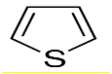
VINAYAKA MISSION'S RESEARCH FOUNDATION, SALEM

(Deemed to be University under section 3 of the UGC Act 1956)

Chemistry

Part –B (35X1=35)

1. Which of the following molecule is aromatic?

a) 

b. 

c. 

d. 

2. On the basis of molecular orbital theory, select the most appropriate option.
   a) The bond order of O_2 is 2.5 and it is paramagnetic
   b) The bond order of O_2 is 1.5 and it is paramagnetic
   c) The bond order of O_2 is 2 and it is diamagnetic
   d) The bond order of O_2 is 2 and it is paramagnetic

3. CO has 10 bonding electrons and 4 anti-bonding electrons and its bond order is

   a) 3
   b) 7
   c) 1
   d) 5/2

4. Two electrons occupying the same orbital are distinguished by
   a) azimuthal quantum number
   b) spin quantum number
   c) Magnetic quantum number
   d) orbital quantum number

5. Organic compounds which contain more than one benzene rings are termed
   a) arenes
   b) Aryls
   c) acyls
   d) benzenes

6. The correct order of different types of energies is
   a) $E_{el}>>E_{vib}>>E_{rot}>>E_{tr}$
   b) $E_{el}>>E_{rot}>>E_{vib}>>E_{tr}$
   c) $E_{el}>>E_{vib}>>E_{tr}>>E_{rot}$
   d) $E_{tr}>>E_{vib}>>E_{rot}>>E_{el}$

7. The number of different orientations which a magnetic nucleus can take is
   a) 2I
   b) 2I-1
   c) 2I+1
   d) 4I

8. Which of the following species will be diamagnetic?
   a) $[Fe(CN)_6]^{4-}$
   (b) $[FeF_6]^{3+}$
   (c) $[Co(C_2O_4)_3]^{3-}$
   (d) $[CoF_6]^{3-}$

9. The magnetic moment of $[Co(NH_3)_6]CI_3$ is
   a) 1.73
   (b) 2.83
   (c) 6.6
   (d) Zero

10. The reference used in NMR is
   a) TMS
   b) Water
   c) KBr
   d) Hexane

11. The allowed electronic transition of hydrogen atom
   a)3d-→1s
   b) 2p -→1s
   c)$2p_z$-→$2p_y$
   d) $2p_y$-→$2p_x$

12. The spin only magnetic moment value (in Bohr magneton units) of $Cr(CO)_6$ is
   a) 0
   b) 2.84
   c) 4.90
   d) 5.92

13. The number of unpaired electrons in d^6 low spin octahedral complex is
    a) 0
    b) 1
    c) 2
    d) 3

14. Which of the following methods use soft X-rays to eject electrons from inner shell orbitals?
    a) Auger electron spectroscopy
    b) Electron impact spectroscopy
    c) X-ray crystallography
    d) X-ray photoelectron spectroscopy

15. The energy required to remove an electron from the highest occupied atomicorbital is known as _____
    a) Ionization energy
    b) Kinetic energy
    c) Binding energy
    d) Vibrational energy

16. The Bragg's equation for diffraction of X-rays is _____
    a) $n\lambda = 2d^2\sin\theta$
    b) $n\lambda = 2d\sin\theta$
    c) $n\lambda = 2d\sin^2\theta$
    d) $n\lambda = d^2\sin\theta$

17. Obtain a Miller indices of a plane whose intercepts are 4,4 and 2 units along the three axes.
    a) (122)
    b) (211)
    c) (121)
    d) (112)

18. The size of Mo is very similar to W due to_____
    a) Shielding effect
    b) Actinide contraction
    c) Poor Shielding by 4f electrons
    d) Poor shielding by 4d electrons

19. Choose the correct order ionization energy
    a) N > O > F
    b) F > O >N
    c) N > O < F
    d) O > F > N

20 . The co-ordination number and oxidation number of X in $[X(SO_4)(NH_3)_4]Cl$ is
(a) 10 and 3
(b) 2 and 6
(c) 6 and 3
(d) 6 and 4

21. Chiral molecules which are non-super-imposable mirror images of each other are called
a) Diastereomers
b) Meso compounds
c) Racemic mixture
d) Enantiomers

22. A centre of symmetry is equivalent to _____ fold alternating axis of symmetry.
a) One
b) Two
c) Three
d) Four

23. Which of the following is not a priority rule for R, S-Configuration?

a) If the four atoms attached to the chiral centre are all different, priority depends on atomic number, with the atom of lower atomic numbers getting lower priority.
b) If the two atoms attached to chiral centre are same, the atoms attached to each of these first atoms are compared.
c) When there is a double bond or triple bond, both atoms are considered to be duplicated or triplicated.
d) If the four atoms attached to the chiral centre are all different, priority depends on atomic number, with the atom of higher atomic numbers getting lower priority.

