Examination: **M.Sc. Biotechnology**

SECTION 1 - SECTION 1

Question No.1

_____ vaccine is an example for toxoid.

- Malaria
- Gonorrhoea
- Typhoid
- Diphtheria

Question No.2

In the Meselson-Stahl experiment, cells with heavy DNA (labeled with a heavy isotope of Nitrogen) were allowed to replicate their DNA in presence of a light isotope. After two rounds of replication, the heavy DNA:

- was lost and replaced by light DNA
- converted to intermediate density DNA while a new light DNA also appeared.
- remained as heavy, while a new light DNA appeared
- was converted to an intermediate density DNA

Question No.3

Two genes show 50% recombination frequency. The following statements were made to explain the observation:
(A) The two genes are on two different chromosomes showing independent assortment
(B) The two genes are on the same chromosome but far apart and thus they show independent assortment
(C) The two genes are located nearby on the same chromosome showing linkage
Which of the above statements are correct?

- (A) only
- (B) only
- Both (A) and (C)
- Both (A) and (B)

Question No.4

A study was designed to test the effect of a novel drug ‘X’ on mammalian cells. The drug ‘X’ was incubated with the mammalian cells at 37^{o}C for 2 hours following which changes in transcriptome of the cells were analyzed. Which among the following is the most appropriate control of the experiment?

- Mammalian cells incubated without ‘X’ at 37^{o}C for 2 hours
- Mammalian cells incubated with ‘X’ at 24 ^{o}C for 2 hours
- Mammalian cells incubated with ‘X’ along with an inhibitor of ‘X’ at 37^{o}C for 2 hours
- Mammalian cells incubated with ‘X’ at 37^{o}C for 5 min

Question No.5

Gel filtration chromatography separates proteins on the basis of

- size and charge
- size and molecular weight
- size and shape
- shape and charge

Question No.6

Bacteriophages adsorb to a bacterial surface and inject the phage DNA through the

- plasma membrane to cytosol
- cell wall into nucleus
- cell wall into cytosol
- cell wall into plasma membrane

Question No.7

Which of these is not found in the cell/organelle membranes?

- Triglyceride
- Cephalin
- Ganglioside
- Cerebroside

Question No.8

The following are names of some genes that have been used for developing transgenic plants:
A. *bar*
B. *barnase*
C. *barstar*
Which of the above if expressed in the tapetum tissue of plants lead to male sterility?

- Only (A)
- Only (B)
- Both (A) and (B)
- Both (B) and (C)

Question No.9

Each individual antigenic determinant of the variable region is referred to as an

- Allotype
- Isotype
- Idiotope
- Paratope

Question No.10

If the genetic code consisted of four base pairs per codon rather than three, the maximum number of unique amino acids that could be encoded is:

- 64
- 256
- 128
- 512

Question No.11

The binding of a competitive inhibitor to an enzyme:

- alters the primary structure of the enzyme
- lowers its activation energy
- takes place at its active site
- releases its prosthetic group

Question No.12

Antigen presenting cells are

- T cells
- Dendritic cells
- Neutrophils
- Monocytes

Question No.13

Which of the following is not true about adenoviral vector?

- replicates as an episomal element
- causes respiratory tract infection
- single stranded
- non-enveloped

Question No.14

Which one of the following scientists has been associated with ‘Green Revolution’?

- T. H. Morgan
- Har Gobind Khorana
- J. D. Watson
- Norman Borlaug

Question No.15

Molecules as large as 10Mb can be separated using _____.

- PFGE
- SDS PAGE
- Native PAGE
- Agar Gel electrophoresis

Question No.16

An in vitro technique in which DNA sequences can be amplified is

- RT PCR
- qPCR
- PCR
- DNA replication

Question No.17

Bar screens are involved in removal of _____ from the sewage.
(i) Plastic bags and cans
(ii) Fat and grease
(iii) Grit

- (i) only
- (i) and (ii) only
- (ii) only
- (iii) only

Question No.18

Which type of bond link the individual nucleotides in a single DNA strand?

