Seat No. _____

PAPER CODE : CCU-8791

M. Sc. (Sem. I) Examination

March – 2022

Chemistry : CHNN-401

(Inorganic Chemistry)

(New Coruse)

Total Time : **60** Minutes
Total Questions : **50**

Total Marks : **70**
Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 The Geometry of $[ICl_4]^-$ anion is _____.

(A) Square Planar
(B) Octrahedral
(C) Tetrahedral
(D) Trigonal bipyramidal

2 The preferred arrangement of a given number of electron pairs in the valence shell of the central atom which permits _____ distance possible.

(A) Minimum
(B) Maximum
(C) Moderate
(D) Zero

3 Who introduce the VSEPR Theory ?

(A) Sidgwik & Powell
(B) Gillespi and Nyhom
(C) Leinus Pauling
(D) Niels Bohr

4 Central Atom 'A' of ABn molecule having all 4 'Bond pairs of electron, then shape of the molecule is :

(A) Trigonal Planner
(B) Square anti prism
(C) Square pyramidal
(D) Tetrahedron

5 Shape of SF_4 molecule is _____.

(A) Tetrahedral

(B) Distorted Trigonal Bipyramidal

(C) Trigonal Planar

(D) Octahedral

6 The total no. of B.P. and L.P. are present in NH_3 molecule is :

(A) 3&3 (B) 3&1

(C) 1&3 (D) 1

7 Choose the molecule that is incorrectly matched with electronic geometry about the central atom.

(A) H_2O - Tetrahedral (B) PF_3 - Pyramidal

(C) NH_3 - Tetrahedral (D) CF_4 - Tetrahedral

8 The 'Bent rule' is used to defined the structure of various fluorides of :

(A) Transition metals (B) Non-metal

(C) Alkaline earth metals (D) All three

9 The regularity of the shape of the molecules indicates the presence of _____ pairs of electrons in the valence shell of central atom: (Where B.P. = Bond pair and L.P = Lone Pair)

(A) B.P. and L.P. (B) Only L.P.

(C) All B.P. (D) None of these

10 The Walsh-diagram of tri atomic AB2 type is deals with which two limiting structure of the following :

(A) Planner trigonal and trigonal pyramidal

(B) Linear and Bent V shaped

(C) Both (A)and (B)

(D) None of the above

11 The 'Bent rule' is used to defined the structure of various fluorides of :

(A) Transition metals (B) Non-metal
(C) Alkaline earth metals (D) All three

12 Sunlight initiates many _____ types of reactions in the atmosphere surrounding us.

(A) Nucleophilicdiplacement (B) Free radical
(C) Barry pseudorotation (D) Atomic inversion

13 The chelating ligands can form _____ complexes ?

(A) More stable (B) Less stable
(C) Unstable (D) None of these

14 ClO_x cycle may be _____ times more efficient in the destruction of ozone layer than is the NO_x.

(A) Zero (B) Two
(C) Three (D) Four

15 The magnetism of the complex $[Fe(CN)_6]^{-4}$ _____ is ?

(A) Diamagnetic (B) Paramagnetic
(C) Both (D) None of these

16 The first optically active compound of sulphur is isolated :

(A) Sulphur dioxide (B) Sulphur trioxide
(C) Sulphuric acid (D) Sulfurane

17 Ammonia molecule can undergo _____ reaction of the hydrogen atoms about nitrogen atom.

(A) Nucleophilicdiplacement (B) Free radical
(C) Barry pseudorotation (D) Atomic inversion

18 According to B. Jerrum, the formation of complex in the solution is proceed by :

(A) Step wise addition of ligand to metal
(B) Random addition of ligand to metal
(C) Both (A) and (B)
(D) None

19 Which of the following is true relation between stepwise and overall formation constant ?

(A) $\beta 4 = k1 + k2 + k3 + k4$

(B) $\beta 4 = k1 \times k2 \times k3 \times k4$

(C) $\beta 4 = k1 - k2 - k3 - k4$

(D) $\beta 4 = k1 + k2 - k3 - k4$

20 What type of trends shown in Stepwise stability constant ?

(A) $k1 > k2 > k3 > k4$ (B) $k1 = k2 = k3 = k4$

(C) $k1 < k2 < k3 < k4$ (D) $k1 > k2 < k3 > k4$

21 Which of the following order is known as Irwing William order of stability ?

(A) $Mn^{+2} > Fe^{+2} > Co^{+2} > Ni^{+2} > Cu^{+2} > Zn^{+2}$

(B) $Mn^{+2} < Fe^{+2} < Co^{+2} < Ni^{+2} < Cu^{+2} < Zn^{+2}$

(C) $Mn^{+2} < Fe^{+2} < Co^{+2} < Ni^{+2} < Cu^{+2} > Zn^{+2}$

(D) None

22 Which of the following complex is more stable according to change and size of metal ion ?

(A) $[Ba(OH)]^{+}$ (B) $[Ca(OH)]^{+}$

(C) $[Mg(OH)]^{+}$ (D) $[Be(OH)]^{+}$

23 In the Al(III)-F^{-} system which one is main factor responsible for complex formation ?

(A) Increase in enthalpy (B) Decrease in enthalpy

(C) Decrease in entropy (D) Increase in entropy

24 Which of the following Statement is False statement ?

(A) As per Lewis, ligand acts as base

(B) As per Lewis, metal acts as acid

(C) More basic ligand can easily donate pair of electrons

(D) H_2O is stronger ligand than NH_3.

25 Write true and false :

(i) The stability of complex is increase with increasing of the charge on the metal ion

(ii) The stability of complex is increase with decreasing of the charge on the metal ion

(iii) $[Fe(CN)]^{-3}$ is more stable than $[Fe(CN)]^{-4}$

(A) T, F, T (B) F, T, F

(C) F, T, T (D) F, F, F

26 Which of the following statement is true ?

(A) Larger the number of chelating ring in a complex is greater its stability

(B) The less number of chelating ring in a complex is greater its stability

(C) Chelate is less stable than any common complex

(D) All above mention

27 How many chelate rings are present in $M(en)_3$?

(A) 0 (B) 2

(C) 3 (D) 4

28 How many chelate rings are present in $M(en)_3$?

(A) 0 (B) 2

(C) 3 (D) 4

29 The paramagnetism of high spin complexes is _____than that of low spin complexes.

(A) Equal (B) Larger

(C) Lower (D) None of these

30 According to B Jerrum, the average number ligand molecules bound per mole of metal is expressed by _____ ?

(A) $n \rightarrow$ (B) $nH \rightarrow$

(C) K_H (D) C_S

31 In Octahedral complex field, t_{2g} are_____

(A) Bonding (B) Nonbonding

(C) Antibonding (D) None of these

32 The inert and labile are the terms represents the _____ stability of the complexes.

(A) Thermodynamic (B) Kinetic

(C) Both (A)and (B) (D) None of these

33 Donor ligand causes Δo to _____

(A) Increases (B) Decreases

(C) Both (D) None of these

34 Which of the following is the characteristic reactions of coordinated compounds ?

(A) Acid dissociation (B) Exchange reaction

(C) Electron transfer reaction (D) All of these

35 Which is the correct relation when ligands are stronger _____.

(A) $\Delta o > P$ (B) $\Delta o < P$

(C) Both (D) None of these

36 Which of the followings is not the electrophilic reagents ?

(A) Br^+ (B) Cl^-

(C) NO_2^+ (D) BF_3

37 What is the value of spin only moment μ_s for low spin d^4 system ?

(A) 2.0 BM (B) 3.0 BM

(C) 3.90 BM (D) 4.90 BM

38 Who calculated the value of CFSE is unit of Dq ?

(A) Sedgwick and Powell (B) Gillespi and Nyhom

(C) Leinus Pauling (D) Basalo and Pearson

39 The order of inertness of low spin octahedral complexes formed by d^3, d^4, d^5, d^6 is _____

(A) $d^6 > d^3 > d^4 > d^5$ (B) $d^5 > d^3 > d^4 > d^6$

(C) $d^5 < d^3 < d^4 < d^6$ (D) $d^6 < d^3 < d^4 < d^5$

40 The t_2g term is used to represents which of the following group orbital's ?

(A) dxy, dyz, dzx (B) px, py, pz

(C) Both (A) and (B) (D) None of these

41 Octahedral $[Co(NH_3)_6]^{+3}$ is_____

(A) Inert (B) Labile

(C) Both (D) None of these

42 Which of the following theory is used to explain the trans effect ?

(A) Electrostatic polarization (B) pi-bonding

(C) Both (D) None of these

43 Which type of mechanism occure in base hydrolysis ?

(A) SN^1 (B) SN^2

(C) SN^1CB (D) None of these

44 Which of the following is the well established general mechanism of one electron transfer reaction ?

(A) Outer sphere (B) Inner sphere

(C) Both (D) None of these

45 The order of liability of low spin complex is _____.

(A) $d^5 > d^4 > d^3 > d^6$ (B) $d^5 > d^6 > d^3 > d^4$

(C) $d^3 < d^4 < d^5 < d^6$ (D) None of these

46 Which of the following factor(s) is / are responsible for electron transfer reaction in complexes ?

(A) Conductivity of ligands

(B) Reorganization of energy

(C) Identity and concentration of the cations present in solution

(D) All of these

47 Which method is used to identify the cis and trans isomers of square planar complexes ?

(A) Reaction with Urea

(B) Reaction with acetic acid

(C) Reaction with Ammonia

(D) Reaction with thiourea

48 Which of the following factor(s) affecting on the magnitude of Dq ?

(A) Nature of metal ion

(B) Nature of the ligand (strong or weak)

(C) Geometry of the complex

(D) All of these

49 Which of the following hybridization shown by $[Co(NH_3)_6]^{+3}$ complex

(A) d^2sp3

(B) sp2

(C) sp^3

(D) sp3d

50 In Octahedral complexes the value of Δ_o is equivalent to _____ Dq.

(A) 1

(B) 10

(C) 100

(D) 10^4

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(Organic Chemistry)

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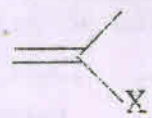
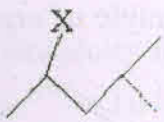
1 Which of the following compound shows the correct decreasing order of solvolysis with aqueous ethanol ?

I. 

II. 

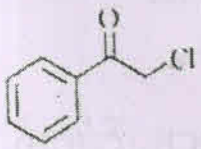
III. 

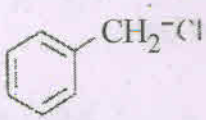
IV. 

The correct choice is :

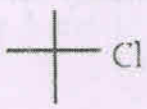
(A) III > II > I > IV
(B) III > II > IV > I
(C) II > III > IV > I
(D) III > I > IV > II

2 Which one is an excellent substrate for SN^2 reaction ?

(A) 

(B) 

(C) $CH_3 - CH_2 - Cl$

(D) 

3 What is the correct order of reactivity series of the halogen ?

(A) F > Cl > Br > I
(B) I > Cl > Br > F
(C) F > Br > Cl > I
(D) I > Br > Cl > F

4 Consider the following three halides :

$CH_3–CH_2–Cl$ (I) $CH_2=CH-Cl$ (II) C_6H_5-Cl (III)

Arrange C–Cl bond length of these halides in decreasing order :

(A) I > II >III (B) I > III> II

(C) III > II > I (D) II > III > I

5 Which of the following is related to Huckel rule ?

(A) (4n+4) π-electrons (B) (4n+1) π-electrons

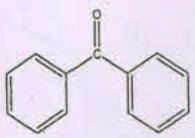
(C) 4n π-electrons (D) (4n+2) π-electrons

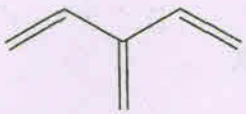
6 A convenient laboratory precursor for generating benzene is :

(A) Benzoic Acid (B) Aniline

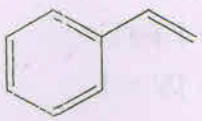
(C) Nitrobenzene (D) Anthranilic acid

7 Which of the following is not example of cross-conjugation ?

(A) 

(B) 

(C) 

(D) 

8 Which of the following can make difference in optical isomers ?

(A) Heat (B) Temperature

(C) Polarized light (D) Pressure

9 The number of optically active isomers of $HOCH_2(CHOH)_4$ CHO is :

(A) 4 (B) 8

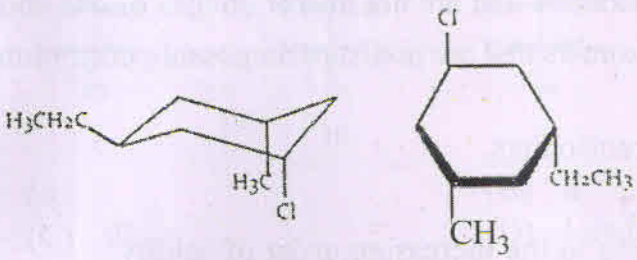
(C) 16 (D) 24

10 Which of the following is an alkane which can exhibit optical activity ?

(A) Neopentane (B) Isopentane

(C) 3-Methylpentane (D) 3-Methylhexane

11 What is the stereochemical relationship between the following two molecules ?



(A) Geometrical isomers (B) Enantiomers
(C) Diastereomers (D) Identical

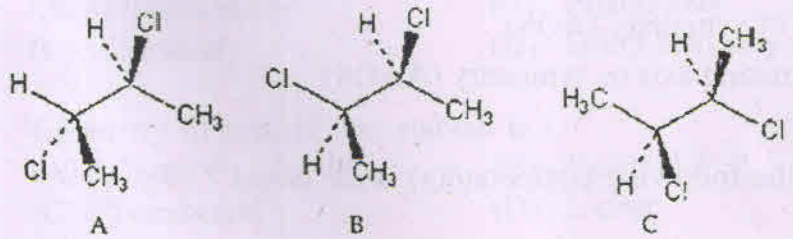
12 What is the molecular formula for the alkane of smallest molecular weight which possesses a stereogenic center ?

(A) C_4H_{10} (B) C_5H_{12}
(C) C_6H_{14} (D) C_7H_{16}

13 Which of the following molecules has a zero dipol moment ?

(A) CH_3Cl (B) CH_2Cl_2
(C) $CHCl_3$ (D) CCl_4

14 Which of the following structures represent the same Stereoisomer ?



(A) Only 1 and 2 (B) Only 2 and 3
(C) 1, 2 and 3 (D) Only 3 and 1

15 How many chiral stereoisomers can be drawn for $CH_3CHFCHFCH(CH_3)_2$?

(A) 4 (B) 5
(C) 6 (D) 7

16 Which of the following is the definition for enantiomerism ?

(A) A pair of stereoisomers each of which has two chirality centres

(B) A pair of stereoisomers that are not mirror images of one another

(C) A pair of stereoisomers that are non-superimposable mirror images of one another

(D) Any pair of stereoisomers

17 Rearrange the following in the increasing order of acidity.

(I) Benzoic acid

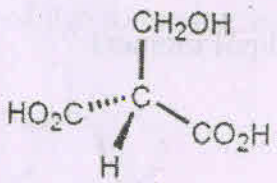
(II) p-methoxy benzoic acid

(III) o-methoxy benzoic acid

(A) I<II<III (B) III<I<II

(C) II<I<III (D) III<II<I

18 Which symmetry element makes the given compound achiral ?



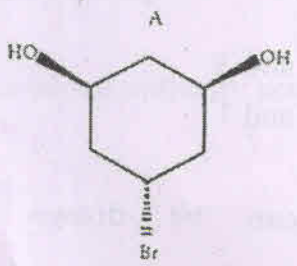
(A) Plane of symmetry (POS)

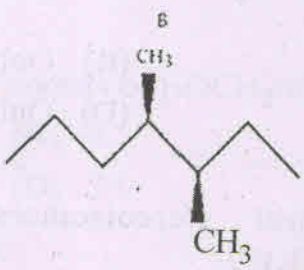
(B) Canter of symmetry (COS)

(C) Axis of symmetry (AOS)

(D) Alternating axis os symmetry (AAOS)

19 Which of the following compound(s) is/are chiral ?

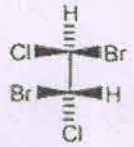




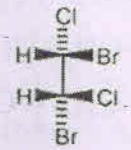
(A) Both A and B (B) Only B

(C) Only A (D) Neither A nor B

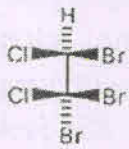
20 Which of the following compound(s) is / are achiral ?



