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

Roll No.

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

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.

P.T.O.

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 dived 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%

(2)

9. If $\bar{a} = 2i - 3j + 4k$ and $\bar{b} = 3i + 2j$, then the angle between $\bar{a}$ and $\bar{b}$ is :

(1) 45°   (2) 90°   (3) 180°   (4) 120°

10. The value of the integral $\int_{0}^{\frac{\pi}{2}} \dfrac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\, dx$ is

(1) π (2) $\dfrac{\pi}{2}$ (3) $\dfrac{\pi}{4}$ (4) $-\dfrac{\pi}{4}$

11. DNA polymerases synthesize DNA only in the 5' to 3' direction. Yet, at the replication fork, both strands of parental DNA are being replicated with the synthesis of new DNA. How is it possible that while one strand is being synthesized in the 5' to 3' direction, the other strand appears to be synthesized in the 3' to 5' direction? This apparent paradox is explained by

(1) 3' to 5' DNA repair enzymes

(2) Okazaki fragments

(3) Replication and immediate crossover of the leading strand

(4) Lack of RNA primer on one of the strands

12. Erythromycin is the antibiotic of choice when treating respiratory tract infections because of its ability to inhibit protein synthesis in certain bacteria by

(1) Inhibiting translocation by binding to 50S ribosomal subunit

(2) Causing premature chain termination

(3) Inhibiting initiation

(4) Mimicking mRNA binding

13. The oxygen dissociation curve of normal adult haemoglobin is most effectively shifted to the right by which of the following ?

(1) Cooperative binding of oxygen   (2) Increased pH

(3) Increased 2,3-bisphosphoglycerate   (4) Decreased CO_2

14. Blood glucose is maintained at the concentration of 4.5 to 5.5 mmole/L but may rise to 6.5 to 7.2 mmole/L after feeding or decrease to 3.9mmole/L in the fasting state. Which enzyme plays an important role in regulating blood glucose levels after feeding ?

(1) Glucokinase

(2) Glucose-6-phosphatase

(3) Phosphofructokinase

(4) Pyruvate kinase

15. Inhibition of ATP synthesis during oxidative phosphorylation by oligomycin is thought to be due to which of the following events?
    (1) Blocking of the proton gradient between NADH-Q reductase and QH_2
    (2) Blocking of the proton gradient between cytochrome $c1$ and cytochrome c
    (3) Inhibition of mitochondrial ATPase
    (4) Uncoupling of electron transfer between NADH and flavoprotein

16. The specific activity of an enzyme is
    (1) The amount of enzyme that produces 1 mole of product per second under standard condition
    (2) The activity of an enzyme in relation to a standard preparation of the enzyme
    (3) The number of enzyme units per milligram of enzyme protein
    (4) The amount of enzyme causing transformation of 1 µ mole of substrate per minute under standard condition

17. Which of the following synaptic transmitters is not a peptide, polypeptide, or protein ?
    (1) Substance P   (2) β-Endorphin   (3) Serotonin   (4) Met-enkephalin

18. As per current concept, blood group type 'o' is because of
    (1) Absence of both agglutinogens A and B on RBC membrane
    (2) Presence of both agglutinins α and β in serum
    (3) Absence of both agglutinins α and β in serum
    (4) Presence of H substance on RBC membrane

19. Sap-sucking insect pests are best managed by the use of:
    (1) Stomach poisons   (2) Contact poisons
    (3) Systemic effect poisons   (4) Fumigants

20. Which of the following is not a characteristic feature of ritualized signals?
    (1) Redundancy   (2) Inconspicuousness
    (3) Stereotypy   (4) Alerting components

21. In nature, female crickets move out from their burrows only after dusk and the male crickets start their calling behaviour at dusk. Under experimental laboratory conditions male crickets were kept for 12 days under constant bright light conditions and same temperature conditions. Under laboratory conditions the male crickets are expected :
    (1) To exhibit their calling bout at exactly the same time as in nature
    (2) Not to produce the calling cycle
    (3) To produce interrupted calling bouts throughout each day
    (4) To produce the calling bout 25 to 26 hours later each day

(4)

22. An evolutionary strategy that favours the reproductive success of an organism's relatives, even at a cost to the organism's own survival and reproduction is known as :
    (1) Natural selection
    (2) Kin selection
    (3) Group selection
    (4) Sexual selection