- Glycosidic
- Electrostatic

- Hydrogen
- Phosphodiester

Question No.19

Electrophoresis of histones and myoglobin under non-denaturing conditions at pH 7.0 results in migration of

- histones to anode and myoglobin to cathode
- histones to cathode and myoglobin to anode
- both the proteins to anode
- both the proteins to cathode

Question No.20

The genetic code is said to be degenerate. What does degeneracy refer to?

- A stop codon may be read by a suppressor tRNA
- Each codon can code for more than one amino acid due to Wobble hypothesis
- One amino acid can be coded for more than one codon
- Different organism prefer to use different codons for a given amino acid

Question No.21

DNA polymerase alpha does not have

- primase activity
- polymerase activity
- proof reading activity
- none of the above

Question No.22

Which one of the following tissues will be used to develop haploid plants?

- Pollen
- Leaves treated with colchicine
- Meristematic region of roots
- Whole buds

Question No.23

_____ g of substance X should be weighed and dissolved in 50 ml of water to prepare 0.1 M solution (m.wt – 40).

- 4
- 0.4
- 0.2
- 2

Question No.24

Which enzyme catalyses change in the linking number of the double stranded DNA?

- Telomerase
- DNA ligase
- Helicase
- Topoisomerase

Question No.25

Assuming that a genomic DNA has a GC content of 50% which one of the following restriction enzymes is likely to have the maximum number of restriction sites in the genome?

- A restriction enzyme that recognizes 4 base pairs
- A restriction enzyme that recognizes 8 base pairs
- A restriction enzyme that recognizes 10 base pairs.
- A restriction enzyme that recognizes 6 base pairs

Question No.26

Which of the following processes leads to formation of polytene chromosomes?

- non-disjunctionof chromatids during meiosis)
- sister chromatid pairing
- heterochromatization
- repeated replication without separation of chromatids

Question No.27

The property of many codons coding for single amino acid is called as

- redundancy
- unambiguous
- overlapping
- universal

Question No.28

Which one of the following subunits of RNA polymerase is responsible for its specificity to promoters?

- Alpha
- Beta
- Gamma
- Sigma

Question No.29

The mechanism of introducing purified DNA into a bacterial cell is known as:

- Conjugation
- Transduction
- Transfection
- Transformation

Question No.30

When two plants with white flowers are crossed, the progeny obtained has pink flowers. When the F_1 pink-flowered proegny is selfed, the F_2 progeny have pink-flowered and white-flowered plants in a 15:1 ratio. This is a case of

- Duplicate gene
- Incomplete dominance
- Recessive epistasis
- Dominant epistasis

Question No.31

Which one of the following is a process of separation of mixture into its components by passing the fluid

mixture through a bed of adsorbant material?

- Chromatography
- Electrophoresis
- Filtration
- Sedimenation

Question No.32

Variable number of tandem repeats (VNTR) in the genome is used for:

- DNA fingerprinting
- Identification of stem cells
- Antibody production
- Genetic engineering

Question No.33

The catabolic endproduct of pyrimidine metabolism is

- Urea
- Uric acid
- Carbon dioxide
- Creatinine

Question No.34

If the solvent travels 6 cm and solute travels 4 cm, then its Rf is

- 1.5
- 0.06
- 0.66
- 4

Question No.35

FRET can be employed if the _____and _____ spectra of two compounds overlap.

- absorption and adsorption
- Emission and Emission
- absorption and emission
- absorption and absorption

Question No.36

Which one of the following is used for transformation of plants

- *Agrobacterium tumefaciens*
- *Escherichia coli*
- *Nitrosomonas stercoris*
- *Rhizobium radiobacter*

Question No.37

If on addition of ammonium sulfate, the protein of your interest gets precipitated, it is called as

- Desalting
- Salting bridging
- Salting out
- Salting in

Question No.38

Centromeres are

- RNA present in centrosomes
- sequences of DNA present at the end of the chromosomes
- proteins involved in cell division
- DNA sequences that get attached to the proteins in mitotic spindle

Question No.39

Duplication, deletion, inversion and translocation are examples of chromosomal rearrangements. Which chromosomal rearrangements can lead to changes in the genetic map?

