

Anthropology (Ph.D.)

1. 't' test is considered as
 - (A) A multivariate parametric test
 - (B) A multivariate non-parametric test
 - (C) A bivariate non-parametric test
 - (D) A bivariate parametric test

2. Which one of the following methods is useful for kinship studies?
 - (A) Genealogy
 - (B) Rorschach test
 - (C) Participant observation
 - (D) Case study

3. Which one of the following is an example of non-probability sampling?
 - (A) Snow-ball sampling
 - (B) Simple random sampling
 - (C) Stratified sampling
 - (D) Cluster sampling

4. Which one of the following is a measure of central tendency?
 - (A) Standard error
 - (B) Standard deviation
 - (C) Range
 - (D) Mode

5. Which of the New Ethnographic approaches does not dwell upon refinement in data collection and interpretation?
 - (A) Etic approach
 - (B) Emic approach
 - (C) Conceptualization of linguistic model
 - (D) Comparative method

6. A method of study which involves living as a member of the society under study and sharing in day-to-day activities is known as
- (A) Survey method
 - (B) Case-study method
 - (C) Participant observation
 - (D) Questionnaire
7. Among the following who is known as the father of field work in Anthropology?
- (A) Durkheim
 - (B) Redcliffe Brown
 - (C) Malinowski
 - (D) Franz Boas
8. A research paper:
- (A) Is a compilation of information on a topic.
 - (B) Contains original research as deemed by the author.
 - (C) Contains peer-reviewed original research or evaluation of research conducted by others.
 - (D) Can be published in more than one journal.
9. "Male and female students perform equally well in a numerical aptitude test". This statement indicates a:
- (A) Research hypothesis
 - (B) Bidirectional hypothesis
 - (C) Statistical hypothesis
 - (D) Null hypothesis
10. A statistical measure of the frequency with which two features are found in association with each other is known as
- (A) Correlation coefficient
 - (B) Standard deviation
 - (C) Regression
 - (D) Variance

- 11.** First stage of research proposal is:
- (A) Identification of research problem
 - (B) Review of literature
 - (C) Research design
 - (D) Data analysis
- 12.** The frequency distribution of a research data which is symmetrical in shape similar to a normal distribution but centre peaks is much higher, is called
- (A) Skewed
 - (B) Mesokurtic
 - (C) Platykurtic
 - (D) Leptokurtic
- 13.** Action research means:
- (A) Fundamental research
 - (B) Research initiated to solve an immediate problem
 - (C) Analytical research
 - (D) Survey
- 14.** Sampling error decreases with the
- (A) Decrease in sample size
 - (B) Increase in sample size
 - (C) Process of randomization
 - (D) Process of analysis
- 15.** Individuals were studied for a continuous period of 10 years in a research project. The statement is an example of
- (A) Cross-sectional study
 - (B) Semi-longitudinal study
 - (C) Mixed longitudinal study
 - (D) Longitudinal study

16. Which one of the following research methods is best suited to study the processual aspect of political organization?
- (A) Key informant interview
 - (B) Extended case study method
 - (C) Participant observation
 - (D) Focus group discussion
17. The issue of 'research ethics' may be considered pertinent at which stage of research?
- (A) At the stage of problem formulation and its definition
 - (B) At the stage of defining the population of research
 - (C) At the stage of data collection and interpretation
 - (D) At the stage of reporting the findings
18. A researcher attempts to evaluate the effect of method of feeding on anxiety-proneness of children. Which method of research would be appropriate for this?
- (A) Survey method
 - (B) Case study method
 - (C) Experimental method
 - (D) Ex-post-facto method
19. 'Goodness of fit' is also known as
- (A) T-test
 - (B) ANOVA
 - (C) Chi square test
 - (D) Regression
20. Which of the following is not a formal experimental design?
- (A) Completely randomized design
 - (B) Latin square design
 - (C) Factorial design
 - (D) Before and after with control design

- 21.** The approach utilized in Anthropology that integrates a wide varieties of disciplines in the study of human behavior:
- (A) Totalistic approach
 - (B) Holistic approach
 - (C) All encompassing approach
 - (D) Comprehensive approach
- 22.** When academicians are called to deliver lecture or presentation to an audience on certain topics or set of topics of educational nature, it is called:
- (A) Training program
 - (B) Seminar
 - (C) Workshop
 - (D) Symposium
- 23.** In doing action research what is the usual sequence of steps?
- (A) Reflect, observe, plan, act
 - (B) Plan, act, observe, reflect
 - (C) Plan, reflect, observe, act
 - (D) Act, observe, plan, reflect
- 24.** First hand personal study of local settings is referred to as
- (A) Ethnology
 - (B) Ethno-science
 - (C) Ethnography
 - (D) Ethno-history
- 25.** Which method is used in anthropology to examine cultures of various societies
- (A) Genealogical method
 - (B) Cross-cultural comparison
 - (C) Psychic unity of mankind
 - (D) Studying unconscious thought process of man

- 26.** Who first formulated the doctrine of 'the psychic unity of mankind'?
- (A) L. H. Morgan
 - (B) E.B. Tylor
 - (C) Franz Boas
 - (D) Adolf Bastian
- 27.** Oldest known stone tool was found in:
- (A) Kenya
 - (B) China
 - (C) Tanzania
 - (D) Indonesia
- 28.** Patau syndrome is due to the abnormality of the following chromosomes:
- (A) 13
 - (B) 18
 - (C) 22
 - (D) 16
- 29.** Which one of the following Epochs is called the "Age of Apes"?
- (A) Oligocene
 - (B) Eocene
 - (C) Pleistocene
 - (D) Miocene
- 30.** The comparative and historical study of cultures or peoples is known
- (A) Ethnography
 - (B) Ethnology
 - (C) Ethnohistory
 - (D) Ethnoscience
- 31.** Which of the following hominids is responsible for use of fire for the first time?
- (A) Homo habilis
 - (B) Homo erectus
 - (C) Homo Neanderthal
 - (D) Homo sapiens

- 32.** Who of the following wrote the book, 'Cultural Materialism'?
- (A) Raymond Firth
 - (B) James Frazer
 - (C) Marvin Harris
 - (D) Oscar Lewis
- 33.** The term 'Anthropometry' was coined by
- (A) Georges Cuvier
 - (B) Quetlet
 - (C) Martin and Saller
 - (D) Hrdlicka
- 34.** The Boyd's racial classification was based on
- (A) DNA markers
 - (B) Anthropometry
 - (C) Dermatoglyphics
 - (D) Blood Groups
- 35.** Which of the following tribes does not practice megalithic burial presently?
- (A) Khasi
 - (B) Santal
 - (C) Ho
 - (D) Bhumij
- 36.** Who proposed the concept of 'Great and Little Tradition'?
- (A) M. Marriot
 - (B) M. N. Srinivas
 - (C) Robert Redfield
 - (D) L.P. Vidyarthi
- 37.** Who wrote the book 'The Remembered Village'?
- (A) M.N. Srinivas
 - (B) L.P. Vidyarthi
 - (C) A.A. Aiyappan
 - (D) S.C. Dube

38. Which one of the following castes in South India is known for matriarchal system?
- (A) Lingayat
 - (B) Numbudri Bhramin
 - (C) Nayar
 - (D) Okkaliga
39. Which one of the following is the earliest Mesolithic sites of India?
- (A) Jwalapuram
 - (B) Bagor
 - (C) Guntoor
 - (D) Lagnajh
40. Alkaptonuria is caused by the deficiency of
- (A) Tyrosinase
 - (B) Homogentisic acid oxidase
 - (C) Carbamyl synthase
 - (D) Arginase
41. The term Scheduled Tribes has been defined in the Indian Constitution under Article:
- (A) 342(1)
 - (B) 341(1)
 - (C) 330
 - (D) 254
42. Who substituted the term bride-price with bride-wealth?
- (A) M.N. Srinivas
 - (B) S.C. Roy
 - (C) L.H. Morgan
 - (D) E.E. Evans-Pritchard
43. The phenotypic ratio in a dihybrid cross is
- (A) 1:3:3:9
 - (B) 1:2:2:1
 - (C) 9:3:3:1
 - (D) 1:2:1:2

44. A childbirth custom in which the father of the child behaves as though he were giving birth is known as:
- (A) Rite of passage
 - (B) Couvade
 - (C) Fictive kin
 - (D) Creation myth
45. Who discovered the first Neolithic site in India?
- (A) William Fraser
 - (B) Primrose
 - (C) R.B. Foote
 - (D) John Evans
46. Which one of the following sites represents the earliest evidence of lower Paleolithic culture of Africa?
- (A) Colombo Falls
 - (B) Lake Turkana
 - (C) Ternifine
 - (D) Olduvai Gorge
47. Which of the following is primary stone tool making technique for fluting?
- (A) Block-on-block technique
 - (B) Pressure flaking technique
 - (C) Free flaking technique
 - (D) Resolved flaking technique
48. Which one of the following is relative method of dating?
- (A) Tree ring
 - (B) Radio carbon
 - (C) Fluorine
 - (D) Thermoluminescence

- 49.** Dian Fossey conducted the pioneering field studies on the social behavior of:
- (A) Howler monkey
 - (B) Baboons
 - (C) Gorilla
 - (D) Orangutan
- 50.** Kula ring, a ceremonial exchange of ritualistically valued shell ornaments, and various items of economic necessities, is an example of:
- (A) Generalized reciprocity
 - (B) Negative reciprocity
 - (C) Market reciprocity
 - (D) Balanced reciprocity

x-x-x

Bio-Physics(Ph.D.)

1. IPR stands for
 - (A) Intellectual patent rights
 - (B) International property rights
 - (C) Indian property rights
 - (D) Intellectual property rights

2. Patent Cooperation Treaty (PCT) entered into force in
 - (A) 1978
 - (B) 1987
 - (C) 1950
 - (D) 1991

3. Which of the following is not included in the basic structure of a research paper
 - (A) Abstract
 - (B) References
 - (C) Conflict of interest statement
 - (D) Details of financial expenditure

4. Which of the following are the indices to measure quality of a research paper
 - (A) Impact factor
 - (B) Journal citation indicator
 - (C) Source Normalized Impact per Paper
 - (D) All of these

5. Common laboratory hazards include
 - (A) Inhalation of Toxic Fumes
 - (B) Cuts to the Skin
 - (C) Thermal and Chemical Burns
 - (D) All of these

6. ICMJE stands for
 - (A) Institutional committee of medical journal editors
 - (B) Indian committee of medical journal editors
 - (C) International committee of medical journal editors
 - (D) International collaborations of medical journal editors

7. OECD principles for Good laboratory practice do not include
 - (A) Storage and Retention of Records and Materials
 - (B) Standard Operating Procedures
 - (C) Deletion of unsuitable data and records
 - (D) Quality Assurance Programme

8. ISBN stands for
- (A) International Social Book Number
 - (B) Indian Standard Book Number
 - (C) Institutional Standard Book Number
 - (D) International Standard Book Number
9. Which of the following is not a form of plagiarism
- (A) Cutting and pasting from the Internet without clear acknowledgement
 - (B) Accurate citation
 - (C) Failure to acknowledge assistance
 - (D) Verbatim quotation without clear acknowledgement
10. World Intellectual Property Organization headquarters are situated in
- (A) New Delhi
 - (B) Geneva
 - (C) New York
 - (D) Ottawa
11. IAEC stands for
- (A) Institute Animal Ethics Committee
 - (B) International Animal Ethics Committee
 - (C) Indian Animal Ethics Committee
 - (D) Indian Academic Ethics Committee
12. A hypothesis is NOT _____.
- (A) An informed assumption about a certain phenomenon, predicting a factor or interpreting an observation
 - (B) A conjecture that is grounded in support background originating from secondary research
 - (C) An educated claim
 - (D) A guess that directs the course of a research
13. The level of certainty that samples actually include the true population parameter is known as _____.
- (A) Confidence interval
 - (B) Confidence range
 - (C) Confidence level
 - (D) Confidence limit
14. Attribute is
- (A) A constant that describes a sample
 - (B) A constant that describes a population
 - (C) A characteristic based on which a population can be categorized
 - (D) A variable

15. According to Sturges rule, no. of classes (k) can be calculated for given observations (N) as
- (A) $k = \log N$
 - (B) $k = 1 + 3.322 \log N$
 - (C) $k = 1 - 3.322 \log N$
 - (D) $k = 1 + \log N$
16. Which of the following measures are not used to describe a data set
- (A) Measure of shape
 - (B) Measure of position
 - (C) Measure of spread
 - (D) Measure of size
17. Which of the following statement is True
- (A) Mean is not sensitive to outliers
 - (B) Mode is sensitive to outliers
 - (C) Median is sensitive to outliers
 - (D) Both mode and median are not sensitive to outliers
18. Coefficient of correlation (r) is $+1$, which means correlation is
- (A) Positive
 - (B) Negative
 - (C) Perfect positive
 - (D) Perfect negative
19. Median of the following data (6, 13, 9, 14, 8, 17) is
- (A) 11
 - (B) 9
 - (C) 13
 - (D) 22
20. Rejecting the null hypothesis when it is actually true, is known as
- (A) Type II error
 - (B) Type I error
 - (C) Both Type I and Type II errors
 - (D) None of the above
21. Data collected in a statistical investigation are known as
- (A) Ordered array
 - (B) Raw data
 - (C) Continuous data
 - (D) Discrete data

22. Standard deviation is the square root of
- (A) Variance
 - (B) Coefficient of variation
 - (C) Range
 - (D) Mean
23. ANOVA is a statistical method of comparing the
- (A) Standard deviation
 - (B) Mean
 - (C) Median
 - (D) Mode
24. Which of the following is one-way ANOVA post-hoc test when equal variances are not assumed
- (A) Student-Newman-Keuls test
 - (B) Bonferroni's test
 - (C) Tukey's test
 - (D) Games-Howell test
25. Which of the following is parametric statistics test
- (A) Student's t-test
 - (B) Mann-Whitney-Wilcoxon test
 - (C) Kruskal-Wallis test
 - (D) None of the above
26. The amount of alpha-helix in a given protein can be measured using
- (A) Western blotting
 - (B) Atomic absorption spectroscopy
 - (C) Circular dichroism spectroscopy
 - (D) None of the above
27. 2D gel electrophoresis includes
- (A) Isoelectric focusing
 - (B) SDS-PAGE
 - (C) Both A and B
 - (D) None of the above
28. Which of the following is used to study the surface details of a specimen
- (A) Scanning electron microscopy
 - (B) Atomic absorption spectroscopy
 - (C) Circular dichroism spectroscopy
 - (D) Transition electron microscopy

29. Osmium Tetroxide is traditionally used in electron microscopy as
- (A) Fixative and staining agent
 - (B) Fixative and mordant
 - (C) Mordant and staining agent
 - (D) None of the above
30. Polymerase used for PCR is extracted from
- (A) Homo sapiens
 - (B) Thermus aquaticus
 - (C) Escherichia coli
 - (D) Saccharomyces cerevisiae
31. In atomic absorption spectroscopy the most strongly absorbed light is called as
- (A) Stokes line
 - (B) Base line
 - (C) Anti-Stokes line
 - (D) Resonance line
32. Which of the following cells are not present in cerebral cortex of human brain
- (A) Astrocytes
 - (B) Kupffer cells
 - (C) Cajal-Retzius cells
 - (D) Oligodendrocytes
33. “Fight or flight” response is associated with
- (A) Sympathetic nervous system
 - (B) Parasympathetic nervous system
 - (C) Somatic nervous system
 - (D) None of the above
34. In what type of machine learning, labelled training data is used
- (A) Unsupervised learning
 - (B) Supervised learning
 - (C) Reinforcement learning
 - (D) None of the above
35. Broca’s area is associated with
- (A) Motivation, behavior and emotions
 - (B) Word formation
 - (C) Language comprehension and intelligence
 - (D) None of the above

- 36.** SVAU stands for
- (A) Solvent Volume Analytical Ultracentrifugation
 - (B) Solution Velocity Analytical Ultracentrifugation
 - (C) Sedimentation Volume Analytical Ultracentrifugation
 - (D) Sedimentation Velocity Analytical Ultracentrifugation
- 37.** The movement of food bolus inside the digestive tract through series of involuntary wave-like muscle contractions is called as
- (A) Gastric reflux
 - (B) Peristalsis
 - (C) Swallowing
 - (D) Gastroesophageal reflux
- 38.** Which gastric secretory cells secrete hydrochloric acid (HCl)
- (A) Chief cells
 - (B) Mucous cells
 - (C) Parietal cells
 - (D) G cells
- 39.** Which of the following are not a part of Hepatic lobules
- (A) Kupffer cells
 - (B) Cajal-Retzius cells
 - (C) Portal triad
 - (D) Bile canaliculi
- 40.** The radiation produced by the deceleration of a charged particle is called as
- (A) Bremsstrahlung radiation
 - (B) Ionizing radiation
 - (C) Infrared rays
 - (D) Gamma rays
- 41.** What is the oxygen effect in radiotherapy?
- (A) Detrimental effect of oxygen in presence of therapeutic radiations
 - (B) Enhancement effect of oxygen in presence of therapeutic radiation
 - (C) A positive effect of oxygen in absence of therapeutic radiations
 - (D) Presence of oxygen during radiation treatment
- 42.** Which of the following genes are responsible for genome stability
- (A) Gatekeeper genes
 - (B) Caretaker genes
 - (C) Tumor suppressor genes
 - (D) Landscaper genes
- 43.** Aflatoxins are potent carcinogens produced by
- (A) Algae
 - (B) Bacteria
 - (C) Fungi
 - (D) Bats

44. DNA polymerase II has
- (A) 5'–3' exonuclease activity
 - (B) 3'–5' exonuclease activity
 - (C) Both 3'–5' and 5'–3' exonuclease activity
 - (D) None of the above
45. The activation of C1-complex triggers which pathway of complement system
- (A) Classical pathway
 - (B) Alternative pathway
 - (C) Lectin pathway
 - (D) None of the above
46. Non-steroidal anti-inflammatory drugs (NSAID) inhibit
- (A) Acetylcholinesterase
 - (B) Hexosaminidase
 - (C) Phenylalanine hydroxylase
 - (D) Cyclooxygenase
47. In which type of BLAST, a protein sequence query is compared to the six-frame translations of the sequences in a nucleotide database
- (A) BLASTp
 - (B) BLASTn
 - (C) tBLASTn
 - (D) BLASTx
48. Which of the following is used for the multiple sequence alignments
- (A) FASTA
 - (B) BLAST
 - (C) LALIGN
 - (D) Clustal W
49. Which amino acid is established as a potent breaker of both alpha-helical and beta-sheet structures in globular proteins
- (A) Glycine
 - (B) Alanine
 - (C) Proline
 - (D) Tyrosine
50. Otolith organs consist of
- (A) Saccule
 - (B) Utricle
 - (C) Calcium carbonate crystals
 - (D) All of the above

