

*(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 30 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 change 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 pages 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 : 24**

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## Research Entrance Test-2017

No. of Questions : 50

प्रश्नों की संख्या : 50

Time : 2 Hours

Full Marks : 200

समय : 2 घण्टे

पूर्णाङ्क : 200

**Note: (1)** This Question Booklet contains **40** Multiple Choice Questions followed by **10** Short Answer Questions.

इस प्रश्न पुस्तिका में **40** वस्तुनिष्ठ व **10** लघु उत्तरीय प्रश्न हैं।

**(2)** 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.

अधिकाधिक वस्तुनिष्ठ प्रश्नों को हल करने का प्रयत्न करें। प्रत्येक वस्तुनिष्ठ प्रश्न **3 (तीन)** अंकों का है। प्रत्येक गलत उत्तर के लिए **1 (एक)** अंक काटा जायेगा। प्रत्येक अनुत्तरित प्रश्न का प्राप्तांक शून्य होगा। यदि वस्तुनिष्ठ प्रश्नों के एकाधिक वैकल्पिक उत्तर सही उत्तर के निकट प्रतीत हों, तो निकटतम सही उत्तर दें।

**(3)** 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.

केवल **5 (पाँच)** लघुउत्तरीय प्रश्नों के उत्तर दें। प्रत्येक प्रश्न **16 (सोलह)** अंकों का है तथा उनका उत्तर **150-200** शब्दों के बीच होना चाहिए। इसके लिए इस पुस्तिका में लगे हुए सादे **5 (पाँच)** पृष्ठों का ही उपयोग आवश्यक है। प्रत्येक प्रश्न का उत्तर एक नए पृष्ठ से, प्रश्न संख्या लिखकर शुरू करें।

1. Booklungs are found in :

- |              |                  |
|--------------|------------------|
| (1) Amoeba   | (2) Polystomella |
| (3) Euglypha | (4) Arachnids    |

2. Silk is obtained from :

- |                |                       |
|----------------|-----------------------|
| (1) Adult moth | (2) Caterpillar stage |
| (3) Egg        | (4) Cocoon            |

3. Neurogenic heart is found in :

- |                  |                   |
|------------------|-------------------|
| (1) Human beings | (2) Rat           |
| (3) Rabbit       | (4) Invertebrates |

4. Epiphysis is also known as :

- |             |                  |
|-------------|------------------|
| (1) Pineal  | (2) Pituitary    |
| (3) Thyroid | (4) Hypothalamus |

5. Simplest and smallest form of amino acid is :

- |             |              |
|-------------|--------------|
| (1) Glycine | (2) Proline  |
| (3) Lysine  | (4) Arginine |

6. PCOS is related to :

- |            |             |
|------------|-------------|
| (1) Ovary  | (2) Uterus  |
| (3) Testes | (4) Oviduct |

7. Seminogelin is secreted by :

- |                  |                     |
|------------------|---------------------|
| (1) Epididymis   | (2) Seminal Vesicle |
| (3) Thecal cells | (4) Oviduct         |

8. First cleavage in frog is :

- |                |                 |
|----------------|-----------------|
| (1) Horizontal | (2) Meridional  |
| (3) Equatorial | (4) Latitudinal |

9. Which of the following is nuclear receptor ?

- |        |          |
|--------|----------|
| (1) AR | (2) GPCR |
| (3) IR | (4) MT1  |

10. Cryptorchidism is related to :

- |            |              |
|------------|--------------|
| (1) Testes | (2) Thyroid  |
| (3) Ovary  | (4) Pancreas |

11. Atoke and Epitoke regions in the body are found in :

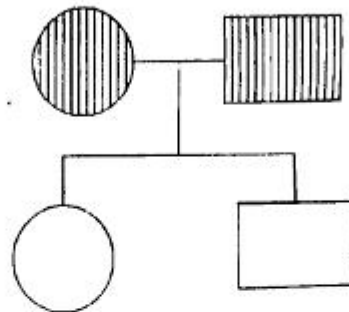
- |                         |                        |
|-------------------------|------------------------|
| (1) <i>Heteronereis</i> | (2) <i>Hirudinaria</i> |
| (3) <i>Peripatus</i>    | (4) <i>Pennatula</i>   |