24.The following are state functions EXCEPT
a) H – enthalpy
b) q – heat
c) E – internal energy
d) S – entropy

25.In corrosion, as a result of decay, the metals are not converted into _____
a) Oxides
b) Hydroxides
c) Carbonates
d) Peroxides

26.Helmholtz free energy A is expressed as

a. A=U+TS
b. A=H+TS
c) A=U-TS
d) A=H-TS

27.In a reversible process $\Delta_{sys} + \Delta_{surr}$ is

a) >0
b) < 0
c) ≥ 0
d) =0

28.Identify the hard acid from the following:

a) $AlCl_3$
b)N_2H_4
c) H_2O
d) $OH^{(-)}$

29. The name of the equation showing relation between electrode potential (E)standard potential (E^o) and concentration of ions in solution is

a) Kohlrausch equation
b) Nernst equation
c) Faradays equation
d) Ohm's equation

30. Which of the following compound would show optical isomerism?

a) CH_3 – CH(OH) COOH
b) H_2N $CH(CH_3)_2$
c) $(CH_3)_2$ CHCHO
d) H_2N CH_2 COOH

31. The potential energy of n-butane is minimum for

a) Skew conformations
b) Staggered conformations
c) Eclipsed conformations
d) Gauche

32. When the nucleophile :OR attacks the RX, the resultant product will be
    a) R – OH
    b) ROR
    c) RCN
    d) RNHR

33. Which step in S_N1 reaction is a slow rate determining step?
    a) Attack of nucleophile
    b) Formation of racemic mixture
    c) Formation of transition state
    d) Both a and b

34. Identify reducing agent the following

    a)OS O_4
    b) PCC
    c) LiAlH4
    d) $K_2Cr_2O_7$

35. In a free radical reaction, free radicals are formed at
    a. Initiation step
    b. propagation step
    c. termination step
    d. both A and B

Computer Science

Part –B (35X1=35)

1) Controlling access to a network by analyzing the incoming and outgoing packets is called
a. IP Filtering
b. Data Filtering
c. Packet Filtering
d. Firewall Filtering

2) The management of data flow between computers or devices or between nodes in a network is called
a. Flow control
b. Data Control
c. Data Management
d. Flow Management

3) Which of the following is not the possible ways of data exchange?
a. Simplex
b. Multiplex
c. Half-duplex
d. Full-duplex

4)An attribute of a table cannot hold multiple values is the property of
a. First normal form (1NF)
b. Second normal form (2NF)
c. Third normal form (3NF)
d. Fourth normal form (4NF)

5) A key that consists of more than one attribute to uniquely identify rows in a table is called
a. Composite key
b. Candidate key
c. Primary key
d. Foreign key

6)In hierarchical model, data is organized into
a. logical structure
b. physical structure
c. tree like structure
d. none of them

7) Time quantum is defined in
a) shortest job scheduling algorithm
b) round robin scheduling algorithm
c) priority scheduling algorithm
d) multilevel queue scheduling algorithm

8)Which one of the following is the deadlock avoidance algorithm?
a) banker's algorithm
b) round-robin algorithm
c) elevator algorithm
d) karn's algorithm

9)A problem encountered in multitasking when a process is perpetually denied necessary resources is called
a) deadlock
b) starvation
c) inversion
d) aging

10) In the following indexed addressing mode instruction, MOV 5(R1),LOC the effective address is _____
a) EA = 5+R1
b) EA = R1
c) EA = [R1].
d) EA = 5+[R1].

11) The addressing mode/s, which uses the PC instead of a general purpose register is _____
a) Indexed with offset
b) Relative
c) direct
d) both Indexed with offset and direct

12) An LALR(1) parser for a grammar G can have shift-reduce (S-R) conflicts if and only if
a. the SLR(1) parser for G has S-R conflicts
b. the LR(1) parser for G has S-R conflicts
c. the LR(0) parser for G has S-R conflicts
d. the LALR(1) parser for G has reduce-reduce conflicts

13) In a compiler, keywords of a language are recognized during
a. parsing of the program
b. the code generation
c. the lexical analysis of the program
d. dataflow analysis

14)The recurrence relation capturing the optimal time of the Tower of Hanoi problem with n discs is

a. $T(n) = 2T(n - 2) + 2$
b. $T(n) = 2T(n - 1) + n$
c. $T(n) = 2T(n/2) + 1$
d. $T(n) = 2T(n - 1) + 1$

15) Consider a B+-tree in which the maximum number of keys in a node is 5. What is the minimum number of keys in any non-root node?

a) 1
b) 2
c) 3
d) 4

16) Which of the following sorting algorithms can be used to sort a random linked list with minimum time complexity?

A .Insertion Sort
b. Quick Sort
c. Heap Sort
d. Merge Sort

17) _____ establishes information about when, why and by whom changes are made in a software.

a. Software Configuration Management
b. Change Control
c. Version Control
d. An Audit Trail

18) Which one of the following is not a step of requirement engineering?

a. Requirement elicitation
b. Requirement analysis
c. Requirement design
d. Requirement documentatIon

19) Let L1 = $\{w \in \{0,1\}* \mid$ w has at least as many occurrences of (110)'s as (011)'s$\}$.
Let L2 = $\{ \in \{0,1\}* \mid$ w has at least as many occurrences of (000)'s as (111)'s$\}$.
Which one of the following is TRUE?

a. L1 is regular but not L2
b. L2 is regular but not L!
c. Both L2 and L1 are regular
d. Neither L1 nor L2 are regular

20) The length of the shortest string NOT in the language (over Σ = {a, b}) of the following regular expression is _____. a*b*(ba)*a*

a.2
b.3
c.4
d.5

21)In the following indexed addressing mode instruction, MOV 5(R1),LOC the effective address is _____

a) EA = 5+R1
b) EA = R1
c) EA = [R1].
d) EA = 5+[R1].