(BOTANY)

1. Function of β -mercaptoethanol in SDS-PAGE _____
 - (A) To give negative charges to amino acids in proteins
 - (B) For the oxidation of disulphide bonds in the proteins
 - (C) The reduction of disulphide bonds in the proteins
 - (D) For breaking hydrogen bonds in the proteins
2. The variation in the restriction DNA fragment lengths between individuals of a species is called:
 - (A) Restriction fragment length polymorphism (RFLP)
 - (B) Random amplified Polymorphic DNA (RAPD)
 - (C) Amplified fragment length polymorphism (AFLP)
 - (D) Simple sequence repeats (SSR)
3. A researcher is said to be committed the Type 1 error when _____
 - (A) When he rejects a null hypothesis which is actually true
 - (B) When he accepts a null hypothesis which is actually false
 - (C) Both the null and alternate hypothesis is rejected
 - (D) Both the null and alternate hypothesis is accepted
4. Retardation factor (RF) is the ratio of _____
 - (A) Distance moved by substance from base line to the distance moved by the solvent from base line
 - (B) Distance moved by solvent from base line to distance moved by the substance from baseline
 - (C) Distance moved by substance from top line to distance moved by the solvent from top line
 - (D) Distance moved by solvent from top line to distance moved by the substance from top line
5. Photosynthetic pigments are separated by using paper chromatography; the order of pigments on chromatogram is as follows:
 - (A) Chl.b, Chl.a, Xanthophyll, Carotenes
 - (B) Chl.a, Chl.b, Xanthophyll, Carotenes
 - (C) Chl.a, Chl.b, Carotenes, Xanthophyll
 - (D) Carotenes, Chl.a, Chl.b, Xanthophyll
6. Acid-fast staining is a differential stain used to identify acid-fast organisms (genus Mycobacterium). The procedure of acid-fast staining includes heating of bacteria and mixing basic fuchsin phenol. Once basic fuchsin penetrates the cell wall, acid-fast cells are not easily decolorized by an acid alcohol treatment and hence remain red this is because of which component:-
 - (A) Dipicolinic acid
 - (B) Teichoic acid
 - (C) Peptidoglycans (murein)
 - (D) Mycolic acid
7. Lactose permease formed a channel during processing for transport of lactose from outside to inside cell, it is an example of
 - (A) Co-transporter
 - (B) Uniporter
 - (C) Antiporter
 - (D) Active transport

8. A scientist is performing an experiment of synthesis of very-long-chain fatty acid. But unable to get the same result, the reason behind this
 (A) Problem in lysosome (B) Problem in Peroxisome
 (C) Problem in Golgi apparatus (D) Problem in ER
9. The interaction of CDK-2 & Cyclin A helps in
 (A) Passaging of cell into S phase (B) Passaging of the cell into G₁ phase
 (C) Passaging of the cell into G₂ phase (D) Transition of cell into G₂-M phase
10. Separation of charged molecules is based on varying rates of migration through a solid matrix when subjected to an electric field?
 (A) Photoreactivation (B) Gel electrophoresis
 (C) Autoradiography (D) Eastern blotting
11. What are the techniques used to transfer protein onto nitrocellulose paper?
 (A) Electrophoresis (B) Southern blotting
 (C) Northern blotting (D) Western blotting
12. Optical density of 1 means
 (A) 1% of the incident light is absorbed (B) 0% of the incident light is transmitted
 (C) 10% of the incident light is transmitted (D) 90% of the incident light is transmitted
13. A Competitive inhibitor:
 (A) Increases the K_m of an enzyme
 (B) Decreases the K_m of an enzyme
 (C) Increases both the V_{max} and K_m of an enzyme
 (D) Decreases the K_m but increases the V_{max} of an enzyme
14. Which of the following types of chromatography involves the process, where the mobile phase moves through the stationary phase by the influence of gravity or capillary action?
 (A) Column Chromatography (B) High Pressure Liquid Chromatography
 (C) Gas Chromatography (D) Planar Chromatography
15. Cellular respiration/ cellular viability of seeds and pollen grains can be analysed by using which of the following dye:
 (A) TTC (triphenyltetrazolium chloride) (B) Aniline blue
 (C) Crystal violet (D) Saffranin
16. Transmission Electron Microscopy (TEM) is most often used to reveal _____.
 (A) surface structures
 (B) internal structures
 (C) both surface and internal structures simultaneously
 (D) either surface or internal structures, but not simultaneously
17. Which of the following pair of molecular markers is co-dominant?
 (A) AFLP and RAPD (B) RFLP and SSR
 (C) RAPD and SSR (D) RAPD and RFLP

18. Southern blotting, Northern blotting and Western blotting, mainly separates _____, _____ and _____ respectively.

- (A) DNA, Proteins and RNA (B) DNA, RNA and Proteins
 (C) RNA, DNA and Proteins (D) Proteins, RNA and DNA

19. Some floral characters and their taxonomic status are shown below

Floral characters		Taxonomic status	
1.	Basal Placentation	(a)	Primitive
2.	Superior Ovary	(b)	Primitive
3.	Stamens many	(c)	Advanced
4.	Gamopetalous condition	(d)	Advanced

Choose the combination with all correct matches

- (A) 1-(a), 2-(c), 3-(b), 4-(d) (B) 1-(b), 2-(d), 3-(c), 4-(a)
 (C) 1-(c), 2-(a), 3-(b), 4-(d) (D) 1-(d), 2-(c), 3-(a), 4-(b)

20. Four groups of students gather following data in order to study species diversity at 4 different locations of a site using quadrat method. Different locations here represent 4 plant communities.

Species	Community (species abundance)			
	C1	C2	C3	C4
Sp1	70	0	25	60
Sp2	30	0	220	50
Sp3	0	185	0	0
Sp4	20	30	30	45
Sp5	65	0	0	70
Sp6	95	0	0	45

Based on the observations, following conclusions were drawn:

- (a) Community C₁ and C₄ show strong similarity
 (b) Community C₁ is least diverse
 (c) Community C₄ is most diverse
 (d) Community C₂ and C₃ show strong similarity

Which of the following statements is correct regarding conclusions?

- (A) All are correct (B) Only (a) and (c) are correct
 (C) Only (a), (b) and (c) are correct (D) Only (b) and (d) are correct

21. DPX, a colourless synthetic mounting media used for histology

- (A) Is a resin-based slide mountant with xylene solvent
 (B) Dries quickly and preserves stains
 (C) Both A and B
 (D) DPX is expensive mountant than Canada balsam

22. Tick mark the INCORRECT statement regarding sterilization techniques employed in plant tissue culture:
- (A) In Laminar Flow cabinet, air is passed through HEPA filter which removes all airborne contamination
 (B) Autoclave is a type of dry heat sterilization method used to remove microorganisms
 (C) Autoclaving is generally done at 15 Psi pressure, 121°C temperature for 15-20 minutes
 (D) Centrifugation is a process where a mixture is separated through spinning and operates on the basis of sedimentation
23. Cell A has osmotic potential of -20 bars and pressure potential of 8 bars, whereas, cell B has osmotic potential of -16 bars and pressure potential 2 bars. The direction of flow of water will be:
- (A) From cell B to cell A
 (B) From cell A to cell B
 (C) No flow of water
 (D) In both directions
24. Glycerol is added to protein samples before they are loaded to the wells of PAGE. The function of glycerol is to _____
- (A) Stabilize protein structure
 (B) Maintain pH of the sample
 (C) Helps to bind SDS to the protein
 (D) Helps to reduce disulphide bonds by β -mercaptoethanol
25. Which one of the following chemicals is a DNA intercalator?
- (A) 5-Bromouracil
 (B) Ethyl methane sulfonate
 (C) Acridine orange
 (D) UV
26. In terpenes biosynthesis pathway, 3 acetyl-CoA are joined together stepwise to form mevalonic acid. Which one of the following three steps is required by mevalonic acid to form isopentenyl diphosphate or isopentenyl pyrophosphate (IPP)?
- (A) Pyrophosphorylation, Decarboxylation and Dehydration
 (B) Alkylation, Pyrophosphorylation and Decarboxylation
 (C) Methylation, Dehydration and Alkylation
 (D) Phosphorylation, Carboxylation and Methylation
27. Calyptra develops from?
- (A) Venter wall of the archegonium
 (B) Neck of the archegonium
 (C) Outgrowth of the gametophyte
 (D) Outgrowth of sporophyte
28. Which part of capsule produces sporogenous cells in *Marchantia* ?
- (A) Endothecium
 (B) Outer amphithecium
 (C) Inner amphithecium
 (D) Seta
29. In which bryophyte the sporophyte is partially independent with unlimited growth?
- (A) *Anthoceros*
 (B) *Sphagnum*
 (C) *Porella*
 (D) *Marchantia*
30. In *Sphagnum*, the gametophyte structure compensating for the absence of seta is known as?
- (A) Columella
 (B) Sporangiphore
 (C) Pseudopodium
 (D) Elaterophore

31. Eusporangiate mode of sporangium development is found in?
 (A) *Funaria* (B) *Marchantia*
 (C) *Rhynia* (D) *Lycopodium*
32. Which one of the following features is not correct about 'horse tail' plant strobilus?
 (A) Peltate sporangia (B) Heterosporous
 (C) Presence of elaters (D) Homosporous
33. In Raunkiaer's life form, tuberous plants are kept in?
 (A) Thermophytes (B) Chamaephytes
 (C) Phanerophytes (D) Cryptophytes
34. The facilitation model of succession characterizes the following?
 (A) Inhibition view (B) Monoclimax view
 (C) Polyclimax view (D) Maturation of communities
35. Rhizobial genes that participate in legume nodule formation are called nodulation (nod) genes. The nod-encoded protein
 (A) An acetyl transferase that adds a fatty acyl chain to the Nod factor
 (B) Binds to the nod box and induces transcription of all nod genes
 (C) Catalyzes the linkage of N-acetyl glucosamine residues
 (D) Influences the host specificity of Rhizobium
36. DCMU herbicide inhibits photosynthesis at photosystem during:
 (A) Phe → QA (B) QA → QB
 (C) Cyt-bf6 → PC (D) QB → Cytbf6
37. Plants dissipate excess excitation energy as heat so as to protect from photo oxidative damage. The mechanism is known as
 (A) Photo chemical quenching (B) Non Photochemical quenching
 (C) Photo-inhibition (D) Warburg effect
38. α-Amanitin is a fungal toxin which inhibits eukaryotic RNA polymerases. The eukaryotic RNA polymerases show differential sensitivity to this toxin. Which of the following order is correct:
 (A) RNA POL III> RNA POL II>RNA POL I
 (B) RNA POL II> RNA POL III> RNA POL I
 (C) RNA POL I> RNA POL III>RNA POL II
 (D) RNA POL II> RNA POL I>RNA POL III
39. Which of the algae is responsible for red colour of red sea?
 (A) *Chlamydomonas braunii* (B) *Trichodesmium erythrium*
 (C) *Ulothrix zonata* (D) *Cephaleuros*
40. Carpogonia is the female sex organ in which of the algae?
 (A) Rhodophycophyta (B) Xanthophycophyta
 (C) Chrysophycophyta (D) Chlorophycophyta

41. Two lateral flagella are present in which of following groups of algae?
 (A) Rhodophycophyta (B) Xanthophycophyta
 (C) Phaeophycophyta (D) Bacillariophycophyta
42. Which fungi cause black wart disease of potato?
 (A) *Saprolegnia parasitica* (B) *Synchytrium endobioticum*
 (C) *Rhizopus stolonifer* (D) *Saccharomyces cerevisiae*
43. Bunt of rice is caused by which of the following fungus?
 (A) *Tilletia barclayana* (B) *Helminthosporium oryzae*
 (C) *Pyricularia oryzae* (D) *Saccharomyces cerevisiae*
44. In cellular respiration, which of the following processes occur only inside mitochondria and not in the cytoplasm?
 (A) Glycolysis and pentose – phosphate pathway
 (B) Glycolysis and Citric acid cycle
 (C) Citric acid cycle and oxidative phosphorylation
 (D) Glycolysis and oxidative phosphorylation
45. What kind of aneuploidy gametes will be generated if meiotic non disjunction occurs at first division? (“n” represents the haploid number of chromosomes)
 (A) Only n+1 and n (B) Only n-1 and n
 (C) Both n+1 and n-1 (D) Either n+1 or n-1
46. APG IV gives an update on classification of angiosperms at the level of:
 (A) Species and genera (B) Genera and families
 (C) Families and Orders (D) Orders and classes
47. Which of the following medicinal plant is used for treatment of hypertension?
 (A) *Aconitum* (B) *Digitalis*
 (C) *Rauwolfia serpentine* (D) *Adhatoda*
48. The development of a diploid gametophyte from sporophytes without gamete formation is called:
 (A) Apospory (B) Parthenogenesis
 (C) Apogamy (D) Hyperplasia
49. Tetrasporicsporic type of embryo sac development found in;
 (A) *Polygonum* (B) *Allium*
 (C) *Oenothera* (D) *Fritillaria*
50. Diploxylic vascular bundle is found in;
 (A) *Cycas* leaves (B) *Cycas* roots
 (C) *Pinus* needle (D) *Gnetum* leaves

x-x-x

Environment Studies(Ph.D.)

1. Plagiarism detection software checks plagiarism by providing
 - (A) Citation Index
 - (B) Copying Index
 - (C) Similarity Index
 - (D) Cheating Index
2. Skewness is a measure of
 - (A) Peakedness
 - (B) Symmetry
 - (C) Correlation
 - (D) Regression
3. Which of the following is not a discrete probability distribution?
 - (A) Bernoulli's Distribution
 - (B) Binomial Distribution
 - (C) Poisson's Distribution
 - (D) Gaussian's Distribution
4. In statistical hypothesis testing, the False positive refer to
 - (A) Type I error
 - (B) Type II error
 - (C) Type III error
 - (D) No error
5. One-way ANOVA compares two means from two independent groups using how many independent variables?
 - (A) One
 - (B) Two
 - (C) Three
 - (D) Any Number
6. What would be the probability of an event 'G' if H denotes its complement, according to the axioms of probability?
 - (A) $P(G) = 1 / P(H)$
 - (B) $P(G) = 1 - P(H)$
 - (C) $P(G) = 1 + P(H)$
 - (D) $P(G) = P(H)$
7. A variable that can assume any value between two given points is called _____
 - (A) Discrete random variable
 - (B) Irregular random variable
 - (C) Uncertain random variable
 - (D) Continuous random variable
8. In a Universal Polar stereographic coordinate system, the northings and eastings are computed by using which of the following methods?
 - (A) Non-Polar Aspect Mercaptor Projections
 - (B) Polar Aspect Mercaptor Projections
 - (C) Polar Aspect Stereographic Projections
 - (D) Non-Polar Aspect Stereographic Projections

9. In normal distribution the area under the curve within $\pm 2\sigma$ of μ is
- (A) 68%
 - (B) 95%
 - (C) 99.7%
 - (D) 100%
10. Which of the following tests is used to ascertain whether there is a significant difference between the variance of two sets of observations?
- (A) Chi-square test
 - (B) t-test
 - (C) F-test
 - (D) p-test
11. After the environment clearance of the hydropower project, its EIA report would be valid upto how many years?
- (A) 5
 - (B) 10
 - (C) 15
 - (D) 20
12. For degrees of freedom (df) > 1 , the mean (μ) of the t- distribution is
- (A) Zero
 - (B) One
 - (C) Two
 - (D) Three
13. Out of the following values, which one is not possible in probability?
- (A) $P(x) = 1$
 - (B) $\sum x P(x) = 3$
 - (C) $P(x) = 0.5$
 - (D) $P(x) = -0.5$
14. The sum of three numbers is 98. If the ratio of first number to second is 2:3 and that of second to third is 5:8; the second number is
- (A) 26
 - (B) 30
 - (C) 48
 - (D) 50
15. Which of the following is non probability sampling method?
- (A) Systematic sampling
 - (B) Quota sampling
 - (C) Cluster sampling
 - (D) Simple random sampling

16. Reliability of a research result implies its
- (A) Validity
 - (B) Verifiability
 - (C) Usefulness
 - (D) Biasedness
17. Which of the following have direct bearing on the research tools and techniques?
- (A) Processes
 - (B) Knowledge
 - (C) Concepts
 - (D) Aspirations
18. Which of the following is a goal of evaluation research?
- (A) Situation based decision making
 - (B) Trend based decision making
 - (C) People based decision making
 - (D) Data based decision making
19. Which of the following is responsible for assessing ISBN in India?
- (A) Raja Ram Mohan Roy National Agency
 - (B) Imperial Library, Kolkata
 - (C) National Library, Kolkata
 - (D) National Book Trust, New Delhi
20. Which of the following citation style is famously followed in science and medical research?
- (A) APA Style
 - (B) MLA style
 - (C) The Chicago Manual Style
 - (D) The Vancouver referencing style
21. Chicago citation style is commonly used for citing sources in
- (A) Chemistry
 - (B) History
 - (C) Languages
 - (D) Mathematics
22. Which of the following plagiarism software is available under open access?
- (A) Urkund
 - (B) Turnitin
 - (C) Viper
 - (D) Wipro
23. MLA and APA are
- (A) Citation synonyms
 - (B) Citation Sources
 - (C) Citation Acronyms
 - (D) Citation Styles

24. Which of the following is NOT covered under Intellectual Property Rights in India?
(A) Trademark
(B) Copyright
(C) Patent
(D) Geoheritage
25. In UGC-CARE list of journals 'CARE' stands for
(A) Consortium for Academic and Research Ethics
(B) Consent for Academic and Research Ethics
(C) Consultation for Academic and Research Ethics
(D) Competence for Academic and Research Ethics
26. Which of the following organization has been appointed as coordinator for engineering courses under SWAYAM courses in India?
(A) NCERT
(B) UGC
(C) NITTTR
(D) NPTEL
27. Amnesty International is
(A) a global Human Rights Movement
(B) a non-governmental organization to help people voluntary very poor people
(C) an agency of the United Nations to help refugees of civil wars
(D) an inter-governmental agency to cater to medical emergencies in war-ravaged regions
28. Which of the following transitions are studied by UV Spectrometer?
(A) Rotational
(B) Electronic
(C) Nuclear
(D) Vibrational
29. UNEP is celebrating _____ anniversary of UN Conference on Human Environment in 2022.
(A) 10th
(B) 25th
(C) 50th
(D) 75th
30. Optical fibre works on the principle of
(A) Refraction
(B) Total Internal Reflection
(C) Scattering
(D) Interference
31. River piracy is a feature which is more active in its _____ stage.
(A) Incipient
(B) Mature
(C) Youth
(D) Old