12. Which one of the following is correct match of all the metazoan larval forms with their groups ?
- (1) Brachiolaria-Trochophore; Cysticercus-Cestoda, Platyhelminth-fish; Asterozoa-Polycheta
  - (2) Brachiolaria-Asterozoa; Cysticercus-Cestoda, Platyhelminth-fish; Trochophore-Polycheta
  - (3) Brachiolaria-Asterozoa; Cysticercus-Jelly fish; Platyhelminth-Cestoda, Trochophore-Polycheta
  - (4) Brachiolaria-Cestoda; Cysticercus-Asterozoa; Platyhelminth-Polycheta, Trochophore-Jelly fish
13. Which of the following is early gnathostome ?
- (1) *Parasitacarus*
  - (2) *Heterostegus*
  - (3) *Artiodiran*
  - (4) *Anapodion*
14. Which of the following lack secondary palate ?
- (1) Mammals
  - (2) Birds
  - (3) Reptiles
  - (4) Amphibians
15. Juvenile haemolymph is produced by :
- (1) Corpora allata
  - (2) Corpora cephalica
  - (3) Prothoracic gland
  - (4) Ring gland

16. If an object is viewed under a compound microscope in the following conditions : Wevelenght of light used= 500nm; Refractive index of medium=1.0; Angular aperture  $\sin 70^\circ=0.94$ , the limit of fesolution will be approximately :
- (1) 150nm      (2) 275nm      (3) 325nm      (4) 400nm
- 17 Beer's law states that the absorbance equal to :
- (1)  $2\text{-log}\%$  transmission  
(2) Extinction coefficient x light path x concentration  
(3) Natural log of the concentration x the light path length  
(4) Extinction coefficient x light path x concentration and  $2\text{-log}\%$  transmission
18. A 60 kD molecular weight protein made up of two identical subunits when resolved on SDS-polyacrylamide gel will show :
- (1) a single band of 60kD      (2) two bands of 60kD each  
(3) a single band of 120kD      (4) a single band of 30kD
- 19 gRNA-dependent insertion of uridylate residue during RNA editing requires all the enzymes except :
- (1) 3-U- exonuclease      (2) Endonuclease  
(3) TuTase      (4) RNA ligase



20. Which one of the following is called as a pace maker enzyme in glycolytic pathway ?
- (1) Hexokinase (2) Phosphofructokinase I  
(3) Pyruvate kinase (4) Glucokinase
21. What will happen if a lysosome is ruptured inside a cell ?
- (1) The individual will get inclusion cell disease  
(2) All organelles of the cell will get digested  
(3) The lysosomal proteins will get transported back to other lysosomes  
(4) The lysosomal enzymes will get inactivated due to non acidic pH of cytoplasm
22. Following are four considerable modes of inheritance for the given pedigree :
- A. X-linked recessive      B. X-linked dominant  
C. Autosomal dominant      D. Autosomal recessive



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

23. Segregation of the two alleles takes place at which phase of cell cycle ?

- A. At anaphase I during gamete formation
- B. After fertilization at mitotic anaphase
- C. At anaphase II if crossing over between maternal and paternal chromosomes has taken place involving the given allele
- D. At diplotene when crossing over is completed

Which of the above statement/s can answer the question most appropriately ?

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

24. If a *Drosophila* species has 3 pairs of metacentric chromosomes and 1 pair of telocentric chromosome, 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

25. The hormone that causes acromegaly if present in abnormally high concentration in an adult is :

- (1) Antidiuretic hormone
- (2) Growth hormone
- (3) Gonadotropic hormone
- (4) Thyroid-stimulating hormone

**26.** Androgen binding protein is secreted by :

- (1) Leydig cells
- (2) Peritubular cells
- (3) Germ cells
- (4) Sertoli cells

**27.** The hormone required for conversion of carotene to vitamin-A is :

- (1) Thyroid hormone
- (2) Glucagon
- (3) Calcitonin
- (4) Parathormone

**28.** In doing histochemistry for enzymes the tissue is :

- (1) fixed in Bouins prior to sectioning and staining
- (2) fixed in gluteraldehyde prior to sectioning and staining
- (3) frozen prior to sectioning and staining
- (4) stained prior to fixation

**29.** Methyl-green pyronin-Y is used to stain :

- (1) DNA only
- (2) DNA and RNA
- (3) RNA only
- (4) Nucleoproteins

10.  $t^2$  test is a :

- (1) parametric test and is calculated by using mean and SE of mean values
- (2) parametric test and is calculated by using observed and expected values
- (3) non-parametric test and is calculated by using mean and SE of mean values
- (4) non-parametric test and is calculated by using observed and expected values

