



JEPAS(PG)-2020

Subject: Fellowship in Regenerative Medicine & Translational Sciences (FRMTS)-2020

Duration: 90 minutes

Full Marks: 100

Instructions

1. All questions are of objective type having four answer options for each. Only one option is correct. Correct answer will carry full marks 1. In case of incorrect answer or any combination of more than one answer, $\frac{1}{4}$ mark will be deducted.
2. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C, or D.
3. Use only **Black/Blue ball point pen** to mark the answer by complete filling up of the respective bubbles.
4. Mark the answers only in the space provided. Do not make any stray mark on the OMR.
5. Write your roll number carefully in the specified locations of the **OMR**. Also fill appropriate bubbles.
6. Write your name (in block letter), name of the examination centre and put your full signature in appropriate boxes in the OMR.
7. The OMR is liable to become invalid if there is any mistake in filling the correct bubbles for roll number or if there is any discrepancy in the name/ signature of the candidate, name of the examination centre. The OMR may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be sole responsibility of candidate.
8. Candidates are not allowed to carry any written or printed material, calculator, docu-pen, log table, wristwatch, any communication device like mobile phones etc. inside the examination hall. Any candidate found with such items will be **reported against** & his/her candidature will be summarily cancelled.
9. Rough work must be done on the question paper itself. Additional blank pages are given in the question paper for rough work.
10. Hand over the OMR to the invigilator before leaving the Examination Hall.

- 1) It is difficult to observe individual chromosomes with a light microscope during prophase because:
- the DNA has not been replicated yet.
 - they are uncoiled in long, thin strands.
 - they leave the nucleus and are dispersed to other parts of the cell.
 - sister chromatids do not pair up until division starts.
- 2) Which of the following is the correct order of organization of genetic material from largest to smallest?
- Genome, chromosome, gene, nucleotide
 - Nucleotide, gene, chromosome, genome
 - Gene, nucleotide, chromosome, genome
 - Chromosome, genome, nucleotide, gene
- 3) Genes of same species, similarly related to each other are _____
- Ortholog
 - Synteny
 - Paralog
 - Microarray
- 4) cDNA, a term used in recombinant DNA technology means _____:
- Competitive DNA.
 - Chemical DNA.
 - Complex DNA.
 - Complementary DNA.
- 5) Which of the following is not denatured by heating steps during PCR?
- DNA pol
 - DNA pol
 - Restriction enzymes
 - DNA ligase
- 6) At which cell cycle checkpoint, cell cycle is halted if cell's DNA is damaged?
- G₁ - S
 - S - G₂
 - G₂ - M
 - G₁ - G₂
- 7) Which of the following has beads on a string structure?
- Chromosomes
 - Chromatin
 - Nucleosomes
 - Heterochromatin
- 8) In which phase of cell cycle is DNA replicated?
- G₁ phase.
 - S phase
 - G₂ phase
 - M phase
- 9) The study of the full complement of proteins expressed by a genome is called _____:
- Proteome
 - Proteomics
 - Genomics.
 - Protein formation.
- 10) How are expression vectors useful?
- To produce protein products
 - Used for genomic libraries.
 - Used for chromosome synthesis.
 - Used for finger printing.