32. Which of the following layer of atmosphere is responsible for the deflection of radio waves?
- (A) Troposphere
 - (B) Stratosphere
 - (C) Mesosphere
 - (D) Ionosphere
33. Which of the following species is often termed as 'atmospheric detergent'?
- (A) Chloride radical
 - (B) Hydroxyl radical
 - (C) Methyl radical
 - (D) Bromyl radical
34. Which of the following is correctly matched?
- (A) Pb - Blue baby syndrome
 - (B) As - Kidney disorder
 - (C) PAN - Hypoxemia
 - (D) Hg - Nervous disorders
35. An important source of As in MSW is
- (A) Household Pesticides
 - (B) Batteries
 - (C) Rubber products
 - (D) Pigment in plastics
36. Cultural eutrophication is a type of
- (A) Noise Pollution
 - (B) Radiation Pollution
 - (C) Water Pollution
 - (D) Air Pollution
37. Which of the following salts is the main cause of permanent hardness of water?
- (A) Magnesium Phosphate
 - (B) Magnesium Oxalate
 - (C) Magnesium Sulphate
 - (D) Magnesium Carbonate
38. The determination of strength of odour compounds in water is usually done with which of the following techniques?
- (A) Flushing
 - (B) Stripping
 - (C) Settling
 - (D) Ozonization
39. Which of the following element do many scientists believe can provide an unlimited source of clean energy?
- (A) Hydrogen
 - (B) Helium
 - (C) Selenium
 - (D) Oxygen

40. Moh's scale of hardness is used for the measurement of hardness.
- (A) Indentation
 - (B) Dynamic
 - (C) Rebound
 - (D) Scratch
41. Polycaprolactone (PCL) is a
- (A) Biodegradable polyester
 - (B) Non Biodegradable polyester
 - (C) Dacron
 - (D) Rayon
42. Which of the following organism can act as primary, secondary, tertiary consumer or scavenger in different types of food chains?
- (A) Tiger
 - (B) Raven
 - (C) Snake
 - (D) Phyto planktons
43. The highest seismic domain in India is in
- (A) The Himalayas
 - (B) The Dharwar Craton
 - (C) The Western Ghats
 - (D) The Indo-gangetic plains
44. Which one of the following pairs is mismatched?
- | | | |
|-----------------------|---|-----------------|
| (A) Tundra | — | permafrost |
| (B) Prairie | — | epiphytes |
| (C) Coniferous forest | - | evergreen trees |
| (D) Savanna | - | acacia trees |
45. Which of the following is the only mineral component of chlorophyll?
- (A) Calcium
 - (B) Hydrogen
 - (C) Magnesium
 - (D) Carbon
46. Which of the following formation neither contains water nor transmits water?
- (A) Aquifer
 - (B) Aquitard
 - (C) Aquiclude
 - (D) Aquifuge
47. Which of the following is not correctly matched?
- | | |
|----------------------------|---------------------------|
| (A) World Earth Day | 22 nd of April |
| (B) World Biodiversity Day | 22 nd of May |
| (C) World Water Day | 22 nd of July |
| (D) World Environment Day | 5 th of June |

48. Artificial sweetener which is stable under cold condition is
- (A) Sucralose
 - (B) Aspartame
 - (C) Alitame
 - (D) Saccharine
49. What is the transition area between two biomes called?
- (A) Landscape
 - (B) Ecotype
 - (C) Population
 - (D) Ecotone
50. Prolonged liberal irrigation of agricultural fields is likely to create the problem of
- (A) Acidity
 - (B) Aridity
 - (C) Metal toxicity
 - (D) Salinity

x-x-x

(GEOLOGY)

1. Which geophysical method would be appropriate to predict the presence of shallow depth massive tabular multimetal sulphide orebody
(A) Ground geomagnetic survey
(B) Resistivity sounding
(C) Ground gravity survey
(D) Self-potential method of geophysical prospecting
2. Why is EPMA commonly used
(A) For mineral analysis
(B) For rock analysis
(C) Gravity survey
(D) Resistivity survey
3. What does BSE stand for in microscopy
(A) Better seismic emission image
(B) Back scattered electron image
(C) Borehole secondary electron image
(D) Base seismic data
4. A technique in optical mineralogy that helps determine the relative refractive index of two minerals.
(A) Becke line method
(B) Loop method
(C) Borehole method
(D) Gravity method
5. The SP log is used for
(A) Detection of seismic activity
(B) Detection of permeable beds
(C) Detection of mineral composition
(D) Detection of ore bodies
6. Brunton Compass is used to get directional degree measurement based on
(A) Gamma rays
(B) Earth's magnetic field
(C) Earth's Seismic waves
(D) Porosity of rocks
7. Topographic maps are made by using
(A) Plane table and alidade
(B) Magnetic susceptibility meter
(C) Gravimeter
(D) Dredge cores
8. Seismograph is used to record
(A) Motion of Wind
(B) Motion of water
(C) Motion of ground
(D) Motion of vapours
9. What is the thickness of a thin section for optical microscopy
(A) .3mm
(B) .03mm
(C) 3mm
(D) 30mm
10. X-rays have wavelength in the range
(A) .01nm-10nm
(B) 100nm-1000nm
(C) 1mm-10mm
(D) 1cm-10cm
11. Which of the following is used as an accessory plate in optical mineralogy
(A) Magnetite plate
(B) Galena plate
(C) Quartz wedge
(D) Chromite plate

12. Light coloured lunar highlands (on moon) are likely to show
 (A) Positive Eu anomaly
 (B) Negative Eu anomaly
 (C) Both positive and negative Eu anomaly
 (D) Positive nickel anomaly
13. Characteristic X-rays are emitted
 (A) When an inner-shell electrons fill a vacancy in the outer shell of an atom
 (B) When outer-shell electrons fill a vacancy in the inner shell of an atom
 (C) When there is no movement of electrons
 (D) The movement of electrons is insignificant
14. Impregnation is a technique commonly used to obtain high quality sections for
 (A) Soft and poorly consolidated sediments
 (B) Hard rocks
 (C) Mantle rocks
 (D) Lunar rocks
15. Which is a technique to **study the fossils in laboratory**
 (A) Maceration
 (B) Michael-Levy
 (C) Point counter
 (D) Geiger muller
16. Which statement about P-waves is incorrect
 (A) P waves are the first wave to hit the earth's surface
 (B) These waves travel in a linear direction
 (C) These waves travel through only solids
 (D) These waves travel in the speed range of 1.5-13 km/s
17. Geiger counter is used to detect
 (A) Radiations
 (B) P-waves
 (C) S-waves
 (D) L-waves
18. Isogonic lines are contours of equal magnetic
 (A) Declination
 (B) Inclination
 (C) Horizontal field intensity
 (D) Total intensity
19. ^{40}K is the most abundant radioactive isotope in
 (A) Upper mantle
 (B) Oceanic crust
 (C) Lower mantle
 (D) Continental crust
20. On a survey of India toposheet No. 44A/16, the distance between two points is 10 cm. The actual ground distance between the two point is
 (A) 10 Km
 (B) 20 Km
 (C) 5 Km
 (D) 2.5 Km
21. On a toposheet of 1:100000 scale, the distance between upper and lower traces of a bed is 2 cm. The actual distance on ground in kilometers is:
 (A) 2
 (B) 2.5
 (C) 3
 (D) 4
22. The binary diopside-anorthite system can be used to explain
 (A) Myrmekite texture
 (B) Graphic texture
 (C) Ophitic texture
 (D) Spinifex texture

23. Commonly used geothermometer in metamorphic petrology is
 (A) quartz-plagioclase (B) sillimanite-kyanite
 (C) garnet-pyroxene (D) quartz-kyanite
24. QAP classification for plutonic felsic igneous rocks is based on its
 (A) Mineral content/Mode (B) Geochemical data
 (C) Isotopic data (D) Isotope data
25. Which of the following is not used to characterize mineral hand specimens
 (A) Hardness test (B) Magnetism test
 (C) Hydrostatic test (D) Tenacity test
26. Nepheline Syenite is plutonic equivalent of
 (A) Basalt (B) Gabbro (C) Phonolite (D) Granite
27. Arête is formed by
 (A) Wind erosion (B) Water erosion
 (C) Glacial erosion (D) Sea wave cutting
28. Komatiites commonly exhibit
 (A) Graphic texture (B) Myrmekitic texture
 (C) Ophitic texture (D) Spinifex texture
29. Barakar Formation is the most coaliferous unit of
 (A) Aravalli Supergroup (B) Dharwar Supergroup
 (C) Delhi Supergroup (D) Gondwana Supergroup
30. The element that makes up most of the earth's crust is
 (A) Oxygen (B) Silicon (C) Aluminum (D) Iron
31. Magnetite is a member of
 (A) Mellilite group (B) Spinel Group
 (C) Olivine Group (D) Mica Group
32. Which of the following is a ceramic raw material
 (A) Calcite (B) Muscovite (C) Olivine (D) Kaolinite
33. Orangeite rock was named after
 (A) Orange free state of south Africa (B) Orange mountain of Africa
 (C) Orange growing region of Africa (D) Orange colour of the rock
34. Which of the following deposit is not an outcome of residual processes?
 (A) Nickel laterites (B) Bauxite
 (C) Limonite (D) Coal
35. Coesite is stable in
 (A) Low grade metamorphic rocks (B) Ocean floor metamorphism
 (C) High pressure metamorphic rocks (D) High temperature metamorphic rocks

36. The youngest age on the International Chronostratigraphic Chart is represented by
 (A) Chibanian (B) Meghalayan (C) Tortonian (D) Tithonian
37. Miaolingian is an Epoch of
 (A) Cambrian (B) Silurian (C) Permian (D) Carboniferous
38. Reunion hotspot is located in
 (A) Australian Plate (B) India plate
 (C) Antarctic plate (D) African plate
39. Hornfels is associated with
 (A) Ocean floor metamorphism (B) High pressure metamorphism
 (C) Thermal metamorphic aureole (D) Eclogite facies
40. The amplitude of ground motion during an earthquake of magnitude 5 in Richter scale is how many times more than that of a magnitude 8?
 (A) 10 (B) 100 (C) 1000 (D) 10,000
41. Permian-Triassic geological time boundary marks
 (A) Extinction of dinosaurs (B) Extinction of trilobites
 (C) Extinction of ammonites (D) Extinction of turtles
42. Which foraminifera has agglutinated wall structure
 (A) Cibicides (B) Fusulina (C) Textularia (D) Quinqueloculina
43. Bijli Formation is well known for
 (A) Sandstone (B) Rhyolite (C) Limestone (D) Granite
44. Phosphate deposits are well known from
 (A) Mansar formation (B) Udaipur Formation
 (C) Nallamalai Group (D) Shiwalik Group
45. Products belongs to Phylum
 (A) Cephalopoda (B) Gastropoda (C) Pelecypoda (D) Brachiopoda
46. Amba Dongar Igneous complex is known for
 (A) Chromite mineralization (B) Copper mineralisation
 (C) REE mineralization (D) Diamonds
47. Sargipalli Pb-Zn belong to
 (A) Alwar Group (B) Ajabgarh Group
 (C) Gangpur Group (D) Rialo Group
48. The Average crustal abundance (%) of metal A is 0.01 and its Average minimum exploitable grade (%) is 40. The concentration factor for metal A is
 (A) 4 (B) 400 (C) 0.4 (D) 4000
49. Boula Nuasahi deposits are resource for
 (A) PGM (B) Zinc (C) Copper (D) Lead

50. The depth of the perched water table is
- (A) Above the water table
 - (B) Below the water table
 - (C) Not related to the water table
 - (D) Can be above and below the water table

x-x-x

Human Genomics(Ph.D.)

1. A solution that has a pH of 1.0 has ___ times the $[H^+]$ as a solution with a pH of 2.0
(A) 10 times (B) 2 times (C) 50 times (D) 0.1 times
2. Which one of the following radioisotopes does not emit β rays?
(A) ^{14}C (B) ^{33}P (C) 3H (D) ^{125}I
3. A sample of 0.2 ml of purified protein is diluted to a total volume of 1.0 ml. The absorbance of the sample was determined to be 0.50 at 280 nm in a cuvette having 1 cm light path. What is the protein concentration in the original sample? [Consider 1 absorbance unit at 280 nm equal to 1 mg protein/ml]
(A) 1.50 mg/ml (B) 1.0 mg/ml (C) 2.50 mg/ml (D) 1.25 mg/ml
4. ___ is a bibliographic software used to store and organize citation information
(A) End Note (B) Rasmol (C) Mega 6 (D) INFLIBNET
5. Which of the following methods can be used to identify DNA sequences where a particular transcription factor binds?
(A) Chromatin Immunoprecipitation (B) RNA-seq
(C) Western blotting (D) RNase protection assay
6. Which of the following is not a genome editing technology?
(A) Transcription activator-like effector nucleases
(B) CRISPR-Cas system
(C) Zinc finger nucleases
(D) Gateway cloning system
7. The 'goodness of fit' can be determined by:
(A) t-test (B) F-test (C) Chi square test (D) Z-test
8. The sequencing technology capable of delivering read length of >15 kb is:
(A) Illumina sequencing (B) SOLiD sequencing
(C) Ion Torrent sequencing (D) Single molecule real time sequencing
9. A study to compare the proteome of normal cells and cancer cells was carried out to identify the biomarkers for cancer using 2D-DIGE. The proteins from normal cells were labeled with Cy3 and the proteins from cancer cell with Cy5. The Cy2 labeling was also used in the experiment. The reason for using Cy2 labeling is:
(A) The use of Cy2 labeling is not required. The experiment could have been performed with only Cy3 and Cy5
(B) Cy2 will help in uniform labeling of the proteins from normal cells
(C) Cy2 will help in uniform labeling of the proteins from cancer cells
(D) Cy2 labeled proteins can act as an internal standard for normalization of all protein spots
10. Normal distribution is not symmetric around:
(A) the mode (B) the median (C) the mean (D) the variance

11. Select the correct set of 7 bp primers to amplify the region in CAPITAL LETTERS using PCR 5'-aatcaaggatgcaGACCATATTGACCATTGCACGGttccatgaagcat-3'
- (A) 5'AGGATGCA3' and 5'GTACCTT3' (B) 5'AGGATGCA3' and 5'CATGGAA3'
(C) 5'AGGATGCA3' and 5'TTCCATG3' (D) 5'TGCATCCT3' and 5'CATGGAA3'
12. Which of the following statements is not correct:
- (A) Taqman probes can be multiplexed
(B) Taqman probes have a reporter and a quencher molecule
(C) Taqman probes intercalate in double stranded DNA
(D) In the beginning of PCR experiment where Taqman probes are used, no fluorescence is detected
13. In a study, patients are treated with a new drug and gene expression in the blood of the patients is to be measured. Which method would you suggest to measure expression of all genes in the genome and identify novel transcripts?
- (A) Microarray analysis (B) Real time PCR
(C) ChIP seq (D) RNA-seq
14. Which one of the following is a primary database?
- (A) InterPro (B) Ensembl (C) UniProt (D) GenBank
15. Standard deviation
- (A) has value generally comparable with the average value
(B) is the square root of variance
(C) is measured using the squared unit of the variable
(D) is measured using the unit of the variable
16. The h-index, or Hirsch index, measures the impact of
- (A) a book (B) an indexed journal
(C) a researcher (D) a non indexed journal
17. A protein sample should be in a solution of high salt concentration for binding to the column in _____ chromatography:
- (A) Hydrophobic interaction chromatography
(B) Preparative chromatography
(C) Chromatofocusing
(D) Gel permeation chromatography
18. Which of the following statements about studying protein interactions using Bimolecular fluorescence complementation (BiFC) is not correct:
- (A) BiFC analysis can be used to study protein interactions in living cells
(B) BiFC assay generally requires very high levels of protein expression to detect energy transfer
(C) BiFC assay does not require complex formation by a large fraction of the proteins but
can detect interactions between subpopulations of each protein
(D) Multicolor BiFC assay enables visualization of interactions between multiple combinations of proteins in the same cell

19. Which of the following would be used to search translated nucleotide database using a translated nucleotide query?
(A) tBLASTx (B) BLASTn (C) tBLASTn (D) BLASTx
(2)
20. Contamination of animal cell cultures with _____ is very difficult to detect
(A) Bacteria (B) Fungi (C) Molds (D) Mycoplasma
21. _____ g of NaCl will be required to prepare 10 ml of 10 mM solution (MW of NaCl = 58.5)
(A) 0.585 g (B) 0.0585 g (C) 0.00585 g (D) 0.000585 g
22. Which of the following can be used to quantify hundreds of proteins in thousands of samples derived from tissue or cell lysates, serum, plasma, or other body fluids
(A) Analytical Protein microarrays (B) Functional Protein microarrays
(C) Reverse phase protein microarrays (D) cDNA arrays
23. A LOD score of 3 means the odds are _____ that the two genes are linked and therefore inherited together.
(A) 10:1 (B) 100:1 (C) 1000:1 (D) 1:1
24. A Biosafety Level 3 facility should have which type of air pressurization?
(A) Neutral (B) Negative (C) Positive (D) Atmospheric
25. In which of the following experiments are you most likely to use diethyl pyrocarbonate?
(A) RNA isolation (B) DNA isolation
(C) Protein isolation (D) PCR amplification
26. A mutant of *lacI* called *lacI^S* [super repressor] would:
(A) repress the *lac* operon whether lactose is present or not
(B) induce the *lac* operon only when lactose is present
(C) induce the *lac* operon by binding to *lacO* operator sequence when lactose is absent
(D) repress the *lac* operon only when glucose is absent
27. Which of the following statements about the possible effects of transposition is NOT correct:
(A) Host genome acquires antibiotic resistance
(B) Activates gene expression
(C) Inactivates gene expression
(D) Always activates host DNA replication
28. Which of the statements about *E. coli* DNA Polymerases is not correct:
(A) DNA Pol III is the primary replicative polymerase
(B) DNA Pol I is involved in repair and does not play any role in replication
(C) Both DNA Pol III and DNA Pol I have 3'-5' exonuclease activity and only DNA Pol I has 5' to 3' exonuclease activity.
(D) DNA Pol IV allows replication to bypass certain types of damage in DNA