- Only translocation
- Only deletion
- Both translocation and deletion
- All four

Question No.40

Restriction endonucleases that recognize the same sequences are called as

- Isonucleases
- Isocraters
- Isoschizomers
- Isoenzymes

Question No.41

Grave's disease is categorized under _____ hypersensitivity.

- Type I
- Type III
- Type II
- Type IV

Question No.42

_____ and _____ are present in antigen and antibody respectively

- Epitope, Paratope
- Paratope, Hapten
- Paratope, Epitope
- Hapten, Paratope

Question No.43

Which one of the following techniques can be used to identify the location of a gene on a metaphase chromosome?

- C- banding
- G- banding
- Southern hybridization
- *in situ* hybridization

Question No.44

Bax is a protein involved in

- Necrosis
- Cell lysis
- Apoptosis
- Autophagy

Question No.45

Genetic map distances are measured in

- cm
- cM
- bp
- A^o

Question No.46

If a man with blood group AB marries a woman of blood group A whose father was of blood group O, what are the likely blood groups their children can have?

- AB, O
- A, AB, O, B
- A, B, O
- A, B, AB

Question No.47

Which of the following cells will naturally have more than two types of genomes?

- Leaf cell
- Kidney cell
- Fungal cell
- Blood cell

Question No.48

Which one of the following transgenic crop(s) have been approved for commercial cultivation in India?

- Only cotton
- Only Brinjal
- Cotton and Brinjal
- Cotton, Brinjal and Mustard

Question No.49

If the DNA content of a diploid cell in the G_1 phase of the cell cycle were ‘C’, then the DNA content of the same cell at Metaphase of Meiosis I would be:

- 0.25C
- 2C
- 0.5C
- C

Question No.50

There are ____ operators in lac operon

- 2
- 1
- 4

- 3

Question No.51

Penicillin allergy is due to the production of

- IgD
- IgG
- IgA
- IgE

Question No.52

Two fragments of double stranded DNA were chemically synthesized. However, the two fragments could not be ligated by DNA ligase. Treating the fragments with which one of the following enzymes will help in ligation?

- DNA polymerase I
- Kinase
- Phosphatase
- Terminal transferase

Question No.53

A radioactive material has a count of 1000cpm on day one. After 70 days the count is around 7 cpm. What is the half life of the radioactive material?

- 10 days
- 16 days
- 15 days
- 9 days

Question No.54

A gene has eight alleles. The maximum number of alleles of this gene that can be found in a diploid cell at metaphase will be:

- One
- Two
- Four
- Eight

Question No.55

The mutation of UUA to UAA is a _____ mutation.

- non-sense
- silent
- mis-sense
- deletion

Question No.56

Which of the following technique use radio isotope?

- DELFIA
- CLIA
- Sandwich ELISA
- IRMA

Question No.57

Which of the following can help determine if two mutations are allelic?

- Co-segregation of the two mutations
- Suppression of one mutation by the other
- Lack of recombination between the two mutations
- The two mutants do not complement each other

Question No.58

_____ is used to link the secondary antibody and HRP.

- Cyanogen chloride
- Cyanogen bromide
- Acetamide
- Glutaraldehyde

Question No.59

Which of these conditions would you expect to result in synthesis of high levels of expression of Beta galactosidase of lac operon?

- no glucose and high lactose
- high glucose and high lactose
- high glucose and high galactose
- no glucose and high galactose

Question No.60

Which one of the following can be used for positive selection of transformed cells in plants?

- Gene coding for β-galactosidase protein
- Gene conferring resistance to ampicillin
- Gene coding for Green fluorescent protein
- Gene conferring resistance to kanamycin

Question No.61

Which of the sequences cannot be a part of the alpha helix?