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- 11) The information which is represented by a signal is detected by specific receptors and converted to a cellular response; this conversion is called _____:
- Signal amplification
 - Signal transversion
 - Signal transduction
 - Signal integration
- 12) The process of introduction of foreign DNA into an animal cell is called _____:
- Transversion
 - Conversion
 - Inversion
 - Transfection
- 13) Number of affected molecules increases geometrically in an enzyme cascade in _____:
- Specificity
 - Amplification
 - Adaptation
 - Integration
- 14) Transgenic organisms are generally _____:
- Extinct organisms
 - Naturally occurring and endemic
 - Produced by traditional plant breeding technique
 - Produced by gene transfer technology
- 15) Which out of the following statements is true about gene regulation in bacteria?
- Repressor protein blocks transcription by binding to operator sequence
 - Activator proteins bind near promoters and increase the efficiency of transcription
 - Enhancers commonly regulate transcription
 - Genes with related functions are often grouped together and have a single start codon
- 16) Explant can be a _____:
- Cut part of the plant used in tissue culture
 - Plant extract used in tissue culture
 - Source of growth regulators added to media
 - Solidifying agent
- 17) Which of the following codons is not a termination codon for protein synthesis?
- UUU
 - UAG
 - UAA
 - UGA
- 18) How many types of signal transducers are there?
- 3
 - 4
 - 5
 - 6
- 19) Rauwolfia serpentina, to save this plant under the threat of extinction, which of the following techniques is useful?
- Genetic engineering
 - In vitro culture
 - DNA fingerprinting
 - Hybridoma technology
- 20) At the end of each phase of cell cycle cyclins activating Cdk's in that phase are inactivated irreversibly by _____:
- Multiple phosphorylations
 - De-phosphorylation
 - Ubiquitinylation
 - Destabilizing by proteolysis in a proteasome

- 21) Which blood groups are codominant?
- I^A and I^O.
 - I^B and I^O.
 - I^A and I^B.
 - None of these.
- 22) Which of the following statements regarding cyclins is not correct?
- They can become linked to ubiquitin.
 - They catalyze the phosphorylation of protein.
 - They contain a specific amino acid sequence that target them for proteolysis.
 - They are activated and degraded during cell cycle.
- 23) Which of the following term is associated with DNA finger printing?
- Hybridoma.
 - Site specific mutagenesis.
 - Shotgun cloning.
 - RFLP.
- 24) The DNA threads which appear inside the nucleus at the time of cell division?
- Spindle fibers.
 - Centrioles.
 - Asters.
 - Cytosomes.
- 25) Mode of action of steroid hormones involve _____.
- Stimulation of DNA replication.
 - Stimulation of mRNA transcription.
 - Inhibition of protein synthesis.
 - Secondary messenger.
- 26) The precise biochemical activity of a protein is described in _____.
- Phenotypic function.
 - Cellular function.
 - Molecular function.
 - Structural genomics.
- 27) The word homologous literally means same location. How does this relate to homologous chromosomes?
- All of the below are correct.
 - The bands resulting from staining are found in the same location.
 - The chromosomes always move to the same location in the cell during division.
 - None is correct.
- 28) Which of the following histones bind to linker DNA?
- H1.
 - H2A.
 - H2B.
 - H3.
- 29) An allele that is fully expressed is referred to as (fully expressed means that the allele is transcribed and translated into a perfectly functional protein):
- dominant.
 - recessive.
 - homologous.
 - heterozygous.
- 30) Plasma membrane protein predicted to have seen 7 transmembrane helices segment binds _____.
- Progesterone.
 - Thyroid stimulating hormone.
 - Insulin.
 - Follicle stimulating hormone.

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- 31) Which is an example of negative regulator?
- CAP
 - Lac I gene
 - Nuclear receptors
 - Phosphorylated STAT proteins
- 32) Which of the following bacterium is used for gene transfer in plants?
- Agrobacterium
 - Azotobacter
 - Rhizobium
 - E. coli
- 33) How do the daughter cells at the end of mitosis and cytokinesis compare with their parent cell when it was in G1 of the cell cycle?
- The daughter cells will have half the amount of cytoplasm and half the amount of DNA.
 - The daughter cells will have half the number of chromosomes and half the amount of DNA.
 - The daughter cells will have the same number of chromosomes and half the amount of DNA.
 - The daughter cells will have the same number of chromosomes and the same amount of DNA.
- 34) When a gene for a given trait comes in alternative versions that specify different forms of the trait (for example, purple-flower and white-flower versions of a flower color gene), the versions of the gene are called:
- loci.
 - supergenes.
 - chromosomes.
 - alleles.
- 35) The network of interactions engaged in by protein at cellular level is described in _____:
- Phenotypic function.
 - Cellular function.
 - Molecular function
 - Structural genomics.
- 36) What is the drug antagonist of estrogen?
- Tamoxifen
 - Metformin
 - Glucophage
 - Victoza
- 37) Genes of different species but possessing a clear sequence and functional relationship to each other are _____.
- Ortholog
 - Synteny
 - Paralog
 - Microarray
- 38) Meristem culture helps in developing which of the following?
- Tall plants
 - Disease resistant plants
 - Virus free plants
 - Hybrid plants
- 39) Which drug is used to terminate early pregnancies?
- RU486
 - Metformin
 - Glucophage
 - Victoza
- 40) Which of these has not undergone selective breeding?
- Highland cows.
 - Dolly the sheep.
 - Broccoli.
 - German shepherd dogs.