29. To generate knockout mouse using homologous recombination, a viral thymidine kinase gene is often included in the vector outside the region of homology between the vector and targeted sequence. The purpose of using this gene is:
- (A) Positive selection of cells in which integration of the targeting sequence has occurred by random insertion into the genome
 - (B) Positive selection of cells in which integration of the targeting sequence has occurred by homologous recombination
 - (C) Negative selection of cells in which integration of the targeting sequence has occurred by random insertion into the genome
 - (D) Negative selection of cells in which integration of the targeting sequence has occurred by homologous recombination
30. In the reaction mix for DNA sequencing by Sanger's method using Sequenase version 2.0 DNA Polymerase:
- (A) The concentration of dideoxynucleotides should be lower than the deoxynucleotides
 - (B) The concentration of dideoxynucleotides should be higher than the deoxynucleotides
 - (C) The concentration of dideoxynucleotides and deoxynucleotides should be exactly equal
 - (D) The reaction should not contain even trace amounts of deoxynucleotides
31. A protein contains 3 disulphide bonds, which are necessary for its folding and activity. Which of the following strategies is best suited for obtaining correctly folded protein?
- (A) Expression in the cytosol of *E. coli* BL21 (DE3)
 - (B) Expression in *E. coli* BL21 (DE3) pLysS
 - (C) Expression in the cytosol of *E. coli* (DE3) Origami
 - (D) Expression in the cytosol of *E. coli* (DE3) Rosetta
32. _____ occurs when the inhibitor binds at the same site as the substrate
- (A) Non-competitive inhibition
 - (B) Competitive Inhibition
 - (C) Allosteric inhibition
 - (D) Feedback inhibition
33. The advantage of the conventional yeast 2-hybrid method for analysis of protein interactions is that:
- (A) the method works well with the membrane bound proteins
 - (B) there is no need to purify proteins to screen for interaction partners of a protein
 - (C) the method detects the interacting residues and the interaction interface between two proteins
 - (D) the proteins are secreted out from the cell and thus works well for proteins with disulphide bridges.
34. Which of the following is not correct about cyclins that facilitate progression of cell cycle:
- (A) Cyclins bind to and activate cyclin dependant kinases
 - (B) Cyclins are the sole controllers of cyclin dependant kinase activity
 - (C) Appropriate cyclins are synthesized at the start of each phase of cell cycle and are destroyed at the end of that phase
 - (D) The cyclins associate with different CDKs to provide specificity of function at different times during the cell cycle

35. A culture of *E. coli* is shifted to high temperature resulting in heat shock response triggered by:
(A) a sensor protein on the ribosome
(B) conversion of a repressor protein to an activator protein
(C) removal of a repressor protein
(D) specific sigma factors
36. The proteins synthesized by the ribosomes attached to the endoplasmic reticulum direct proteins to which of the following organelles:
(A) peroxisome (B) mitochondria (C) nucleus (D) lysosomes
37. Which of the following statements about the Na⁺/K⁺ ATPase is correct?
(A) The Na⁺/K⁺ ATPase uses energy to pump Na⁺ outside the cell and K⁺ inside
(B) The phosphorylation of the Na⁺/K⁺ ATPase does not change its conformation
(C) The Na⁺/K⁺ ATPase uses energy to pump K⁺ outside the cell Na⁺ inside
(D) The Na⁺/K⁺ ATPase uses energy to pump both Na⁺ and K⁺ inside the cell
38. Which of these cell types is an important antigen presenting cell?
(A) Helper T cells (B) Natural Killer Cells
(C) Dendritic cells (D) Epithelial cells
39. Which of the following statements is correct for lysozyme:
(A) Lysozyme activates complement (B) Lysozyme is a proteolytic enzyme
(C) Lysozyme is released by Mast cells (D) Lysozyme splits peptidoglycan
40. For vaccination against mycobacterial diseases such as tuberculosis, what is the most important facet of the immune response to be stimulated?
(A) Macrophage-activating cell-mediated immunity
(B) Cytotoxic T-cells
(C) Neutrophils
(D) A high titer of antibody
41. The heptad repeats of the sequence YSPTSPS are found in:
(A) TFIID (B) *E. coli* RNA Polymerase
(C) RNA Pol III (D) RNA Pol II
42. Glutathione is a:
(A) Polypeptide (B) Dipeptide (C) Tripeptide (D) Iso-peptide
43. α -aminin is an inhibitor of:
(A) DNA synthesis (B) mRNA synthesis
(C) Protein synthesis (D) Post translational modifications
44. Whole-genome multiple displacement amplification of DNA from single cells can be carried out by:
(A) Taq DNA polymerase (B) Pfu DNA polymerase
(C) Vent DNA polymerase (D) Phi 29 polymerase

45. Bromodomain containing proteins recognize:
(A) Methylated lysine residues in histones
(B) Acetylated lysine residues in histones
(C) Phosphorylated lysine residues in histones
(D) Ubiquitinated lysine residues in histones
46. Which of the following is an advantage of using adenoviruses for gene therapy?
(A) Long term expression
(B) Low risk of insertional mutagenesis
(C) Low immunogenicity
(D) Easy assembly
47. Which of the following is a ribozyme?
(A) Aminoacyl tRNA synthetase
(B) Release Factor 1
(C) Peptidyl transferase
(D) Ribosome Recycling Factor
48. Which of the following can be used to check the orientation of a cloned gene in a plasmid vector?
(A) PCR using gene specific primers
(B) Restriction digestion with an enzyme that has one restriction site within the cloned gene and none in the vector
(C) Restriction digestion with an enzyme that has two restriction sites within the vector sequence and none in the gene
(D) PCR using a combination of one gene specific primer and one vector specific primer
49. _____ is used for phage display:
(A) Phage λ (B) Phage T7 (C) Phage M13 (D) ϕ 6
50. _____ is a widely used ionization method in mass spectrometry of proteins:
(A) Electrospray Ionization (B) Fast Atom Bombardment Ionization
(C) Electron Impact Ionization (D) Electron Ionization

Microbial Biotechnology(Ph.D.)

1. Why do you need to review the existing literature?
 - (A) To give your dissertation a proper academic appearance, with lots of references
 - (B) Without it you could never reach the required word-count
 - (C) To find out what is already known about your area of interest
 - (D) To help in your general studying

2. Type-I Error occurs if
 - (A) the null hypothesis is rejected even though it is true
 - (B) the null hypothesis is accepted even though it is false
 - (C) both the null hypothesis as well as alternative hypothesis are rejected
 - (D) alternative hypothesis are rejected even though it is true

3. What out of following refers to inferring about the whole population based on the observations made on a small part.
 - (A) Pseudo-inference
 - (B) Objective inference
 - (C) Inductive inference
 - (D) Deductive inference

4. Uniting various qualitative methods with quantitative methods can be called as
 - (A) Coalesce
 - (B) Triangulation
 - (C) Bipartite
 - (D) Impassive

5. In Hindi language the term Anusandhan refers to
 - (A) Become goal-oriented
 - (B) Attain the aim
 - (C) Preying of an aim
 - (D) Follower of an aim

6. Testing hypothesis is a _____
 - (A) Inferential statistics
 - (B) Descriptive statistics
 - (C) Data preparation
 - (D) Data analysis

7. To explain, predict and/ or control phenomenon are the goals of.....
 - (A) Tradition
 - (B) Inductive logic
 - (C) Deductive logic
 - (D) The Scientific method

8. A deductive theory is one that
 - (A) Allows theory to emerge out of the data
 - (B) Involves testing an explicitly defined hypothesis
 - (C) Allows for findings to feed back into the stock of knowledge
 - (D) Uses qualitative methods whenever possible

9. Which of these is a preferred sampling method for the population with finite size?
- (A) Systematic sampling
 - (B) Purposive sampling
 - (C) Cluster sampling
 - (D) Area sampling
10. The mean and variance of Poisson distribution are both
- (A) 0
 - (B) 1
 - (C) λ
 - (D) $1/\lambda$
11. Which of the following cannot be the probability of an event?
- (A) 0.0
 - (B) 0.3
 - (C) 0.9
 - (D) 1.2
12. Which test is applied to Analysis of Variance (ANOVA)?
- (A) t test
 - (B) z test
 - (C) F test
 - (D) χ^2 test
13. The arithmetic mean of all possible outcomes is known as
- (A) expected value
 - (B) critical value
 - (C) variance
 - (D) standard deviation
14. Which of the following cannot be the value of a correlation coefficient?
- (A) -1
 - (B) -0.75
 - (C) 0
 - (D) 1.2
15. What is variance of the data set: 2, 10, 1, 9, and 3?
- (A) 15.5
 - (B) 17.5
 - (C) 5.5
 - (D) 7.5
16. If an experiment is repeated independently for a large number of times, it converges to a/an
- (A) expected value
 - (B) variance – mean
 - (C) normal distribution
 - (D) uniform distribution

17. Which statistical method is used to estimate the relationship between two variables?
- (A) Correlation
 - (B) Regression
 - (C) Covariance
 - (D) ANOVA
18. The value of R^2 , the coefficient of determination, is always between
- (A) 0 and 1, including 0 and 1
 - (B) 0 and 1, excluding 0 and 1
 - (C) -1 and 1, including -1 and 1
 - (D) -1 and 1, excluding -1 and 1
19. If the distribution is symmetric about mean then the skewness is
- (A) 0
 - (B) 1
 - (C) positive
 - (D) negative
20. A hypothesis is a theory (or an assumption) based on
- (A) sufficient evidence
 - (B) insufficient evidence
 - (C) data
 - (D) experimentation
21. The lowest significance level that results in rejecting the null hypothesis is known as
- (A) α value
 - (B) p value
 - (C) test statistic
 - (D) confidence interval
22. Which statistical test is used to compare group means in a sample?
- (A) Correlation
 - (B) Regression
 - (C) Covariance
 - (D) ANOVA
23. If a researcher is studying the effect of using laptops in his classroom to ascertain their merit and worth, he is likely conducting which type of research?
- (A) Basic
 - (B) Applied
 - (C) Experimental
 - (D) Evaluation
24. A researcher selects a probability sample of 100 out of the total population. It is
- (A) cluster sample
 - (B) random sample
 - (C) systematic sample
 - (D) stratified sample

25. Which of the following is not a type of research question?
- (A) Hypothesis
 - (B) Predicting an outcome
 - (C) Evaluating a phenomenon
 - (D) Developing good practice
26. The restriction endonuclease has a defense mechanism in the bacterial system against foreign DNA such as viruses. But how can it protect its own DNA?
- (A) By methylation of bacterial DNA by restriction enzyme
 - (B) By methylation of foreign DNA by restriction enzyme
 - (C) By phosphorylation of bacterial DNA by restriction enzyme
 - (D) By phosphorylation of foreign DNA by restriction enzyme
27. The correct statement for topoisomerases is?
- (A) They act only on double-stranded molecules
 - (B) They alter the degree of supercoiling of DNA molecules
 - (C) They are less effective than conventional DNA ligase
 - (D) There are three types of topoisomerases
28. Theme for International Day for Biological Diversity 2022 was
- (A) Building a shared future for all life
 - (B) We're part of the solution # for nature
 - (C) Our solutions are in nature
 - (D) Our biodiversity, our food, our health
29. Compared to the secondary antibody response, the primary response.
- (A) Attains a higher IgG titer
 - (B) Has a longer lag phase
 - (C) Persists for a longer plateau period
 - (D) Produces antibodies with a higher affinity for the antigen
30. LOD scores are used to predict
- (A) crossover frequency
 - (B) gene sequence
 - (C) gene linkage
 - (D) the number of chromosomes in a genome
31. The World Intellectual Property Day 2022 was focused on
- (A) IP and Youth innovating for a better future
 - (B) Taking your ideas to the market
 - (C) Innovate for a green future
 - (D) Reach for Gold: IP and sports

32. The greatest resolution in light microscopy can be obtained with
- (A) Shortest wavelength of visible light used
 - (B) Longest wavelength of visible light used
 - (C) An objective with minimum numerical aperture
 - (D) Shortest wavelength of visible light used and an objective with the maximum numerical aperture
33. The respiratory chain of bacteria is associated with the
- (A) cytoplasmic membrane
 - (B) cell wall
 - (C) cytoplasm
 - (D) mitochondrial membrane
34. Which of the following enzyme removes the RNA primer with its 5'-nuclease activity?
- (A) DNA polymerase III
 - (B) RNA polymerase
 - (C) DNA polymerase I
 - (D) DNA polymerase I
35. Hepatitis vaccine is an example of _____
- (A) Subunit vaccine
 - (B) Killer vaccine
 - (C) Toxoid vaccine
 - (D) Recombinant vaccine
36. Which among the following is a pathogenic algae for humans?
- (A) *Cephaleuros*
 - (B) *Acanthopeltis*
 - (C) *Chlorella*
 - (D) *Prototheca*
37. Which one of the following will travel fastest through the gel if the amount of DNA present is the same in all?
- (A) Circular
 - (B) Supercoiled
 - (C) Nicked
 - (D) Supercoiled and circular will move at the same speed and faster than nicked
38. Plasmodium divides by which of the following method most commonly?
- (A) Regeneration
 - (B) Budding
 - (C) Binary fission
 - (D) Multiple fission

39. Which of the following is a family of lambda phage viruses?
(A) Styloviridae
(B) Corticoviridae
(C) Microviridae
(D) Pedoviridae
40. Which of the following microorganism produces dextran?
(A) *Leuconostoc mesenteroides*
(B) *Streptomyces olivaceus*
(C) *Bacillus thuringiensis*
(D) *Bacillus polymyxa*
41. Cell wall of Archaeobacteria does not contain----
(A) Peptidoglycan
(B) Proteins
(C) Glycoproteins
(D) Polysaccharides
42. A non directed physico-chemical interaction between heavy metal ions and microbial surface is called
(A) biotransformation
(B) bioconversion
(C) biosorption
(D) biomining
43. Hematopoietic stem cells are pluripotent, which means that they are
(A) antigen-specific cells
(B) capable of developing into any blood cells
(C) committed to produce cells of a single lineage
(D) not self-renewing
44. Nif gene for nitrogen fixation in cereal crops like wheat, jowar etc. is introduced by cloning in
(A) *Rhizobium meliloti*
(B) *Bacillus thuringiensis*
(C) *Rhizopus oryzae*
(D) *Rhizophora*
45. Biopiracy means
(A) Use of biopatents
(B) Thefts of plants and animals
(C) Stealing of bioresources
(D) Exploitation of bioresources without authentic permission

46. In tissue culture, callus can be induced to form shoot or root by altering the ratio of
- (A) auxin to cytokinin
 - (B) cytokinin to ethylene
 - (C) auxin to gibberellin
 - (D) gibberellin to cytokinin
47. Heat transfer rates (per unit volume) will be lowest in
- (A) stirred tank bioreactor with biomass recycle
 - (B) continuous air lift bioreactor
 - (C) continuous packed bed reactor
 - (D) continuous fluidized bed bioreactor
48. What is a genomic library?
- (A) a collection of recombinant molecules with inserts that contain all of the genes of an organism
 - (B) a collection of recombinant molecules that have been sequenced
 - (C) a collection of recombinant molecules that express all of the genes of an organism
 - (D) a collection of recombinant molecules with inserts that contain all of an organism's genome
49. The coenzyme involved in oxidative decarboxylation is
- (A) thiamine pyrophosphate
 - (B) biotin
 - (C) NAD^+
 - (D) pyridoxal phosphate
50. siRNA
- (A) forms complex in the spliceosome
 - (B) recruits histone acetyl transferases to the nucleus
 - (C) forms a complex with RISC proteins to inhibit translation or cause degradation of complementary mRNA
 - (D) is not transmitted to daughter cells after cell division

x-x-x

Microbiology(Ph.D.)

1. The ground breaking microorganism in the field of microbiology is
(A) Bacillus anthracis (B) Saccharomyces cerevisiae
(C) Streptomyces aurefaciens (D) Penicillium notatum
2. α amylase is produced from cassava by
(A) Bacillus licheniformis (B) Trichoderma reesei
(C) Saccharomyces cerevisiae (D) Lactobacillus sanfrancisco
3. DNA polymerase has been isolated from
(A) Thermotogalitoralis (B) Thermus aquaticus
(C) Thermofilumfurius (D) Thermococcus fecalis
4. Discovery of anaerobiosis is attributed to
(A) Louis Pasteur (B) Antony Van Leeuwenhoek
(C) Robert Koch (D) Robert Sokel
5. Which is not an anaerobic organism of industrial importance?
(A) Clostridium (B) Escherichia
(C) Streptococcus (D) Propionibacteria
6. Biomass retention can be done by
(A) Sterilization (B) Immobilization
(C) Evaporation (D) Lyophilization
7. Biosafety level II facility refers to work with only
(A) Viable organism
(B) Viable organism not known to cause disease
(C) Organism that pose some risk
(D) Organism that pose significant risk
8. Bioremediation is a
(A) Environmental treatment technology (B) Industrial treatment technology
(C) Pollution treatment technology (D) Ecological treatment technology
9. A method used to amplify short fragments of DNA is
(A) Cloning (B) DNA hybridization
(C) PCR (D) RFLP
10. Secondary metabolites are
(A) Essential for growth (B) Requiring for reproduction
(C) Produced by all microorganism (D) Produced in the stationary phase
11. α -amylase are
(A) Exoenzyme (B) Endoenzyme
(C) Isoenzyme (D) Isomerase
12. Phages that destroy the host cell DNA, direct synthesis of phage particle leads to lysis of host cell are known as
(A) Temperate (B) Transduction
(C) Lysogenic (D) Virulent

13. A bacterium devoid of cell wall is called
 (A) Protoplast (B) Mycoplasma
 (C) L-form (D) Gram negative
14. Hybridomas are formed by fusing antibody producing white blood cells with
 (A) Myeloma cells (B) Bone marrow cells
 (C) Red blood cells (D) Viral cells
15. In light microscope, what function does a condenser serve
 (A) focuses the light rays on to our eyes
 (B) magnifies the light rays after they pass through the sample
 (C) focuses the light rays on the sample
 (D) enhances the light intensity
16. What does heat fixation of bacterial smear accomplish?
 (A) Dry organism, kill them cause them to adhere to the slide
 (B) Cause the bacteria to kill and to adhere to the slide
 (C) Cause the bacteria to adhere to the slide, kill microbes and make them to stain more readily
 (D) Dry and kill the organism that makes them to adhere to the slide
17. The use of antibiotics that inhibit or inactivate cellular ribosomes will result directly in the lose of which of the following function
 (A) ATP production (B) Cell division
 (C) Protein synthesis (D) DNA replication
18. The typical end products of complete aerobic cell respiration are CO₂, H₂O and
 (A) Glucose (B) Citric acid
 (C) Pyruvate (D) ATP
19. The bacteria that multiply in improperly treated, sealed, canned food are most likely to be
 (A) Anaerobes (B) Aerobes
 (C) Facultative anaerobes (D) Omnivores
20. Mobile genetic sequences are called
 (A) Transducible element (B) Transposons
 (C) Conjugates (D) Transposable
21. The first vaccine for human use produced using recombinant DNA technology was
 (A) MMR (B) Polio
 (C) Hepatitis A (D) Influenza
22. Small protein that are capable of causing disease are called
 (A) Virions (B) Prions
 (C) Viroids (D) RNA virus
23. Which of the following is not an RNA virus?
 (A) Adenovirus (B) Retrovirus
 (C) Rhabdovirus (D) Enterovirus