I



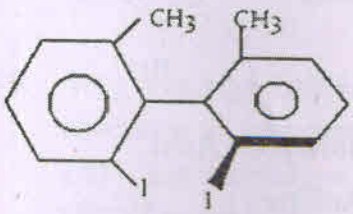
II



III

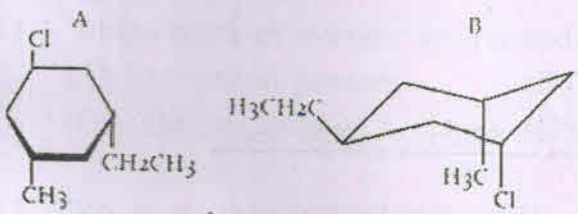
(A) I
(B) II
(C) III
(D) I and II

21 Would the following compound have an enantiomer ?



(A) True
(B) False

22 What is the relationship between given compound ?

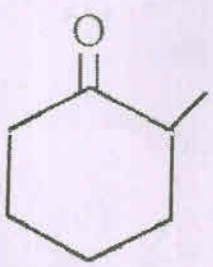


(A) Diastereomer
(B) Enantiomer
(C) Identical
(D) Don't have any relation

23 Geometry of methyl free radical is :

(A) Planar
(B) Pyramidal
(C) Tetrahedral
(D) Linear

24 How many tautomers can you draw for the following ketone ?



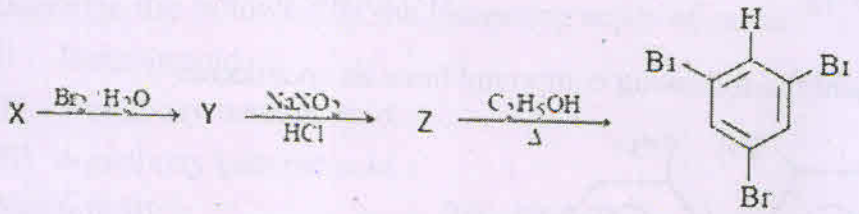
(A) 1
(B) 2
(C) 3
(D) 4

25 In which of the following organic species all the carbon atoms are in the same hybrid state ?

(A) $CH_2=C=CH_2$ (B) $CH_3-{}^{+}CH-CH_3$

(C) CH3-C ≡ CH (D) $CH2 = CH-{}^{+}CH_2$

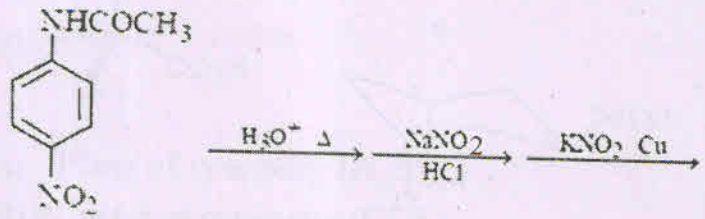
26 In the following reaction sequence, what will be X ?



(A) Benzoic Acid (B) Salicyclic Acid

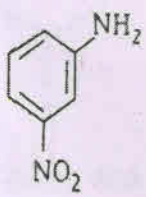
(C) Phenol (D) Aniline

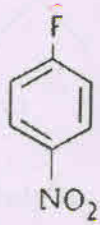
27 What will be the final product in the below reaction ?



(A) 

(B) 

(C) 

(D) 

28 Which of the following is not true for SN^1 reactions ?

(A) They occur through a single step concerted reaction

(B) They are favoured by polar solvents

(C) Tertiary alkyl halides generally react through this mechanism

(D) Concentration of nucleophile does not affect the rate of such reactions

29 What will be the total number of isomers formed when 2-methyl butane is subjected to monoclorination ?

(A) 5 (B) 4

(C) 3 (D) 6

30 Why are aryl halides less reactive towards nucleophilic substitution reactions as compared to alkyl halides ?

(A) The formation of a less stable carbanion

(B) Longer carbon halogen bond

(C) The inductive effect

(D) Sp2-hybridized carbon attached to the halogen.

31 Which types of isomers are formed in rearrangement reactions ?

(A) Structural isomers (B) Geometrical isomers

(C) Optical isomer (D) Conformational isomers

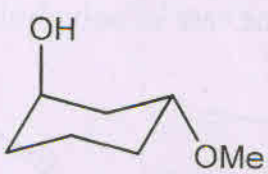
32 Which medium is used in benzylic acid rearrangement reaction ?

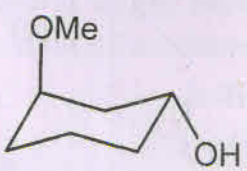
(A) Neutral (B) Strong base

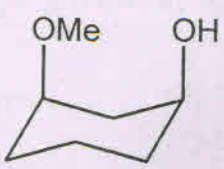
(C) Mild acidic (D) Strong acidic

33 Among the following the most stable isomer for 3-methoxycyclohexanol is :

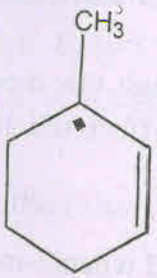
(A) 

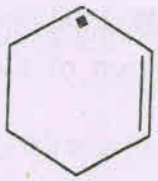
(B) 

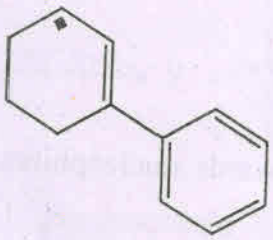
(C) 

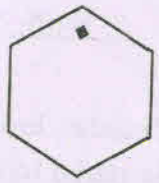
(D) 

34 Most stable free radical is :

(A) 

(B) 

(C) 

(D) 

35 Which of the following will undergo free radical bromination most readily ?

(A) CH_3COOH
(B) CH_3COCl
(C) CH_2CH_2COOH
(D) $HOOCCH_2CH_2COOH$

36 Arrange the following compounds in order of decreasing selectivity in free radical halogenation :

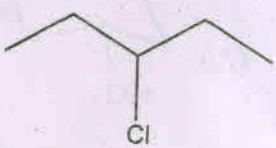
(A) NBS
(B) NCS (N-Chlorosuccinimide)
(C) Cl2
(D) F2

(A) A>B>C>D
(B) A>D>C>B
(C) B>C>A>D
(D) D>C>A>B>

37 Using the given codes, arrange the following compounds is decreasing order the rate of solvolysis by SN^1 mechanism :

(a)

(b)



(c)

(A) A>C>B>
(B) C>B>A
(C) A>B>C
(D) B>A>C

38 Allenes exhibit optical isomerism due to the presence of _____.

(A) Asymmetric carbon atom

(B) Cumulated double bond

(C) Conjugated double bond

(D) Isolated double bond

39 The angle strain in cyclohexane is nearly_____

(A) 20° (B) 15°

(C) 13.28° (D) 10°

40 How many transition states are involved in SN^2 reaction ?

(A) 1 (B) 2

(C) 3 (D) 0

41 The reactive intermediate involved in the conversion of chlorobenzene to aniline by potassium amide is :

(A) Carbanion (B) Nitrene

(C) Benzyne (D) Free radical

42 The number of stereoisomers of 1,3-dicholro-2-bromo butane is :

(A) 2 (B) 3

(C) 6 (D) 4

43 The dihedral angle between the methyl groups in the most stable conformation of n-butane is :

(A) 0° (B) 180°

(C) 60° (D) 240°

44 Which of the following is anti-aromatic ?

(A) 

(B) 

(C) 

(D) 

45 Match the column I with column II

	Column I	Column II
A	Phthaloyl peroxide	1. Free radical
B	Terazole	2. Benzyne
C	Benzoyl peroxide	3. Carbene
D	Alkyl halide	4. Carbocation

	A	B	C	D
(A)	2	3	4	1
(B)	3	2	1	4
(C)	2	3	1	4
(D)	2	4	1	3

46 Which one of the following ylides are least stable ?

(A) Nitrogen (B) Sulphur

(C) Phosphorus (D) None

47 According to Cahn- Ingold-Prelog rules, the decreasing order of priority of the groups CH_3, COOH, CHO and CD_3 is :

(A) $CD_3 > CH_3 > COOH > CHO$

(B) $CH_3 > CD_3 > COOH > CHO$

(C) $COOH > CHO > CH_3 > CD_3$

(D) $COOH > CHO > CD_3 > CH_3$

48 When R-$CH_2CH{=}CH_2$ reacts with NBS, the mechanism is.....

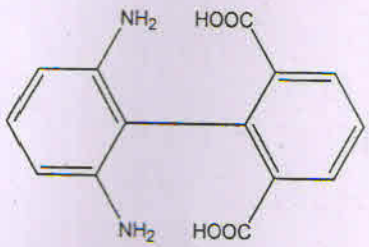
(A) AdE

(B) Free Radical substitution

(C) and

(D) Elimination

49 The following compound is :



(A) Chiral due to the presence of asymmetric carbon atom

(B) Achiral due to plane of symmetry

(C) Achiral due to centre of symmetry

(D) Chiral due to restricted rotation

50 One of the modern methods of studying free radicals is :

(A) IR spectra

(B) UV spectra

(C) Microwave spectra

(D) CI DNP

Seat No. _____

PAPER CODE : CCU-8809

M. Sc. (Sem. I) Examination

March - 2022

CHN-403 (P)-Physical Chemistry : Paper-III

Total Time : **60** Minutes
Total Questions : **50**

Total Marks : **70**
Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

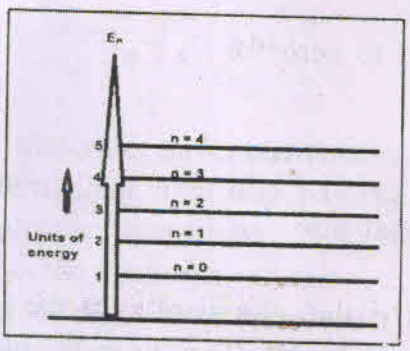
1 The zero point energy of a harmonic oscillator is :
(A) hv (B) zero
(C) 1/2 hv (D) 3/2 hv

2 The units of $\frac{h^2}{8ml^2}$ the energy differences between levels corresponding to 3 and 2 node eigen functions for a particle of mass m in a one dimensional box of length l is :
(A) 1 (B) 3
(C) 5 (D) 7

3 What is the degeneracy of H-atom in state n = 3 ?
(A) 9 (B) 7
(C) 5 (D) 3

4 If E_o is the zero-point energy of a harmonic oscillator of frequency v and h is Planck's constant then its energy in the n = 2 state will be :
(A) $(E_o + hv)$ (B) $2E_o$
(C) $4E_o$ (D) $(E_o + 2hv)$

5 The figure shown in the energy level diagram corresponding to a



(A) Particle in a box (B) Harmonic oscillator
(C) Particle tunneling (D) Hydrogen atom

6 The following are the three statements about perturbation theory

(1) Second order perturbation correction to the ground state energy is ALWAYS negative.

(2) Sum of the zeroth order and the first order corrections to the ground state energy is ALWAYS greater than the exact ground state energy.

(3) Sum of the zeroth order and first order corrections to the ground state energy is less than the exacte state energy.

From the following which one is correct ?

(A) Only 1 is true (B) Both 1 and 2 are true

(C) Only 3 is true (D) Both 2 and 3 are true

7 the energy of the ground state is known as the _____ of the system.

(A) Zero-point energy (B) Two point energy

(C) Single point energy (D) None

8 The Schrodinger equation is a linear partial differential equation that governs the wave function of _____ system.

(A) a quantum mechanics system (B) a classical mechanics system

(C) a quantity mechanics system (D) a quality mechanics system

9 The size of s-orbital increases when the values of the principal quantum number :

(A) decreases (B) increases

(C) remains constant (D) fluctuates

10 The Pauli's exclusion principles states two electrons in the same orbital have :

(A) Different spin (B) Same spin

(C) Vertical spin (D) Opposite spin

11 The lowest allowed energy is equal to zero for

(A) the hydrogen atom

(B) a rigid rotor

(C) a harmonic oscillator

(D) a particle in a three dimensional box

12 If 'n' denotes a quantum number and 'c' the velocity of light, the energy of a particle of mass 'm' in a box of length 'l' is proportional to :

(A) l^2 (B) m^2

(C) n^2 (D) $c^{1/2}$

13 The wave function in quantum mechanics represents :

(A) a state of the system (B) shape of the system

(C) Probability of the system (D) Energy of the system

14 Which one of the following gives an electron a greater probability of being found close to the nucleus ?

(A) 3s (B) 3p

(C) 3s (D) 4s

15 An is orbital is :

(A) A circular track in an atom in which an electron travels

(B) a one electron wave function.

(C) an observable property of the system

(D) a hermitian operators

16 What is the atomic term symbols for electrons for which L = 2 and S = 1 ?

(A) $^3D_1$ (B) $^3P_1$

(C) $^3S_1$ (D) None of the above

17 Zeeman effect has been explained on the basis of the removal of degeneracy of orbitals having magnetic quantum number m greater than _____ in the presence of a magnetic field.

(A) 3 (B) 2

(C) 1 (D) 0

18 Which equation gives the frequency of the linear harmonic oscillator ?

(A) $v = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$ (B) $v = \frac{1}{\pi}\sqrt{\frac{k}{m}}$

(C) $v = \frac{1}{2\pi}\sqrt{\frac{m}{k}}$ (D) $v = \frac{1}{\pi}\sqrt{\frac{m}{k}}$

19 A diatomic molecule rotating about an axis perpendicular to the internuclear axis and passing through the center of gravity of the molecule, constitutes an example of _____.