22) The Instruction fetch phase ends with _____

a) Placing the data from the address in MAR into MDR
b) Placing the address of the data into MAR
c) Completing the execution of the data and placing its storage address into MAR
d) Decoding the data in MDR and placing it in IR

23) The algorithm which replaces the block which has not been referenced for a while is called _____

a) LRU
b) ORF
c) Direct
d) Both LRU and ORF

24) The process of assigning load addresses to the various parts of the program and adjusting the code and data in the program to reflect the assigned addresses is called _____

a) Symbol Resolution
b) Parsing
c) Assembly
d) Relocation

25) The counter that keeps track of how many times a block is most likely used is _____

a) Count
b) Reference counter
c) Use counter
d) Probable counter

26) The number of comparisons done by sequential search is ……

a) (N/2)+1
b) (N+1)/2
c) (N-1)/2
d) (N+2)/2

27) In ……, search start at the beginning of the list and check every element in the list.
a) Linear search
b) Binary search
c) Hash Search
d) Binary Tree search

28) CMM model in Software Engineering is a technique of _____ .
a.Develop the software
b.Improve the software process
c.Improve the testing process
d.All of the above

29) What is the output of lexical analyzer?
a. A parse tree
b. A list of tokens
c. Intermediate code
d. Machine code

30) _____ is a subject-oriented, integrated, time-variant, nonvolatile collection of data in support of management decisions.
a. Data Mining.
b. Data Warehousing.
c. Web Mining.
d. Text Mining.

31) Expansion for DSS in DW is_____.
a. Decision Support system.
b. Decision Single System.
c. Data Storable System.
d. Data Support System.

32) Record cannot be updated in _____.
a. OLTP
b. files
c. RDBMS
d. data warehouse

33) _____ is a good alternative to the star schema.
a. Star schema.
b. Snowflake schema.
c. Fact constellation.
d. Star-snowflake schema.

34) What is true about private constructor?

a) Private constructor ensures only one instance of a class exist at any point of time
b) Private constructor ensures multiple instances of a class exist at any point of time
c) Private constructor eases the instantiation of a class
d) Private constructor allows creating objects in other classes

35) What would be behaviour if the constructor has a return type?

a. Compilation error
b.Runtime error
c. Compilation and runs successfully
d. Only String return type is allowed

Mathematics

Part –B (35X1=35)

1. Which of the following is valid objective function for a linear programming problem?
   (a) Max $5xy$
   (b) Min $4x + 3y + \frac{2}{3}z$
   (c) Max $5x^2 + 6y^2$
   (d) Min $(x_1 + x_2)/x_3$
2. Consider the subspaces W_1 and W_2 of R^3 given by
   $W_1 = \{(x, y, z) \in R^3 | x + y + z = 0\}$ and $W_2 = \{(x, y, z) \in R^3 | x - y + z = 0\}$. If W is a subspace of R^3 such that $(i) W \cap W_2 = \text{span}\{(0, 1, 1)\}$
   $(ii) W \cap W_1$ is orthogonal to $W \cap W_2$ with respect to the usual inner product of R^3, then
   $(a) W = \text{span}\{(0, 1, -1), (0, 1, 1)\}$
   (b) $W = \text{span}\{(1, 0, -1), (0, 1, -1)\}$
   $(c) W = \text{span}\{(1, 0, -1), (0, 1, 1)\}$
   (d) $W = \text{span}\{(1, 0, -1), (1, 0, 1)\}$

3. In any simple graph G, the number of vertices of odd degree is
   (a) prime
   (b) odd
   (c) even
   (d) none of these
4. Define $f(x) = 1/\sqrt{x}$ for $x > 0$. Then f is uniformly continuous
   (a) on $(0, \infty)$
   (b) on $[r, \infty)$ for any $r > 0$
   (c) on $(0, r]$ for any $r > 0$
   (d) only on intervals of the form $[a, b]$, $0 < a < b < \infty$.