24. Organisms that feed on soluble substances are
 (A) Saprozoic (B) Saprophytes
 (C) Holozoic (D) Coelozoic
25. Recommended method for testing that an autoclave has truly sterilized
 (A) Mycobacterium tuberculosis (B) Bacillus stearothermophilus
 (C) Staphylococcus aureus (D) Corynebacterium dephtheriae
26. Deuteromycota do not
 (A) Have complete hyphae (B) Form conidia
 (C) Have sexual cycle (D) Form hyphae
27. The target for quinolone is
 (A) Protein synthesis (B) DNA replication
 (C) RNA transcription (D) Membrane structure
28. Resident flora are commonly found in the
 (A) Stomach (B) Lung
 (C) Blood (D) Intestine
29. The presence of a few, non-multiplying, bacteria in the blood is termed as
 (A) Septicimia (B) Bacterimia
 (C) Viremia (D) Secondary infections
30. An example of a non-communicable disease is
 (A) Measles (B) Pneumonia
 (C) Tetanus (D) Leprosy
31. HERD immunity does not play a significant role in the prevention of which of the following disease?
 (A) Measles (B) Polio
 (C) AIDS (D) Chicken pox
32. Inflammation is influenced by histamines, which is released by
 (A) Eosinophils (B) Leucocytes
 (C) Neutrophils (D) Basophils
33. Large parasites, such as helminths, are most likely attacked by
 (A) Basophils (B) Neutrophils
 (C) Eosinophils (D) Erythrocytes
34. B-cells are activated by
 (A) Complement (B) Antibody
 (C) Antigen (D) Interferon
35. A living microbe with reduced virulence that is used for vaccination is considered
 (A) Toxoid (B) Virulent
 (C) Dormant (D) Attenuated

36. A positive tuberculin test is an example of
 (A) Type 1 hypersensitive (B) Delayed hypersensitive
 (C) Acute dermatitis (D) Pollen allergic response
37. Which of the following foods may not be produced by microbial actions?
 (A) Sauerkraut (B) Vinegar
 (C) Olives (D) Soy sauce
38. *Aspergillus ozyzae* is one of the microorganisms that is used to make
 (A) Hard cheese (B) Soy sauce
 (C) Pickles (D) Cottage cheese
39. Hallucinogenic compounds can be produced in foods contaminated with *Claviceps purpurea*. This organism is a type of
 (A) Protozoa (B) Bacterium
 (C) Algae (D) Fungus
40. The most common microorganisms found in drawn milk is
 (A) *Staphylococcus epidermis* (B) *S.aureus*
 (C) *M. bovis* (D) *E.coli*
41. Biohydrometallurgy is a process
 (A) To extract metal from ores (B) To extract metal from sea
 (C) To extract metal from soil (D) To extract metal from water
42. The 1st application of bioconversion to hormone synthesis involved the use of
 (A) *Rhizopus nigricans* (B) *Thiobacillus ferroxidans*
 (C) *Corynebacterium glutamicum* (D) *Phanerochaete chrysosporium*
43. The most numerous group of microorganism found in soil are
 (A) Fungi (B) Algae
 (C) Protist (D) Bacteria
44. The most common microbiological contaminant of air is
 (A) Spores from bacteria (B) Spores from molds
 (C) Spores of gram positive (D) Fungal hyphae
45. Which of the following nutrients is often in limited supply in fresh water lakes and ponds?
 (A) Carbon (B) Oxygen
 (C) Nitrogen (D) Minerals
46. *Naegleria fowleri* causes primary amoebic meningoencephalitis type of
 (A) Algae (B) Virus
 (C) Bacteria (D) Amoeba

47. The endospores of _____ is most heat resistant
(A) Streptococcus thermicos (B) Clostridium tetani
(C) Clostridium botulinum (D) Listeria monocytogenes
48. In 1933, a vaccine was developed and is effective in reducing the disease even today, caused by
(A) Clostridium botulinum (B) Clostridium tetani
(C) Listeria monocytogenes (D) Japanese encephalitis virus
49. What type of RNA carries an anticodon?
(A) t RNA (B) m RNA
(C) r RNA (D) ribosomes
50. Bacteriocins are
(A) Peptides (B) Polysaccharides
(C) Glycopolyptide (D) Peptidoglycan

x-x-x

Physics(Ph.D.)

1. Cross-sectional researches are fundamentally related with:
(A) Tendencies (B) Eugenics (C) Sample (D) Statistics
2. There are three pillars X, Y and Z of different heights. Three spiders U, V and W start of climb on these pillars simultaneously. In one chance U climbs on X by 5 cm but slips down 1 cm. V climbs on Y 6 cm but slips down 3 cm. W climbs on Z 7 cm but slips down 2 cm. If they each require 50 chances to reach the top of the pillar, what is the height of the shortest pillar?
(A) 153 cm (B) 151 cm (C) 200 cm (D) 250 cm
3. A normal TV screen has a width to height ratio of 4:3, while a high definition TV screen has a ratio of 16:9. What is the approximate ratio of their diagonals, if the heights of the two types of screens are the same?
(A) 5:6 (B) 5:9 (C) 5:15 (D) 5:18
4. The fundamental assumption of experimental method is related with:
(A) Law of two variable (B) Law of single variable
(C) Intermediary variables (D) Controlled variable
5. A can do a piece of work in 15 days and B alone can do it in 10 days. B works at it for 5 days and then leaves. In how many days, A alone can finish the remaining work?
(A) 12 days (B) 9 days (C) 5 days (D) 1 and half days
6. There is a need for the qualities of labeling, page-numbering and refinement in the graphical figures in a researcher:
(A) Painter's qualities (B) Appreciative qualities
(C) Specific qualities (D) Artistic qualities
7. Ram, Shyam and Krishna are wise. Manoj, Ram and Suresh are industrious. Manoj, Krishna and Suresh are honest. Ram, Shyam and Suresh are sportsman. Find out which of them is not wise but is a sportsman.
(A) Suresh (B) Manoj (C) Ram (D) Krishna
8. One third of the students in a class are Hindi speaking. One-half of the students know Tamil. The number of Marathi speaking students is twice that of Hindi speaking students. Two third of the students are girls. Which of the following statements is definitely true?
(A) Some Marathi speaking students know Tamil
(B) All Hindi speaking students are boys
(C) A half of the Hindi speaking students know Tamil
(D) All Marathi speaking students are girls

9. Replace the question mark (?) from the answer choices to fit the series.
 ABXW, EFTS, ?, MNLK
 (A) IJOP (B) IJPO (C) JIOP (D) JIPO
10. The minimum number of colors required to paint all the sides of a cube so that no two adjacent faces may have the same color, is:
 (A) Two (B) Three (C) Four (D) Six
11. Which one of the following is not a quality of a problem?
 (A) Practicality of the problem
 (B) Innate nature of the problem
 (C) Measurability of problem
 (D) Problem according to the interests of the researcher
12. 15 apples and 20 oranges cost as much as 20 apples and 15 oranges. How do you compare the costs of two?
 (A) Oranges are costly than apples
 (B) Apples are as costly as oranges
 (C) Apples are costly than oranges
 (D) Nothing can be found from the given data
13. Reverse the digits of each of the following numbers and arrange them in descending order. Which of the following will be the middle digit of the second highest number?
 739, 279, 359, 549
 (A) 8 (B) 7 (C) 5 (D) 3
14. Two iron spheres of radii 12 cm and 1 cm are melted and fused. Two new spheres are made without any loss of iron. Their possible radii could be:
 (A) 2 and 11 cm (B) 8 and 5 cm (C) 9 and 4 cm (D) 9 and 10 cm
15. Seeds when soaked in water gain about 20% by weight and 10% by volume. By what factor does the density increase?
 (A) 1.09 (B) 1.10 (C) 1.11 (D) 1.20
16. The research problems available in the field of philosophy are called as:
 (A) Invisible problem (B) Presentable problems
 (C) Historical problem (D) Philosophical problem
17. What will come in place of the question mark (?) in the following number series?
 384, 192, 96, 48, ?
 (A) 24 (B) 28 (C) 32 (D) 36
18. Of the following, which is the odd one out?
 (A) Torus (B) Sphere (C) Cone (D) Ellipsoid

19. A solid contains a spherical cavity. The cavity is filled with a liquid and includes a spherical bubble of gas. The radii of cavity and gas bubble are 2 mm and 1 mm, respectively. What proportion of the cavity is filled with liquid?
 (A) $\frac{7}{8}$ (B) $\frac{5}{8}$ (C) $\frac{3}{8}$ (D) $\frac{1}{8}$
20. Two brothers Mohan and Sohan walk to school from their house. The former takes 40 minutes while the later, 30 minutes. One day Mohan started 5 minutes earlier than Sohan. In how many minutes would Sohan overtake Mohan?
 (A) 25 (B) 20 (C) 15 (D) 5
21. The UGC has made it compulsory for every teacher to participate in Seminars because:
 (A) The teacher is the builder of young generation
 (B) The teacher is the nation builder
 (C) The teacher is awakening the nation
 (D) The teacher is the transmitter of democratic values
22. A certain basketball team that has played $\frac{2}{3}$ of its games has a record of 17 wins and 3 losses. What is the greatest number of the remaining games that the team can lose and still win at least $\frac{3}{4}$ of the total games played?
 (A) 5 (B) 4 (C) 6 (D) 7
23. A milkman mixes 20 litres of water with 80 litres of milk. After selling one-fourth of this mixture, he adds water to replenish the quantity that he has sold. What is the current proportion of water to milk?
 (A) 2:3 (B) 3:4 (C) 1:2 (D) 1:3
24. A man invests Rs 3000/- at the rate of 5% per annum. How much more should he invest at the rate of 8%, so that he can earn a total of 6% per annum?
 (A) 2000/- (B) 1500/- (C) 1300/- (D) 1200/-
25. Fresh grapes contain 90% of water by weight. Dry grapes contain 20%. What is the weight of the dry grapes available from 20 kg of fresh grapes?
 (A) 2 kg (B) 2.3 kg (C) 3 kg (D) 2.5 kg
26. In a square matrix, each diagonal element is zero and $a_{ij} = -a_{ji}$ then its matrix will be:
 (A) Hermitian (B) Symmetric (C) Skew-Hermitian (D) Skew-symmetric
27. When spin is included the degeneracy of hydrogen energy level is given by:
 (A) n^2 (B) $2n^2$ (C) $n + 1$ (D) $2n(n + 1)$
28. The second law of Kepler for planetary motion is a consequence of the law of conservation of:
 (A) Angular momentum (B) Linear momentum
 (C) Energy (D) Isospin

29. A gas at pressure P , volume V and temperature T , has a mean free path of λ . If this gas is isothermal compressed to a volume $V/2$, then the mean free path will be:
 (A) $\lambda/\sqrt{2}$ (B) λ (C) $\lambda/2$ (D) 2λ
30. The relation between length l and radius R of a cylinder, if the moment of inertia of the cylinder about its axis is to be the same as its moment of inertia above the equatorial axis:
 (A) $\sqrt{2}R$ (B) $4R$ (C) $3R$ (D) $\sqrt{3}R$
31. Which of the following is known as a half adder?
 (A) NAND gate (B) NOR gate (C) XNOR gate (D) XOR gate
32. A plane electromagnetic wave propagating in free space is incident normally on a large slab of loss-less, non magnetic, dielectric material with $\epsilon > \epsilon_0$. Maxima and minima are observed when the electric field is measured in front of the slab. The maximum electric field is found to be 5 times the minimum field. The intrinsic impedance of the medium should be:
 (A) $600 \pi \Omega$ (B) $60 \pi \Omega$ (C) $24 \pi \Omega$ (D) $120 \pi \Omega$
33. A certain charge distribution consists of two equivalent dipoles which are oppositely oriented. The leading term in the expansion of the potential is that due to a:
 (A) Octopole (B) Quadrupole (C) Dipole (D) Monopole
34. If A_i and B_j are components of a contravariant and covariant of rank one, then $C_j^i = A^i B_j$ is:
 (A) Mixed tensor of rank 2 (B) Mixed tensor of rank 1
 (C) Contravariant tensor of rank 2 (D) Covariant tensor of rank 2
35. The ground state energy and Bohr radius for the hydrogen atom are $E_0 = -(e^2/2a_0)$, $a_0 = (\hbar^2/me^2)$ where m = reduced mass of the system. The degeneracy of the positronium ground state due to electron spin:
 (A) 4 (B) 5 (C) 3 (D) 2
36. WKB approximation is not applicable, if the:
 (A) Wavelength of the particle is changing slowly with distance
 (B) Problem is reducible to one dimension
 (C) Momentum of the particle is too small
 (D) Momentum of the particle is too large
37. In Joule Kelvin's expansion the quantity remaining constant is:
 (A) Enthalpy (B) Internal energy
 (C) Helmholtz free energy (D) Gibb's free energy
38. A gamma ray of energy 2.2 MeV produces an electron positron pair. Then the energy imparted to each of the charge particle is nearly
 (A) 0.51 MeV (B) 0.59 MeV (C) 1.1 MeV (D) 1.18 MeV

39. For a diatomic gas having 3 translational and 2 rotational degrees of freedom, the energy is given by:
 (A) kT (B) $1/2 kT$ (C) $5/2 kT$ (D) $3/2 kT$
40. If the volume of black body radiation is increased quasistatically and adiabatically by a factor of 8 then the wavelength of highest intensity λ_m will shift to:
 (A) $2\sqrt{2} \lambda_m$ (B) $8\lambda_m$ (C) $1/2\lambda_m$ (D) $2\lambda_m$
41. A container open to atmosphere contains air (assumed to be an ideal gas) at temperature 27°C . The temperature is now raised to 227°C . The ratio of the number of atoms in the container now and at the beginning is:
 (A) $227/27$ (B) $27/227$ (C) $5/3$ (D) $3/5$
42. Number of flip-flop needed to divide the input frequency by 32 is:
 (A) 5 (B) 4 (C) 2 (D) 8
43. The dissociation energy of the H_2 molecule is 4.46 eV while that of the D_2 molecule is 4.54 eV. The zero point energy of H_2 molecule is:
 (A) 27.3 eV (B) 2.73 eV (C) 0.273 eV (D) 0.0273 eV
44. A monochromatic electromagnetic wave in vacuum is incident normally on a substance of refractive index 1.5, the ratio of the electric vector which is reflected to that of incident wave is:
 (A) $1/5$ (B) $1/4$ (C) $1/3$ (D) $1/2$
45. The susceptibility of a superconductor is:
 (A) Positive and unity (B) Negative and unity
 (C) Positive and small (D) Negative and small
46. Which of the following instrument can be used for the measurement of temperatures above 1500°K ?
 (A) Gas thermometer (B) Thermoelectric pyrometer
 (C) Mercury thermometer (D) Any of these
47. The center frequency of a band pass filter is always equal to the:
 (A) Bandwidth divided by Q
 (B) 3-dB frequency
 (C) Geometric average of the cut-off frequency
 (D) Bandwidth
48. If the series limit of the Balmer series for hydrogen is 364.6 nm, the atomic number of the element which gives X-ray wavelength down to 0.1 nm (K-series):
 (A) 32 (B) 29 (C) 30 (D) 31

Statistics(Ph.D.)

1. A bag contains 7 red and 4 blue balls. Two balls are drawn at random with replacement. The probability of getting the balls of different colours is
(A) 28/121 (B) 1/16 (C) 56/121 (D) 1/128
2. Consider a dice with the property that probability of a face with n dots showing up is proportional to n. The probability of face showing 4 dots is?
(A) 1/7 (B) 5/42 (C) 1/21 (D) 4/21
3. Sum of n independent Exponential random variables (λ) results in _____
(A) Uniform random variable (B) Binomial random variable
(C) Gamma random variable (D) Normal random variable
4. For a large population the ratio between standard error and standard deviation is 8:48. The sample size n will be:
(A) 48 (B) 36 (C) 8 (D) 18
5. The variance of Mann-Whitney statistics used to test for identity of two distributions based on independent samples of sizes 20 and 27 respectively is:
(A) 280 (B) 5300 (C) 2160 (D) 875
6. Let $X \sim N(\mu, \sigma^2)$. If $\sigma^2 = \mu^2, (\mu > 0)$, then the expression $P[X < -\mu | X < \mu]$ in terms of cdf of $N(0,1)$ is given by
(A) $1 + \Phi(-2)$ (B) $\Phi(2)$ (C) $1 - \Phi(-2)$ (D) $2[1 - \Phi(-2)]$
7. If X is a random variable and all the expectations exist. Then which one of the following is true
(A) $E|X| \leq E(X)$ (B) $-E|X| \leq E(X)$
(C) $-E|X| \leq E|X| \leq E(X)$ (D) $|E(X)| \leq E|X|$
8. In case of three variables x_1, x_2 and x_3 given that every pair-wise simple correlation coefficient is 'r', what is the partial correlation coefficient $r_{12.3}$ equal to:
(A) r (B) $\frac{1}{r+1}$ (C) $\frac{r}{r+1}$ (D) $\frac{1}{r-1}$
9. Consider the following statements
1. Mean and Variance of Chi-Square distribution are not same
2. Sum of two Chi-square variates is also a Chi-Square variate
Which of the above statements is/are correct?
(A) 1 only (B) 2 only (C) Both 1 and 2 (D) Neither 1 nor 2

10. The correlation coefficient of a random sample of size 18 from a bivariate normal population is found to be 0.8. The value of t-statistic used to test for significance of the population correlation coefficient is
 (A) 7.25 (B) 5.33 (C) 2.90 (D) 8.44
11. Let X be a random variable with probabilities given below

Values	2	-2	$(-1)^{i+1} \frac{2^i}{i!}$
Probabilities	$\frac{1}{2}$	$\left[\frac{1}{2}\right]^2$	-----	$\left[\frac{1}{2}\right]^i$

The E(X) equal to

- (A) $1 - e$ (B) e^{-1} (C) $1 - e^{-1}$ (D) $1 - e^{-2}$
12. If the mean deviation about mean of a random variable X is 15, then mean deviation of $Y=2X+3$ about its mean is
 (A) 18 (B) 22.5 (C) 29.4 (D) 30
13. For two attributes A and B, (A)=50, (B)=60, (AB)=40, N=100. Then
 (A) Attributes A and B are independent
 (B) Attributes A and B are positively associated
 (C) Attributes A and B are negatively associated
 (D) Nothing can be said about association without further information
14. The regression lines of Y on X and that of X on Y are respectively $Y=aX+b$, and $X=cY+d$. If r_{xy} is the correlation coefficient between X and Y, and $\frac{S_X}{S_Y}$ is the ratio of standard deviation X to standard deviation of Y, then the pair $\left[\sqrt{r_{xy}}, \frac{S_X}{S_Y}\right]$ would assume the value
 (A) $\left[\sqrt{ac}, \sqrt{\frac{c}{a}}\right]$ (B) $\left[\sqrt{\frac{c}{a}}, \sqrt{ac}\right]$
 (C) $\left[\sqrt{\frac{bd}{a}}, \sqrt{ac}\right]$ (D) $\left[\sqrt{ac}, \sqrt{\frac{a}{c}}\right]$
15. If $x=4y+5$ and $y=kx+4$ are the lines of regression of x on y and that of y on x respectively, then which one of the following is true
 (A) $k \geq 1$ (B) $k \leq -1$ (C) $-1 \leq k \leq 0$ (D) $0 \leq k \leq \frac{1}{4}$
16. Increasing the sample size has the following effect upon the sampling error?
 (A) It increases the sampling error
 (B) It reduces the sampling error
 (C) It has no effect on the sampling error
 (D) Sampling error reduces for $n < 30$, but increases for > 30