- Ala-Ala-Ala
- Gly-Gly-Gly
- Ser-Pro-Thr
- Ser-Ala-Gly

Question No.62

Amplicon is

- Amplifying enzyme
- amplified DNA
- primer used for amplification
- amplification temperature

Question No.63

CM cellulose can be used to separate a mixture of

- cationic and neutral proteins
- anionicproteins

- one anionic and one neutral proteins
- neutral proteins

Question No.64

Cos sites of cosmids are derived from

- SV40
- Ti plasmids
- lambda phages
- T4 phages

Question No.65

Fumarase belongs to

- Ligases
- Hydrolase
- Dehydrogenases
- Lyases

Question No.66

What is the generation time of a bacterial cell that grows from 100 to about 100,000 in 5 hours of growth?

- 18 min
- 30 min
- 60 min
- 22 min

Question No.67

If you want to clone a 1000000 bp DNA, you have to select this vector

- Bacteriophage lambda
- BACS
- pUC19
- pBR322

Question No.68

Which one of the following processes is used by some bacteria to regulate expression of an amino acid biosynthetic operon in accordance to the levels of aminoacetylated tRNA in the cell?

- Antitermination
- Attenuation
- Activation of transcription
- Aminoacylation

Question No.69

An diploid organism has 20 chromosomes. How many linkage groups would be present if all genes were mapped?

- 20
- 10
- 5
- 40

Question No.70

These RNAs act as sponges for miRNAs.

- mRNA
- hnRNA
- siRNA
- lncRNA

Question No.71

The type of chromatography where a protein (say X) is bound to a resin and placed in a column to identify proteins in a extract that can bind to protein X is called as:

- Ion-exchange chromatography
- Isoelectric chromatography
- Affinity chromatography
- Gel filtration chromatography

Question No.72

How many codons are there to code amino acids?

- 61
- 20
- 3
- 64

Question No.73

Which of the following is not true?

- Passive immunity involves transfer of immunoglobulins from mother to child
- Passive immunization elicits long term protection
- Active immunity involves formation of memory cells
- active immunity involves T cells and B cells

Question No.74

Which one of the following describes the nature of Human embryonic stem cells (ECS)?

- Pluripotent
- Totipotent
- Multipotent
- Unipotent

Question No.75

Labelled bacteriophages were used by

- Watson and Crick
- Messlson and Stahl
- Fredrick Griffith
- Herschey and Chase

Question No.76

DNA glycosylases are associated with

- Mismatch repair
- SOS repair

- Base excision repair
- Nucleotide excision repair

Question No.77

Matrilineality, i.e. tracing descent through the female line can be studied using information on:

- Mitochondrial DNA
- Nuclear DNA
- Both X- chromosome and mitochondrial DNA
- X- chromosome

Question No.78

This pair explicits degeneracy

- CAU and CAC
- AUG and UUU
- UGA and AUG
- UAA and UAC

Question No.79

5-bromouracil, a base analoguecan lead to

- Deletion
- Transversion
- Transition
- Frame-shift

Question No.80

Suppose that a bacterial cell divides once every minute and take 1 hour to fill a cup. How much time will it take to fill half a cup?

- 59 minutes
- 30 minutes
- 60 minutes
- 29 minutes

Question No.81

Temporary downregulation of the gene product is done by

- silencing of the gene
- addition of extra copies of the gene
- Knock out of the gene
- epigenetic modifications

Question No.82

Shine Dalgarno sequence is involved in

- Prokaryotic transcription
- Eukaryotic translation
- Eukaryotic transcription
- Prokaryotic translation

Question No.83

Starting with a double stranded DNA which one of the following represents a correct sequence of events in Polymerase Chain reaction (PCR)

- Denaturation at ~90 to 95 ^{o}C followed by annealing of primer based on T_m of the primer and then extension at around 72 ^{o}C
- Annealing of primer based on T_m of the primer followed by extension at around 72 ^{o}C and then denaturation at ~90 to 95 ^{o}C
- Annealing of primer at around 40 ^{o}C followed by extension at around 72 ^{o}C and then denaturation at ~90 to 95 ^{o}C
- Denaturation at based on T_m of the double stranded DNA followed by annealing of primer at around 40 ^{o}C and then extension at around ~90 to 95 ^{o}C

Question No.84

An extract has a protein of concentration 50mg/mL. How much of water would one add to 200 µl of the extract to make a concentration of 10 mg/mL.