5. Every bounded infinite set in the complex plane has
   (a) no limit point
   (b) divergent sequence
   (c) a limit point
   (d) All of these
6. Domination number of complete bipartite graph $K_{m,n}$ is
   (a) 0
   (b) 2
   (c) m
   (d) n

7. The Wronskian of x and e^x is
   (a) $x + e^x$
   (b) $x - e^x$
   (c) $(x+1)e^x$
   (d) $(x-1)e^x$

8. Let A be a closed subset of $R, A \neq \phi, A \neq R$. Then A is
   (a) the closure of the interior of A
   (b) a countable set
   (c) a compact set
   (d) not open

9. Let $B: R \times R \to R$ be the function $B(a,b) = ab$.Which of the following is true?
   (a) $B$is a linear transformation
   (b) $B$is positive definite bilinear form
   (c) $B$is symmetric but not positive definite
   (d) B is neither linear nor bilinear

10. Let R denote the radius of convergence of the power series $\sum_{k=1}^{\infty} kx^k$. Then
    (a) $R > 0$and the series is convergent on $[-R, R]$
    (b) $R > 0$and the series converges at $x = -R$ but does not converge at $x = R$
    (c) $R > 0$and the series does not converge outside $(-R, R)$
    (d) $R = 0$

11. Let R be a Euclidean domain such that R is not a field. Then the polynomial ring $R[X]$ is always
    (a) a Euclidean domain
    (b) a principal ideal domain, but not a Euclidean domain
    (c) a unique factorization domain, but not a principal ideal domain
    (d) not a unique factorization domain

12. Let X be a topological space and U be a proper dense open subset of X. Pick the correct statement from the following

    (a) if X is connected, then U is connected
    (b) if X is compact, then $U$is compact
    (c) if $X \backslash U$ is compact, then X is compact
    (d) if X is compact, then $X \backslash U$ is compact

13. The number of group homomorphism from the alternating group A_5 to the symmetric group S_4 is:
    $(a)1$
    (b) 12
    (c) 20
    (d) 6

14. The maximization or minimization of a quantity is the
    (a) goal of management science
    (b) decision for decision analysis
    (c) constraint of operations research
    (d) objective for linear programming

15. For any simple graph G, the chromatic number χ is
    (a) $\leq \Delta$
    (b) $\leq \Delta + 1$
    (c)$\leq \Delta - 1$
    (d) $\leq \Delta - 2$

16. The period of the complex function e^z is
    (a) 0
    (b) 2π
    (c)$2\pi i$
    (d) undefined

17. A real complete matrix of order n has n mutually independent real eigen vectors, then
    (a) All eigen vectors are orthogonal
    (b) All eigen vectors are orthonormal
    (c) All eigen vectors form orthonormal basis
    (d) none of these

18. The number of elements in a basis for a polynomial space $P_k(R)$ over R is
    (a) n
    (b) k
    (c)$k + 1$
    (d) $k - 1$

19. To find the optimal solution to a linear programming problem using the graphical method
    (a) find the feasible point that is the farthest away from the origin
    (b) find the feasible point that is at the highest location
    (c) find the feasible point that is closest to the origin
    (d) none of these

20. If G is a simple graph with $n \geq 2$ vertices and minimum degree $\delta \geq \frac{n}{2}$, then G is
    (a) Hamiltonian
    (b) Eulerian
    (c) non-hamiltonian
    (d) none of these

21. The diameter of the Petersen graph is
    (a) 0
    (b) 1
    (c) 2
    (d) 3

22. The function $f(z) = x^2 - iy^2$ is
    (a) not continuous on C
    (b) uniformly continuous on C
    (c) uniformly continuous on R
    (d) both (a) and (b)
23. The relation $|3 - z| + |3 + z| = 5$ represents
    (a) a circle
    (b) a parabola
    (c) an ellipse
    (d) a hyperbola

24. The residue of a function can be found if the pole is an isolated singularity
    (a) true
    (b) false
    (c) partially false
    (d) none of these
25. Every finite point set in a Hausdorff space X is
    (a) open
    (b) neither open nor closed
    (c) closed
    (d) none of these

26. Let $A \neq I_n$ be an$n \times n$ matrix such that $A^2 = A$, where I_n is the identity matrix of order n. Which of the following statements is false?
    (a) $(I_n - A)^2 = I_n - A$
    (b) Trace of A = Rank of A
    (c) Rank(A) +rank$(I_n - A) = n$
    (d) Theeigen values of A are each equal to 1

27. If A is a 5×5 real matrix with trace 15 and if 2 and 3 are eigen values of A, each with algebraic multiplicity 2, then the determinant of A is equal to
    (a) 0
    (b) 24
    (c) 120
    (d) 180

28. A sequence in R can have
    (a) at least on limit
    (b) exactly one limit
    (c) at most one limit
    (d) all of these

29. What is the cardinality of the set $\{z \in C \mid z^{98} = 1$ and$z^n \neq 1$ for any $0 < n < 98\}$?
    (a) 0
    (b) 12
    (c) 42
    (d) 49

30. What is the total number of positive integer solutions to the equation $(x_1 + x_2 + x_3)(y_1 + y_2 + y_3 + y_4) = 15$?
    (a) 1
    (b) 2
    (c) 3
    (d) 4

31. The number of 4 digit number with no two digit common is
    (a) 4536
    (b) 3024
    (c) 5040
    (d) 4823

32. Let $A = \{x^2 : 0 < x < 1\}$and $B = \{x^3 : 1 < x < 2\}$. Which of the statements is true?
    (a) there is a 1-1, onto function from A to B
    (b) there is no 1-1, onto function from A to B
    (c) there is no 1-1 function from A to B which is onto
    (d) there is no onto function from A to B which is one-one