17. Which of the following is not a type of non-probability sampling?
 (A) Quota sampling (B) Convenience sampling
 (C) Snowball sampling (D) Simple random sampling
18. **The difference between a statistic and the parameter is called:**
 (A) Non-random (B) Probability (C) Sampling error (D) Random
19. **The difference between the expected value of a statistic and the value of the parameter being estimated is called a:**
 (A) **Standard error** (B) **Bias**
 (C) **Sampling error** (D) **Non-sampling error**
20. **A technique used when selecting clusters of different sizes is**
 (A) **Cluster sampling**
 (B) **Two-stage sampling**
 (C) **Probability proportional to size sampling**
 (D) **Multiple stage sampling**
21. $(1 - \beta)$ is called
 (A) Type-1 error (B) Rejection region
 (C) Type-II error (D) Power
22. Which of the following is an assumption underlying the t-distribution
 (A) The variance of the population must be known
 (B) The sample must be drawn from a normally distributed population
 (C) Sample standard is an unbiased estimate of population variance
 (D) The graph of the data should be positively skewed
23. t-test is used for testing
 (A) Equality of variances (B) Equality of means
 (C) Equality of more than two variances (D) Equality of two mean vectors
24. Analysis of variance (ANOVA) is used for testing equality of
 (A) Variances (B) Proportions
 (C) Only two parameters (D) Means
25. What is the probability of Type-II error when $\alpha = 0.025$
 (A) 0.95
 (B) 0.025
 (C) Cannot be determined without more information
 (D) 0.05
26. Conditions for applying Central Limit Theorem (CLT) which approximate the sampling distribution of the mean with a normal distribution is
 (A) $N < 30$ (B) $n/N > 5$ (C) $N(1-P) > 5$ (D) $N > 30$

27. The critical value of the Test statistic is determined from
 (A) Sampling distribution of the statistic assuming null hypothesis to be true
 (B) Sampling distribution of the statistic assuming alternative hypothesis to be true
 (C) Calculations based on repeating the experiment
 (D) Consistency of the data
28. Which of the following is a true statement, for comparing the t distributions with standard normal
 (A) The Normal Curve is symmetrical whereas the t-distribution is positively skewed
 (B) The proportion of area beyond a specific value of "t" is less than the proportion of normal curve
 (C) Greater the degree of freedom, the more the t-distribution resembles the standard normal distribution
 (D) The Normal Curve is symmetrical whereas the t-distribution is negatively skewed
29. In one-way ANOVA, the total variation is split up into
 (A) Two components (B) Four components
 (C) Six components (D) Three components
30. Nonparametric analogue of Two-way (repeated) ANOVA is
 (A) Kruskal Wallis test (B) Jonkheere-Trepstra test
 (C) Friedman test (D) Mann-Whitney test
31. The sign test is
 (A) Less Powerful than that of the Wilcoxon signed-rank test
 (B) More Powerful than the paired sample t-test
 (C) More Powerful than the Wilcoxon signed-rank test
 (D) Equivalent to Mann-Whitney test
32. If $\text{Var}(T_2) < \text{Var}(T_1)$, then T_2 is
 (A) Unbiased (B) Efficient (C) Sufficient (D) Consistent
33. Let $L(\theta; X_1, X_2, \dots, X_n)$ be the likelihood function for a sample X_1, X_2, \dots, X_n having joint density $f(x_1, x_2, \dots, x_n; \theta)$ where $\theta \in \Theta$ is the parametric space. Then a test defined as

$$\lambda = \lambda_n = \lambda(x_1, x_2, \dots, x_n) = \frac{\text{Sup}_{\theta \in \theta_0} L(\theta; x_1, x_2, \dots, x_n)}{\text{Sup}_{\theta \in \Theta} L(\theta; x_1, x_2, \dots, x_n)}$$
 is
 (A) Generalized Likelihood Ratio test (B) Most Powerful Uniformly Test
 (C) Monotone Likelihood Ratio Test (D) Unbiased Test
34. If the conditional distribution of X_1, X_2, \dots, X_n given $T=t$, does not depend on θ , for any value of $T=t$, the statistics $T=t(X_1, X_2, \dots, X_n)$ is called
 (A) Unbiased (B) Consistent (C) Sufficient (D) Efficient
35. A set of jointly sufficient statistics is defined to be minimal sufficient if and only if
 (A) It is a function of every other set of sufficient statistics
 (B) It is not a function of every other set of sufficient statistics
 (C) It is a function of some other set of sufficient statistics
 (D) It is a function of any sufficient statistics in the set

36. A test is said to be the most powerful test of size α , if
- (A) Among all other tests of size α or greater it has the largest β
 - (B) Among all other tests of size α or less, it has the largest power
 - (C) Among all other tests of size α or greater it has the larger $1-\alpha$
 - (D) Among all other tests of size α or greater, it has the smallest power
37. Let X_1, X_2, \dots, X_n , the n random variables, have the joint density say, $f(X_1, X_2, \dots, X_n; \theta)$ which is considered to be a function of θ . Then $L(\theta; X_1, X_2, \dots, X_n)$ is called
- (A) Maximum Likelihood function
 - (B) Likelihood Function
 - (C) Log Function
 - (D) Marginal Function
38. The chart that is used to deal with the number of defects in the manufactured items is
- (A) Xbar-chart
 - (B) R-chart
 - (C) C-chart
 - (D) P-chart
39. The chart which is applicable when the quality of product is a continuous variable is
- (A) Xbar-chart
 - (B) P-chart
 - (C) np-chart
 - (D) C-chart
40. In Two-way ANOVA with 'p' rows and 'q' columns, the error degrees of freedom are
- (A) $q-1$
 - (B) $p(q-1)$
 - (C) $(p-1)(q-1)$
 - (D) $q(p-1)$
41. The Generalized least square estimation (GLSE) is used when
- (A) Disturbance term has constant variance
 - (B) Disturbance term does not have constant variance
 - (C) Error terms are correlated
 - (D) Residual variance is constant
42. Heteroskedasticity refers to a situation in which the error terms from a regression analysis
- (A) do not have equal variance
 - (B) are not normally distributed
 - (C) do not have a mean of zero
 - (D) have equal variance
43. Multicollinearity refers to a situation in which
- (A) successive error terms derived from the application of regression analysis to time series data are correlated
 - (B) there is a high degree of correlation between the independent variables included in a multiple regression model
 - (C) the dependent variable is highly correlated with the independent variable(s) in a regression analysis
 - (D) the application of a multiple regression model yields estimates that are nonlinear in form
44. The adjusted value of the coefficient of determination
- (A) will always increase if additional independent variables are added to the regression model
 - (B) is equal to the proportion of the sum of the squared deviations of the dependent variable from its mean that is explained by the regression model
 - (C) is always greater than the proportion of the sum of the squared deviations of the dependent variable from its mean that is explained by the regression model
 - (D) is always less than the proportion of the sum of the squared deviations of the dependent variable from its mean that is explained by the regression model

45. One of the advantage of estimating a function in which all variables have been transformed into their natural logarithms is that
- (A) problems with multicollinearity will be eliminated
 - (B) problems with heteroskedasticity will be eliminated
 - (C) the estimated slope coefficients are all elasticities
 - (D) None of the above is correct
46. The Variation Inflation Factor (VIF) statistic is used to check
- (A) Autocorrelation
 - (B) Multicollinearity
 - (C) Heteroskedasticity
 - (D) Linearity of variables
47. Fisher's ideal index number does not satisfy
- (A) Circular test
 - (B) Unit test
 - (C) Time reversal test
 - (D) Factor reversal test
48. A relative obtained by dividing the price in a given year by price in proceeding year and expressed as a percentage is called:
- (A) Price relative
 - (B) Volume relative
 - (C) Link relatives
 - (D) None of these
49. Seasonal Variation Index is equal to:
- (A) $(\text{Seasonal Average} \div \text{General Average}) \times 100$
 - (B) $(\text{General Average} \div \text{Seasonal Average}) \times 100$
 - (C) $(\text{Seasonal Average} - \text{General Average}) \times 100$
 - (D) $(\text{Seasonal Average} + \text{General Average}) \times 100$
50. Time series does not relate to
- (A) Cyclical variation
 - (B) Cross-sectional variation
 - (C) Secular trend
 - (D) Seasonal variation

Stem Cell Tissue Engineering(Ph.D)

1. The appendix in a thesis is placed
 - (A) After the Reference section
 - (B) Before the Reference section
 - (C) After the Introduction
 - (D) After the Table of Contents
2. The text of the certificate in the certificate page of a thesis is typed with
 - (A) Single-line spacing
 - (B) 1.5 - line spacing
 - (C) Double-line spacing and 2 inches from the top edge
 - (D) Double -line spacing and 1 inch from the top edge
3. If the research work requires the use of agents which are likely to cause lethal human disease in healthy adult humans for which preventive or therapeutic interventions are not usually available then which of the following should be used for this type of research
 - (A) Bio-safety level-1
 - (B) Bio-safety level-2
 - (C) Bio-safety level-3
 - (D) Bio-safety level-4
4. Sterilization by autoclaving involves heating in a chamber with saturated steam under heavy pressure at _____ temperature for a minimum period of 15 minutes
 - (A) 121°C
 - (B) 134°C
 - (C) 126°C
 - (D) 115°C
5. The culture medium that has been discarded in a beaker while passaging a given cell line is rendered harmless by
 - (A) Adding Ethanol
 - (B) Adding water
 - (C) Adding saline
 - (D) Throwing in the sink
6. Na^{125}I is a radio isotope. It is called
 - (A) γ - radiation emitter
 - (B) β - radiation emitter
 - (C) X-ray radiation emitter
 - (D) Ultrasonic radiation emitter
7. An index based on the principle that there is some meaningful relationship between the work of two authors who published the papers is called
 - (A) Clonal index
 - (B) Paper index
 - (C) Citation index
 - (D) Copyright

8. An intellectual property protection granted under law to the creators of original work such as musical and artistic work is called
- (A) Copy left
 - (B) Copy right
 - (C) CTAB
 - (D) Design
9. The study in which a gene is introduced into bone marrow cells isolated from a patient and subsequently the recombinant cells are introduced back into the same patient by transfusion or injection is called
- (A) *in vitro* study
 - (B) *in vivo* study
 - (C) *ex vivo* study
 - (D) *in situ* study
10. HEPA filter is capable of screening out particles larger than _____ and used in laminar flow cabinet (hood) for sterile transfer work.
- (A) 0.3 μm
 - (B) 0.1 μm
 - (C) 0.3 nm
 - (D) 0.1 nm
11. In an experiment dealing with stem cells, high accuracy is obtained when size of sample is large. This size of sample refers to performance of an experiment in which a particular treatment is subjected to
- (A) 1×10^5 cells/ml/well in a single well of 6 well tissue culture plate
 - (B) 1×10^6 cells/ml/well in a single well of 6 well tissue culture plate
 - (C) 1×10^5 cells/ml/well in three wells of 6 well tissue culture plate
 - (D) 1×10^7 cells/ml/well in a single well of 6 well tissue culture plate
12. If you are working with Na^{125}I for radiolabeling Bovine Serum Albumin then the handling of Na^{125}I is done behind the barrier made of which metal?
- (A) Tin
 - (B) Zinc
 - (C) Magnesium
 - (D) Lead
13. The use of animals in experimental studies requires special considerations, the procedures and the facilities to be used must be reviewed by
- (A) Institutional Biosafety Committee and Institutional Animal Ethics Committee
 - (B) WIPO
 - (C) WTO
 - (D) ABD
14. Euthanasia of laboratory animals by cervical dislocation is recommended in all except
- (A) Mouse
 - (B) Rat
 - (C) Hamster
 - (D) Guinea pig

15. All of the following points are taken into consideration while writing Title of a table except
- (A) The Title of a table should not be a complete sentence
 - (B) The Title of a table should give background information
 - (C) The Title of a table should not describe the results shown in the Table
 - (D) The Title of a table should not begin with phrases such as “Table showing.....”
16. All of the followings are considered as guidelines for writing the Discussion section of Thesis except
- (A) We must emphasize our key findings and their interpretations
 - (B) We must compare our results to other studies without citing references from the primary literature
 - (C) We must try to justify how our results have contributed to our knowledge of specific system
 - (D) Any unexpected result that has been obtained during the investigation must be mentioned in the discussion
17. While writing the Results section of the thesis, we must avoid the following
- (A) Any illustration like graph, diagram, chromatogram, all of them are referred to as “Figures”
 - (B) All the Tables and Figures should be separately and serially numbered
 - (C) We do not give raw data in this section, but only processed data
 - (D) We should include the same data in both a Table and a Figure
18. The abstracts of research articles of standard journals are made available on the Internet by indexing services such as
- (A) Medline
 - (B) Medicare
 - (C) Taguchi
 - (D) Mediabstracts
19. The following is the Bibliography management system
- (A) Mendeley
 - (B) Medline
 - (C) IMRAD
 - (D) CBE
20. The APA in-text citation consists of
- (A) Author’s last name and the year of publication
 - (B) Author’s last name followed by Arabic numeral within the bracket
 - (C) Author-numbered system
 - (D) Alphabet-number system
21. All DOI numbers begin with a _____ and contain a prefix and a suffix separated by a slash.
- (A) 1
 - (B) 10
 - (C) 100
 - (D) 1000

22. This is an eight-digit code used to identify newspapers, journals, magazines and periodicals of all kinds and on all media-print and electronic
- (A) DOI
 - (B) ISBN
 - (C) ISSN
 - (D) EMBL
23. Suppose the two works of the year 2021 have been distinguished as 2021a and 2021b while writing in-text citations using the name-year system then it means that
- (A) The same author or group of authors has one publication in the same year
 - (B) The same author or group of authors has two publications in the same year
 - (C) The same author or group of authors has four publications in the same year
 - (D) The same author or group of authors has 2021 publications in the same year
24. The referencing style which is commonly used in medicine and science and consists of citations to someone else's work in the text, indicated by the use of a number as well as sequentially numbered reference list at the end of the document providing full details of the corresponding in-text reference is called
- (A) Vancouver style
 - (B) MLA style
 - (C) Name-Year system
 - (D) SCOPUS
25. An experiment has been planned to check the effect of Transforming growth Factor- β (TGF- β) on the differentiation potential dental pulp stem cells grown in a six well culture plate. In Well No. 1 of six well culture plate, these cells are grown in the medium which does not contain TGF- β and in Well No. 2 of the same six well culture plate, the cells are grown in medium containing TGF- β . Which of the following is correct?
- (A) Well No. 1 is Negative control
 - (B) Well No. 1 is Positive control
 - (C) Well No. 2 is Negative control
 - (D) Well No. 2 is Positive control
26. Very long chain fatty acids (VLCFAs, $>C_{20}$) are degraded to acetyl CoA preferentially in peroxisomes through a process which involves the transfer of electrons produced from $FADH_2$ to _____
- (A) H_2O_2 by oxidases
 - (B) O_2 by electron transport chain
 - (C) O_2 by oxidases
 - (D) O_2 by catalases
27. The toxin produced by a pathogenic bacteria causes inactivation of G α i in epithelial cells of airways of humans. This results in _____
- (A) Reduced inhibition of adenylyl cyclase
 - (B) Decrease in cAMP concentration within epithelial cells
 - (C) Increase in cAMP concentration in lumen of airways of humans
 - (D) Decrease in cAMP concentration in lumen of airways of humans

28. Binding of acetylcholine to its receptor in heart muscle cells leads to opening of associated K^+ channels due to the following process
- (A) Binding of $G\alpha.GTP$ to K^+ channels
 - (B) Binding of $G\beta\gamma$ to K^+ channels
 - (C) Binding of activated receptor to K^+ channels
 - (D) Depolarization of membrane
29. The Clara cells are present in the lung tissue and these are killed when treated with naphthalene. These cannot be detected with the following except
- (A) Anti-Scgb1a1 (Secretoglobin 1a1) antibody
 - (B) Anti-Cgrp antibody
 - (C) Anti-P63 antibody
 - (D) Anti-Forkhead transcription factor (Foxj1) antibody
30. The affinity maturation of an antibody occurs in
- (A) Lymph Nodes
 - (B) Bone Marrow
 - (C) Thymus
 - (D) Liver
31. When the cytosolic pH rises beyond 7.2 – 7.5 then which transporter gets activated in order to restore the intracellular pH close to 7.4
- (A) $Na^+ HCO_3^-/Cl^-$ antiporter
 - (B) Na^+/H^+ antiporter
 - (C) Cl^-/HCO_3^- antiporter
 - (D) Na^+/K^+ ATPase pump
32. In neurons the reopening of voltage gated Na^+ channels which were previously open just upstream of action potential is inhibited during the refractory period due to
- (A) Binding of channel inactivating segment into the channel opening
 - (B) Displacement of channel inactivating segment from the channel opening
 - (C) Closure of the channel opening without the binding of channel inactivating segment
 - (D) Movement of Voltage sensing α -helices towards the outer membrane surface
33. If a labeled cell from a donor murine morula is inserted inside another morula-stage murine embryo then the transplanted labeled cell would preferentially form
- (A) Embryo tissues
 - (B) Only trophectoderm
 - (C) Only placenta
 - (D) Only extraembryonic tissues
34. The eukaryotic membrane bilayer that contains large numbers of cone-shaped lipids forms
- (A) Flat bilayer
 - (B) Stable membrane structures such as microvilli
 - (C) Long ribbon like bilayer
 - (D) Thicker bilayer