- 1000 µl
- 0.8 ml
- 1.0 ml
- 600 µl

Question No.85

Hybridomas are produced by fusing:

- Antibody- producing B cells with myeloma cell
- Antibody-producing spleen cells with myeloma cell
- Antibody producing myeloma cells with B-cells
- Antibody producing T cells with myeloma cells

Question No.86

This forms the basis for separation of proteins in the first dimension of 2D gel electrophoresis

- Molecular mass
- Solubility
- pI
- Shape

Question No.87

_____ are substances that enhance the immunogenicity of the antigen.

- Immunogens
- Haptens
- Adjuvants
- Antibodies

Question No.88

Which one of the following will consume the least volume of 0.1 N NaOH when titrated?
(i). 10 ml of 0.1 N HCl
(ii) 10 ml of 0.1 N Acetic acid
(iii) 20 ml of 0.05 N HCl
(iv) 20 ml of 0.05 N Acetic acid

- (i), (ii) and (iv)
- (i), (ii) and (iii)

- (i) and (ii)
- (i), (ii), (iii) and (iv)

Question No.89

_____ shifts the hemoglobin saturation curve to the right?

- 1,3 -BPG
- Hemoglobin
- 2,3-BPG
- Oxygen

Question No.90

A solution of DNA polymeasre has an absorbance of 0.60 at 280 nm. If one wanted to calculate the concentration of DNA polymerase solution, which one of the following information is needed?

- Absorbance at 260 nm
- Transmittance at 260 nm
- Transmittance at 280 nm
- Molar absorptivity of DNA polymerase

Question No.91

_____ gene therapy comprises transfer of corrected copy of the gene into the targeted organ or tissue.

- *Ex situ*
- *In situ*
- *In vitro*
- *Ex vivo*

Question No.92

Which one of the following techniques is used for genome editing?

- Clustered regularly interspaced short palindromic repeats (CRISPR)/Cas
- RNA interference (RNAi)
- Antisense RNA
- Targeting Induced Local Lesions in Genomes (TILLING)

Question No.93

This inhibitor of Succinate dehydrogenase that alters the Km and not Vmax

- Malonate
- Maleate
- Succinate
- Malate

Question No.94

The cloned sheep ‘Dolly’ was

- diploid with the genotype identical to a mother’s egg cell
- haploid with a genotype identical to the mother’s egg
- diploid with a genotype identical to the mother’s somatic cell.
- diploid with one haploid set of chromosome from the egg cell and the other from the mother’s somatic cell

Question No.95

A in HAT is

- inhibitor of *de novo* purine biosynthesis
- Adenosine
- inhibitor of *de novo* pyrimidine biosynthesis
- HGPRT inhibitor

Question No.96

SNPs in introns can be identified using this library.

- Transcriptome
- cDNA library
- Proteome
- Genomic library

Question No.97

“Anti-HIV drugs have created drug resistance in the virus”. Which one of the following is the most appropriate response to the statement?

- The statement is accurate as in the absence of the drugs there would be no variation available for the target molecule in the viral population and thus resistance will not develop.
- The statement is inaccurate as variations in the target molecule exist in the viral population and these would get selected for even in the absence of drug exposure.
- The statement is inaccurate as variations in the target molecule exist in the viral population and these get selected for during exposure to drugs.
- The statement is accurate because when viruses are exposed to drugs, the drugs induce changes in the target molecule and that then leads to resistance.

Question No.98

The concept of gene regulation in prokaryotes was first proposed by:

- Watson and Crick
- Beadle and Tatum
- Jacob and Monod
- Ochoa and Kornberg

Question No.99

The discovery of Taq polymerase was key to the wide range of usage of Polymerase Chain Reaction (PCR). This enzyme was isolated from:

- *Thermus thermophilus*
- *Geobacillus stearothermophilus*
- *Thermus aquaticus*
- *Geobacillus thermoleovorans*

Question No.100

I^{131} is quantified by

- Autoradiography
- Beta counter
- Gamma counter
- Alpha counter