33. The unit digit of 2^{100} is
    (a) 2
    (b) 4
    (c) 6
    (d) 8

34. From the six letters A, B, C, D, E and F, three letters are chosen at random with replacement. What is the probability that either the word BAD or the word CAD can be formed from the chosen letters?
    (a) $\frac{1}{216}$
    (b) $\frac{3}{216}$
    (c)$\frac{6}{216}$
    (d) $\frac{12}{216}$

35. The period of the constant function is

    (a) π
    (b) 0
    (c)2π
    (d) undefined

Physics

Part –B (35X1=35)

1. At what height above the earth's surface does the acceleration due to gravity fall to 1% of its value at the earth's surface?
   (a) 9*R*
   (b) 10*R*
   (c) 99*R*
   (d) 100*R*

2. If a small part separates from an orbiting satellite, the part will
   (a) fall to the earth directly
   (b) move in a spiral and reach the earth after a few rotations
   (c) continue to move in the same orbit as the satellite
   (d) move farther away from the earth gradually

3. If a metal wire is stretched a little beyond its elastic limit (or yield point), and released, it will

   (a) lose its elastic property completely
   (b) not contract
   (c) contract, but its final length will be greater than its initial length
   (d) contract only up to its length at the elastic limit

4. When an air bubble rises from the bottom to the surface of a lake, its radius becomes double. Find the depth of the lake, given thatthe atmospheric pressure is equal to the pressure due to acolumn of water 10 m high. Assume constant temperature anddisregard surface tension.

   (a) 30 m
   (b) 40 m
   (c) 70 m
   (d) 80 m

5. A metal wire of length *l* and area of cross-section *A* is fixed between rigid supports at negligible tension. If this is cooled, the tension in the wire will be

   (a) proportional to *l*
   (b) inversely proportional to *l*
   (c) independent of *l*
   (d) independent of *A*

6. The average degree of freedom per molecule for a gas is 6. The gas performs 25 J of work when it expands at constant pressure. The heat absorbed by the gas is

   (a) 75 J
   (b) 100 J
   (c) 150 J
   (d) 125 J

7. A spherical black body with a radius of 12 cm radiates 450 W power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watts would be

   (a) 225
   (b) 450
   (c) 900
   (d) 1800

8. Two waves travelling in a medium in the x-direction are represented by $y_1 = A\sin(\omega t - kx)$ and $y_2 = A\cos(\omega x - \omega t - 4)$, where y_1 and y_2 are the displacements of the particles of the medium, t is time, and ω and k are constants. The two waves have different

   (a) speeds
   (b) directions of propagation
   (c) wavelengths
   (d) frequencies

9. A wave represented by the equation $y = a\cos(kx - \omega t)$ is superposed with another wave to form a stationary wave such that the point $x = 0$ is a node. The equation for the other wave is

   (a) $a\sin(kx + \omega t)$
   (b) $a\cos(kx + \omega t)$
   (c) $-a\cos(kx + \omega t)$
   (d) $a\sin(kx + \omega t)$

10. The tension of a string is increased by 44%. If its frequency of vibration is to remain unchanged, its length must be increased by
    (a) 44 %
    (b) -44 %
    (c) 22 %
    (d) 20 %

11. For a scalar function φ satisfying the Laplace equation, $\nabla\varphi$ has
    (a) zero curl and non-zero divergence
    (b) non-zero curl and zero divergence
    (c) zero curl and zero divergence
    (d) non-zero curl and non-zero divergence

12. Consider the vector $V = r / r^3$. The surface integral of this vector over the surface of a cube of size a and centered at the origin
    (a) 0
    (b) 2π
    (c) $2\pi a^3$
    (d) 4π

13. the determinant of a 3 x 3 real symmetric matrix is 36. If two of its eigen values are 2 and 3 then the third eigenvalue is

    (a) 4
    (b) 6
    (c) 8
    (d) 9

14. An electron is moving with a velocity of 0.85c in the same direction as that of a moving photon. The relative velocity of the electron with respect to photon is

    (a) c
    (b) – c
    (c) 0.15c
    (d) -0.15c

15. A particle of mass m moving with speed v collides with a stationary particle of equal mass. After the collision, both the particles move. Let θ be the angle between the two velocity vectors. If the collision is elastic, then

    (a) θ is always less than 90˚
    (b) θ is always equal to 90˚
    (c) θ is always greater than 90˚
    (d) θ cannot be deduced from the given data

16. A planet moves around the Sun in an elliptical orbit with semi-major axis a and time period T. So T is proportional to
    (a) a^2
    (b) $a^{1/2}$
    (c) $a^{3/2}$
    (d) a^3

17. Light beam can travel as a parallel beam up to a distance of

    (a) d^2/λ
    (b) λ / d
    (c) $d\lambda^2$
    (d) λ/d^2

18. Which of the following is not a four-level laser

    (a) CO_2

    (b) He- Ne

    (c) Nd-YAG

    (d) Ruby

19. How long an atom can stay in metastable state?

    (a) 10^{-3} s

    (b) 10^{-5} s

    (c) 10^{-8} s

    (d) 10^{-9} s

20. Assume that the particle is confined to the region $0 < x < L$ in one dimensional box. If the particle is in the first excited state, then the probability of finding the particle is maximum at