- 41) Any change in the nucleotide sequence of the DNA of a gene is called:
- a mutation.
 - an advantage.
 - a codon.
 - an anticodon.
- 42) Which of the following are the two methods of screening?
- ELISA and blotting.
 - ELISA and PCR.
 - Hybridization and PCR.
 - PCR and RFLP.
- 43) Southern blotting technique is used in _____:
- Monoclonal antibody production.
 - In vitro culture.
 - Genetic finger printing.
 - Polymerase chain reaction.
- 44) Which of the following process occurs between DNA molecules of very similar sequences?
- Homologous genetic recombination.
 - Site specific recombination.
 - Non-homologous recombination.
 - Replicative recombination.
- 45) Regulatory outcome results from integrated input from both receptors is in _____:
- Signaling.
 - Amplification.
 - Adaptation.
 - Integration.
- 46) Which of the following involves remarkable capacity of a short segment of DNA to move from one place to another?
- DNA transposition.
 - DNA replication.
 - Translation.
 - Transcription.
- 47) A segment of DNA that reads from the same forward and backward is called _____:
- Palindromic DNA.
 - Complementary DNA.
 - Plasmid DNA.
 - Copy DNA.
- 48) What is a section of DNA that codes for a protein called?
- Gene.
 - Chromosome.
 - Allele.
 - Plasmid.
- 49) Which of the following is not a major class of chromatin proteins?
- Histones.
 - Topoisomerases.
 - Cohesins.
 - SMC proteins.
- 50) Cdk2/cyclinE functions in _____:
- G₁S transition.
 - G₂M transition.
 - G₂.
 - M.

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- 51) Which of the following statements regarding DNA fingerprinting is false?**
- a) DNA fingerprinting cannot be used for paternity testing.
 - b) DNA profile using STR (short terminal repeats) is unique to an individual.
 - c) PCR is used for DNA profiling.
 - d) Forensic analysis makes use of SNPs (single nucleotide polymorphisms) in coding sequences to distinguish between individuals.
- 52) Which of the following are essential to the condensation of chromosomes as cells enter mitosis?**
- a) Cohesins
 - b) Condensins
 - c) Histones
 - d) Topoisomerases
- 53) Insulin receptor is an example of _____:**
- a) Steroid receptors
 - b) Serpentine receptors
 - c) Adhesion receptors
 - d) Receptor enzymes
- 54) Which of these is a correct type of mutation?**
- a) Transcription.
 - b) Polymerase.
 - c) Substitution.
 - d) Addition.
- 55) Recombinant DNA construction involves _____:**
- a) Cleaving DNA with a restriction endonuclease and joining with ligase.
 - b) Cleaving DNA with ligase and joining with endonuclease.
 - c) Cleaving and joining DNA with restriction endonuclease.
 - d) Cleaving DNA with a restriction endonuclease and joining with polymerase.
- 56) Chromatin is composed of _____:**
- a) DNA
 - b) DNA and proteins
 - c) DNA, RNA and proteins
 - d) None
- 57) What is Ubiquitin?**
- a) Protein kinase
 - b) Protease
 - c) Component of the electron transport system
 - d) Protein that tags another protein for proteolysis
- 58) Glucose is added to the tissue culture media as a/an _____:**
- a) Carbon source
 - b) Growth regulator
 - c) Solidifying agent
 - d) Antibiotic
- 59) Short sub-sequence of a cDNA sequence is _____:**
- a) Sequence tagged site.
 - b) Expressed sequence tag
 - c) Contig
 - d) YAC.
- 60) Acetylcholine receptor ion channel is an example of _____:**
- a) Gated ion channel
 - b) Receptor enzymes
 - c) Membrane protein
 - d) Nuclear protein