(A) the hydrogen atom

(B) a rigid rotor

(C) a harmonic oscillator

(D) a particle in three dimensional box

20 An operator A is defined as $A = -\frac{d}{dx} + x$ Which one of the following statements is true ?

(A) A is a Hermitian operator
(B) A* is an antihermitian operator
(C) Both AA* and A*A are Hermitian
(D) AA* is Hermitian, but A*A is antibermitian

21 For a d-electron, the orbital angular momentum is :

(A) $\sqrt{6\hbar}$ (B) $\sqrt{2\hbar}$
(C) $\hbar$ (D) $2\hbar$

22 The operation of the commutator $\left[x, x\frac{d}{dx}\right]$ on a function f (x) is equal to :

(A) 0 (B) $x\frac{d}{dx}f(x)$
(C) -x (f(x) (D) x f(x)

23 As per the uncertainty principle, $\Delta x.\Delta p$ equals to :

(A) $\frac{h}{2\pi}$ (B) $\frac{h}{2}$
(C) λ (D) Zero

24 If ΔG^o is zero for a reaction, then which one of the following is correct ?

(A) $\Delta H = 0$ (B) $\Delta S = 0$
(C) Equilibrium constant is 1 (D) Rate constant is 1

25 Consider the following statements :

(1) The enthalpy change for a reaction (ΔH) is dependent on temperature
(2) The enthalpy of a system will only decrease, when heat energy is transferred from the system to its surroundings.
(3) The enthalpy change in giving from one thermodynamic state of the system of another is dependent or the path taken.

Which of the above statements is/are correct ?

(A) 1 alone (B) 2 alone
(C) 1 and 2 (D) 1 and 3

26 One mole of an ideal gas (C_v = 10 J / K mol), initially at STP is heated at constant volume to twice the initial temperature. For this process, w and q will be :

(A) w = 0, q = 2.73 kJ
(B) w = 0, q = 0
(C) w = –2.73 kJ, q = 2.73 kJ
(D) w = 2.73 kJ, q = 2.73 kJ

27 In the reaction :

$NH_4CL_{(s)} \rightarrow NH_{3(g)} + HCl_{(g)}$, what is the entropy ΔS^o ?

(A) It is less than zero
(B) It is greater than zero
(C) It is equal to Zero
(D) It has no role

28 The specific heats of an ideal gas C_p and C_v :

(A) Vary with temperature
(B) Vary with pressure
(C) Vary with both pressure and temperature
(D) are constant

29 If A is in thermodynamic equilibrium with B, B is in thermodynamic equilibrium with C then A and C will be in thermodynamic equilibrium stated by :

(A) First law of thermodynamics
(B) Second law of thermodynamics
(C) Third law of thermodynamics
(D) Zeroth law of thermodynamics

30 The chemical potential (μ_i) of the i^{th} component is defined as :

(A) $\mu_i = \left(\frac{\partial E}{\partial n_i}\right)_{T.P.}$
(B) $\mu_i = \left(\frac{\partial H}{\partial n_i}\right)_{T.P.}$
(C) $\mu_i = \left(\frac{\partial A}{\partial n_i}\right)_{T.P.}$
(D) $\mu_i = \left(\frac{\partial G}{\partial n_i}\right)_{T.P.}$

31 For the following reaction,

$CO_2 + H_2O \rightarrow H_2CO_3$

The entropy change (ΔS_{system}) was calculated to be -96 JK^{-1} mol^{-1}. The enthalpy change (ΔH) was measured to be -45 kJ K^{-1} mol^{-1}. This reaction is expected to be a spontaneous process. The total change in entropy $(\Delta S_{system+surroundings})$ is :

(A) +54 JK^{-1} mol^{-1}
(B) -96 JK^{-1} mol^{-1}
(C) –45096 Kj^{-1} mol^{-1}
(D) –44004 KL^{-1} mol^{-1}

32 Which model is used for predicting liquid-phase activity coefficients ?

(A) Entropy models
(B) Enthalpy models
(C) Gibb's free equation model
(D) Keller model

33 Gibbs phase rule for general system :

(A) P+F=C-1 (B) P+F=C+1
(C) P+F=C-2 (D) P+F=C+2

34 Maxwell-Bolztmann statistics cannot be applied to _____.

(A) Atoms (B) Molecules
(C) Photons (D) Lattice

35 Consider the three collections of particles (ensembles) named microcanonical, canonical and grand canonical. Which one physical property is constant in all three ensembles ?

(A) Total number of particles, N
(B) Pressure, P
(C) Volume, V
(D) Temperature, T

36 The vibrational partition function equation is given by _____.

(A) $q_{vib} = 1 / 1-e^{-hv/kT}$ (B) $q_{vib} = 1 / 1+e^{-hv/kT}$
(C) $q_{vib} = 1 / 1+e^{hv/kT}$ (D) $q_{vib} = 1 / -1+e^{-hv/kT}$

37 For an ideal gas, the fugacity is equal to pressure and _____.

(A) f/p = 1 (B) f / p = 0
(C) f / p varies (D) f / p > 1

38 Striling's approximation In N!= _____

(A) NInN-N (B) N/2lnN+2
(C) InN! (D) NinN+N

39 At 300 K, 2 moles of an ideal gas expand reversibly and isothermally from 1 L to 10 L. What is the entropy change for the process ? (R=2 cal K^{-1} kol^{-1} and In 10 = 2.303)

(A) 2.76 cal K^{-1} mol^{-1} (B) 4.6 cal K^{-1} mol^{-1}
(C) 9.2 cal K^{-1} mol^{-1} (D) 0

40 According to transition state theory of reaction rates the entropy of deactivation $\Delta S^{\#}$ (where A is the frequency factor) is given as :

(A) $\Delta S^{\#} = R \log\left(\frac{Ah}{K}\right)$ (B) $\Delta S^{\#} = R \log\left(\frac{Ah}{KT}\right)$

(C) $\Delta S^{\#} = R \log\left(\frac{KT}{Ah}\right)$ (D) $\Delta S^{\#} = R \log\left(\frac{Ah}{T}\right)$

41 Who gave a statement about the second law of thermodynamics ?

(A) Kelvin planck (B) Clausius

(C) Plank (D) All of above

42 Grandcanonical ensemble having _____.

(A) Same chemical potential

(B) Same energy

(C) Same number of identical system

(D) None of this

43 Given the following two relations

$X_1 d\mu_1 + x_2 d\mu_2 = 0$ (A) and

$x_1 d\nabla_1 + x_2 d\nabla_2 = 0$, (B)

for a binary liquid mixture at constant temperature and pressure, the true statement is that

(A) Relation B is correct, but A is not

(B) Relation A is correct, but B is not

(C) Both the relations are correct

(D) Both the relations are incorrect, except for very dilute solutions

44 During isothermal expansion of an ideal gas which of the following happen :

(i) Temperature does not change

(ii) Process is spontaneous

(iii) The energy of the system does not change

(iv) Entropy increases

(A) (i) and (iii) only (B) (i), (ii), and (iv) only

(C) (i), (iii) and (iv) only (D) (i), (ii), (iii) and (iv)

45 For a cyclic process :

(A) $\Delta E = 0$ (B) $\Delta H = 0$

(C) both $\Delta E = 0$ and $\Delta H = 0$ (D) None of these

46 The number of ways in which four molecules can be distributed in two different energy levels is :

(A) 6 (B) 3

(C) 16 (D) 8

47 The number of configurations in the most probable state, according to Boltzmann formula is :

(A) $e^{S/kB}$ (B) $e^{-S/kB}$

(C) $e^{-E/TkB}$ (D) $e^{-\Delta G/TkB}$

48 If the entropy of vaporization of a liquid is 110 JK^{-1} mol^{-1} and its enthalpy of vaporization is 50,000 J mol^{-1}, the boiling point of the liquid is:

(A) 354.5 K (B) 454.5 K

(C) 554.5 K (D) 394.5 K

49 Consider the following statements :

(1) The work done in the reversible isothermal expansion of an ideal gas is greater than for a van der Waal gas.

(2) When an ideal gas undergoes expansion under adiabatic condition in vacuum internal energy increases

Which of the statements given above is/are correct ?

(A) 1 only (B) 2 only

(C) Both 1 and 2 (D) Neither 1 nor 2

50 For an irreversible adiabatic expansion of a perfect gas from volume V_i to V_f, the change in entropy of the gas is :

(A) nR log (V_f/V_i) (B) Zero

(C) Less than zero (D) Greater than Zero

Seat No. _____

PAPER CODE : CCU-8818

M. Sc. (Sem. I) Examination

March – 2022

Chemistry : CHNN-404

Group Theory & Spectroscopy

(New Course)

Total Time : **60** Minutes

Total Marks : **70**

Total Questions : **50**

Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 The point group of BCl_3 (planner) is

(A) D_3h (B) C_3V

(C) C_3h (D) C_2V

2 Which of the following molecule not showing Td point group ?

(A) CCL4 (B) CH_4

(C) Ni(CO)4]) (D) $PtCl_4$

3 $SOCl_2$ having _____ planes of symmetry.

(A) 0 (B) 1

(C) 2 (D) 3

4 Which of the following symmetry operation make its own separate class ?

(A) E (B) i

(C) σh (D) all of these

5 The PCl_3 molecule contains which principal rotational axis ?

(A) C2 (B) C3

(C) C4 (D) C6

6 Which of the following matrix contains diagonal ?

(A) Raw (B) column

(C) Square (D) None of these

7 Which matrix satisfy the condition $A = \tilde{A}$?

(A) Symmetrical (B) Adjoint

(C) Raw (D) All of these

8 Which matrix is non-real matrix ?

(A) [1.2.3.4] (B) [10,20,30,40]

(C) [3i, 2,3,4] (D) None of these

9 How many base vectors are arise for PH_3 molecules ?

(A) 3 (B) 4

(C) 9 (D) 12

10 The characteristic value for the matrix of identity (E or I) operation in 3×3 matrix is "

(A) 3 (B) 1

(C) –3 (D) –1

11 The character of any irreducible representation in any group in Symmetry operation ('E') is 3 then it is represented by the Mullikan Symbol of :

(A) A (B) B

(C) E (D) T

12 Which of the following condition is represented by Orthogonal matrix A ?

(A) $A = \tilde{A}$ (B) $A = A^*$

(C) $A = A^+$ (D) $A^{-1} = \tilde{A}$

13 Character table contains how many sections ?

(A) 2 (B) 3

(C) 4 (D) 6

14 The dimension of irreducible representation T_1g is ____ of Oh point group.

(A) 1 (B) 2

(C) 3 (D) 4

15 The characteristic of Irreducible representation is explain by :

(A) V.S.E.P.R. theory

(B) The great orthogonality theory

(C) VB Theory

(D) MO theory

16 Base vectors is represented by _____

(A) $^{r}1N$ (B) $^{r}2N$

(C) $^{r}3N$ (D) $^{r}3N-4$

17 The equation for 'Vib. is

(A) $^{r}3N-(^{r}T + ^{r}R)$ (B) $^{r}3N-(^{r}T - ^{r}R)$

(C) $^{r}3N-(^{r}T \times ^{r}R)$ (D) $^{r}3N-(^{r}T \div ^{r}R)$

18 How many irreducible representation of C_2h point group have :

(A) 2 (B) 3

(C) 4 (D) 6

19 In the character table the irreducible representation is denoted by which symbol ?

(A) Term (B) Rutherford

(C) Mullikan (D) None of these

20 Which of the following condition is satisfied by equivalent matrix ?

(A) Aij = Bij (B) Aij $\neq$ Bij

(C) Both (A) and (B) (D) None

21 The total no. of classes of any point group is equal to :

(A) reducible representation (B) irreducible representation

(C) Both (A) and (B) (D) None

22 CO_2 having _____ number. Of fundamental molecular vibrations ?

(A) 6 (B) 4

(C) 5 (D) 3

23 The correct formula for determining the fundamental molecular vibration for non linear molecules is :

(A) 3N-5 (B) 3N-6

(C) 3N-4 (D) 3N

24 Which electromagnetic radiation is used for Mossbauer spectroscopy ?

(A) x-ray (B) γ-rays

(C) Radio wave (D) Micro wave

25 How much energy was released γ-rays during excitation of Fe(3/2) states to its ground state ?

(A) 14.4 Kev (B) 25.5 ev

(C) 14 Kev (D) 25.5 Kev

26 The signal observed in the Mossbauer spectroscopy mainly depends on _____.

(A) Electron density

(B) Nuclear density

(C) Symmetry of the compound

(D) Ejection

27 The order (h) of the C2v point group is :

(A) 3 (B) 4

(C) 6 (D) 12

28 Due to which effect Mossbauer spectroscopy arise ?

(A) Crompton effect (B) Photoelectric effect

(C) Doppler effect (D) Mossier effect

29 The absorption of gamma rays in MB spectroscopy depends on

(A) Electron density

(B) Nuclear density

(C) Symmetry of the compound

(D) Ejection

30 The MB spectroscopy was given by :

(A) Newton (B) Einstein

(C) Rudolf (D) Rutherford

31 MB spectroscopy is mainly dealt with which of the metals ?

(A) ^{57}Fe (B) ^{119}Sn

(C) ^{121}Sb (D) All of the above

32 H_2O has total no. of fundamental molecular vibrations ?

(A) 4 (B) 3

(C) 6 (D) 5

33 The molecule shows the IR and RAMAN active 'signals' and 'bends' respectively in their corresponding spectra which indicate the absence of _____ symmetry operation ?

(A) Cn (B) Sn

(C) σ (D) i

34 Which one of the following is considered to be ionizing radiation ?

(A) Visible light
(B) Radio waves
(C) X-rays
(D) Microwaves

35 Spectroscopy is the study of :

(A) Electromagnetic radiation
(B) Matter
(C) Interaction of EMR with matter
(D) None of these

36 Which one of the following is correct formula for determining the stretching vibration and bending vibration for linear molecules respectively ?

(A) (2N-3) + (N-2)
(B) (N-4) + (2N-1)
(C) (2N-4) + (N-1)
(D) (N-3) + (2N-2)

37 Which colour of visible light has the longest wavelength ?

(A) Blue
(B) Violet
(C) Red
(D) Yellow

38 Which one of the following is correct formula for determining the fundamental molecular vibration for linear molecules ?

(A) 3N
(B) 3N-6
(C) 3N-4
(D) 3N-5

39 The constant value for one molecule of Cn(z) symmetry Operation is :

(A) 2Cos θ+1
(B) Cos θ-1
(C) Cos θ+1
(D) 2Cos θ-1

40 The classes of D3h point group is E, 2C3, 3C2, σh, 2S3, $3\sigma v$ so, the order of the group is :

(A) 4 (B) 3

(C) 6 (D) 12

41 $Ptcl_4$ shows _____ fundamental molecular vibration.

(A) 6 (B) 36

(C) 9 (D) 3

42 Electromagnetic waves are :

(A) longitudinal (B) transverse

(C) Both (A) and (B) (D) None

43 Correct formula for determining irreducible representation from Reducible representation is :

(A) $a_i = 1/h\left[\sum_R n_r \chi_i(r)\chi_i(r)\right]$ (B) $a_i = h\left[\sum_R n_r \chi_i(r)\chi_i(r)\right]$

(C) $a_i = \left[\sum_R n_r \chi_i(r)\chi_i(r)\right]$ (D) None

44 Nuclear quadrupole splitting mainly occurs due to :

(A) Spin (I) > 3/2

(B) Asymmetric charge distribution

(C) Both (A) and (B)

(D) None of these

45 Electromagnetic radiation travels through vacuum at a speed of _____ m/s.

(A) 18600 (B) 125

(C) 3.00×10^8 (D) 10000

46 s-orbitals are identified from which section of the character table ?

