}/K_m is lower in the presence of citrate
29. Correct statements regarding the urea cycle include all of the following except
- (1) the immediate precursor of urea in the cycle is ornithine
 - (2) the supply of carbamoyl phosphate to the urea cycle enzymes is regulated by N-acetyl glutamate
 - (3) the formation of carbamoyl phosphate requires two molecules of ATP per molecule of ammonia incorporated
 - (4) aspartate used in the urea cycle can arise from oxaloacetate by transamination with cytosolic alpha-ketoglutarate
30. All of the following statements about the nucleolus are true except
- (1) it is the site of synthesis of ribosomal RNAs
 - (2) it is derived from the nucleolar organizer region of the chromosome
 - (3) ribosome assembly begins in the nucleolus
 - (4) it is surrounded by a single membrane

31. Eosine is used to
- (1) fix the tissue
 - (2) stain cytoplasm
 - (3) stain nuclei
 - (4) mount the sections
32. Best results in enzyme histochemistry is obtained if preceding sectioning and staining the tissue is
- (1) fixed in Bouins
 - (2) fixed in Zenker's fluid
 - (3) fixed in formaldehyde
 - (4) unfixed frozen
33. Which of the following is a protein database?
- (1) Cn3D
 - (2) BankIt
 - (3) CATH
 - (4) PubMed
34. In complete heart block
- (1) fainting may occur because the atria are unable to pump blood into the ventricles
 - (2) fainting may occur because of prolonged periods during which the ventricles fail to contract
 - (3) ventricular fibrillation is common
 - (4) the atrial rate is lower than the ventricular rate.
35. If the clearance of a substance which is freely filtered is less than that of inulin
- (1) there is net reabsorption of the substance in the tubules
 - (2) there is net secretion of the substance in the tubules
 - (3) the substance is neither secreted nor reabsorbed in the tubules
 - (4) the substance is secreted in the proximal tubule to a greater degree than in the distal tubule

36. The dorsal-most vegetal cells of amphibian blastula, capable of inducing the organizer, is called as
- (1) Primary organizer (2) Dorsal lip
(3) Nieuwkoop centre (4) Dorsal marginal zone

37. African Trypanosomes cause sleeping sickness. The following statements are towards describing the process by which these parasites evade host immune response:

- A. Trypanosomes have variable surface glycoproteins on their surface coat
B. Only one VSG is expressed at a time
C. A new VSG is synthesized after everyone to two weeks
D. The VSG genes are present in the host and they are expressed following infection by the parasites

The following combination of statements is correct

- (1) A and B (2) A, B and C (3) B and C (4) A, B and D

38. If the allelic distribution of a given gene in a population is: A 70% and a 30%, then the genotypic distribution of AA, Aa and aa will be approximately:

- (1) 1 : 2 : 1 (2) 9 : 3 : 4 (3) 5.5 : 4.5 : 1 (4) 6.5 : 12 : 1.5

39. Aquatic primary production was measured using Light and Dark bottle technique. If the initial oxygen concentration was 'I', oxygen concentration in Light bottle after 24 hour of experimental period was 'L' and that in dark bottle was 'D', then the Net Productivity of the given ecosystem in terms of oxygen production will be

- (1) L + D (2) L - I (3) (I - L) + (I - D) (4) I - D

40. Maximum amount of information can be communicated by using

- (1) Visual signals (2) Tactile signals
(3) Acoustic signals (4) Chemical signals

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. Comment upon retrogressive metamorphosis in urochordates.
2. Write a note on vitellogenin processing in maturing oocytes.
3. What is blood-testis barrier? Write about important biological actions of testosterone in male.
4. In order to measure the amount of a newly synthesized protein by radio-labeling method, the radio labeled protein is dissolved in a scintillation cocktail before it is subjected to the scintillation counter. Briefly, explain the principle of use of the cocktail in determining the level of a radio labeled material.
5. With the help of a labeled diagram depict the consequence of meiotic recombination at a single point in an individual heterozygous for a paracentric inversion.
6. If mRNA and ribosomal subunits reside free in cytoplasm, then how some of the proteins get synthesized on endoplasmic reticulum? Illustrate the mechanism with the help of diagrams only. Also comment on the fate of those proteins which are synthesized on endoplasmic reticulum.
7. Draw a well labeled diagram of a glutamatergic synapse and briefly describe the steps of events involved in the induction of an early LTP during consolidation of memory.
8. Illustrate molecular understanding of initiation of limb bud formation in vertebrates and its subsequent specification in proximo-distal axis.
9. What is photochemical smog and how is it produced?
10. Demonstrate Natural Selection in action with a suitable example.

Roll No. :

Q. No. :

Roll No. :

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Q. No. :

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Q. No. :

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Q. No. :

FOR ROUGH WORK