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- 61) What is the goal of structural proteomics project?
- To crystallize and determine the structure of as many proteins as possible, in many cases with little or no existing information about protein function
 - To identify and sequence of all the genes present in the human body
 - To introduce new genes to human beings
 - To remove disease causing genes from humans
- 62) Receptor proteins that indirectly activate enzymes that generate intracellular second messengers are _____?
- steroid receptors
 - Serpentine receptors
 - Adhesion receptors
 - Receptor enzymes
- 63) Receptor is removed from cell surface in _____:
- Specificity
 - Amplification
 - Adaptor
 - Downstream
- 64) Which of the following is used to transfer genes in plants?
- Ti plasmid
 - pBR 322
 - Fcod
 - pUC 18
- 65) In a cross between two heterozygous (Aa), results will be:
- in the ratio 1:3 homozygous to heterozygous.
 - in the ratio 1:1 homozygous to heterozygous.
 - in the ratio 1 :3 heterozygous to homozygous.
 - all heterozygous.
- 66) Passage of a cell through stages of cell cycle is controlled by a protein kinase that phosphorylates many different proteins at appropriate times.
- Cdk activating kinase
 - Cyclin-dependent kinase
 - Cyclins
 - Tyrosine kinase
- 67) Which of the following plays a substantial role in linking together sister chromatids immediately after replication?
- Cohesins
 - Condensins
 - Histones
 - Topoisomerases
- 68) Which of the following is helpful in distinguishing DNA of one individual from another?
- PCR.
 - Reverse transcriptase
 - cDNA
 - RFLP
- 69) The sister chromatids separate at _____:
- Prophase
 - Metaphase
 - Anaphase
 - Telophase
- 70) In crossing a homozygous recessive with a heterozygote, what is the chance of getting an offspring with the homozygous recessive phenotype?
- 75%
 - 25%
 - 50%
 - 0%

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- 71) A base substitution mutation in a gene sometimes has no effect on the protein the gene codes for. Which of the following factors could account for this?
- the rarity of such mutations.
 - some amino acids have more than one codon.
 - a correcting mechanism that is part of the mRNA molecule.
 - A and B
- 72) Steroid hormones receptor binds to_____:
- Hormone response elements in m-RNA
 - Hormone response elements in DNA
 - Hormone response elements in proteins
 - Ribosomes to stimulate translation
- 73) Which of the following is a nuclear receptor protein?
- Steroid receptor
 - Adhesion receptor
 - Serpentine receptor
 - Receptor with no intrinsic enzyme activity
- 74) During DNA profiling, DNA nucleotides hybridized with the probe can be detected through _____:
- Electrophoresis.
 - Polymerase chain reaction.
 - Autoradiography.
 - Hybridoma.
- 75) Cellular DNA is uncondensed throughout_____:
- Prophase
 - Interphase
 - Telophase
 - Anaphase
- 76) How do steroid hormones produce their effects in cells?
- By activating key enzymes in metabolic pathway
 - By binding to intracellular receptors and promoting transcription of specific genes
 - By promoting the degradation of specific m-RNAs
 - By activating translation of certain m-RNAs
- 77) A set of overlapping DNA segments that together represent a consensus region of DNA is _____:
- Expressed sequence tag
 - Sequence tagged site.
 - Contig.
 - YAC
- 78) Which of the following enzyme is used in PCR?
- Taq DNA polymerase
 - HRP.
 - EcoRI
 - EcoRII.
- 79) Which is an example of a positive regulator?
- CAP
 - Lac I gene
 - Trapperon
 - Met operon
- 80) The effects of protein on an entire organism is described in_____:
- Phenotypic function
 - Cellular function
 - Molecular function
 - Structural genomics