(A) First (B) Second

(C) Third (D) Fifth

47 IR Spectroscopy is mainly deals with :

(A) Nuclear spin (B) Electron spin

(C) Molecular Vibrations (D) None of these

48 Nucleus with spin (I) split into _____ states.

(A) 2I + 1 (B) I + 1

(C) I + 3/2 (D) 2I + 3

49 Which complex shows significant quadruple splitting ?

(A) K4 [Fe(CN)6] (B) Na2[Fe(CN)5NO]

(C) Both the complexes (D) None of these complex

50 In which case quadruple splitting not arise ?

(A) On complex with all same ligands

(B) D4h symmetry of complex

(C) C4v symmetry of complex

(D) Oh symmetry of complex with different ligands

Seat No. _____

PAPER CODE : CCU-8830

M. Sc. (Sem. I) Examination

March – 2022

Chemistry : CHNN-405C

(Organic Spectroscopy) (Elective)

Total Time : **25** Minutes
Total Questions : **25**

Total Marks : **35**
Students need to Tick only : **18**

Students need to tick only **18** questions. If more than **18** questions are ticked, the first **18** questions will only be evaluated.

1 How many percentage of ^{13}C is present in nature ?

(A) 1.0 (B) 1.2
(C) 1.1 (D) 0.9

2 The number of peaks possible for the TMS in CMR spectroscopy is :

(A) 1 (B) 2
(C) 3 (D) 4

3 The no. of peaks in CMR spectra possible in CH_3-CH_2-CO-CH_2-CH_3

(A) 5 (B) 2
(C) 3 (D) 4

4 Give the splitting of methylene group of following compound CH_3-CH_2-O-$CH(CH_3)_2$

(A) Doublet (d) (B) Triplet (t)
(C) Singlet (s) (D) Triplet (t)

5 The effect of electronegative atom in 13 C NMR will be more in

(A) alpha-carbon (B) beta carbon
(C) gamma-carbon (D) All are equal

6 Which of the following nuclei has spin quantum number I as 1/2

(A) ^{12}C (B) ^{16}O

(C) ^{2}H (D) ^{19}F

7 In what region of a 13C NMR spectrum would you find a carbon in an aromatic ring ?

(A) 30-40 ppm (B) 110-170 ppm

(C) 165-175 ppm (D) 205-220 ppm

8 Which of the following has the greatest value for its chemical shift in a ^{13}C NMR spectrum ?

(A) the alpha carbon of an alkyl halide

(B) the carbon of a benzene ring

(C) a carbon of TMS

(D) a carbonyl carbon

9 Which is correct due to the substitution of C1 in following compound ?

(A) α - effect > β - effect (B) α - effect < β - effect

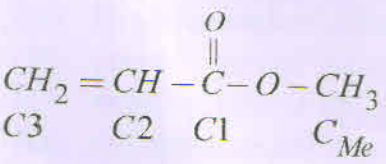
(C) α - effect = β - effect (D) None of the above

10 Which is correct due to the substitution of C1 in following compound ?

(A) α - effect – Upfield (B) α - effect < β - effect

(C) γ-effect – Upfield (D) β - effect – upfield

11 Which of (a)-(d) indicates the correct order of carbon chemical shifts of the four carbons of the following compound ?



(A) CMe < C2 < C3 < C1 (B) CMe < C3 < C2 < C1

(C) CMe < C2 < C1 < C3 (D) CMe < C1 < C2 < C3

12 Give the splitting of carbonyl group of following compound.
CH_3-CH_2-CO-CH_2-CH_3

(A) Doublet (d) (B) Triplet (t)
(C) Singlet (s) (D) Triplet (s)

13 How many signals does the unsaturated ketone ?
$(CH_3)_2CHCH_2$ CO CH = CH_2 have in ^1H NMR and ^{13}C NMR spectra ?

(A) five ^1H signals and six ^{13}C signals
(B) six ^1H signals and six ^{13}C signals
(C) six ^1H signals and seven ^{13}C signals
(D) five ^1H signals and seven ^{13}C signals

14 Which carbon of (a)-(d) of hex-3-en-3-one shows the largest (most downfield) chemical shift in the NMR spectrum ?

(A) C1 (V) C2
(C) C3 (D) C6

15 The Base peak in MASS spectra is.....

(A) The lowest mass peak
(B) The highest mass peak
(C) The peak set to 100% relative intensity
(D) The peak corresponding to the parent ion

16 The Molecular Ion Peak of Aniline will be observed at m/z value of _____

(A) 93 (B) 77
(C) 92 (D) 91

17 The path of ions after deflection depends on .....

(A) Only the mass of the ion
(B) only the charge on the ion
(C) both the charge and the mass of the ion
(D) neither the charge nor the mass of the ion

18 Which ratio is measured by mass detector ?

(A) z/m (B) e/m
(C) m/v (D) m/z

19 In which state of matter mass spectroscopy is being performed ?

(A) gaseous (B) liquid
(C) solid (D) plasma

20 The procedure for mass spectroscopy starts with which of the following processes ?

(A) The sample is bombarded by electron beam
(B) The ions are separated by passing them into electric and magnetic field
(C) The sample is converted into gaseous state
(D) The ions are detected

21 The correct order for the basic features of a mass spectrometer is.....

(A) acceleration, deflection, detection, ionization
(B) ionization, acceleration, deflection, detection
(C) acceleration, ionization, deflection, detection
(D) acceleration, deflection, ionization, detection

22 Which species of the following is used to bombard with the sample for which mass spectroscopy has been performed ?

(A) Alpha particles (B) Protons
(C) Electrons (D) Neutrons

23 Which of the following main component of mass spectroscopy deal with resolving the ions into their characteristics mass components according to their mass-to-charge ratio ?

(A) Ion Source (B) Analyzer tube
(C) Detector System (D) Analyzer

24 Which of the following statements is wrong ?

(A) A mass spectrum does not show signals due to uncharged radicals.
(B) A conventional mass spectrometer does not employ a spectrophotometric detector
(C) Conventional mass spectrometry does not always require samples of high purity
(D) A conventional mass spectrometer employs high energy UV radiation.

25 Which type of ionic species are allowed to pass through the slit and reach the collecting plate ?

(A) Negative ions of all masses
(B) positive ions of the specific mass
(C) negative ions of the specific mass
(D) positive ions of all masses

Seat No. _____

PAPER CODE : CCU-8838

M. Sc. (Sem. I) Examination

March - 2022

MSPHY-102ES : Physics

(Energy Technology and Storage System (ETS))

(New Course)

Total Time : **25** Minutes | Total Marks : **35**

Total Questions : **25** | Students need to Tick only : **18**

Students need to tick only **18** questions. If more than **18** questions are ticked, the first **18** questions will only be evaluated.

1 How is the heat inside earth restored ?

(A) Radioactive decay of elements

(B) Cosmic rays

(C) Sun restores the heat

(D) Hot steam is pumped into earth

2 Geothermal energy is :

(A) Readable (B) Radiation

(C) Non Renewable (D) Renewable

3 'Petro' is related

(A) Rock (B) Pate rolling

(C) Hydro (D) Five

4 'Hydro' is related

(A) Coal (B) Fluid

(C) Non renewable (D) None of these

5 The magma is :

(A) Petro mass
(B) Magic mass
(C) Mega mass
(D) Molten mass

6 The HDR is :

(A) Hot Dry Rock
(B) Hard Dry Rock
(C) Hit Dry Rock
(D) Hard Dark Rock

7 The VATW is :

(A) Vertical Axel Wind Turbines
(B) Vertical Axel Wind Turbo
(C) Vertical Axis Wind Turbulences
(D) None of these

8 The Power Coefficient of a wind turbine is :

(A) The ratio in the wind power to turbine height
(B) The ratio of power in the wind to the shift power
(C) The ratio of turbine size
(D) None of these

9 The Oceans cover about _____ of earth's surface.

(A) 35%
(B) 21%
(C) 70%
(D) 82%

10 Binary cycle OTEC plant based on _____ and special turbine.

(A) NaCl
(B) NO_2
(C) NH_3
(D) NaOH

11 Which of the following countries hosts the largest geothermal field ?

(A) United States
(B) India
(C) Iran
(D) Australia

12 Which of the following is the most probably location of geothermal site ?

(A) Grasslands
(B) Coasts
(C) River beds
(D) Volcanoes

13 Which of the following is the major drawback of geothermal energy ?

(A) Low initial cost

(B) Low carbon dioxide production

(C) High carbon dioxide production

(D) Extremely location specific

14 There are _____ types of geothermal power plants.

(A) 2 (B) 4

(C) 3 (D) 5

15 _____ types of geothermal power plants will be the future of geothermal power plants.

(A) Dry stream geothermal plants

(B) Binary geothermal plants

(C) Flash geothermal plants

(D) Neither dry stream nor flash

16 1 kwh = _____Joule.

(A) 0.36×10^{7} (B) 6.3×10^{6}

(C) 3.6×10^{-6} (D) 0.36×10^{6}

17 What are used to turn wind energy into electrical energy ?

(A) Turbine (B) Generators

(C) Yaw Otor (D) Blades

18 At what range of speed is the electricity from the wind turbine is generated ?

(A) 100 to 125 mph (B) 450 to 650 mph

(C) 10 to 12 mph (D) 30 to 35 mph

19 Which is the active material present on the negative plate a Lead Acid Battery ?

(A) Copper (B) Sponge Lead

(C) Zinc (D) Nickel

20 Which is not conventional Battery ?

(A) Lead Acid
(B) Nickel Iron
(C) Nickel Cadmium
(D) Zinc Nickel Oxide

21 Unit of energy density is :

(A) k Wh/m^3
(B) k W/m^2
(C) k Wh/cm^3
(D) k Wh

22 Temperature of conducting material is near _____ known Super conductivity.

(A) 10000 Kelvin
(B) Absolute Zero
(C) Boiling Temperature
(D) Melting point

23 What material used as anode in Lead Acid battery ?

(A) Sponge Lead
(B) Lead Dioxide
(C) Carbon
(D) Lead Monoxide

24 S.U.F =

(A) Energy Extracted / Energy Stored
(B) Energy Extracted / Power Stored
(C) Power Extracted / Energy Stored
(D) None of these

25 Superconductivity was discovered by

(A) Albert Einstein
(B) Kamerlingh Onnes
(C) Issac Newton
(D) Messioner

Seat No. _____

PAPER CODE : CCU-8812

M. Sc. (Sem. I) Examination

March – 2022

Physics : MS-PHY-103CC

Total Time : **60** Minutes
Total Questions : **50**

Total Marks : **70**
Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 Identify the property which is not characteristic for a semiconductor?
(A) At a very low temperature, it behaves like an insulator
(B) At higher temperatures, two types of charge carriers will cause conductivity
(C) The charge carriers are electrons and holes in the valence band at higher temperatures
(D) The semiconductor is electrically neutral

2 The n-type semiconductor is which of the following?
(A) Positively charged
(B) Negatively charged
(C) Neutral
(D) Positive or negative depending upon doping materials

3 The dominant contribution to current comes from holes in case of which of the following?
(A) Metals
(B) Intrinsic semiconductors
(C) p-type extrinsic semiconductors
(D) n-type extrinsic semiconductors

4 In a p-type semiconductor, germanium is doped with which of the following?
(A) Gallium
(B) Copper
(C) Phosphorous
(D) Nitrogen

5 Thermocouple is a _____
(A) Primary device
(B) Secondary transducer
(C) Tertiary transducer
(D) None of the mentioned

6 Operation of thermocouple is governed by _____
(A) Peltier effect
(B) Seebeck effect
(C) Thomson effect
(D) All of the mentioned

7 At absolute zero temperature, which level is above the Fermi energy level in the case of donors?

(A) Donor energy level
(B) Acceptor energy level
(C) Conduction Band
(D) Valence Band

8 At T = 0 K, the location of Fermi level with respect to the Ec and Ed for the n type material is?

(A) Above than conduction band
(B) Midway
(C) Lower than Ed
(D) Greater than Ed

9 Solving the wave equation for a given periodic potential, u(x), can be challenging. In the lecture and in ASF, a periodic System of finite, rectangular quantum wells is solved. Even for this simple problem, the math is non---trivial, but the solutions display the general features of all periodic crystal potentials. What is the name of this classic, model problem for bandstructure?

(A) The WKB Approximation
(B) Fermi's Golden Rule
(C) The Debye model
(D) The Kronig---Penney Model

10 Where does the centre of mass of two particles of an equal mass lie?

(A) Inside the body
(B) Outside the body
(C) Near the first body
(D) Midway between them

11 For a band structure with $E(k_x, k_y) = \hbar^2 k_x^{\,2} / 2m^* + \hbar^2 k_y^{\,2} / 2m^*$ what is the shape of the constant energy 'surface'.

(A) a line
(B) a circle
(C) an ellipse
(D) a sphere

12 The density of energy radiated by a blackbody in the infrared region is proportional to:

(A) T
(B) T^2
(C) T^4
(D) T^3

13 A mono-energetic electron beam is incident normally on a sheet of aluminum foil. On a fluorescent screen placed behind the foil, we observe:

(A) small, scattered bright spots
(B) bright concentric rings
(C) nothing
(D) all of the above

14 The expression of the momentum of a photon is :

(A) $p = \lambda$ (B) $p = h/\lambda$
(C) $p = c/\lambda$ (D) $p = hc$

15 The wavelength of a photon of energy E is given by:

(A) $\lambda = hc/E$ (B) $\lambda = h/cE$
(C) $\lambda = c/hE$ (D) $\lambda = E/hc$

16 A solid body heated to a very high temperature T emits radiation power proportional to:

(A) T (B) T^2
(C) T^4 (D) T^3

17 The angular momentum of a particle in uniform circular motion is:

(A) directly proportional to the radius of the circular path
(B) inversely proportional to the radius of the circular path
(C) proportional to the square of the radius of the circular path
(D) All of the above

18 For a linear harmonic oscillator whose total mechanical energy is constant, the elongation reaches its maximum when:

(A) potential energy is equal to zero
(B) kinetic energy is equal to zero
(C) potential energy equals the kinetic energy
(D) All of the above

19 The electromagnetic wave is due to the spread of:

(A) an electrical disturbance in a material medium
(B) a magnetic disturbance in a material medium
(C) an electromagnetic field
(D) All of the above

20 The concept of matter wave was suggested by _____

(A) Heisenberg (B) de Broglie

(C) Schrodinger (D) Laplace

21 A solid sphere rolls down two different inclined planes of the same heights but different angles of inclination. In each case, the ball will reach the bottom _____

(A) With the same speed

(B) With different speed

(C) with different speed but same time

(D) Immediately

22 In a semiconductor which of the following carries can contribute to the current?

(A) Electrons (B) Holes

(C) Both (D) None

23 The intrinsic Fermi level of a semiconductor depends on which of the following things?

(A) E_{midgap} (B) m_p^*

(C) m_n^* (D) All of the mentioned

24 The thermal equilibrium concentration of the electrons in the conduction band and the holes in the valence band depends upon?

(A) Effective density of states

(B) Fermi energy level

(C) Both A and B

(D) Neither A nor B

25 In which of the following semiconductor, the concentration of the holes and electrons is equal?

(A) Intrinsic (B) Extrinsic

(C) Compound (D) Elemental

26 On doping germanium metal, with a little amount of indium, what does one get?

(A) Intrinsic semiconductor (B) Insulator

(C) n-type semiconductor (D) p-type semiconductor

27 In a pure semiconductor crystal, if current flows due to breakage of crystal bonds, then what is the semiconductor is called?

