UNIVERSITY OF MYSORE

Ph.D. Entrance Examination, November - 2020

SUBJECT CODE : 3 1

Entrance Reg. No.						

QUESTION BOOKLET NO.

503792

QUESTION BOOKLET

(Read carefully the instructions given in the Question Booklet)

SUBJECT : **GENETICS**

MAXIMUM MARKS : 100 **MAXIMUM TIME : THREE HOURS**

(Including initial 10 minutes for filling O.M.R. Answer sheet)

INSTRUCTIONS TO THE CANDIDATES

1. The sealed questions booklet containing 50 questions enclosed with O.M.R. Answer Sheet is given to you.
2. Verify whether the given question booklet is of the same subject which you have opted for examination.
3. Open the question paper seal carefully and take out the enclosed O.M.R. Answer Sheet outside the question booklet and fill up the general information in the O.M.R. Answer sheet. If you fail to fill up the details in the form of alphabet and signs as instructed, you will be personally responsible for consequences arising during scoring of your Answer Sheet.
4. During the examination:
   a) Read each question carefully.
   b) Determine the Most appropriate/correct answer from the four available choices given under each question.
   c) Completely darken the relevant circle against the Question in the O.M.R. Answer Sheet. For example, in the question paper if "C" is correct answer for Question No.8, then darken against Sl. No.8 of O.M.R. Answer Sheet using Blue/Black Ball Point Pen as follows:

Question No. 8. Ⓐ Ⓑ ● Ⓓ (Only example) (Use Ball Pen only)

5. Rough work should be done only on the blank space provided in the Question Booklet. Rough work should not be done on the O.M.R. Answer Sheet.
6. If more than one circle is darkened for a given question, such answer is treated as wrong and no mark will be given. See the example in the O.M.R. Sheet.
7. The candidate and the Room Supervisor should sign in the O.M.R. Sheet at the specified place.
8. Candidate should return the original O.M.R. Answer Sheet and the university copy to the Room Supervisor after the examination.
9. Candidate can carry the question booklet and the candidate copy of the O.M.R. Sheet.
10. The calculator, pager and mobile phone are not allowed inside the examination hall.
11. **If a candidate is found committing malpractice, such a candidate shall not be considered for admission to the course and action against such candidate will be taken as per rules.**

INSTRUCTIONS TO FILL UP THE O.M.R. SHEET

1. There is only one most appropriate/correct answer for each question.
2. For each question, only one circle must be darkened with BLUE or BLACK ball point pen only. Do not try to alter it.
3. Circle should be darkened completely so that the alphabet inside it is not visible.
4. Do not make any stray marks on O.M.R. Sheet.

ಗಮನಿಸಿ : ಸೂಚನೆಗಳ ಕನ್ನಡ ಆವೃತ್ತಿಯು ಈ ಪುಸ್ತಕದ ಹಿಂಭಾಗದಲ್ಲಿ ಮುದ್ರಿಸಲ್ಪಟ್ಟಿದೆ.

PART - A

I. This part shall contains 50 multiple choice/objective type questions, each question carrying one mark. **[50 × 1 = 50]**

1) The genetic code is believed to be very ancient because:

(A) it had to exist before the proteins for the first cell could be formed

(B) amino acids must have a template in order to form peptide bonds

(C) it is universal

(D) all of the above

2) A diploid somatic cell:

(A) cannot undergo division again

(B) can undergo mitosis but not meiosis

(C) can undergo mitosis and meiosis

(D) can undergo meiosis but not mitosis

3) During differentiation, cells with the same DNA

(A) develop similarly

(B) divide at equal rate

(C) contain different genes

(D) transcribe different genes

4) Non translated DNA segments in genes are called

(A) exons (B) introns

(C) prions (D) neutrons

5) The tRNA contains a specific trinucleotide sequence called:

(A) tricodon (B) trinucleotide

(C) anticodon (D) codon

6) A reverse-transcriptase is:

(A) RNA-directed DNA polymerase

(B) DNA-directed DNA polymerase

(C) Protein-directed RNA polymerase

(D) none of the above

7) The new okazaki fragment is joined to the lagging strand by the enzyme:

(A) DNA polymerase (B) RNA polymerase

(C) Protease (D) DNA ligase

8) Structure of DNA was discovered by

(A) Watson, Crick and Khorana (B) Watson, Crick and Gilbert

(C) Watson, Crick and Nirenberg (D) Watson, Crick and Wilkins

9) mRNA is synthesised by:

(A) DNA directed RNA polymerase

(B) RNA directed RNA polymerase

(C) reverse transcriptase

(D) taq polymerase

10) The completion of the polypeptide chain is signalled by:

(A) initiation codon (B) elongation codon

(C) termination codon (D) releasing factor

11) Ultraviolet damage results in the formation of:

(A) uracil tetramer
(B) adenine dimer
(C) thymine dimer
(D) thyminehexamer

12) An individual is classified in AB blood group if he/she has the following antibody in the blood plasma:

(A) anti-A
(B) anti-B
(C) neither
(D) anti-A and anti-B

13) In Cell cycle "S" stands for

(A) standard phase
(B) simple phase
(C) synthetic phase
(D) none of the above

14) Some bacteria contain small circular DNA molecules called

(A) Plasmids
(B) Prion
(C) Genome
(D) None of the above

15) The DNA can be transferred into bacteria by

(A) transformation
(B) conjugation
(C) transduction
(D) all of the above

16) Nucleic acid contains

(A) carbon, hydrogen, oxygen, nitrogen and phosphorous
(B) carbon, hydrogen, oxygen, nitrogen and sulphur
(C) carbon, hydrogen, oxygen, nitrogen, sulphur and phosphorous
(D) carbon, hydrogen, oxygen and nitrogen

17) Mitochondria

(A) contain genetic material
(B) is the power house of the cell
(C) contain electron transport chain
(D) all of the above

18) Barr body production is due to

(A) condensation
(B) replication
(C) lyonisation
(D) supercoiling

19) Genomic imprinting means

(A) differential expression of genes inherited from sex chromosomes
(B) gene expression in an individual from a lethal gene
(C) differential expression of a gene inherited from mother or father
(D) genetic defect due to transposans

20) A proto oncogene may be activated by any of the following mechanisms EXCEPT

(A) chromosome rearrangement
(B) point mutation
(C) deletion
(D) amplification

21) The most common genetic change that occurs in the development of tumors is

(A) activation of c-myc gene by somatic mutation
(B) activation of c-myc gene by chromosome rearrangement
(C) inherited inactivation or loss of the p53 gene
(D) inactivation or loss of the p53 gene by somatic mutation

22) Which one of the following statements about normal phenotypic variation is true?

(A) most normal characters in boys are inherited from their fathers and most characters in girls are inherited from their mothers
(B) the genes involved are the same in all populations
(C) environmental factors play a role
(D) most normal characters such as eye or hair color are transmitted as autosomal recessive traits

23) The number of hydrogen bonds between the two strands of the duplex oligonuceotide illustrated below is

AGCTC

TCGAG

(A) 7 (B) 10

(C) 11 (D) 13

24) Major events of early mammalian embryogenesis include

(A) establishment of clonal cell lineages with predetermined fates

(B) segmentation

(C) amplification of preformed maternal mRNA

(D) activation of proto-oncogenes

25) Genetic polymorphisms are clinically important because

(A) they can be used as genetic markers in family studies

(B) they often cause chromosome rearrangements

(C) they usually cause disease when homozygous

(D) they are valuable vectors in genetic therapy

26) Proper initiation of transcription in prokaryotes requires all of the following factors except

(A) DNA melting (B) DNA template

(C) Promotors (D) Rho factor

27) Which of the following statements best describes genetic polymorphisms?

(A) they usually alter protein structure and function

(B) they allow tissues from identical twins to distinguished

(C) they reflect alterations of DNA sequence

(D) they are usually apparent on careful physical examination

28) Which of the following statements regarding multifactorial congenital anomalies is true?

(A) defects typically occur with other embryologically unrelated malformations in affected patients

(B) defects usually have a characteristic appearance that distinguishes them from similar defects due to other causes

(C) concordance for defects is similar in monozygotic and dizygotic twins

(D) recurrencerisk for defects is similar in the siblings and children of an affected patient

29) In eukaryotes, DNA is best differentiated from RNA in that DNA (but not RNA) has which of the following characters?

(A) It is confined to the nucleus

(B) It is double stranded

(C) It contains a deoxyribosyl group rather than a ribosyl group

(D) It requires a DNA template for synthesis

30) X chromosome inactivation in females is best described by which one of the following statements?

(A) it involves all genes on the X chromosome

(B) it occurs during adolescence

(C) it is associated with demethylation of the affected chromosome

(D) it produces dosage compensation for x-linked genes

31) Genetic imprinting is best described by which one of the following statements?