- 81) Cyclin dependent kinases which control progression through cell cycle checkpoints are totally activated by which of the following?
- Binding to cyclin plus phosphorylation by a Cdk-activating protein kinase
 - Binding to cyclins
 - Phosphorylation by Cdk-activating protein kinase
 - Phosphorylation by a tyrosine kinase
- 82) Who was the first person to develop DNA fingerprinting?
- David Suzuki
 - Khorana
 - Alec Jeffreys
 - Albert
- 83) Production of a large number of genetically similar plants through plant tissue culture is called _____.
- Recombinant DNA technology
 - Gene therapy
 - Micro propagation
 - Hybridoma technology
- 84) Which of the following statements is false?
- BAC is a circular DNA molecule.
 - YAC is a linear DNA molecule
 - TaqI is a DNA polymerase
 - BAC is a linear DNA molecule.
- 85) Which of the following statements regarding cyclin-dependent protein kinase is not correct?
- Their activity is regulated by cyclins.
 - They can alter the activity of proteins involved in the progression of cells through cell cycle
 - Their activity fluctuates during cell cycle
 - Each type of cell contains one specific form
- 86) Conserved gene order can be termed as _____.
- Ortholog
 - Synteny
 - Paralog
 - Microarray
- 87) Dolly, the first animal produced by cloning is a _____.
- Cow
 - Sheep
 - Rat
 - Dog
- 88) Collection of microscopic DNA spots attached to the solid surface are _____.
- Ortholog
 - Synteny
 - Paralog
 - Microarray
- 89) Cytokinesis usually, but not always, follows mitosis. If cells undergo mitosis and not cytokinesis, this would result in:
- a cell with a single large nucleus.
 - a cell with two nuclei.
 - cells with abnormally small nuclei.
 - feedback responses that prevent mitosis.
- 90) Signal molecule fits the binding site on its complementary receptor called as _____.
- Specificity
 - Amplification
 - Integration
 - Cooperativity

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- 91) Which of the following contains only the sequences required for transposition and the genes for proteins that promote the process?
- Complex transposons
 - Insertion sequences
 - Transposons
 - Chromosomes
- 92) Which out of the following statements is true about gene regulation in bacteria?
- Repressor protein blocks transcription by binding to operator sequence
 - Activator proteins bind near promoters and increase the efficiency of transcription
 - Enhancers commonly regulate transcription
 - Genes with related functions are often grouped together and have a single start codon
- 93) Sequencing of genomic DNA is included in _____:
- Phenotypic function
 - Cellular function
 - Molecular function
 - Structural genomics
- 94) Which of the following histones shows more sequence similarity among eukaryotic species?
- H1
 - H2A
 - H2B
 - H3
- 95) Gene therapy is a technique preferred to cure inherited diseases by _____:
- Repairing the faulty gene
 - Introducing the correct copy of the gene
 - Adding new cells to the body
 - PCR
- 96) Cyclin dependent kinases which control progression through cell cycle checkpoints are totally activated by which of the following?
- Binding to cyclin plus phosphorylation by a Cdk-activating protein kinase
 - Binding to cyclins
 - Phosphorylation by Cdk activating protein kinase
 - Phosphorylation by a tyrosine kinase
- 97) Which of the following occurs in meiosis but not in mitosis?
- Attachment of spindle fibers to kinetochore
 - Replication of DNA prior to start of cell division
 - Separation of sister chromatids at anaphase
 - Pairing of homologous chromosomes at metaphase plate
- 98) Electrophoresis helps to separate _____:
- DNA segments.
 - Cells from DNA
 - Tissues
 - RNA from DNA
- 99) In a given organism, how do cells at completion of meiosis compare with cells that are just about to begin meiosis?
- They have half the number of chromosomes and one-fourth the amount of DNA.
 - They have half the amount of cytoplasm and twice the amount of DNA.
 - They have twice the amount of cytoplasm and half the amount of DNA.
 - They have the same number of chromosomes and half the amount of DNA.
- 100) Steroid regulatory proteins mediate the act by binding at _____:
- Zinc finger motif
 - Leucine zipper motif
 - Helix turn helix motif
 - Histone helix motif