(A) Acceptor
(B) Donor
(C) Intrinsic semiconductor
(D) Extrinsic semiconductor

28 Which of the following, when added as an impurity, into the silicon, produces n-type semiconductor?

(A) Phosphorous
(B) Aluminum
(C) Magnesium
(D) Sulfur

29 In n-type semiconductors, which one is the majority charge carriers?

(A) Holes
(B) Protons
(C) Neutrons
(D) Electrons

30 A small impurity is added to germanium to get a p-type semiconductor. Identify the impurity?

(A) Bivalent substance
(B) Trivalent substance
(C) Pentavalent substance
(D) Monovalent substance

31 Bloch's theorem is about the wave function of an electron in a periodic potential In the lecture ,this state as : $\Psi(x+a)=\Psi(x)e^{ika}$. In ASF, the Bloch theorem is also stated in a different but mathematically equivalent way as :

(A) $\Psi(x)=u(x)e^{ikx}$, where $u(x)$ is the periodic, crystal potential: $u(x+a)=u(x)$

(B) $\Psi(x)=u(x)e^{ik(x+a)}$

(C) $\Psi(x+a)=u(x)e^{ikx}$

(D) $\Psi(x+a)=u(x+a)e^{ika}$

32 We saw earlier that when we impose boundary condition on electron confined in a quantum well only discrete values of k are permitted when we impose periodic boundary condition on a string of n atom the same thing happens how many discrete values of k are there and what is their spacing?

(A) 2N discrete value spaced 2Π/Na

(b) 2N discrete value spaced Π/Na

(C) N discrete value spaced 2Π/Na

(D) N discrete value spaced Π/Na

33 What is a Brillouin zone?

(A) A region of energy space that encompasses all of the unique values of energy

(B) A region of k space where the group velocity is positive

(C) Another name for the unit cell of the crystal

(D) A region of the k space that contains all of the unique solution of the wave equation

34 Exactly what is a hole in semiconductor terminology?

(A) another name of positron

(B) a fictitious partical that is really just an empty state in nearly filled band

(C) an h+ ion

(D) an impurity in the crystal lattice

35 Effective mass is widely used concept in semiconductor consider a 1 D band structure given by $E(k_x) = h\upsilon_f |k_x|$, where υ_F is a velocity . What is the effective mass?

(A) $m' = h\upsilon F$

(B) $m' = m_0$

(C) $m' = 0$

(D) not really defined

36 The force on a particle with an effective mass of m* could be written as F = m* a, but the effective mass depends on the band structure, and effective mass may not even be defined. More generally, how is the force defined?

(A) F = L×r

(B) $F = m^* \upsilon^2$

(C) $F = \hbar \frac{dk}{dt}$

(D) None of the above

37 The name of the point at the center of the Brillion zone for a diamond lattice is called :

(A) X (B) L

(C) K (D) F

38 Silicon, Germanium and Gallium Arsenide have different band structure. Which of the following is true?

(A) The conduction bands for them are similar in shape

(B) The valence bands for them are similar in shape

(C) The conduction and valence bands are different all three

(D) None of the above

39 The band gap is an important property of a semiconductor, but the type of band gap is also important. Which of the three semiconductor Ge, Si and GaAs has a direct band gap?

(A) Ge (B) Si

(C) GaAs (D) Ge and Si

40 Constant energy surface consisting of six ellipsoids along $\{1\ 0\ 0\}$ direction occur for which of the following?

(A) The Ge valence band

(B) The Ge conduction band

(C) The Si valence band

(D) The Si conduction band

41 The Energy of the particle is proportional to

(A) n (B) n^{-1}

(C) n^2 (D) n^{-2}

42 Which function is considered independent of time to achieve the steady state form?

(A) Ψ (B) $d\Psi/dt$

(C) $d^2\Psi/dx^2$ (D) U

43 The Steady-state form of Schrodinger wave equation is _____

(A) Linear (B) Quadratic

(C) Differential equation (D) Derivable

44 The values of Energy for which Schrodinger's steady state equation can be solved is called as _____

(A) Eigen Vectors
(B) Eigen Values
(C) Eigen Functions
(D) Operators

45 Which quantity is said to be degenerate when $H\Psi_n = E_n\Psi_n$?

(A) Eigen Vectors
(B) Eigen Values
(C) Eigen Functions
(D) Operators

46 For a box with infinitely hard walls, the potential is maximum at _____

(A) L
(B) 2L
(C) L/2
(D) 3L

47 What does the conductivity of metals depend upon?

(A) The nature of the material
(B) Number of free electrons
(C) Resistance of the metal
(D) Number of electrons

48 What happens to the free electrons when an electric field is applied?

(A) They move randomly and collide with each other
(B) They move in the direction of the field
(C) They remain stable
(D) They move in the direction opposite to that of the field

49 Which of the following theories cannot be explained by classical theory?

(A) Electron theory
(B) Lorentz theory
(C) Photo-electric effect
(D) Classical free electron theory

50 Which of the following theories can be adopted to rectify the drawbacks of classical theory?

(A) Compton theory
(B) Quantum theory
(C) Band theory
(D) Electron theory

Seat No. _____

PAPER CODE : CCU-8794

M. Sc. (Sem. I) Examination

March – 2022

Physics : MSPHY 101 CC

(Mathematical Physics - 1 & Programming in C - 1)

(New Course)

Total Time : **60** Minutes
Total Questions : **50**

Total Marks : **70**
Students need to Tick only : **35**

Students need to tick only 35 questions. If more than 35 questions are ticked, the first 35 questions will only be evaluated.

1 Arguments passed to a function in C language are called _____ arguments.
(A) Formal arguments
(B) Actual arguments
(C) Definite arguments
(D) Ideal arguments

2 Arguments received by a function in C language are called _____ arguments.
(A) Definite arguments
(B) Formal arguments
(C) Actual arguments
(D) Ideal arguments

3 Choose a correct statement about C language function arguments.
(A) Number of arguments should be same when sending and receiving.
(B) Type of each argument should match exactly.
(C) Order of each argument should be same.
(D) All the above

4 What is the default return value of C function if not specified explicitly ?
(A) –1
(B) 0
(C) 1
(D) None of the above

5 What are the data type of variables that can be returned by a C function ?
(A) int, float, double, char
(B) struct, enum
(C) Pointers to variables, arrays, functions, struct variables, enum variables etc.
(D) All the above

6 A recursive function can be replaced with _____ in C language.

(A) for loop
(B) while loop
(C) do while loop
(D) All the above

7 A recursive function is faster than _____ loop.

(A) for
(B) while
(C) do while
(D) None of the above

8 A recursive function without If and Else conditions will always lead to :

(A) Finite loop
(B) Infinite loop
(C) Incorrect result
(D) Correct result

9 How will you print on the screen ?

(A) printf(" ");
(B) printf(' ');
(C) printf("\n");
(D) printf(" " ")

10 Strcat function adds null character :

(A) Only if there is space
(B) Always
(C) Depends on the standard
(D) Depends on the compiler

11 Which of the following function sets first n characters of a string to a given character ?

(A) strset( )
(B) strnset( )
(C) strcset( )
(D) strinit( )

12 What will happen if in a C program you assign a value to an array element whose subscript exceeds the size of array ?

(A) The element will be set to 0
(B) The compiler would report an error
(C) The program may crash
(D) None of the above

13 What will happen if in a C program you assign a value to an array element whose subscript exceeds the size of array ?

(A) The element will be set to 0
(B) The compiler would report an error
(C) The program may crash
(D) None of the above

14 Functions can return structure in C ?

(A) True (B) False

(C) May be (D) Can't say

15 What is the output of C program ?

intmain( ) {char grade[ ] = {'A', 'B', 'C'}; printf ("GRADE=%c, ", *grade); printf("GRADE=%d", grade);}

(A) GRADE = some address of array, GRADE=A

(B) GRADE=A, GRADE=some address of array

(C) GRADE=A, GRADE=A

(D) Compiler error

16 What is the work of break keyword ?

(A) Halt execution of program

(B) Restart execution of program

(C) Exit from loop or switch statement

(D) None of the above

17 If $x = r\cos\theta; y = r\sin\theta$ then polar form of the complex number is :

(A) $x + iy = 0$ (B) $x + iy = 1$

(C) $x + iy = re^{i\theta}$ (D) None of the mentioned

18 If Z is complex function which is correct ?

(A) $1 + e^{i\theta}$ (B) $\sinh \infty r$

(C) $\cosh \infty r$ (D) $\tanh \infty r$

19 $\ln\left(r, e^{i\theta}\right) =$ _____ + ln r.

(A) $i\left(\theta + \frac{\pi}{2}\right)$ (B) $i(\theta + 2n\pi)$

(C) $i(\theta + [2n+]\pi)$ (D) $i(\theta + 3\pi)$

20 As per Cauchy-Riemann condition if $f(x) = u(x, y) + iv(x, y)$ is analytical in a region then in that region

(A) $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}; \frac{\partial v}{\partial x} = \frac{\partial v}{\partial y}$ (B) $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}; \frac{\partial v}{\partial x} = -\frac{\partial v}{\partial u}$

(C) $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}; \frac{\partial v}{\partial x} = \frac{\partial u}{\partial y}$ (D) $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}; \frac{\partial v}{\partial x} = -\frac{\partial u}{\partial y}$

21 If $f(z)$ is analytical on and inside a simple closed curve C, the value of $f(z)$ at a point $z=0$ inside C

(A) $f(a)=\frac{1}{2}\oint \frac{f(z)}{z-a}dz$ (B) $f(a)=\frac{1}{2\pi i}\oint \frac{f(z)}{z-2}dz$

(C) $f(a)=\frac{1}{2\pi i}\oint \frac{f(z)}{z-a}dz$ (D) $f(a)=\frac{2}{\pi i}\oint \frac{f(z)}{z-a}dz$

22 Lorentz series is :

(A) $f(z)=\sum_{n=a}^{\alpha} a_n(z-z_0)^n+\sum_{n=1}^{\alpha}\frac{b^n}{(z-z_0)^n}$

(B) $f(z)=\sum_{n=a}^{n-1} a_n+\sum_{n=1}^{\alpha}\frac{b^n}{(z-z_0)^n}$

(C) $f(z)=\sum_{n=a}^{\alpha} a_n(z-z_0)^n+\sum_{n=1}^{\alpha}\frac{b^{na}}{(z-z_0)^n}$

(D) $f(z)=\sum_{n=a}^{\alpha} a_n(z+z_0)^n+\sum_{n=1}^{\alpha}\frac{b^n}{(z-z_0)^n}$

23 Laplace transform of $L(f)$ is given by _____.

(A) $L(f)=\oint_0^{\infty} f(t)e^{-pt}dt$ (B) $L(f)=\int_0^{\infty} f(t)e^{-p}dt$

(C) $L(f)=\oint_0^{\infty} f(t)e^{-p}dt$ (D) $L(f)=\int_0^{\infty} f(t)e^{-pt}dt$

24 Fourier transform of $g(\alpha)$ is given by _____.

(A) $g(\alpha)=\frac{1}{2\pi}\int_0^{\infty} f(x)e^{-i\alpha x}dx$ (B) $g(\alpha)=\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty} f(x)e^{-i\alpha x}dx$

(C) $g(\alpha)=\int_{-\infty}^{\infty} f(x)e^{-i\alpha x}dx$ (D) $g(\alpha)=\pi\int_{-\infty}^{\infty} f(x)e^{-i\alpha x}dx$

25 The residue of $f(x)=\frac{(z\sin z)}{(z-\pi)^3}$ at $z=\pi$.

(A) -1 (B) 0

(C) 3 (D) 3π

26 $\int_0^{\infty}\frac{\sin^2 x}{x^2}dx$ = _____.

(A) $\frac{1}{2}$ (B) $\frac{3\pi}{2}$

(C) $\frac{\pi}{2}$ (D) $\frac{5\pi}{2}$

27 $\int_0^{\infty}\frac{(\ln x)^2}{1+x^2}dx$ = _____.

(A) π (B) $\frac{3\pi}{2}$

(C) $\frac{\pi}{8}$ (D) $\frac{\pi^3}{8}$

28 If a function is analytical everywhere in the entire z-plane, it is called _____.

(A) Holonomic function (B) Holomorphic function

(C) Green function (D) Non Holonomic function

29 Green function G(x,z) satisfies the differential equation :

(A) $LG(x,z)=-\delta(x+z)$ (B) $LG(x,z)=-\delta(x/z)$

(C) $LG(x,z)=\delta(x-z)$ (D) $LG(x,z)=-\delta(x-z)$

30 For loop in a C program, if the condition is missing :

(A) it is assumed to be present and taken to the true

(B) it result in a syntax error

(C) execution will be terminated abrupt

(D) it is assumed to be present and taken to be false

31 Which of the following statement about for loop is true ?

(A) Goto can be used to carry, out of the loop

(B) Goto can't be used to jump, out of the loop

(C) If can be used to jump, out of the loop

(D) Goto can be used to jump, out of the loop

32 If c is a variable initialized to 1, how many times will the following loop be executed ?

```
while ((c>0) && (c<60))
{
loop body
c++;
}
```

(A) 60 (B) 59

(C) 61 (D) None of these

33 How many times will the following loop be executed if the input data item is 1 2 3 4 ?

```
while (c=getchar()! = 0)
{ }
```

(A) Initiality (B) Never

(C) Ones (D) None of these

34 The following program fragment

```
for (i=3; i<15; i+=3);
printf("%d", i);
```

results in

(A) printing of 12 (B) printing of 3

(C) printing of 18 (D) printing of 15

35 In a for loop, if the condition is missing, then infinite looping can be avoided by a

(A) If Statement (B) Goto Statement

(C) Syntax error (D) None of these

36 The for loop

```
for (i=0; i<10; ++i)
printf("%d", i&1);
```

prints

(A) 0111010111 (B) 1101110001

(C) 0101010101 (D) 1010101010

37 What is the maximum number of dimensions an array in C may have ?

(A) Two

(B) Eight

(C) Sixteen

(D) Theoretically no limit. The only practical limits are memory size and compilers.

38 Array is an example of _____ type memory allocation.

(A) Complete time (B) Run time

(C) Both (A) and (B) (D) Compile time

39 The parameter passing mechanism for an array is :

(A) Call by value (B) Call by reference

(C) Call by value-result (D) None of the above

40 Which of the following function is more appropriate for reading in a multi-word string ?

(A) scanf( ) (B) printf( )

(C) gets( ) (D) puts( )

41 Length of the string "letsfindcourse" is :

(A) 13 (B) 14

(C) 15 (D) 12

42 Strcat function adds null character :

(A) Only if there is space (B) Always

(C) Depends on the standard (D) Depends on the compiler

43 What characters are allowed in a C function name identifier ?

(A) Alphabets, Numbers, %, $, _

(B) Alphabets, Numbers, Underscore (_)

(C) Alphabets, Numbers, dollar $

(D) Alphabets, Numbers, %

44 Functions can return structure in c ?

(A) True (B) False

(C) May be (D) Can't Say

45 Choose a correct statement about C string.

(A) String is a group of characters enclosed by double quotes.