(A) it produces differential expression of genes depending on whether they were inherited from father or mother

(B) it affects most genes except those on sex chromosomes

(C) it occurs only in female gametes

(D) it is reversed or removed when a cell passes mitosis

32) The Falconi pancytopenia syndrome and Bloom syndrome are autosomal recessive conditions in which there is an increased risk of developing malignancy. Cytogenetically, both syndromes are associated with

(A) triploidy

(B) trisomies

(C) monosomy

(D) chromosome breakage

33) Indirect DNA diagnosis is useful only for which one of the following situations?

(A) diseases caused by dynamic mutations

(B) diseases that have considerable allelic heterogeneity

(C) within populations that exhibit linkage disequilibrium

(D) within families that have multiple affected members who are informative for closely linked markers

34) Anticipation is characteristic of conditions caused by

(A) microdeletions

(B) mitochondrial inheritance

(C) genomic imprinting

(D) trinucleotide triplet expansions

35) Uniparentaldisomy is best described by which of the following statements?

(A) it occurs when both chromosomes in a pair have been inherited from the same parent

(B) it means that all the chromosomes in a diploid set have been inherited from the same parent

(C) it usually is inherited from mother in Down syndrome

(D) it is most common cause of triploidy

36) Linkage between two loci is considered likely if the lod score is

(A) lower than - 2 at a recombination distance of less than 50 cM

(B) lower than - 2 at a recombination distance of more than 50 cM

(C) higher than + 3 at a recombination distance of less than 50 cM

(D) higher than + 3 at a recombination distance of more than 50 cM

37) Most nuclear DNA in humans consists of which one of the following types of sequences?

(A) unique sequences

(B) repetitive sequences

(C) introns

(D) exons

38) DNA banking is particularly useful when

(A) a specific disease mutation is known to exist within a family

(B) a child has been shown to have a genetic disease due to a new dominant mutation

(C) the gene for a particular disease in a family has not yet been identified, but its pattern of inheritance is clear

(D) a family is known to be segregating a balanced translocation

39) Ethnic differences in a disease frequencies are most apparent for

(A) autosomal dominant conditions (B) autosomal recessive conditions

(C) x-linked recessive conditions (D) autosomal trisomies

40) What is the ratio of absorbance of UV light by pure DNA at 260 and 280nm

(A) 2.0 (B) 1.5

(C) 1.8 (D) 4.6

41) The Hardy-Weinberg law is based on all of the following assumptions except

(A) mating within the population is completely random

(B) the genes involved are autosomal dominant

(C) there is no mutation occurring at the locus

(D) there is no selection for or against any of the genotypes at the locus

42) The Human genome Project was done between

(A) 1990-2003 (B) 2003-2020

(C) 1980-1990 (D) 1983-1993

43) A mutation in a codon leads to the substitution of one amino acid with another. What is the name for this type of mutation?

(A) nonsense mutation (B) missense mutation

(C) frameshift mutation (D) promoter mutation

44) Duchenne Muscular dystrophy is inherited in

(A) Autosomal dominant fashion
(B) Autosomal recessive fashion
(C) X linked fashion
(D) Maternal inheritance

45) Single nucleotide Polymorphism is defined as

(A) Any variant which is in excess of 1% of general population
(B) Any variant which is in excess of 0.1% of general population
(C) Any variant which is in excess of 5% of general population
(D) Any variant which is in excess of 0.5% of general population

46) Parametric LOD scores are used in

(A) Multifactorial disorders
(B) Mendelian disorders
(C) Mitochondrial disorders
(D) Imprinting disorders

47) The stage of meiosis in which chromosomes pair and cross over is:

(A) prophase I
(B) metaphase I
(C) prophase II
(D) metaphase II

48) Origin of Species by means of Natural Selection was proposed by

(A) Darwin
(B) Lamarck
(C) Mendel
(D) de Vries

49) NGS is used in

(A) Clinical exome analysis
(B) Whole exome analysis
(C) Whole genome analysis
(D) All of the above

50) The following technique can be used for the detection of RNAVirus infection

(A) PCR technique
(B) RFLP technique
(C) RT-PCR technique
(D) FISH analysis

PART - B

II. This part shall contains five questions, each question carrying ten marks. **[5 × 10 = 50]**

1) Explain the applications of Next Generation Sequencing.

2) Elaborate on Mendelian Inheritance in Man.

3) What is molecular phylogenetics? Write a note on Human Phylogeny.