35. The integral membrane proteins can be isolated with the help of the following reagent
- (A) Buffer solution of high ionic strength
 - (B) Buffer solution of low ionic strength
 - (C) Buffer solution containing Triton-X-100
 - (D) PBS Buffer pH 7.2
36. What would happen if the P-segment of a bacterial resting K^+ channel is replaced with the homologous segment from a mammalian K^+ channel?
- (A) The chimeric protein would exhibit normal selectivity for K^+ over other ions
 - (B) The chimeric protein would lose its selectivity for K^+ ion
 - (C) The chimeric protein would allow both Na^+ and K^+ to pass through it
 - (D) The chimeric protein would allow any of the following ions, like Na^+ , K^+ and Ca^{2+} ions to pass through it
37. Actin nucleation by Arp2/3 (Actin related protein 2/3) complex requires
- (A) Activated WASp, preformed actin filaments and Arp2/3
 - (B) Inactivated WASp and Arp2/3
 - (C) Preformed actin filaments and Arp2/3
 - (D) Activated WASp and Arp2/3
38. What happens when β -catenin function is blocked in the small intestine in mammals
- (A) Activates stem cells in intestine
 - (B) Abolishes stem cells in intestine
 - (C) Activates mesenchymal cells in the intestine
 - (D) Abolishes mesenchymal cells in the intestine
39. What happens when 5-azacytidine is added to mesenchymal stem cell line such as C3H 10T $\frac{1}{2}$
- (A) Transcriptional activation of genes which were previously repressed by methylation
 - (B) Transcriptional inactivation of genes which were previously present in the active state by demethylation
 - (C) Translational activation of genes which were previously repressed by demethylation
 - (D) Transcriptional inactivation of genes which were previously present in the active state by methylation
40. In an experiment, 1ml of cultured animal cells (8×10^5 cells/ml/well) in 24 well tissue culture plate are incubated with a molecule say 'X' in increasing concentrations for 2 hours, followed by the addition of 3H -leucine for 1 hour and finally the cells are lysed and radioactivity is counted. It is observed that there is a decrease in radioactivity counts as the concentration of molecule X is increased. Which of the following is correct?
- (A) Molecule "X" acts as an inhibitor of replication
 - (B) Molecule "X" acts as an activator of transcription
 - (C) Molecule "X" acts as an inhibitor of translation
 - (D) Molecule "X" acts as an activator of replication

41. The muscle-regulatory factors (MRFs) are bHLH (basic helix-loop-helix) family of DNA-binding transcription factors that contain a domain which is responsible for interaction with myocyte enhancing factors (MEFs), which is another family of DNA-binding proteins thereby mediating dimer formation. This domain is called
- (A) E box
 - (B) Transactivation domain
 - (C) MADS domain
 - (D) B domain
42. The Nanos protein is produced in the posterior region of normal fly embryo. However, if it is produced in the anterior region then what would happen?
- (A) Anterior body parts fail to form due to translational repression of hunchback mRNA by Nanos
 - (B) Posterior body parts fail to form due to translational repression of hunchback mRNA by Nanos
 - (C) Abdominal development is inhibited due to translational repression of hunchback mRNA by Nanos
 - (D) Anterior body parts develop due to translational activation of hunchback mRNA by Nanos
43. In stem cells such as murine embryonic stem cells (mES), the docking site of STAT3 are present in the
- (A) Four consensus motifs YXXQ present in the intracellular domain of gp130
 - (B) Tyrosine residues present in the SH2 domain of STAT3
 - (C) Tyrosine residues present in the SH2 domain of gp130
 - (D) Tyrosine residues present in the SH3 domain of STAT3
44. The osteogenic differentiation of mesenchymal stem cells can be verified by checking expression of which of the following molecule
- (A) Bone morphogenetic protein (BMP)-2
 - (B) BMP-6
 - (C) Alkaline phosphatase
 - (D) Oct-4
45. Considering the Cre-loxP system if in the reporter mice, the constitutive expression of Gene X has to be replaced by the expression of Gene Y upon the removal of loxP – flanked STOP sequence, then the role of STOP sequence is to
- (A) Act as termination sequence for the transcription of Gene Y
 - (B) Act as stop codon for the translation of Gene Y
 - (C) Act as termination sequence for the transcription of Gene X
 - (D) Act as stop codon for the translation of Gene X
46. When the cells are provided with a pulse of bromodeoxyuridine, which gets incorporated into dividing cells, then during the chase, which cells remain labeled
- (A) Dividing cells
 - (B) Adult stem cells
 - (C) Differentiated cells
 - (D) Neuronal cells

47. In the human subventricular zone within the lateral wall of the lateral ventricles of the brain which of the following layer contains cells that generate neurospheres?
- (A) Layer I
 - (B) Layer II
 - (C) Layer III
 - (D) Layer IV
48. The basal layer of the ductal epithelial tissue of the human breast contains which of the following cell type
- (A) Cuboidal epithelial cells
 - (B) Lactocytes
 - (C) Myoepithelial cells
 - (D) Fibroblast cells
49. In the secondary lymphoid organ, the naïve B cell expresses both Antibody IgM and Antibody IgD on its surface while upon interaction with its specific antigen, it now expresses
- (A) Membrane bound IgE
 - (B) Membrane bound IgD and membrane bound IgM
 - (C) Membrane bound IgM
 - (D) Secretory IgD and secretory IgM
50. The primary follicles in secondary lymphoid organs are enriched in which of the following cells?
- (A) B cells
 - (B) Follicular dendritic cells
 - (C) Tc cells
 - (D) Macrophages

System Biology & Bioinformatics(Ph.D.)

- Optical rotatory dispersion is based on the refractive indices of one of the following. Identify the correct answer.
(A) Differences in left and right polarized light
(B) Differences in left and right circularly polarized light
(C) Rotation in left polarized light
(D) Rotation in right polarized light
- World trade organisation deals with which one of the following
(A) Global rules of trade between nations
(B) Global rules of organization of nation
(C) Trade between any two countries of world
(D) Trade between organization of any two countries of the world
- Which of the following is the correct definition of trademark
(A) A sign that distinguishes the goods and services of one trader from others
(B) A sign that distinguishes the appearance of goods only from others
(C) A sign that distinguishes the services of trader only from others
(D) A sign that distinguishes the appearance of goods and services from each other's
- A rod of length 'a' is broken into three parts at random. What is the probability that a triangle can be formed from these parts?
(A) 1/6 (B) 1/4 (C) 1/3 (D) 1/2
- All of the following are measurements of central tendency in data analysis approaches, except one. Identify the incorrect answer.
(A) Arithmetic mean (B) Geometric mean
(C) Harmonic mean (D) Probable mean
- What is the arithmetic mean of the following frequency distribution

x	:	1	2	3	4	5	6	7
f	:	5	9	12	17	14	10	6

(A) 299 (B) 73 (C) 4.09 (D) 40.9
- All of the following statements are false for Mode central tendency, except one. Identify the correct answer.
(A) Mode is the value of variable which occurs least frequently in a set of observations
(B) Mode is the value of variable which occurs most frequently in a set of observations
(C) Mode is the value of variable which occurs at minima values in a set of observations
(D) Mode is the value of variable which occurs at maxima values in a set of observations
- To perform the clustering analysis between objects all of the following methods can be used except one, identify the incorrect answer.
(A) Hierarchical (B) K-means
(C) Self -Organizing maps (D) Dynamic Programming
- In order to separate the solids in a mixture of products, various types of chromatographic practices can be used. The separation of molecules on the basis of size can be achieved by which type of chromatography mentioned below.
(A) Gel Filtration chromatography (B) Partition chromatography
(C) Ion exchange chromatography (D) Adsorption chromatography

10. The original patent document granted by a patent office provide patent rights upto a period of
 (A) 10 Years (B) 20 Years (C) 30 Years (D) 40 Years
11. In a survey, a question that sways a respondent to answer in desired manner is
 (A) Open ended question (B) Leading question
 (C) Closed ended question (D) Loaded question
12. Radioisotopes are also utilized in sterilization of surgical and plastic disposables in laboratory. Which type of radioactive emitters are most commonly used for such purpose.
 (A) Alpha-emitters (B) Beta-emitters (C) Gamma-emitters (D) Delta -emitters
13. A chemical can be fluorescent probe in microscopy, if it performs one of the following features. Identify the correct answer.
 (A) Absorbs light at one wavelength and emits at a specific shorter wavelength
 (B) Absorbs light at one wavelength and emits at a specific longer wavelength
 (C) Absorbs light at one wavelength and emits at any wavelength
 (D) Absorbs light at one wavelength and emits at a same wavelength
14. In order to view the cell architecture in most details, which type of microscopy would be most suitable?
 (A) Simple microscope (B) Compound microscope
 (C) Transmission electron microscope (D) Scanning electron microscope
15. In the electromagnetic spectrum, which of following waves have the highest energy?
 (A) Infrared (B) Microwave (C) X-ray (D) Ultraviolet
16. What is the appropriate description for following computational terms.
.Doc, . pdf, .JPG, .Tiff
 (A) Computer application software's (B) Computer Programming languages
 (C) Computer File extensions (D) Computer Programs
17. The Analytical centrifugation technique can be used in the determination of all of the Following, except
 (A) Molecular weight information of nucleic acids and proteins
 (B) Molecular weight information of proteins only
 (C) Conformational changes information in DNA and proteins
 (D) Sequence information in DNA and proteins
18. In a research design where in order to minimize the number of participants , one person is measured repeatedly, this type of study is called as
 (A) Small-n design (B) Single -case design
 (C) Sequential design (D) Cohort study
19. Which of the following doesn't represent a rotor type for centrifugation process
 (A) Swinging bucket (B) Fixed Angle
 (C) Horizontal tube (D) Vertical tube
20. Which of the following is not a measure of central tendency;
 (A) Percentile (B) Median (C) Mode (D) Standard deviation

21. Which of the following mentioned factors have no impact on resolving power of a microscope?
(A) Wavelength of incident light
(B) Wavelength of transmitted light
(C) Refractive index of the medium between the object and objective
(D) Half angle of cone of light from one of the objects
22. For electrophoresis of protein molecules following types of gels materials are used, except one. Identify which one cannot be.
(A) Silica gel (B) Starch gel
(C) Agar gel (D) Acrylamide gel
23. Radioactive isotopes mentioned below emit β type of radiations. One of the isotopes is listed here incorrectly, identify;
(A) ^3H (B) ^{32}P (C) ^{35}S (D) ^{125}I
24. To decontaminate and disinfect the laboratory equipment's and surrounding area it must be cleaned with which of the following.
(A) 70% Acetone (B) 70% Salt solution
(C) 70% Soap solution (D) 70% Ethanol
25. Which one of the following practices does not qualify as good laboratory practice?
(A) Wearing proper lab attire (B) Good hygiene
(C) Labeling all sample containers (D) Food or drink in the laboratory
26. Which of the following format is not acceptable for performing the BLAST analysis of the nucleotide sequence data, identify the incorrect answer.
(A) PDB format (B) FASTA format
(C) Ref Seq identifier (D) Gene Bank Identifier
27. The Operational Taxonomic Unit in a phylogenetic tree is described by which of the following terms
(A) Internal branch of two nodes (B) External branch between node and leaf
(C) Terminal nodes or leaves (D) Evolutionary distance between sequence
28. The gene prediction programs are based either on gene signals or gene content features. All of the following are the examples of gene signals, except;
(A) Start and stop codons (B) Ribosomal binding sites
(C) Transcription factor binding sites (D) Statistical pattern of the coding region
29. The visualisation and localization of nucleic acid by fluorescently labelled Probes in a tissue sample could be achieved by which of the following techniques?
(A) Fluorescence activated cell sorting (B) Fluorescence *in situ* hybridization
(C) Fluorescence quenching (D) Fluorescence spectroscopy
30. SBML is an abbreviation for the acronym
(A) Systems Biology Metabolite Language
(B) Systems Biology Metabolite Linker
(C) Systems Biology Markup Language
(D) Systems Biology Markup Linker

31. The scatter plots in Microarray data analysis can be used to provide all of the following information, except
- (A) The gene expression at relatively high or low level.
 - (B) The gene is up regulated or down regulated in query data
 - (C) The gene copy number in an organism genome
 - (D) The gene constitutes the 5-10% of most regulated genes in the query experiment
32. The following computational tools help to predict the secondary structure features of protein, Except one. Identify the incorrect answer.
- (A) Chou–Fasman
 - (B) PSIPRED
 - (C) Predator
 - (D) Phred
33. In order to cite an example of a protein domain, which of the following answers qualifies as correct answer?
- (A) Alpha helix region only in immunoglobulin
 - (B) Beta sheet only in immunoglobulin
 - (C) Antigen binding area of Immunoglobulin
 - (D) The whole structure of Immunoglobulin
34. In order to draw the information for a ‘X’ protein using Gene Ontology software’s, all of the following information can be provided by these programs, except.
- (A) Gene translocation
 - (B) Biological process
 - (C) Cellular component
 - (D) Molecular function
35. A frame shift mutation in 5’ upstream region of mRNA coding gene in prokaryotes led to alterations in the Ribosomal binding region within the newly formed mRNA, such sequences have been named as
- (A) KOZAK Sequences
 - (B) Hogness box sequences
 - (C) Pribnow box sequences
 - (D) Shine Dalgarno sequences
36. Which of the following represents a Ref Seq accession number corresponding to a mRNA molecule?
- (A) J01539
 - (B) IMBN
 - (C) NM_15392
 - (D) NP_15392
37. Only one of the following statements is true for the stable and active drug molecule, identify which one.
- (A) The most stable conformation is always the active one of the drug molecule
 - (B) The stable conformation is always the most reactive one of the drug molecule
 - (C) The active and stable conformation are always identical in a drug molecule
 - (D) The conformation adopted by a drug when it binds to target site is the active one
38. In order to compare the Cytochrome C Oxidase protein sequences from different species to understand evolutionary relationship among them, which of the following bioinformatics tools should be used. Identify the correct answer.
- (A) BLASTn
 - (B) BLASTt
 - (C) BLASTx
 - (D) BLASTp

39. The Ramachandran plot of a globular protein is used to study which of the following features for a protein.
- (A) Sterically allowed conformations of a polypeptide back bone
 - (B) The frequency of occurrence of amino acids in beta-sheet structure
 - (C) The frequency of occurrence of amino acids in alpha helical structure
 - (D) The NMR data pattern of the protein in query
40. For performing Orthogonal Field Alternation Gel Electrophoresis of Chromosomes in a eukaryotic cell the electric field is applied
- (A) Directly along the length of the gel
 - (B) Directly across the length of the gel
 - (C) Alternately between two pairs of electrodes
 - (D) Alternately between one pair of electrodes
41. All of the following are examples of high energy phosphate compounds in biological systems., except one. Identify the incorrect answer.
- (A) Phosphoenol pyruvate
 - (B) Adenosine tri-phosphate
 - (C) Glucose -6- phosphate
 - (D) 1,3 -Bisphospho glycerate
42. All of the following statements are true for data mining practices except one. Identify the incorrect statement.
- (A) It enables to query large databases to interrogate a hypothesis
 - (B) It enables to interrogate a database to generate a new hypothesis
 - (C) It is based on rigorous statistical correlations
 - (D) It cannot be based on statistical correlations
43. Which of the following terms appropriately describes the divergence phenomenon of two protein sequences due to gene duplication within a species. Identify the correct answer.
- (A) Orthologous
 - (B) Paralogous
 - (C) Analogous
 - (D) Heterologous
44. Which of the following answer is the correct order of basic steps in Polymerase Chain Reaction?
- (A) Denaturation, Annealing and Synthesis
 - (B) Denaturation, Synthesis and Renaturation
 - (C) Annealing, Denaturation, and Renaturation
 - (D) Annealing, Synthesis and Denaturation
45. Ligand mediated dimerization is a classical mode of activation in certain type of receptors. Identify the correct answer.
- (A) Steroid Receptor
 - (B) Cytokine receptors
 - (C) G-protein coupled receptors
 - (D) Nitric Oxide receptors
46. All of the following represent the type of database models, except one, Identify the incorrect answer.
- (A) Divisive
 - (B) Hierarchical
 - (C) Relational
 - (D) Object oriented

47. The two types of substitution matrices are widely used for scoring amino acid substitutions which are mentioned below. Identify the correct answer
- (A) Point accepted mutation and Blocks Substitution matrix
 - (B) Point substituted mutation and Blocks Substitution matrix
 - (C) Point accepted mutation and Blocks Scoring matrix
 - (D) Point acquired mutation and Blocks Scoring matrix
48. During the intense exercise the overall process of anaerobic glycolysis in limb muscle would Yield how many ATPs per glucose molecule
- (A) 36
 - (B) 6
 - (C) 4
 - (D) 2
49. Which of the following terms represents the data presentation format of a PDB file.
- (A) Each line is 60 columns wide and terminated by a number
 - (B) Each line is 80 columns wide and terminated by a number
 - (C) Each line is 60 columns wide and terminated by an end-of-line indicator
 - (D) Each line is 80 columns wide and terminated by an end-of-line indicator
50. All of the following mentioned molecules can have RNA molecule in their macromolecular composition except one. Identify that molecule.
- (A) Ribozymes
 - (B) Antisense RNA
 - (C) miRNA
 - (D) Ribonuclease

x-x-x

(ZOOLOGY)

1. Eastern blot is a molecular biology technique that is used to detect
 - (A) DNA
 - (B) Lipid linked oligosaccharides
 - (C) Protein-protein interaction
 - (D) mRNA
2. Which of the following stain is used for staining the blood cells specifically WBCs?
 - (A) Wright's stain
 - (B) Masson's Trichrome stain
 - (C) Schiff stain
 - (D) Weigert's elastic stain
3. In fluorescence microscopy, which of the following permit only selected wavelengths from the illuminator to pass through on the way toward the specimen
 - (A) Exciter filter
 - (B) Barrier filter
 - (C) Dichroic mirror
 - (D) Mercury arc lamp
4. Which test is a statistical test used to determine whether two population means are different when the variances are known and the sample size is large?
 - (A) Z-test
 - (B) Wilcoxon signed-rank test
 - (C) Kruskal-Willis Test
 - (D) Mann-Whitney Test
5. What is the main objective of risk assessment?
 - (A) To evaluate hazard and minimize the risks
 - (B) Remediation of contaminated sites
 - (C) Hazard management
 - (D) To know source of pollutants
6. _____ is the plan structure & strategies of investigation conceived so as to obtain answers to research questions & to control "Variance".
 - (A) Research Design
 - (B) Research problem
 - (C) Research Report
 - (D) Sample Design
7. DNA profiling technique to demonstrate the similarity between different animal species with reference to some specific protein coding DNA sequences is called
 - (A) Zoo blot
 - (B) Phylogenetic blot
 - (C) Animal profiling
 - (D) Animal blot

8. Short subsequence of cDNA sequence that represents a unique segment of an active gene is called
- (A) SNPs
 - (B) SnRNAs
 - (C) ESTs
 - (D) Contigs
9. For sustained expression of a transgene in the successive generation of a cell line in culture, the ideal gene transfer can be obtained using
- (A) Lentiviral vector
 - (B) Adenoviral vector
 - (C) Plasmid DNA containing the transgene
 - (D) Only transgenic DNA
10. Which of the following stains nucleus blue in immunocytochemistry?
- (A) Ethidium Bromide
 - (B) Rhodamine
 - (C) DAPI
 - (D) Fluorescein
11. The relative granularity/ internal complexity of cells in flow cytometry is measured through
- (A) Fluorescent detector channels
 - (B) Forward scatter (FSC)
 - (C) Side scatter (SSC)
 - (D) Energy content
12. Buffers are mixture of
- (A) Strong acid and strong base
 - (B) Strong acid and weak base
 - (C) Weak acid and their conjugate base
 - (D) Weak base and their conjugate acid
13. Which of the following is the definitive method to identify monomolecular organic compounds?
- (A) Mass spectroscopy
 - (B) Infrared spectroscopy
 - (C) X – ray crystallography
 - (D) NMR spectroscopy
14. What is the first step of radioimmunoassay _____?
- (A) Antibody reagent is firstly incubated with antigens of interest
 - (B) Antigen reagent is firstly incubated with antibody of interest
 - (C) Radiolabeled Antigens are added in well
 - (D) Unlabeled antigens are added in well.