(B) If a string is defined with double quotes, NULL is automatically added at the end.

(C) Size of a string is without counting NULL character at the end

(D) All the above

46 C string elements are always stored in :

(A) Random memory locations (B) Alternate memory locations

(C) Sequential memory locations (D) None of the above

47 Choose a correct C statement about String functions

(A) strrev("abcD") returns Dcba.

(B) strcmp("abc", "bcd") returns a negative number

(C) strcmp("234", "123") returns a positive number

(D) All the above

48 What is actually passed to PRINTF or SCANF functions ?

(A) Value of String (B) Address of String

(C) End address of String (D) Integer equivalent value of String

49 A recursive function can be replaced with _____ in C language.

(A) for loop (B) while loop

(C) do while loop (D) All the above

50 A recursive function is faster than _____ loop.

(A) for (B) while

(C) do while (D) None of the above

Seat No. _____

PAPER CODE : CCU-8803

M. Sc. (Sem. I) Examination

March – 2022

MS PHY 102CC : Classical Mechanics-I & Electrodynamic-I

(New Course)

Total Time : **60** Minutes
Total Questions : **50**

Total Marks : **70**
Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 Stability of equilibrium depends on _____.

(A) Only on V

(B) First derivative of V

(C) Second order derivative of V

(D) Magnitude of V and K

2 System is in equilibrium at a point when _____.

(A) All generalised forces vanishes at that point

(B) Generalised forces does not vanish

(C) Both (A) and (B) are true

(D) Both (A) and (B) are false

3 Theory of small oscillation has its application in _____.

(A) Only in Acoustic

(B) Only in molecular spectra

(C) Only in coupled circuits

(D) All of these

4 In stable equilibrium _____.

(A) V is minimum

(B) V is maximum

(C) (A) and (B) are true

(D) None of these

5 If potential energy is the function of position system is _____.

(A) Conservative (B) Non conservative

(C) (A) and (B) are true (D) None of these

6 Condition for stable equilibrium _____.

(A) $\frac{\partial^2 V}{\partial^2 x}$ at $x = x_0 > 0$ (B) $\frac{\partial^2 V}{\partial^2 x}$ at $x = x_0 < 0$

(C) $\frac{\partial^2 V}{\partial^2 x}$ at $x = x_0 = 0$ (D) $V < 0$

7 In small oscillations system we choose _____ oscillations.

(A) Rheonomous (B) Holonomic

(C) Non-holonomic (D) Scleronomous

8 Which of the following is secular equation in for ω^2 ?

(A) $\left|K_{jk} - \omega\, m_{jk}\right| = 0$ (B) $\left|K_{jk} - \omega^2\, m_{jk}\right| = 0$

(C) $\left|m_{jk} - \omega^2\, m_{jk}\right| = 0$ (D) None of these

9 How Euler angles are obtained ?

(A) With vibration of the system

(B) With rotational of the system

(C) With tralarional motion of the system

(D) None of these

10 Diagonal elements of I are known as _____.

(A) Angular momentum (B) Inertia coefficient

(C) Mass (D) Perpendicular distance

11 Off Diagonal elements are known as _____.

(A) Angular momentum
(B) Inertia coefficient
(C) Mass
(D) Products of inertia

12 Angular momentum $\vec{J}$ = _____.

(A) $I\vec{\omega}$
(B) ω
(C) β
(D) Φ

13 Orientation of the rigid body is completely specified by _____.

(A) Momentum
(B) Azimuthal angle
(C) Three Euler's angle
(D) Torque

14 Rigid body can perform _____.

(A) Only spin motion
(B) Only processional motion
(C) Only nutational motion
(D) All of these

15 Lagragian L = _____.

(A) $T + V$
(B) TV
(C) $T - V$
(D) All of these

16 Canonical transformation are also known as _____.

(A) Gauge transformation
(B) Contact transformation
(C) Contactless transformation
(D) None of these

17 Poisson bracket is useful for _____.

(A) Transformation
(B) Writing equation of motion in symmetric form
(C) Writing equation of motion in asymmetric form
(D) None of these

18 $\frac{\partial H}{\partial P_i}$ = _____.

(A) q_i (B) q_i

(C) p_i (D) pq_i

19 Hamilton H = _____.

(A) $T + V$ (B) TV

(C) $T - V$ (D) All of these

20 Canonical transformation are in _____.

(A) Phase space (B) Inverse space

(C) In both (A) and (B) (D) None of these

21 At a point Kinetic energy and potential energy function are _____.

(A) Unique

(B) Depends on choice of coordinate system

(C) In both (A) and (B)

(D) None of these

22 If coordinate is cyclic is also cyclic in Lagragian is _____.

(A) Cyclic in Hamiltonian (B) Not cyclic in Hamiltonian

(C) In both (A) and (B) (D) None of these

23 If Hamiltonian is cyclic in Q, Congugate momentum P = _____.

(A) $H\frac{H}{\omega}$ (B) $\frac{H}{\omega}$

(C) H (D) E

24 $[u+v, w]$ = _____.

(A) $[u+v, w+v]$ (B) u, w

(C) $[u, w+v]$ (D) $[u, w]+[v, w]$

25 In infinitesimal transformation _____.

(A) All terms are retained (B) Only first older term is retained

(C) Second order term is retained (D) None of these

26 $\vec{q}$ = _____.

(A) $\vec{A} \bullet \vec{\eta}$ (B) $\vec{A}$

(C) p (D) r

27 If wave is polarized in x-direction which component of electric field can not be zero ?

(A) x (B) y

(C) z (D) None of these

28 For conductors _____.

(A) Value of β is large (B) Value of β is small

(C) Value can not be predicted (D) None of these

29 Intrisic impedance for conductors _____.

(A) Large (B) Small

(C) Value can not be predicted (D) None of these

30 Velocity of electromagnetic in conductors _____.

(A) Decreases (B) Increases

(C) Remain constant (D) Becomes zero

31 Phase shift factor for a perfect dielectric

(A) $\omega\sqrt{\mu\varepsilon}$ (B) $\sqrt{\mu\varepsilon}$

(C) $\omega\sqrt{\varepsilon}$ (D) Zero

32 At an angle 45° value of α = _____.

(A) λ (B) $\frac{\gamma}{\sqrt{2}}$

(C) ω (D) Zero

33 Depth of penetration is given by _____.

(A) $\lambda\alpha$ (B) $\frac{\gamma}{\sqrt{2}}$

(C) $\frac{1}{\alpha}$ (D) infinite

34 For plane polarized wave _____.

(A) φ changing (B) φ always increasing

(C) φ always decreasing (D) φ always constant

35 When *Ex* and *Ey* have equal magnitude and phase difference between them is 90° wave is _____.

(A) Circularly polarized (B) Plane polarized

(C) Elliptically polarized (D) None of these

36 When *Ex* and *Ey* have unequal magnitude and phase difference between them is 90° wave is _____.

(A) Circularly polarized (B) Plane polarized

(C) Elliptically polarized (D) None of these

37 Unit of beta β is _____.

(A) rad/m (B) rad

(C) m/s (D) None of these

38 Insulators are _____.

(A) Dielectric (B) Conductors

(C) Both (D) None of these

39 $\sin\Phi$ represents _____.

(A) Impedance
(B) Resistance
(C) Power factor
(D) None of these

40 Velocity of electromagnetic wave depends on _____.

(A) Only on conductivity
(B) Only on frequency
(C) Only on dielectric constant
(D) All of the above

41 $div\left(curl\ \vec{G}\right) =$ _____.

(A) 0
(B) 1
(C) –1
(D) ∞

42 Direction of $\vec{E}\ X\ \vec{B}$ is the direction of _____.

(A) $\vec{E}$
(B) $\vec{B}$
(C) Both (A) and (B)
(D) None of these

43 $\int \vec{E} \cdot \vec{J}\, dv =$ _____.

(A) Energy dissipated in volume V
(B) Power dissipated in volume V
(C) Momentum dissipated
(D) None of these

44 Magnitude of dissipation factor for conductors is _____.

(A) $>>1$
(B) 1
(C) $<<1$
(D) ∞

45 Rate of energy flow per unit area is given by _____.

(A) $\vec{E}\ X\ \vec{B}$
(B) $\vec{E}\ X\ \vec{H}$
(C) $\vec{P}\ X\ \vec{B}$
(D) $\vec{M}\ X\ \vec{B}$

46 Voltage and current in Average power is _____.

(A) Out of phase (B) Is in phase

(C) (A) and (B) are true (D) None of these

47 Voltage and current of Reactive power is _____.

(A) Out of phase (B) Is in phase

(C) (A) and (B) are true (D) None of these

48 Intrinsic impedance η_m = _____.

(A) $\frac{E_{\tan}}{P_{\tan}}$ (B) $\frac{E_{\tan}}{I_{\tan}}$

(C) $\frac{E_{\tan}}{H_{\tan}}$ (D) None of these

49 Unit of Poynting vector is _____.

(A) V (B) A

(C) $\frac{W}{m^2}$ (D) W

50 The energy transported by the fields per unit time per unit are is called _____.

(A) Poynting energy (B) Electro-magnetic energy

(C) Poynting vector (D) Flux density

Seat No. _____

PAPER CODE : CCU-8821

M. Sc. (Physics) (Sem. I) Examination

March - 2022

MSPHY-104CC : Electronics - 1

Total Time : **60** Minutes | Total Marks : **70**

Total Questions : **50** | Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 The astable multivibrator has _____ stable state.

(A) 0 (B) 1

(C) 2 (D) 3

2 The gate of a JFET is _____ biased.

(A) reverse

(B) forward

(C) reverse as well as forward

(D) None of the above

3 In a p-channel JFET, the charge carriers are _____.

(A) electrons

(B) holes

(C) both electrons and holes

(D) None of the above

4 A common base configuration of a pnp transistor is analogous to _____ of a JFET.

(A) common source configuration

(B) common drain configuration

(C) common gate configuration

(D) none of the above

5 A JFET has three terminals, namely _____.

(A) cathode, anode, grid (B) emitter, base, collector

(C) source, gate, drain (D) none of the above

6 A FET is a _____ controlled device whereas a bipolar transistor is a _____ controlled device.

(A) Current, voltage (B) Drain, gate

(C) Gate, drain (D) Voltage, current

7 Which of the following devices has the highest input impedance ?

(A) JFET (B) MOSFET

(C) Crystal diode (D) Ordinary transistor

8 The transconductance of FET depends upon :

(A) Drain supply (B) The type of FET

(C) Gate to source voltage (D) Gate current

9 _____ multivibrator is a square wave oscillator.

(A) Monostable (B) Astable

(C) Bistable (D) None of the above

10 The gate and source connection in JFET is generally _____ biased.

(A) Forward (B) Reverse

(C) Always no (D) None of these options

11 A switch has _____

(A) One State (B) Two States

(C) Three States (D) None of the above

12 A MOSFET is sometimes called _____ JFET.

(A) many gate
(B) open gate
(C) insulated gate
(D) shorted gate

13 In a JFET, I_{DSS} is known as _____.

(A) drain to source current
(B) drain to source current with gate shorted
(C) drain to source current with gate open
(D) None of the above

14 The input control parameter of a JFET is _____.

(A) gate voltage
(B) source voltage
(C) drain voltage
(D) gate current

15 A JFET has high input impedance because _____.

(A) it is made of semiconductor material
(B) input is reverse biased
(C) of impurity atoms
(C) none of the above

16 The size of a power transistor is made considerably large to _____.

(A) Provide easy building
(B) Dissipate heat
(C) Facilitate connections
(D) None of the above

17 Class_____ power amplifier has the highest collector efficiency.

(A) C
(B) A
(C) B
(D) AB

18 The use of amplifier in a circuit is to _____ for input signal.

(A) Provide a phase shift
(B) Provide strength
(C) Provide frequency enhancement
(D) Make circuit compatible

19 In normal circuits, and in most of the books, a class A power amplifier uses_____.

(A) Two transistors
(B) Three transistors
(C) One transistor
(D) None of the above

20 In class A operation, the operating point is generally located_____ of the d.c. load line.

(A) At cut off point
(B) At the middle
(C) At saturation point
(D) None of the above

21 A power amplifier has comparatively _____β.

(A) Small
(B) Large
(C) Very Large
(D) None of the above

22 A Voltage amplifier is designed to achieve maximum _____ amplification.

(A) Voltage
(B) Power
(C) Resistance
(D) Transconductance

23 If the power rating of a transistor if 1W and collector current is 100 mA, then maximum allowable collector voltage is _____.

(A) 1V
(B) 100V
(C) 10V
(D) 20V

24 A transformer coupled class A power amplifier has a load of 100 Ω on the secondary. If the turn ratio is 10:1, what is the value of load appearing on the primary ?

(A) 5 kΩ
(B) 20 kΩ
(C) 100 kΩ
(D) 10 kΩ

25 The push-pull circuit must use _____ operation.

(A) Class A
(B) Class C
(C) Class B
(D) Class AB

26 The switching times in PN junction diode is _____.

(A) Forward recovery time and Reverse recovery time

(B) Forward bias time and Reverse bias time

(C) Field time and off field time

(D) None of these options

27 Find the cutoff frequency of low pass RC circuit with 1Kohm resistor and 1microfarad capacitor.

(A) 1 MHz (B) 1 KHz

(C) 159 Hz (D) 15.9 MHz

28 When the frequency of the source voltage decreases, the impedance of a parallel RC circuit ?

(A) Increases (B) Decreases

(C) Does not change (D) Decreases to zero

29 A 16 kHz sinusoidal voltage is applied to a series RC circuit. The frequency of the voltage across the resistor is :

(A) 0 Hz (B) 12 kHz

(C) 26 kHz (D) 18 kHz

30 AN RC differentiator acts as a :

(A) low-pass filter (B) high-pass filter

(C) band-pass filter (D) band-stop filter

31 When a 12 V input pulse with a width equal to five time constants is applied to an RC integrator, the capacitor charges to :

(A) 24 V (B) 15.12 V

(C) 20.64 V (D) 12 V

32 In a series RC circuit, when the frequency and the resistance are halved, the impedance

(A) Doubles

(B) Is halved

(C) Is reduced to one-forth

(D) Cannot be determined without values

33 In an RC differentiator, the sum of the capacitor voltage and the resistor voltage at any instant.

(A) must be zero

(B) must be equal to the applied voltage

(C) is less than the applied voltage but greater than zero

(D) cannot be determined

34 In a RC circuit, the impedance is determined by both the resistance and the capacitive reactance combined.

(A) True (B) False

(C) neither true nor false (D) None of above

35 The output of an RC integrator is taken across the _____.

(A) diode (B) capacitor

(C) resistor (D) source

36 In RC differentiator circuit the criterion for good oscillation is _____.

(A) RC less than 0.0016 T

(B) RC greater than 10 T

(C) RC less than 10.5 HT

(D) RC is equal to 10.5 T

37 What is the high time of the 10 KHz square wave ?

(A) 50 micro second (B) 0.1 millisecond

(C) 10 millisecond (D) 100 microsecond

38 In an RC differentiator, responding to repetitive pulses, the average value of the output :

(A) is zero

(B) is equal to the input voltage

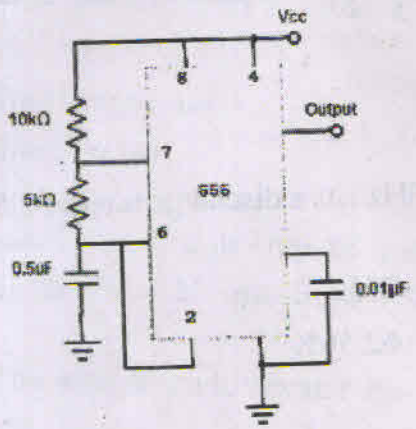
(C) is 63 per cent of the input voltage

(D) cannot be determined

39 The active components in an IC are _____.

(A) Resistors
(B) Capacitors
(C) Transistors and diodes
(D) None of the above

40 Find the approximate charging and discharging time of 0.5 μF capacitor.



(A) Charging time = 2ms; Discharging time = 5ms
(B) Charging time =5ms; Discharging time = 2ms
(C) Charging time = 3 ms; Discharging time = 5ms
(D) Charging time = 5ms; Discharging time = 3ms

41 A monostable multivibrator has R = 10 kΩ and the time delay T = 110ms, calculate the value of C.

(A) 0.9 μF
(B) 1.32 μF
(C) 10 μF
(D) 2.49 μF

42 Determine the time period of a monostable 555 multivibrator.

(A) T = 0.33 RC
(B) T = 1.1 RC
(C) T = 3 RC
(D) T = RC

43 The 555 Timer IC can be work if we connect pin no. 1 with _____.

(A) Ground
(B) Supply Voltage
(C) Output
(D) Reset

44 An IC has _____ size.

(A) Very large
(B) Large
(C) Extremely small
(D) None of the above

45 Doping means :

(A) Addition of impurity material in semiconductor band structure
(B) Removing of impurity material in semiconductor band structure
(C) Cleaning the surface
(D) None of the above

46 Astable multivibrator operating at 150Hz has a discharge time of 2.5mS. Find the duty cycle of the circuit.

(A) 50%
(B) 75%
(C) 95.99%
(D) 62.56%

47 ICs are generally made of _____.

(A) Silicon
(B) Iron
(C) Steel
(D) Wood

48 The SiO2 layer in an IC acts as _____

(A) A resistor
(B) An insulating layer
(C) Mechanical output
(D) None of the above

49 _____ cannot be fabricated on an IC.