23. Following examples illustrate four types of species interactions in a community:
    (A) The cleaner fish remove parasites from larger fish
    (B) Fig-pollinating wasps lay eggs in the fig flowers
    (C) The cattle egret catches insects that fly out from the grass as the cattle grazes
    (D) Tapeworms attach themselves to the intestine of man and eat the partly digested food According to the above examples the type of associations shown by the interacting species are called respectively,
    (1) Commensalism, obligate mutualism, facultative mutualism, parasitism
    (2) Facultative mutualism, obligate mutualism, commensalism, parasitism
    (3) Parasitism, obligate mutualism, commensalism, facultative mutualism
    (4) Obligate mutualism, facultative mutualism, parasitism, commensalism

24. Vitamin B2 deficiency causes
    (1) Cheilosis   (2) Pellagra   (3) Anaemia   (4) Beriberi

25. *Renin is secreted by*
    (1) Liver   (2) Kidney   (3) Stomach   (4) Pancreas

26. Addison's disease is caused by deficiency of
    (1) TSH   (2) ACTH   (3) ADH   (4) GH

27. Relaxin is secreted by
    (1) Ovary   (2) Placenta   (3) Uterus   (4) all of the above

28. mineralocorticoids ae secreted by
    (1) *Zona glomerulosa*
    (2) *Zona fasciculata*
    (3) *Zona reticularis*
    (4) Adrenal medulla

29. Arginine vasopressin is synthesised by
    (1) Neurohypophysis
    (2) Median eminence
    (3) Paraventricular nuclei
    (4) Suprachiasmatic nuclei

30. Biological active form of thyroid hormone is
    (1) MIT   (2) DIT   (3) T3   (4) T4

31. The contractile response in skeletal muscle
    (1) Starts after the action potential is over
    (2) Produces more tension when the muscle contracts isometrically than when muscle contracts isotonically
    (3) Produces more work when the muscle contracts isometrically than when muscle contracts isotonically
    (4) Decreases in magnitude with repeated stimulation.

32. GnRH secretion is regulated by
    (1) Kisspeptin
    (2) GnIH
    (3) Sex steroid
    (4) all of the above

33. During meiosis when a cell actually becomes haploid?
    (1) At the end of second division
    (2) During recombination in pachytene
    (3) During chiasmata terminalization at diakinesi
    (4) At the end of first division

34. Which one of the following organelles is rich in acid hydrolases ?
    (1) Lysosomes
    (2) Golgi complex
    (3) Peroxisomes
    (4) Rough endoplasmic reticulum

35. Most of the membrane proteins are synthesized on
    (1) Rough endoplasmic reticulum
    (2) Nucleolus
    (3) Smooth endoplasmic reticulum
    (4) Nucleolus

36. Which of the following is the largest chromosome ?
    (1) Satellite chromosomes
    (2) X-chromosome
    (3) Lampbrush chromosomes
    (4) Polytene chromosomes

37. Due to mutation one amino acid may get replaced by a stop codon. Such mutations are termed as
    (1) Nonsense mutation
    (2) Missense mutation
    (3) Frame shift mutation
    (4) Point mutation

38. For a given gene, a diploid individual will contain
    (1) two alleles
    (2) one allele
    (3) multiple alleles
    (4) two genes

39. Which law of Mendel is revealed by monohybrid cross ?
    (1) Law of dominance
    (2) Law of segregation
    (3) Law of independent assortment
    (4) Law of heterosis

40. The maximum frequency of recombination in a given point cannot be more than
    (1) 100%
    (2) 75%
    (3) 50%
    (4) 25%

(6)

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. What is charge-relay-network ? Explain how this process converts chymotrypsinogen into chymotrypsin.

2. Briefly describe the steps of DNA foot-printing for the characterization of DNA-protein interaction. Add comment on how this technique is better than electrophoretic mobility shift assay ?

3. What is interferon? Elucidate mechanisms of its action in achieving antiviral states in virus infected cells.

4. Describe Eusocial organization

5. Discuss the significance of G- and C- banding on karyotyping and how the nomenclature is given for chromosome subdivisions ?

6. Describe in detail the causes, symptoms, diagnosis and treatment of PCOS.

7. What is diabetes insipidus?

8. What do you understand by RNA interference? Giving suitable example, explain the role of miRNA pathways in regulation of gene expression.

9. Illustrate molecular understanding of role of HOX genes in proximo-distal axis in vertebrate limb formation.

10. What is feedback mechanism ?

Q. No. :

RET/15/Test B/884

Roll No. : ....

Q. No. :

FOR ROUGH WORK