15. Arrange the following steps about ELISA (Enzyme-linked immunosorbent assay) in chronological order
- incubate with antibody-enzyme complex that binds primary antibody
 - coat surface with antigen, block unoccupied sites with nonspecific protein
 - add substrate, formation of colored product indicates presence of specific antigen
 - incubate with primary antibody against specific antigen
- (A) i, iv, ii, iii
(B) i, iv, iii, ii
(C) ii, iv, iii, i
(D) ii, iv, i, iii
16. What is the role of goat anti-rabbit IgG horseradish peroxidase conjugate in direct ELISA?
- (A) Antigen
(B) Primary antibody
(C) Second antibody
(D) Substrate
17. What is the dilution factor for WBC in haemocytometer?
- (A) 1:100
(B) 1:50
(C) 1:20
(D) 1:10
18. How are the cells sorted in FACS?
- (A) By dilution
(B) By differential weight
(C) By electrostatic force
(D) By magnetic force
19. The digestion of mRNA during RT – PCR is carried out by the enzyme _____.
- (A) Exonuclease
(B) RNase H
(C) Bal 31
(D) Endonuclease
20. Two double stranded DNA samples that are identical with respect to the number of base pairs, but differ significantly in their GC content, can be separated by
- (A) Density gradient centrifugation
(B) Agarose gel electrophoresis
(C) Dialysis
(D) Oligo-dT column chromatography
21. Which of following technique is most popular ionization technique for mass spectrometry imaging especially due to its ability to image a wide range of molecular weights and molecular species (metabolites and proteins)?
- (A) ESI (Electro spray ionisation)
(B) MALDI (Matrix Assisted laser desorption ionisation)
(C) LC/MS (LC/MS liquid chromatography mass spectrometry)
(D) APCI (Atmospheric pressure chemical ionization)

22. Copying the work of other authors in whole pieces is called as
(A) Self-plagiarism
(B) Indirect plagiarism
(C) Direct plagiarism
(D) Patch writing
23. Cluster sampling, stratified sampling and systematic sampling are types of
(A) Direct sampling
(B) Indirect sampling
(C) Random sampling
(D) Non random sampling
24. What is the name of the conceptual framework in which the research is carried out?
(A) Research hypothesis
(B) Synopsis of Research
(C) Research paradigm
(D) Research design
25. Which of the following proteins was first sequenced by Frederick Sanger?
(A) Myosin
(B) Insulin
(C) Myoglobin
(D) Haemoglobin
26. **Which of the following messenger molecules are derived from arachidonic acid?**
(A) Steroids
(B) Corticoids
(C) Terpenoids
(D) Eicosanoids
27. **Which of the following signal molecules does not interact with cell surface receptor?**
(A) Insulin
(B) Gastrin
(C) Glucagon
(D) Testosterone
28. Which of the following is the largest invertebrate?
(A) *Architeuthis*
(B) *Sepia*
(C) *Loligo*
(D) *Octopus*
29. Mode of infection of *Dracunculus medinensis* is
(A) Ingestion
(B) Inhalation
(C) Skin penetration
(D) Blood transfusion

30. What protozoan causes the rare but deadly neurological condition granulomatous amoebic encephalitis (GAE)?
(A) *Entamoeba histolytica*
(B) *Dientamoeba fragilis*
(C) *Nagleria fowleri*
(D) *Balamuthia mandrillaris*
31. Ceylon Frogmouth is a
(A) bird species found in the western Ghats
(B) amphibian species found in whole of the Indian Subcontinent
(C) reptilian species found from Himalayas to China
(D) primate species found in southeast Asia
32. Stimulation of which one of the following receptors causes vasoconstriction?
(A) α -adrenergic receptors
(B) β_1 -adrenergic receptors
(C) β_2 -adrenergic receptors
(D) Nicotinic receptors
33. What will be the hemoglobin level when the plasma level of the erythropoietin hormone increases?
(A) 4 to 6 g/dL
(B) 6 to 8 g/dL
(C) 8 to 10 g/dL
(D) 10 to 12 g/dL
34. Embryonic stem cells are also used for generation of transgenic organisms are obtained from _____ of a developing _____.
(A) Trophoectoderm, gastrula
(B) Trophoectoderm, blastula
(C) Inner cell mass, blastula
(D) Inner cell mass, gastrula
35. The term 'ACE2' is talked about in the context of
(A) genes introduced in the genetically modified plants
(B) radio collars for wildlife tracking
(C) spread of viral diseases
(D) cloning of protozoan
36. The first clinical application of gene therapy over a 4-year-old girl was for
(A) Adenosine deaminase deficiency
(B) Adenosine deficiency
(C) Growth deficiency
(D) Adenine deficiency
37. Crypsis is a type of
(A) Offensive behavior
(B) Foraging behavior
(C) Courtship behavior
(D) Defensive behavior

38. During eukaryotic cell division, metaphase to anaphase transition is regulated by degradation of
- (A) Cyclin B1
 - (B) CDK1
 - (C) Aurora A kinase
 - (D) Polo-like kinase
39. The mutation in oncogene falls under which of the following classes?
- (A) Loss of function mutation
 - (B) Gain of function mutation
 - (C) Frameshift mutation
 - (D) Dominant negative mutation
40. Retrogressive metamorphosis is the characteristic feature of
- (A) Lamprey
 - (B) Sea squirt
 - (C) Tongue worm
 - (D) Branchiostoma
41. Who is known as the founder of 'theory of catastrophism'?
- (A) Oparin
 - (B) Haldane
 - (C) Georges Cuvier
 - (D) Darwin
42. Actinomycin D inhibits the process of transcription by
- (A) Binding in the pocket of beta subunit of RNA polymerase
 - (B) Intercalates between GC base pairs of double stranded DNA
 - (C) Acting as an adenosine analog
 - (D) Prevent the binding of RNA polymerase
43. The area on the left hemisphere related to speech is
- (A) Amygdala
 - (B) Broca's Area
 - (C) Occipital lobe
 - (D) Pons varolii
44. The mouth part of honey bee used to mould wax and adhere pollen is
- (A) Ligula
 - (B) Labium
 - (C) Labellum
 - (D) Labrum
45. Which one of the following is a group of signalling molecules that act as morphogens during development of an organism and its effects are mediated through the receptor PTCH1?
- (A) Hedgehog protein
 - (B) Notch protein
 - (C) Wnt protein
 - (D) Beta-catenin

46. What is Turanose?
(A) 7-methyl sugar
(B) A deoxy sugars
(C) Non reducing disaccharide
(D) Reducing disaccharides of glucose and fructose
47. Which of the following compound can be detected by Molisch test?
(A) Lipids
(B) Proteins
(C) Mucoproteins
(D) Flavoproteins
48. The small portion of the embryo that will become its dorsal side develops from the
(A) Gray Crescent
(B) Morula
(C) Primitive streak
(D) Archenteron
49. Rosy gene is used as a selectable marker for transformation in *Drosophila*, it produces an enzyme required for the synthesis of _____.
(A) wing pigment
(B) eye pigment
(C) both eye and wing pigment
(D) thorax pigment
50. Which of the following groups have only two wings?
(A) Honey bee, beetle, ant
(B) Dragonfly, butterfly, fruitfly
(C) Butterfly, housefly, fruitfly
(D) Housefly, fruitfly, mosquito

x-x-x

Question Booklet Series: **A**

Question Booklet Serial No.: **220081**

Ph.D. Entrance Test : 2022

Subject: Chemistry

Paper – I

Important: Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.

Roll No.

(In Figure)

(In Words)

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O.M.R. Answer Sheet Serial No.

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Signature of Candidate: _____

Signature of Invigilator: _____

Time: 60 Minutes

Number of Questions: 50

Maximum Marks: 50





DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.

INSTRUCTIONS:

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Gel Pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. Please check that this Question Booklet contains **50** Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
5. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Gel Pen**. **There shall be no negative marking.**
6. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
7. **20 minutes Extra** would be given to the **visually handicapped/PwD Candidates**.
8. **Darken** the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
9. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
10. For rough work only the blank sheet at the end of the Question Booklet be used.
11. The University will provide Logarithmic table. Borrowing of log table or other material is not allowed.
12. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
13. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
14. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
15. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistant or found giving or receiving assistant or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
16. **Communication equipment such as mobile phones, pager, wireless set, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
17. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

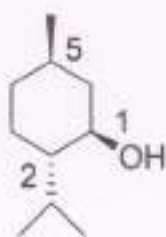
(CHEM)

1. Which of the following is not an objective of 'Research':
(A) Finding the hidden truth (B) Achieving new insights
(C) Testing a hypothesis (D) Enjoying the research fellowship
2. Research is always:
(A) Systematic (B) Illogical
(C) Unplanned (D) Arbitrary
3. Which of the following is not a constituent of the research process:
(A) Literature review (B) Hypothesis formulation
(C) Data Collection (D) Typing a research paper
4. Research in the subject of chemistry can be:
(A) Quantitative only (B) Qualitative only
(C) Both quantitative and qualitative (D) Semi-quantitative only
5. Which of the following should not be a major motivation towards the research:
(A) Getting a PhD degree (B) Getting a Ph.D. stipend
(C) Publishing a research paper (D) Getting a research project
6. Which of the following is not a part of research paper:
(A) References (B) Methodology
(C) Results and discussions (D) Covering letter
7. An abstract in a research article should ideally be written in:
(A) A single paragraph (B) Four paragraphs
(C) Two pages (D) As many pages as possible
8. Which of the following should be least preferred for the literature survey on a research problem:
(A) PubChem (B) Google
(C) Scifinder (D) PubMed
9. Standard deviation of a set of replicate data describes the:
(A) Precision (B) Accuracy
(C) Mean (D) Mode
10. Drugs formulated for the treatment of COVID is not an outcome motivated by:
(A) Political will (B) Scientific determination
(C) Social wellbeing (D) Health and family welfare
11. Suppose a compound is proposed in which carbon is found to be bonded to six other atoms, then the compound should be:
(A) Straightaway rejected without any reason
(B) Rejected because carbon is always tetravalent
(C) Accepted without any doubt
(D) Accepted subjected to further verification

12. While working in a chemical laboratory one should always wear:
 (A) Paper cloth (B) Safety goggles
 (C) Woolen gloves (D) Sports shoes
13. As far as possible, chemical waste from a chemistry laboratory should be:
 (A) Discarded into a public drain (B) Stored in a personal container
 (C) Recycled and reused (D) Handed over to a scrap dealer
14. Copying and pasting contents from research papers of others into your own without any proper citation:
 (A) is always allowed (B) is an act of Plagiarism
 (C) is always rewardable (D) should be discouraged
15. Safety symbol for corrosive chemicals is:
- (A)  (B) 
- (C)  (D) 
16. Symbol of the blue diamond is generally used for :
 (A) Health hazard (B) Flammability
 (C) Reactivity (D) Special notice keys
17. Carcinogen is a substance that causes
 (A) Asthma (B) Cancer
 (C) Spondylitis (D) Myopia
18. Which of the following may be fatal if ingested:
 (A) Glucose (B) Glycerin
 (C) Bromine (D) Sodium Chloride
19. Significant figures in a number are all the digits known with certainty plus:
 (A) the first uncertain digit (B) both first and last uncertain digit
 (C) the last uncertain digit (D) One
20. Accuracy is:
 (A) an absolute term (B) a relative term
 (C) always meaningless (D) exactly same as precision
21. The presence of random errors is generally reflected in the:
 (A) Accuracy of the data (B) Precision of the data
 (C) Inaccuracy of the data (D) Imprecision of the data

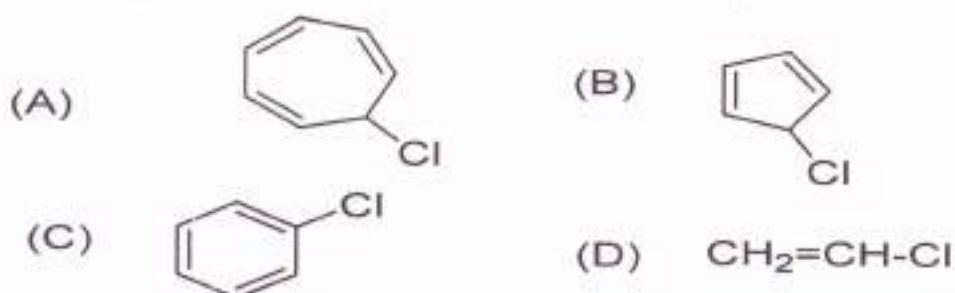
22. Error in the visual detection of the color of a solution at the end-point in a titration is a:
 (A) Personal error (B) Supervision error
 (C) Instrumental error (D) Method error
23. A chemical fume hood in a chemistry laboratory is used:
 (A) for burning firewood (B) to trap and exhaust toxic vapors
 (C) to hide in case of fire (D) to store flammable chemicals
24. A dry lab in chemistry generally refers to:
 (A) a computational chemistry lab (B) lab free from water
 (C) a neat and clean lab (D) a lab that has been dehumidified
25. The formulation of COVID vaccines involved research through:
 (A) Scientific concepts (B) Surveys
 (C) Tally sheets (D) Interviews
26. A plot between logarithmic of rate constant and inverse of temperature is:
 (A) Always linear (B) Always a straight line
 (C) Can be non-linear (D) Not possible
27. The number of states that are thermally accessible to a molecule at the temperature of the system can be described through a:
 (A) Wave-function (B) Helmholtz function
 (C) Gibbs function (D) Partition function
28. Transition state species in a chemical reaction can be experimentally detected using
 (A) Transient vibrational spectroscopy
 (B) Super-resolved nuclear magnetic resonance spectroscopy
 (C) Real-time femtosecond spectroscopy
 (D) Time-resolved microwave spectroscopy
29. pH of a solution can be determined using:
 (A) Nernst equation (B) Schrödinger equation
 (C) Stern-Volmer equation (D) Thompson equation
30. "If A is in thermal equilibrium with B, and B is in thermal equilibrium with C, then C is also in thermal equilibrium with A." This law is known as:
 (A) Zeroth law of thermodynamics (B) First law of thermodynamics
 (C) Second law of thermodynamics (D) Third law of thermodynamics
31. Vibrations in a molecule can be modeled through:
 (A) Particle-in-a-box model (B) Rigid-rotor model
 (C) Harmonic-oscillator model (D) Particle on a ring model
32. Which of the following exhibit a liquid-liquid boundary in its phase diagram:
 (A) Hydrogen (B) Helium
 (C) Nitrogen (D) Oxygen
33. Proton is a:
 (A) Fermion (B) Boson
 (C) Higgs particle (D) Chamon

34. What is the point group of staggered ferrocene?
 (A) C_{5v} (B) C_{10h}
 (C) D_{5d} (D) D_{5h}
35. Which one of the following will have the lowest CO stretching frequency?
 (A) $V(CO)_6^+$ (B) $Co(CO)_4^-$
 (C) $Ni(CO)_4$ (D) $Fe(CO)_4^{2-}$
36. The calculated ground state magnetic moment of Sm^{3+} at room temperature is
 (A) 0.84 BM (B) 5.97 BM
 (C) 3.25 BM (D) 7.9 BM
37. Optical isomerism is shown by
 (A) $[Ni(CO)_4]$ (B) $[Ni(CN)_4]^{2-}$
 (C) $[Pt(NH_3)_4]^{2+}$ (D) $[Co(en)_3]^{3+}$
38. End product of the hydrolysis of XeF_6 is
 (A) XeO_3 (B) XeO_3^-
 (C) XeF_4O (D) XeF_2O_2
39. What is the point group of hydrogen atom?
 (A) $D_{\infty h}$ (B) $C_{\infty v}$
 (C) K_h (D) I_h
40. What is the total number of lone pairs in I_3^- .
 (A) Zero (B) Six
 (C) Three (D) Nine
41. The square pyramidal molecular shape is adopted by
 (A) SOF_4 (B) PF_5
 (C) $XeOF_4$ (D) $SeOCl_4$
42. Assign R / S configuration at C-1, C-2 and C-5 in the following compounds:



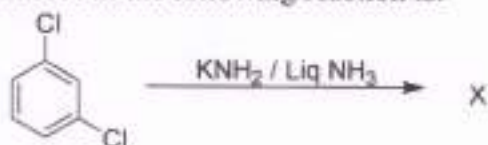
- (A) 1R, 2S, 5R (B) 1R, 2R, 5R
 (C) 1S, 2S, 5S (D) 1R, 2R, 5S
43. Which of the following compound is used for the detection of intermediacy of benzyne in a reaction?
 (A) cis-2-Butene (B) 1-Butyne
 (C) Benzene (D) Anthracene

44. In which compound addition of HBr occurs in an anti-Markovnikov fashion?
- (A) $\text{CH}_3\text{CH}=\text{CH}_2$ (B) $\text{CH}_2=\text{CH}-\text{COOC}_2\text{H}_5$
 (C) $(\text{CH}_3)_2\text{C}=\text{CH}_2$ (D) $\text{C}_6\text{H}_5\text{CH}=\text{CH}_2$
45. Which of the following compound gives a white precipitate with alcoholic silver nitrate?



46. Friedel and Craft's alkylation of benzene with neopentyl chloride in presence of aluminum chloride results in the formation of:
- (A) *neo*-Pentyl benzene (B) *tert.*-Pentyl benzene
 (C) *n*-pentyl benzene (D) *iso*-Pentyl benzene

47. The major product X in the following reaction is:



- (A) *o*-Chloroaniline (B) *m*-Chloroaniline
 (C) *m*-Phenylene diamine (D) *p*-Chloroaniline
48. The selective reagent for selective oxidation of primary alcohol to aldehyde is:
- (A) $\text{CrO}_3/\text{H}_2\text{SO}_4$ (B) $\text{CrO}_3/\text{Pyridine}$
 (C) MnO_2 (D) $\text{DMSO}-(\text{COCl})_2/\text{Et}_3\text{N}$
49. The best reagent to achieve the following transformation given below is:



- (A) $(\text{t-Bu})_2\text{AlH}$ (B) LiAlH_4
 (C) NaBH_4 (D) BH_3
50. Reaction of PhMgBr (3eq.) with diethyl carbonate (1 eq) results in the formation of:
- (A) Benzhydrol (B) Benzyl alcohol
 (C) Benzaldehyde (D) Triphenyl methanol