    (a) x = L/6
    (b) x = L/2
    (c) x = L/3
    (d) x = L/4 and 3L/4

21. In a hydrogen atom, the accidental or Coulomb degeneracy for the n=4 state is

    (a) 4
    (b) 16
    (c) 18
    (d) 32

22. An admissible potential between the proton and the neutron in a deuteron is

    (a) Coulomb
    (b) Harmonic oscillator
    (c) Finite square well
    (d) Infinite square well

23. For an intrinsic semiconductor, m^*_e and m^*_h are respectively the effective masses of electrons and holes near the corresponding band edges. At a finite temperature, the position of the Fermi level

    (a) depends on m^*_e but not on m^*_h
    (b) depends on m^*_h but not on m^*_e
    (c) depends on both m^*_e and m^*_h
    (d) depends neither on m^*_e nor and m^*_h

24. The valence electrons do not directly determine the following property of a metal,
    (a) Electrical conductivity
    (b) Thermal conductivity
    (c) Shear modulus
    (d) Metallic luster

25. In an insulating solid which one of the following physical phenomena is a consequence of Pauli's exclusion principle?
    (a) Ionic conductivity
    (b) Ferromagnetism
    (c) Paramagnetism
    (d) Ferroelectricity

26. The dielectric constant of a material at optical frequencies is mainly due to
    (a) Ionic polarizability
    (b) electronic polarizability
    (c) dipolar polarizability
    (d) ionic and dipolar polarizability

27. A neutron scatters elastically from a heavy nucleus. The initial and final states of the neutron have the
    (a) same energy
    (b) same energy and linear momentum
    (c) same energy and angular momentum
    (d) same linear and angular momenta

28. Nuclear forces are
    (a) spin dependent and have no non-central part
    (b) spin dependent and have a non-central part
    (c) spin independent and have no non-central part
    (d) spin independent and have a non-central part

29. A power amplifier gives 150 W output for an input of 1.5W. The gain, in dB, is
    (a) 10
    (b) 20
    (c) 40
    (d) 100

30. In n a-p-n transistor, the leakage current consists of
    (a) electrons moving from the base to the emitter
    (b) electrons moving from the collector to the base
    (c) electrons moving from the collector to the emitter
    (d) electrons moving from the base to the collector

31. A plane electromagnetic wave traveling in free space is incident normally on a glass plate of refractive index 3/2. If there is no absorption by the glass, its reflectivity is

    (a) 4%
    (b) 16%
    (c) 20%
    (d) 50%

32. The electromagnetic field due to a point charge must be described by LienardWeichert potentials when

    (a) the point charge is highly accelerated
    (b) the electric and magnetic fields are not perpendicular
    (c) the point charge is moving with velocity close to that of light
    (d) the calculation is done for the radiation zone, i.e. far away from the charge

33. A conducting sphere of radius R has charge + Q on its surface. If the charge on the sphere is doubled and its radius is halved, the energy associated with the electric field with

    (a) increase four times
    (b) increase eight times
    (c) remain the same
    (d) decrease four times

34. An external magnetic field of magnitude H is applied to a Type-I superconductor at a temperature below the transition point. Then which one of the following statements is NOT true for H less than the critical field H_c?

    (a) the sample is diamagnetic
    (b) magnetization varies linearly with H
    (c) the lines of magnetic induction are pushed out from the sample
    (d) the sample exhibits mixed states of magnetization near H_c

35. A stationary particle in free space is observed to spontaneously decay into two photons. This implies that

    (a) the particle carries electric charge
    (b) the spin of the particle must be greater than or equal to 2
    (c) the particle is a boson
    (d) the mass of the particle must be greater than or equal to the mass of the hydrogen atom

Microbiology

Part –B (35X1=35)

1. Organism used for quality check of Muller Hinton agar is

A. Enterococcus.
B. B. Staphylococcus.
C. C. Pneumococcus.
D. D. Streptococcus.

2.Drug which act on cytoplasmic membrane of bacteria is

A. Gentamicin.
B. B. Daptomycin.
C. C. Amikacin.
D. D. Tobramycin

3.Disinfecting concentration of Orthophthaldehyde is

A. 0.25%
B. 0. 35%
C. 0.45%
D. 0.55%.

4.Indication of **sterile** gloves for health care worker includes all **Except**

A. Invasive procedures.
B. Collecting blood for serological tests.
C. Collecting blood for blood culture.
D. Surgical procedures.

5.Alternative complement pathway is initiated by all **Except**

A. Teichoic acid.
B. Lipopolysaccharide.
C. Endotoxin.
D. Carbohydrate residue of cell wall.

6.An example of Type 1I hypersensitivity reaction is

A. Transfusion reaction.
B. B. Hay fever.
C. C. Asthma.
D. D. Atopy

7.Prozone phenomenon is due to.