(A) Transistors
(B) Diodes
(C) Resistors
(D) Large inductors and transformers

50 The astable Multivibrator using 555 can generates _____ wave.

(A) Sin
(B) Square
(C) Triangular
(D) Saw tooth

Seat No. _____

PAPER CODE : CCU-8819

M. Sc. (Sem. I) (Theory) Examination

March - 2022

BOC-104 : Botany

(Genetics and Evolution)

(New Course)

Total Time : **60** Minutes
Total Questions : **50**

Total Marks : **70**
Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 The tendency of an offspring to resemble its parent is known as :

(A) Variation
(B) Heredity
(C) Resemblance
(D) Inheritance

2 Who is known as the "Father of Genetics" ?

(A) Morgan
(B) Mendel
(C) Watson
(D) Bateson

3 The alternate form of a gene is :

(A) Alternate type
(B) Recessive character
(C) Dominant character
(D) Allele

4 The genotypic ratio of a monohybrid cross is :

(A) 1:2:1
(B) 3:2
(C) 2:1:1
(D) 9:3:3:1

5 The crossing of F1 to either of the parents is known as :

(A) Test cross
(B) Back cross
(C) F_1 cross
(D) All of the above

6 Homozygosity and heterozygosity of an individual can be determined by

(A) Back cross (B) Self-fertilization

(C) Test cross (D) All of the above

7 An exception to Mendel's law is :

(A) Independent assortment (B) Linkage

(C) Dominance (D) Purity of gametes

8 Pea plants were used in Mendel's experiments because :

(A) They were cheap

(B) They had contrasting characters

(C) They were available easily

(D) All of the above

9 The smallest unit of genetic material which produces a phenotypic effect on mutation is :

(A) Muton (B) Gene

(C) Recon (D) Nucleic acid

10 Mendel's findings were rediscovered by :

(A) Correns (B) De Vries

(C) Tschermark (D) All

11 Alleles are :

(A) Alternate forms of genes

(B) Linked genes

(C) Chromosomes that have crossed over

(D) Homologous chromosomes

12 When the activity of one gene is suppressed by the activity of a non-allelic gene, it is known as :

(A) Pseudo-dominance (B) Hypostasis

(C) Epistasis (D) Incomplete dominance

13 Cystic fibrosis is :

(A) Sex-linked recessive disorder

(B) Autosomal dominant disorder

(C) Autosomal recessive disorder

(D) Sex-linked dominant disorder

14 9:7 ratio in the F_2 generation represents :

(A) Incomplete dominance (B) Co-dominance

(C) Epistasis (D) Complementary interaction

15 Which term represents a pair of contrasting characters ?

(A) Heterozygous (B) Homozygous

(C) Codominant genes (D) Allelomorphs

16 The theory of spontaneous generation stated that :

(A) life arose from living forms only

(B) life can arise from both living and non-living

(C) life can arise from non-living things only

(D) life arises spontaneously, neither from living nor from the non-living

17 Animal husbandry and plant breeding programmes are the examples of :

(A) reverse evolution (B) artificial selection

(C) mutation (D) natural selection

18 Missing link in evolution is :

(A) Pheretima (B) Limulus

(C) Peripatus (D) Archaeopterys

19 Hardy-Weinberg principle explains :

(A) Chromosomal (B) Genetic drift

(C) Genetic equilibrium (D) All of these

20 As per Neo-Darwinism, which is mainly responsible for evolution ?

(A) Mutation (B) Natural drift

(C) Both of these (D) All of these

21 Dispersal of population depends on :

(A) On Immigration (B) On Emigration

(C) On Migration (D) All of these

22 Evolutionary history of an organism is known as :

(A) Ontogeny (B) Phytogeny

(C) Ancestry (D) Palaeontology

23 Book 'Philosophique Zoologique' was written by :

(A) Lamarck (B) Mendel

(C) Darwin (D) Hugo-devries

24 Theory of Pangenesis was given by :

(A) Darwin (B) Lamarck

(C) Weismann (D) DeVries

25 An individual's collection of genes is called _____.

(A) Genotype (B) Phenotype

(C) Trait (D) None of the above

26 Name the scientist who discovered the laws of Heredity.

(A) Gregor Mendel (B) Newton

(C) Punnett (D) None of the above

27 Who introduced chromosomal theory of inheritance ?

(A) Mendel (B) Sutton

(C) Reginald (D) Boyen

28 The plant Mendel used to study inheritance of two genes is _____.

(A) Apple (B) Mango

(C) Garden pea (D) Potato

29 The allele which is unable to express its effect in the presence of another is called _____.

(A) Co-dominant (B) Supplementary

(C) Complementary (D) Recessive

30 A plant having the genotype AABbCC will produce _____ kinds of gametes.

(A) 5 (B) 4

(C) 3 (D) 2

31 Which one from those given below is the period for Mendel's hybridization experiments ?

(A) 1856 – 1863 (B) 1857 – 1869

(C) 1840 – 1850 (D) 1870 – 1877

32 Among the following characters, which one was not considered by Mendel in his experiments of pea _____.

(A) Stem-Tall or Dwarf

(B) Trichomes – Glandular or non-glandur

(C) Seed – Green or Yellow

(D) Pod – Inflated or constricted

33 A small amount of lethal mutation is always present in the population due to :

(A) Positive selection

(B) Negative selection

(C) Frequency-dependent selection

(D) Mutation-selection balance

34 If a plant with genotype AaBb is self-fertilized, the probability of getting AABB genotype will be (A and B are not linked)

(A) 1/2 (B) 1/4

(C) 1/8 (D) 1/16

35 How many phenotypes can occur in the human blood group ABO with alleles I^AI^Bi?

(A) 2 (B) 3

(C) 4 (D) 1

36 The geometrical device that helps to find out all the possible combinations of male and female gametes is known as :

(A) Bateson Square (B) Mendel Square

(C) Punnett Square (D) Mendel's Cube

37 If a genetic disease is transferred from a phenotypically normal but carrier female to only some of the male progeny, the disease is _____.

(A) autosomal dominant (B) autosomal recessive

(C) sex-linked dominant (D) sex-linked recessive

38 A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple would be colour blind ?

(A) 25% (B) 50%

(C) 0% (D) 75%

39 Female heterogamety is _____

(A) Two different types of gametes are produced by females

(B) Four different types of gametes are produced by males

(C) Can be both (A) and (B)

(D) None of these

40 Which of the following statements is true regarding the "law of segregation" ?

(A) Law of segregation is the law of purity of genes

(B) Alleles separate from each other during gametogenesis

(C) Segregation of factors is due to the segregation of chromosomes during meiosis

(D) All of the above

41 Which is the most common mechanism of genetic variation in the population of sexually reproducing organism ?

(A) Transduction (B) Chromosomal aberrations

(C) Genetic drift (D) Recombination

42 The movement of a gene from one linkage group of another is called _____.

(A) Inversion (B) Translocation

(C) Duplication (D) Crossing over

43 In a monohybrid cross between two heterozygous individuals, percentage of pure homozygous individuals obtained in F1 generation will be _____.

(A) 25% (B) 50%

(C) 75% (D) 100%

44 A trait that "overpowers" and hide another trait is called :

(A) Overpowering trait (B) Complex trait

(C) Recessive trait (D) Dominant trait

45 Mendal's law can be applicable only when _____

(A) Characters are linked

(B) Parents are pore breed

(C) F1 generation in monohybrid cross show 2 type of individuals

(D) One pair of contrasting characters depends on another pair

46 Mendel's law of independent assortment holds good for genes situated on the _____

(A) non-homologous chromosomes

(B) homologous chromosomes

(C) extra nuclear genetic element

(D) same chromosome

47 Which of the following characters was not chosen by Mendel ?

(A) Pod shape (B) Pod colour

(C) Location of flower (D) Location of pod

48 How many pairs of contrasting characters in pea plants were studied by mendel in his experiments ?

(A) Five (B) Eight

(C) Six (D) Seven

49 The fruit colour is squash is an example of _____.

(A) Recessive epistasis (B) Dominant epistasis

(C) Complementary epistasis (D) Inhibitory genes

50 F2 generation in a Mendelian cross showed that both genotypic and phenotypic ratios are same as 1:2:1. It represents a case of :

(A) Monohybrid cross with complete dominance

(B) Monohybrid cross with incomplete dominance

(C) Codominance

(D) Dihybrid cross

Seat No. _____

PAPER CODE : CCU-8831-32-33

M. Sc. (Sem. I) Examination

March – 2022

Botany : BOE - 101, 102, 103

(New Course)

(1) BOE-101 : Biofertilizer Technology
(2) BOE-102 : Environmental Biology
(3) BOE-103 : Biodiversity

Total Time : **25** Minutes
Total Questions : **25**

Total Marks : **35**
Students need to Tick only : **18**

Students need to tick only **18** questions. If more than **18** questions are ticked, the first **18** questions will only be evaluated.

(1) BOE-101 : Biofertilizer Technology

1 Which of the following is incorrectly matched ?

(A) Alnus-Frankia
(B) Alfalfa - Rhizobium
(C) Nitrogen fixer - Anabaena
(D) Mycorrhiza - Rhodospirrilum

2 Which of the following nitrogen fixers is found in rice fields associated with Azolla ?

(A) Tolypothrix
(B) Frankia
(C) Anabaena
(D) Spirulina

3 Which of the following is not a biofertilizer ?

(A) Mycorrhiza
(B) Rhizobium
(C) Agrobacterium
(D) Nostoc

4 Which of the following is commonly used as a nitrogen fixer in paddy fields ?

(A) Frankia
(B) Oscillatoria
(C) Azospirrilum
(D) Rhizobium

5 This is not used in organic farming.
(A) Snail
(B) Earthworm
(C) Oscillatoria
(D) Glomus

6 Which of the following is a nitrogen fixer in the root nodules of Alnus ?
(A) Clostridium
(B) Bradyrhizobium
(C) Azorhizobium
(D) Frankia

7 Which of the following is a pair of biofertilizers ?
(A) Salmonella and E.coli
(B) Rhizobium and grasses
(C) Nostoc and legume
(D) Azolla and BGA

8 Which of the following is an endomycorrhiza ?
(A) Rhizobium
(B) Agaricus
(C) Glomus
(D) Nostoc

9 Pick the correct statement .
(A) Legumes do not fix nitrogen
(B) Legumes fix nitrogen independent of bacteria
(C) Legumes fix nitrogen through bacteria in their roots
(D) Legumes fix nitrogen through bacteria in their leaves

10 Organic farming is the technique of raising crops through the usage of
(A) Resistant varieties
(B) Manures
(C) Biofertilizers
(D) All of the above

11 Which of the following plants form a symbiotic relationship with two nitrogen-fixing bacteria Rhizobium and Aero rhizobium in root and stem nodules respectively ?
(A) Sesbania rostrata
(B) Crotalaria juncea
(C) Sesbania aculeata
(D) Cyamopsis tetragonoloba

12 The conversion of nitrogen to ammonia or nitrogenous compounds is called as
(A) Nitrogen assimilation
(B) Nitrogen fixation
(C) Denitrification
(D) Nitrification

13 Plants absorbs N2 in the form of
(A) Nitrites (NO_2^-)
(B) Nitrates (NO_3^-)
(C) Ammonium (NH_4^-)
(D) All of the above

14 Plants cannot absorb molecular N2 in the atmosphere because

(A) N_2 has double bonds making it highly stable

(B) Abundance in the atmosphere inhibits absorption

(C) N_2 has triple bonds making it highly stable

(D) None of these

15 Which of the following N_2 fixe is involved in symbiotic association with legumes forming roof nodules ?

(A) Rhizobium (B) Azotobacter

(C) Rhodospirillum (D) Clostridium

16 Leg hemoglobin creates

(A) Anaerobic condition for optimum activity of nitrogenase

(B) Aerobic condition for optimum activity of nitrogenase

(C) Required oxygen concentration for optimum activity of nitrogenase

(D) Suitable environment for nodule formation

17 The root nodules of legumes contain a pink pigment which has high affinity for oxygen is

(A) Non hemoglobin (B) Leg hemoglobin

(C) Hemoglobin (D) Bacterial hemoglobin

18 An estate where a single cash crop is grown for sale is known as ___.

(A) Subsistence farming (B) Kitchen garden

(C) Jhoom cultivation (D) Plantation farming

19 Horticulture is the study that includes

(A) Fruits, vegetables and flowers

(B) All food crops

(C) Vegetable gardens and lawns near hotels only

(D) Some bush crops and apples

20 In hybridization this is not part of the technique used

(A) Transfer pollen

(B) Collect pollen

(C) Emasculate

(D) Use of two plants to bridge the stems together

21 Cyanobacteria are used as biofertilisers because they ____.

(A) Are photosynthetic

(B) Grow easily anywhere

(C) Fix atmospheric nitrogen

(D) Have mucilage

22 Biofertilisers are ____.

(A) Some bacteria and cyanobacteria

(B) Fertilizers formed by ploughing in barseem

(C) Fertilizers obtained by decay of dead organisms

(D) Fertilizers prepared by mixing cattle dung with crop residues

23 Which of the following is a non-symbiotic biofertilizer ?

(A) VAM (B) Azotobacter

(C) Anabaena (D) Rhizobium

24 Organic farming does not include _____.

(A) Chemical fertilizers (B) Green manures

(C) Farmyard manures (D) Compost

25 Biofertilizers are the living organisms which _____.

(A) Bring about soil nutrient enrichment

(B) Maximize the ecological benefits

(C) Minimize the environmental hazards

(D) All of these

(2) BOE-102 : Environmental Biology

1 A mutual relationship between two organisms, where both of them are benefitting from watching the other is called

(A) Food chain
(B) Parasitism
(C) Mutualism
(D) Saprophyte

2 The natural residence of every organism is known as

(A) Biome
(B) Habitat
(C) Habit
(D) Niche

3 What percentage of oxygen and carbon dioxide exists in the ecosystem ?

(A) 20.95% and 0.004%
(B) 20.95% and 0.04%
(C) 20.0% and 0.40%
(D) 20.0% and 0.44%