4) Explain molecular basis of sex determination and dosage compensation.

5) Give an account of molecular mechanisms of apoptosis and aging.

▽▽▽▽

ಅಭ್ಯರ್ಥಿಗಳಿಗೆ ಸೂಚನೆಗಳು

1. ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯ ಜೊತೆಗೆ 50 ಪ್ರಶ್ನೆಗಳನ್ನು ಹೊಂದಿರುವ ಮೊಹರು ಮಾಡಿದ ಪ್ರಶ್ನೆ ಪುಸ್ತಕವನ್ನು ನಿಮಗೆ ನೀಡಲಾಗಿದೆ.
2. ಕೊಟ್ಟಿರುವ ಪ್ರಶ್ನೆ ಪುಸ್ತಕವು, ನೀವು ಪರೀಕ್ಷೆಗೆ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡಿರುವ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದ್ದೇ ಎಂಬುದನ್ನು ಪರಿಶೀಲಿಸಿರಿ.
3. ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ಮೊಹರನ್ನು ಜಾಗ್ರತೆಯಿಂದ ತೆರೆಯಿರಿ ಮತ್ತು ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯಿಂದ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯನ್ನು ಹೊರಗೆ ತೆಗೆದು, ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯಲ್ಲಿ ಸಾಮಾನ್ಯ ಮಾಹಿತಿಯನ್ನು ತುಂಬಿರಿ. ಕೊಟ್ಟಿರುವ ಸೂಚನೆಯಂತೆ ನೀವು ನಮೂನೆಯಲ್ಲಿನ ವಿವರಗಳನ್ನು ತುಂಬಲು ವಿಫಲರಾದರೆ, ನಿಮ್ಮ ಉತ್ತರ ಹಾಳೆಯ ಮೌಲ್ಯಮಾಪನ ಸಮಯದಲ್ಲಿ ಉಂಟಾಗುವ ಪರಿಣಾಮಗಳಿಗೆ ವೈಯಕ್ತಿಕವಾಗಿ ನೀವೇ ಜವಾಬ್ದಾರರಾಗಿರುತ್ತೀರಿ.
4. ಪರೀಕ್ಷೆಯ ಸಮಯದಲ್ಲಿ:
   a) ಪ್ರತಿಯೊಂದು ಪ್ರಶ್ನೆಯನ್ನು ಜಾಗ್ರತೆಯಿಂದ ಓದಿರಿ.
   b) ಪ್ರತಿ ಪ್ರಶ್ನೆಯ ಕೆಳಗೆ ನೀಡಿರುವ ನಾಲ್ಕು ಲಭ್ಯ ಆಯ್ಕೆಗಳಲ್ಲಿ ಅತ್ಯಂತ ಸರಿಯಾದ/ ಸೂಕ್ತವಾದ ಉತ್ತರವನ್ನು ನಿರ್ಧರಿಸಿ.
   c) ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯಲ್ಲಿನ ಸಂಬಂಧಿಸಿದ ಪ್ರಶ್ನೆಯ ವೃತ್ತಾಕಾರವನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ತುಂಬಿರಿ. ಉದಾಹರಣೆಗೆ, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ ಪ್ರಶ್ನೆ ಸಂಖ್ಯೆ 8ಕ್ಕೆ "C" ಸರಿಯಾದ ಉತ್ತರವಾಗಿದ್ದರೆ, ನೀಲಿ/ಕಪ್ಪು ಬಾಲ್ ಪಾಯಿಂಟ್ ಪೆನ್ ಬಳಸಿ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯ ಕ್ರಮ ಸಂಖ್ಯೆ 8ರ ಮುಂದೆ ಈ ಕೆಳಗಿನಂತೆ ತುಂಬಿರಿ:

   ಪ್ರಶ್ನೆ ಸಂಖ್ಯೆ 8. Ⓐ Ⓑ ● Ⓓ (ಉದಾಹರಣೆ ಮಾತ್ರ) (ಬಾಲ್ ಪಾಯಿಂಟ್ ಪೆನ್ ಮಾತ್ರ ಉಪಯೋಗಿಸಿ)
5. ಉತ್ತರದ ಪೂರ್ವಸಿದ್ಧತೆಯ ಬರವಣಿಗೆಯನ್ನು (ಚಿತ್ತು ಕೆಲಸ) ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ ಒದಗಿಸಿದ ಖಾಲಿ ಜಾಗದಲ್ಲಿ ಮಾತ್ರವೇ ಮಾಡಬೇಕು (ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯಲ್ಲಿ ಮಾಡಬಾರದು).
6. ಒಂದು ನಿರ್ದಿಷ್ಟ ಪ್ರಶ್ನೆಗೆ ಒಂದಕ್ಕಿಂತ ಹೆಚ್ಚು ವೃತ್ತಾಕಾರವನ್ನು ಗುರುತಿಸಲಾಗಿದ್ದರೆ, ಅಂತಹ ಉತ್ತರವನ್ನು ತಪ್ಪು ಎಂದು ಪರಿಗಣಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ಯಾವುದೇ ಅಂಕವನ್ನು ನೀಡಲಾಗುವುದಿಲ್ಲ. ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯಲ್ಲಿನ ಉದಾಹರಣೆ ನೋಡಿ.
7. ಅಭ್ಯರ್ಥಿ ಮತ್ತು ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರು ನಿರ್ದಿಷ್ಟಪಡಿಸಿದ ಸ್ಥಳದಲ್ಲಿ ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯ ಮೇಲೆ ಸಹಿ ಮಾಡಬೇಕು.
8. ಅಭ್ಯರ್ಥಿಯು ಪರೀಕ್ಷೆಯ ನಂತರ ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರಿಗೆ ಮೂಲ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆ ಮತ್ತು ವಿಶ್ವವಿದ್ಯಾನಿಲಯದ ಪ್ರತಿಯನ್ನು ಹಿಂದಿರುಗಿಸಬೇಕು.
9. ಅಭ್ಯರ್ಥಿಯು ಪ್ರಶ್ನೆ ಪುಸ್ತಕವನ್ನು ಮತ್ತು ಓ.ಎಂ.ಆರ್. ಅಭ್ಯರ್ಥಿಯ ಪ್ರತಿಯನ್ನು ತಮ್ಮ ಜೊತೆ ತೆಗೆದುಕೊಂಡು ಹೋಗಬಹುದು.
10. ಕ್ಯಾಲ್ಕುಲೇಟರ್, ಪೇಜರ್ ಮತ್ತು ಮೊಬೈಲ್ ಫೋನ್‌ಗಳನ್ನು ಪರೀಕ್ಷಾ ಕೊಠಡಿಯ ಒಳಗೆ ಅನುಮತಿಸಲಾಗುವುದಿಲ್ಲ.
11. **ಅಭ್ಯರ್ಥಿಯು ದುಷ್ಕೃತ್ಯದಲ್ಲಿ ತೊಡಗಿರುವುದು ಕಂಡುಬಂದರೆ, ಅಂತಹ ಅಭ್ಯರ್ಥಿಯನ್ನು ಕೋರ್ಸ್‌ಗೆ ಪರಿಗಣಿಸಲಾಗುವುದಿಲ್ಲ ಮತ್ತು ನಿಯಮಗಳ ಪ್ರಕಾರ ಇಂತಹ ಅಭ್ಯರ್ಥಿಯ ವಿರುದ್ಧ ಕ್ರಮ ಕೈಗೊಳ್ಳಲಾಗುವುದು.**

ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯನ್ನು ತುಂಬಲು ಸೂಚನೆಗಳು

1. ಪ್ರತಿಯೊಂದು ಪ್ರಶ್ನೆಗೆ ಒಂದೇ ಒಂದು ಅತ್ಯಂತ ಸೂಕ್ತವಾದ/ಸರಿಯಾದ ಉತ್ತರವಿರುತ್ತದೆ.
2. ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ಒಂದು ವೃತ್ತವನ್ನು ಮಾತ್ರ ನೀಲಿ ಅಥವಾ ಕಪ್ಪು ಬಾಲ್ ಪಾಯಿಂಟ್ ಪೆನ್ನಿನಿಂದ ಮಾತ್ರ ತುಂಬತಕ್ಕದ್ದು. ಉತ್ತರವನ್ನು ಮಾರ್ಪಡಿಸಲು ಪ್ರಯತ್ನಿಸಬೇಡಿ.
3. ವೃತ್ತದೊಳಗಿರುವ ಅಕ್ಷರವು ಕಾಣದಿರುವಂತೆ ವೃತ್ತವನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ತುಂಬುವುದು.
4. ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯಲ್ಲಿ ಯಾವುದೇ ಅನಾವಶ್ಯಕ ಗುರುತುಗಳನ್ನು ಮಾಡಬೇಡಿ.

Note : English version of the instructions is printed on the front cover of this booklet.