11. *Clustal* is a bioinformatical tool for :

- (1) finding restriction endonuclease sites in a DNA sequence
- (2) RNA sequence comparison
- (3) protein network
- (4) Human genes and genetic disorders

12. The other molecules are numbered as follows :

1) Fibrinogen-2, Prothrombin-3; Thrombin-4

2) Give the order in which they come during clot formation

- (1) 1,2,3,4
- (2) 2,1,3,4
- (3) 3,2,1,4
- (4) 3,2,1,4

33. In cerebral ischemia, blood brain barrier becomes leaky due to :
- (1) decline in the neuronal ATP content and reduction in the Na<sup>+</sup>-K<sup>+</sup> ATPase activity
  - (2) decline in the endothelial cell ATP content and reduction in the Na<sup>+</sup>-K<sup>+</sup> ATPase activity
  - (3) decline in the astrocytes ATP content and reduction in the Na<sup>+</sup>-K<sup>+</sup> ATPase activity
  - (4) increase in the astrocytes ATP content and increased Na<sup>+</sup>-K<sup>+</sup> ATPase activity

34. The following statements are given for the gene products that help in body pattern formation during development :

- A. contain 180 bp homeodomain
- B. act as transcription factors
- C. have four paralogous groups
- D. the genes are clustered in two complexes

Which combination of above statements is best appropriate for *Drosophila* homeotic gene products ?

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

35. The generic and specific name of an animal is written by the same word, e.g., *Naja naja*. This convention of naming is known as :

- |              |             |
|--------------|-------------|
| (1) Tautonym | (2) Synonym |
| (3) Homonym  | (4) Binomen |

36. A chromosome locus is represented by two alleles 'A' and 'a'. The frequency of 'A' allele in a population of 200 individuals is 0.3. The expected number of heterozygotes in this population will be :

- (1) 98                      (2) 84                      (3) 18                      (4) 42

37. The following terms are given for specific events towards developing adaptive immunity :

- A. Allelic exclusion                      B. Class switching  
C. Clonal selection                      D. Clonal deletion

Which of the above terms is/are associated with the generation of antibody diversity ?

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

38. Which of the following best illustrates ecological succession ?

- (1) Imported pheasants increase in number while local quails disappear  
(2) A mouse eats seed and an owl eats the mouse  
(3) Grasses grow in a deserted field followed by shrubs and then tree  
(4) Decomposition in soil releases nitrogen that plants can use



**Short Answer Questions**

**Note:** 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.

01. Write a note on retrogressive metamorphosis in urochordates.
02. Write a note on digestion of keratin in insects.
03. What is ion-exchange chromatography? Briefly describe how you purify a cationic protein using this technique.
04. What is charge relay network? How is it achieved during activation of chymotrypsinogen to chymotrypsin.
05. Discuss the significance of G-and C-banding on karyotyping. How the nomenclature is given for chromosome subdivisions?
06. Define 'Two cell-Two gonadotropin' concept of estrogen synthesis.
07. Differentiate between Enzyme-histochemistry and Immunohistochemistry.
08. How does counter current exchange and multiplier mechanism differ from each other? Explain the role of these mechanisms in the formation of concentrated urine.



09. Illustrate molecular understanding of antero-posterior axis formation in *Drosophila* during embryogenesis.
  
10. Explain energy flow in an ecosystem considering the laws of thermodynamics.

Question No.

Page for Short Answer

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Question No.

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## अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली-काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 30 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।  
परीक्षा भवन में लिफाफा रहित प्रवेश-पत्र के अतिरिक्त, लिखा या सादा कोई भी खुला कागज साथ में न लायें।
2. उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा। केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।
3. अपना अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से निर्धारित स्थान पर लिखें। उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।
4. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्नपुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्नपुस्तिका पर अनुक्रमांक और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।  
उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।
5. प्रश्न पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिए आपका उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।  
प्रत्येक प्रश्न के उत्तर के लिए केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।  
ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देना चाहते हैं, तो संबंधित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।
6. रफ कार्य के लिए प्रश्न-पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा उत्तर-पुस्तिका के अंतिम पृष्ठ का प्रयोग करें।
7. परीक्षा के उपरान्त केवल ओ एम आर उत्तर-पत्र परीक्षा भवन में जमा कर दें।
8. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।
9. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/का, भागी होगा/होगी।