A. Antigen excess
B. Antibody excess.
C. Complement excess.
D. Both antigen and antibody excess

8.Commonest opportunistic organism causing infections in HIV patients in India is

A. Mycobacterium tuberculosis.
B. Non tuberculous Mycobacterium.
C. Leprosy.
D. Salmonella.

9. What is the modification in Nested PCR

A. More than one primer is used so as to detect many DNA sequence of different organism.
B. Two rounds of PCR amplification with two primers against two different DNA sequences of same organism.
C. Amplification done at isothermal conditions.
D. RNA extracted is converted to DNA by reverse transcriptase.

10. Use of MALDI TOF is to

A. Determine the antibiotic sensitivity.
B. Rapid identification of microorganisms.
C. Automated culure of clinical samples.
D. Automated smear preparation.

11. All are primary pathogens of meningitis**Except**

A. Neisseria meningitids.
B.Group B streptococci.
C. Streptococcus pneumonia
D. Haemophilus influenza.

12. Commonest bacteria causing Urinary tract infection is
    A. Klebsiella pneumonia.
    B. Staphylococcus aureus.
    C. Pseudomonas.
    D.E.coli.

13. First vaccine was developed by
    A. Joseph Lister.
    B. Louis Pasteur.
    C. Edward Jenner.
    D. Paul Ehrlich

14. The resolution power of Electron Microscope is
    A. 5 nm.
    B. 2 nm.
    C. 1 nm.
    D. 0.5 nm

15. Bacterium with stately is
    A. Clostridium.
    B. Corynebacterium.
    C. Listeria.
    D. Spirochete

16. All are sporicidal disinfectants **Except**
    A. Hypochlorite.
    B. Absolute Alcohol.
    C. Glutaraldehyde.
    D. Hydrogen peroxide

17. Lawn culture is used for all the following **Except**
    A. Antibiotic sensitivity testing.
    B. Phage typing.
    C. Antigen preparation.
    D. Isolation of pathogen

18. Gold standard for bacterial typing
    A. Auxotyping.
    B. Serotyping.
    C. Pulse Field Gel Electrophoresis
    D. Microarrays

19. Name the single biochemical test to differentiate between Staphylococci and Streptococci

A. Oxidase.
B. catalase.
C. Coagulase.
D. DNA ase

20. All the following toxins are coded by phage DNA **Except**

A. Cholera toxin.
B. Anthrax toxin.
C. Diphtheria toxin.
D. Verocytotoxin

21. Chemical nature of Endotoxin is

A. Lipid A.
B. Carbohydrate.
C. Teichoic acid.
D. Protein.

22. An example of Hetrophil Antibody test is

A. Widal test.
B. Weil felix test.
C. VDRL test.
D. ASO test

23. Which of the following acts as an anaphylotoxin

A. C2a.
B. C3b.
C. C4b.
D. C3a.

24. Which cell does not have Human leukocyte antigen

A. Monocyte.
B. RBC.
C. Neutrophil.
D. Thrombocyte.

25. Macrophages are major source of

A. IL-1.
B. IL-5.
C. IL-7.
D. IFNy.

26. A patient had prosthetic valve replacement andhe develops endocarditis after few months. Organism responsible is

A. Staphylococcus aureus.
B. Staphylococcus epidermidis.
C. Viridans Streptococci.
D. HACEK.

27. Pneumococci differentiated from Viridans Streptococci by all the following **Except**

A. PYR test.
B. Bile solubility.
C. Optochin sensitivity.
D. Animal pathogenicity in mice.

28. Diphtheria toxin produced by all **Except**

A. C. diphtheria.
B. C. xerosis.
C. C. pseudotuberculosis.
D. C. ulcerans.

29. Bacteria causing travellers diarrhoea is

A. ETEC.
B. EHEC.
C. EPEC.
D. EIEC.

30. An example of Halophilic Vibrios is

A. Vibrio cholerae.
B. Vibrio vulnificus.
C. Vibrio-O139.
D. Aeromonas.

31. Weil's disease is caused by

A. Borrelia recurrentis.
B. Treponema endemicum.
C. Treponema pallidum.
D. Leptospira interrogans.

32.Hepatitis A virus is

A. Adeno virus.
B. Enterovirus 72.
C. Coxasackie B.
D. Coxasackie A

33. Rabies is diagnosed by

A. Negri bodies.
B. Guarneri bodies.
C. Cowdry A bodies.
D. Paschen bodies.

34. Haemorrhagic fever causing virus is

A. Herpes zoster.
B. Herpes simplex.
C. Dengue.
D. H1N1.

35. An example of dematiaceous fungi is

A. Fonsecaea.
B. Candida.
C. Cryptococcus.
D. Mucor.

Commerce

Part –B (35X1=35)

1. Mainly, chief resource of authority throughout allocation channel is
   (a) Company
   (b) Brand
   (c) Distributor
   (d) Customer

2. Match the following

LIST – I (Functions of marketing process)	LIST – II (Area)
(a) Functions of exchange	1. Selling
(b) Transfer of exchange	2. Buying and selling
(c) Functions of ownership	3. Transportation
(d) Facilitating functions	4. Financing

Codes:

A. (a) (b) (c) (d)
   1 2 3 4

B. (a) (b) (c) (d)
   4 2 3 1

C. (a) (b) (c) (d)
   3 1 2 4

D. (a) (b) (c) (d)
   2 3 1 4

3. Marketing management is _____
   (a) Managing the marketing process
   (b) Monitoring the profitability of the companies products and servies
   (c) Selecting target markets
   (d) Developing marketing strategies to move the company forward
   (e) The art and science of choosing target markets and getting, keeping and growing customers through creating, delivering and communicating superior customer value

4. The world trade organization was formed in the year _____ with GATT as its basis.
   a. 1993
   b. 1994
   c. 1995
   d. 1996

5. The final step in target marketing is
   a. Market Analysis
   b. Market Positioning
   c. Market Segmentation
   d. Market Targeting

6. Marketing of services is resorted in which of the following sector?
   (a) Banking process
   (b) Manufacturing business
   (c) Education sectors
   (d) Insurance business

7. Who invented the concept of social marketing
   (a) Kotler and Grusty
   (b) Grusty and Zaltman
   (c) None of the above
   (d) Kotler and Zaltman

8. Which of the following is against marketing concept?
   (a) Remarketing
   (b) Meta marketing
   (c) Mass marketing
   (d) Mega marketing

9. A brand name which is used for several products belonging to the same company is called
   (a) Trade mark
   (b) Individual brand
   (c) Umbrella brand
   (d) Multiple brand

10. Which of the following is not the major component of holistic marketing ?
   (A) Relationship marketing
   (B) Integrated marketing
   (C) Customer satisfaction
   (D) Socially-responsible marketing

11. The emphasis of Human Resource Management is–
    a) Development
    b) Punishment
    c) Promotion
    d) Demotion

12. The purpose of Job evaluation is–
    a) Training
    b) Promotion
    c) Wage fixation
    d) Transfer

13. Induction means –
    a) Training
    b) Orientation
    c) Introducing the employee
    d) Certification

14. Labour productivity means –
    a) Output is greater than input
    b) Output is less than input
    c) output is equal to input
    d) output is negative

15. Which of the following relates to performance appraisal?
    a) Task method
    b) Price method
    c) M.B.O
    d) Link method

16. What is the operative function of Human Resource Management?
    a) Controlling
    b) Organizing
    c) Procurement
    d) None of these

17. What is the method used to determine wage differentials?
    a) Merit rating
    b) Job design
    c) Job evaluation
    d) None of these

18. Which accounting principle differentiates between owners and management?
    a) Going Concern
    b) Dual Aspect
    c) Separate Entity
    d) Conservatism

19. A researcher divides his population into certain groups and fixes the size of the sample from each group. It is called
    a) stratified sample
    b) quota sample
    c) cluster sample
    d) all of the above

20. Attributes of objects, events or things which can be measured are called
    a) qualitative measure
    b) data
    c) variables
    d) none of the above

21. F-test is a –
    a) Probability test
    b) Variance test
    c) Factor analysis
    d) None of these

22. Regression analysis is a measure of –
    a) Degree and direction of relationship
    b) Degree of association
    c) Cause and effect relationship
    d) None of the above

23. Schedules help us in collecting –
    a) Secondary Data
    b) Qualitative Data
    c) Primary Data
    d) None of the Above

24.Match the items from List-I with the items in List II –

List I	List II
a) Random Sampling	1. Structured
b) Hypothesis testing	2. Parametric test
c) Questionnaire	3. Probability sampling
d) T-test	4. B error

Codes:

	a	b	c	d
A.	4	3	1	3
B.	3	4	2	1
C.	3	1	4	2
D.	3	4	1	2

25. Chunk sampling is known as –
    a) Quota sampling
    b) Convenience sampling
    c) Judgment sampling
    d) Cluster sampling

26. t-test is a –
    a) Parametric test
    b) Non-parametric test
    c) Large sample test
    d) None of the above

27. The following item is shown in profit and loss appropriation account.
    A. Dividends declared
    B. Discount of issue of shares
    C. Non-operating expenses
    D. Current assets

28. The assets of a business can be classified as
    A. Only fixed assets
    B. Only current assets
    C. Fixed and current assets
    D. None of the above

29. Which of the following is the test of the long term liquidity of a business?
    A. Interest coverage ratio
    B. Stock turnover ratio
    C. Operating ratio
    D. Current ratio

30. Identify the item that is not taken into account in computing the current ratio.
    A. Bank overdraft
    B. Bank
    C. Stock
    D. Cash

31. A research paper is a brief report of research work based on
    (A) Primary Data only
    (B) Secondary Data only
    (C) Both Primary and Secondary Data
    (D) None of the above

32. _____ is referred to as "the father of research on teaching"?
    A.N. L. Gage
    B.David Berliner
    C.Egon Brunswik
    D.Donald T. Campbell

33 The main purpose of research in education is to _____
    A.Increase social status of an individual
    B.Increase job prospects of an individual
    C.Help in the personal growth of an individual
    D. Help the candidate become an eminent educationist

34. Evaluation research is concerned with _____
    A.Why are we doing?
    B.What are we doing?
    C.How well are we doing?
    D. None of the above

35. The first step of research is:
    A.Finding a problem
    B.Selecting a problem
    C.Searching a problem
    D.Identifying a problem