4 The greenhouse effect in the atmosphere is produced due to :

(A) Absorption and re-emission of infrared radiation by the atmosphere
(B) Absorption and re-emission of ultra violet radiation by the atmosphere
(C) Absorption and re-emission of visible light by the atmosphere
(D) Absorption and re-emission of visible light by clouds

5 What is the name of the feature that allows organisms to survive in the conditions of their habitat ?

(A) Adjustment
(B) Adaptation
(C) Acclimatization
(D) Adaptive variation

6 Acid rain is a result of :

(A) Excess amount CO_2

(B) Excess amount of SO_2 and NO_2

(C) Excess amount of NH_3

(D) Excess carbon monoxide

7 The set of ecosystems is called ____.

(A) Atmosphere (B) Hydrosphere

(C) Biome (D) None of the above

8 The result of acid disposition is :

(A) Dying forests and lakes

(B) Acid indigestion _____ in humans

(C) Greenhouse effect lessens

(D) All of these

9 Which of the following is the smallest artificial ecosystem that has been sustained for a long period ?

(A) Folsom pond (B) Folsom bottle

(C) Folsom stream (D) None of these

10 The reason for soil pollution is ____.

(A) Ozone (B) Aerosol

(C) PAN (D) Acid rain

11 A wide variety of living organisms is called

(A) Biodiversity (B) Population

(C) Habitat (D) Diversity

12 Which is/are the abiotic components of an ecosystem ?

(A) Soil
(B) Protein
(C) Carbon
(D) All of the above

13 Shelford's law of tolerance is named after :

(A) James Shelford
(B) Jacob Shelford
(C) Ernest Shelford
(D) None of these

14 The natural place of an organism or community is known as

(A) Niche
(B) Biome
(C) Habitat
(D) Habit

15 Which is the renewable exhaustible natural energy resource ?

(A) Coal
(B) Petroleum
(C) Kerosene
(D) Biomass

16 An orchid living on a tree exhibits.

(A) Predator
(B) Mutualism
(C) Commensalism
(D) Parasitism

17 Which is not the characteristic of a population ?

(A) Natality
(B) Moratality
(C) Stratification
(D) Sex ratio

18 Plant species with a wide range of genetic distribution evolve into a local population known as

(A) Ecotype
(B) Population
(C) Ecosystem
(D) Biome

19 The ability of population to increase under ideal environmental conditions is called

(A) Natality
(B) Carrying capacity
(C) Biotic potential
(D) Absolute natality

20 Which of the following is not gaseous type cycle ?

(A) Carbon cycle
(B) Nitrogen cycle
(C) Oxygen
(D) Phosphorus cycle

21 Which of the following requires maximum energy ?

(A) Secondary consumer
(B) Decomposer
(C) Primary consumer
(D) Primary producer

22 Which statement is correct with respect to the food chain ?

(A) Every component of food chain forms trophic level
(B) Inter-relation between different food chains is known as a food web
(C) All the chains formed by nutritional relations is used to understand energy flow.
(D) All of the above

23 The term ecosystem was proposed by ____.

(A) Lindeman
(B) Grinnel
(C) Turesson
(D) AG Tansley

24 Lichen is the indicator of _____.

(A) Water pollution
(B) Noise pollution
(C) Air pollution
(D) Soil pollution

25 Phosphorous cycle absorbs phosphotes in the form of ___.

(A) PO_4^{3-}
(B) H_3PO_4
(C) PO_4^{5-}
(D) H_2PO_4

(3) BOE-103 : Biodiversity

1 Beta diversity mean diversity

(A) Over a large area

(B) Within a site

(C) Over an area consisting of many habitats

(D) Over an area consisting of single habitats

2 At present, the most significant cause of dwindling biodiversity is probably

(A) Biological magnificance of DDT

(B) Global warming

(C) The determination of ozone layer

(D) The destruction of habitat

3 Which of the following statements regarding alpha diversity is/ are correct ?

(A) Alpha diversity is represented by the number of species in a specified area

(B) It increase with the total number of individuals encompassed and thus with the increase in the area sampled and the productivity per unit area

(C) It is less on remote islands and increases as on moves towards the equator

(D) All of the above

4 Extinction is a _____ process.

(A) Natural (B) Artificial

(C) Scientific (D) Biotic

5 Which type of ecosystem diversity occur in a single habitat or an ecosystem ?

(A) Alpha diversity (B) Beta diversity

(C) Gamma diversity (D) All the above

6 Which kind of extinction of a species occurs in short duration of time ?

(A) Natural extinction (B) Mass extinction

(C) Anthropogenic extinction (D) None of the above

7 Which alien plant is rapidly spreading in Gujarat forest ?

(A) Lantana camara (B) Water hyacinth

(C) Eichornnia Crassipis (D) Hydrila verticillata

8 Why are blue whale and whooping crane susceptible to extinction ?

(A) Large size

(B) Smaller size of population and lower rate of reproduction

(C) Limited geographical distribution

(D) Fixed migratory routes and limited geographical distribution

9 Which factor influence the wider geographical distribution of a species ?

(A) Ecosystem diversity (B) Species diversity

(C) Genetic diversity (D) All of the above

10 Which one of the following values of diversity we can easily for the beauty of waterfall in "Western Ghats' ?

(A) Ethical values (B) Social values

(C) Option values (D) Aesthetic values

11 Which are the direct uses of biodiversity to mankind ?

(A) Cultural

(B) Aesthtic

(C) Source of medicine, food, fooder etc

(D) Ethical

12 What are called for the values of natures products that are consumed diversity ?

(A) Productive value (B) In Direct Value

(C) Non-Consumptive value (D) Consumptive value

13 Alpha, beta and gamma diversity given scientists name

(A) Raunkiers
(B) Linnaeus
(C) Earnst Mayer
(D) Whittaker

14 The national bureau of plant genetic resources is charged with the task of

(A) Pooling of germplasm
(B) Collection of all desirable varieties of plants and growing them in farms
(C) Maintenance of herbarium specimens collected from all over the world
(D) Maintenance of botanical garden

15 Ex-situ conservation refers to preservation

(A) In arboreta
(B) Inherbaria
(C) In restricted areas of occurrence
(D) Outside the natural areas of occurrence

16 The Red data Book which lists endangered species is maintained by

(A) WWF
(B) UNO
(C) WHO
(D) IUCN

17 When was Man and the Biosphere programme launched by the UNESCO ?

(A) 1965
(B) 1968
(C) 1971
(D) 1986

18 Chipko movement is a public agitation that occurred in

(A) Mansbal area in Kashmir
(B) Silent valley in Kerala
(C) Sundarban area in Bengal
(D) Tehri Garhwal area of Uttar Pradesh

19 IPRs protect the use of information and Ideas that are of _____.

(A) Social value
(B) Moral value
(C) Commercial value
(D) Ethical value

20 Which is called for the illegal collection of indigenous plants by corporations patent them for there own use ?

(A) Biopiracy (B) Biomagnifications

(C) Biodegradation (D) Biodiversity

21 Why India has been traditionally one of the targets of biopiracy ?

(A) Because India has more population

(B) Because India has large amount of biodiversity

(C) Because India is don't use biodiversity

(D) Because India do not impose any punishment for biopiracy

22 Chipko andolan is related to whom ?

(A) Wild life conservation (B) Conservation of forest

(C) Agro-science (D) Deforestation

23 Which one of the following is not a site for "in-situ" ?

(A) Biosphere reserve (B) Botanical garden

(C) National park (D) Wildlife sanctuary

24 The full form of WCMC is ___.

(A) World Conservation Monitoring Centre

(B) World Centre for Management Conservation

(C) World Conference Management Centre

(D) World Cancer Management Centre

25 The Full form of NBPGR is :

(A) National Bureau of Plant Genetic Resources

(B) National Bureau of Plant Gene Resources

(C) National Bureau of Regional Governments

(D) National Bureau of Plant Genetic Regulation

Seat No. _____

PAPER CODE : CCU-8810

M. Sc. (Sem. I) Examination

March – 2022

Botany : BOC-103

(Cell Biology)

(New Course)

Total Time : **60** Minutes | Total Marks : **70**

Total Questions : **50** | Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 Which structure provides structural support and protection to the cell.

(A) Cell membrane (B) Cell wall

(C) Nucleosome (D) Cell

2 What is the S-layer in bacteria's cell wall?

(A) Surface layer (B) Soluble layer

(C) Secondary layer (D) Solid layer

3 Fine strands carried by cytoplasm's small pores are known as?

(A) Plasmodeta (B) Plasmodesmata

(C) Plasmoedeta (D) Plasmodemata

4 Which cell organelle protects the cell's plasmodesmata?

(A) Nucleus (B) Endoplasmic reticulum

(C) Golgi bodies (D) Ribosome

5 Which of the following monitors and regulates entry into and out of the cell?

(A) Ribosome (B) Vacuole

(C) Cell membrane (D) Chloroplast

6 The plasma membrane is composed of ?

(A) A protein, a lipid and a cellulose layer

(B) A lipid layer between two protein layers

(C) A protein layer between two lipid layers

(D) Bimolecular lipid layer surrounded by protein layers

7 Transverse diffusion (flip-flop) is the movement of _____?

(A) Phospholipid (B) Protein

(C) Amino acid (D) Cholesterol molecule

8 Which of the following organelles in a cell does not contain DNA?

(A) Lysosomes (B) Nucleus

(C) Mitochondria (D) Chloroplast

9 The simplest unit, the saucer-like closed compartments of Golgi apparatus is called as?

(A) Tubules (B) Cristae

(C) Vescicles (D) Cisternae

10 Prokaryotic cells lack which of the following cell organelles?

(A) Nucleus (B) Lysosome

(C) Endoplasmic Reticulum (D) All of the above

11 The synthesis of phospholipids is aided by?

(A) Mitochondria

(B) Smooth Endoplasmic Reticulum

(C) Endoplasmic Reticulum

(D) Cytoplasm

12 Which of the following is known as the suicide bag of a cell?

(A) Mitochondria (B) Golgi Complex

(C) Lysosome (D) Nuclei

13 Which is the most important role of peroxisomes in our bodies?

(A) Breakdown of Formaldehyde

(B) Breakdown of Phthalates

(C) Breakdown of Hydrogen Peroxide

(D) Breakdown of proteins

14 What of the following cannot be killed by apoptosis?

(A) Cancer cells

(B) Cell with DNA damage

(C) Cell infected with viruses

(D) Immune cells

15 Microfilament functions include?

(A) Cytokinesis (B) Amoeboid movement

(C) Cell motility (D) All of the above

16 What are flagella and cilia of eukaryotic cells made of ?

(A) Tubulin (B) Desmin

(C) Lamin (D) Keratin

17 This is an active cell death situation.

(A) Senescence (B) Lysis

(C) Apoptosis (D) Necrosis

18 During necrosis, special enzymes are released by?

(A) Lysosomes (B) Vacuoles

(C) Cytoplasm (D) Golgi bodies

19 A network of microfilaments and microtubules is classified as

(A) Cytoskeleton (B) Active skeleton

(C) Vertebral skeleton (D) Endoplasmic skeleton

20 During which stage, a chromosome's thickness is the greatest?

(A) Metaphase (B) Anaphase

(C) Interphase (D) Prophase

21 When a cell divides, what are the DNA threads that appear inside the nucleus?

(A) Spindle fibers (B) Centrioles

(C) Chromosomes (D) Asters

22 The phase is when nuclear DNA replicates.

(A) G2 phase (B) S phase

(C) M phase (D) None of the above

23 Meiosis occurs in organisms during

(A) Sexual reproduction

(B) Vegetative reproduction

(C) Both sexual and vegetative reproduction

(D) None of the above

24 The best period to observe chromosome structure is during?

(A) Metaphase (B) Anaphase

(C) Prophase (D) None of the above

25 When synapsis is complete all along the chromosome, the cell is said to have entered a stage called?

(A) Zygotene (B) Pachytene

(C) Diplotene (D) Diakinesis

26 Out of following which statements is not correct for cyclin-dependent protein kinase?

(A) Their activity is regulated by cyclins.

(B) They can alter the activity of proteins involve in the progression of cells through cell cycle

(C) Their activity fluctuates during cell cycle

(D) Each type of cell contains one specific form

27 The chromosomes present in Drosophila's salivary gland are

(A) Lampbrush (B) B-chromosomes

(C) Polytene (D) Supernumerary

28 What are the names of the chromosomes found in oocytes?

(A) Lampbrush (B) B-chromosomes

(C) Polytene (D) Supernumerary

29 The color blindness gene in humans is found on the?

(A) X-chromosome only

(B) Y-chromosome only

(C) Both X and Y chromosome

(D) Either X-chromosome or Y-chromosome

30 The locations of _____ are puffs or balbiani rings in the chromosome of the salivary gland.

(A) Protein synthesis (B) RNA synthesis

(C) DNA replication (D) DNA duplication

31. Name the control center of the eukaryotic cell?

(A) Nucleus (b) Ribosome

(C) Cytoplasm (D) Golgi complex

32 What are the nuclear pores made up or.

(A) RNA (B) Nucleoporin

(C) DNA (D) None of the above

33 The main function of nucleolus is

(A) Protein synthesis (B) ATP production

(C) DNA synthesis (D) rRNA synthesis

34 Nucleosome is the primary structure of _____ ?

(A) Chromosome (B) Chromatin

(C) Both (D) None

35 The tightly packed form of DNA is called

(A) Upercoiling (B) Compressed state

(C) Euchromatin (D) Heterochromatin

36 Euchromatin is the

(A) Lightly packed form of chromatin

(B) Tightly packed form of chromatin

(C) Concentrated form of chromatin

(D) Elongated form of chromatin

37 The chromosome with the centromere in the center is known as _____.

(A) Submetacentric (B) Metacentric

(C) Telocentric (D) Acrocentric

38 A chromosome with a very short arm and a very long arm is referred to as

(A) Metacentric (B) Telocentric

(C) Acrocentric (D) Sub-metacentric

39 Name the part of a chromosome where t-loop is found.

(A) Telomere (B) Centromere

(C) Acromere (D) Tetraplex

40 Which of the following microscope is best suited for observing live specimens without staining?

(A) Compound microscope (B) Phase contrast microscope

(C) SEM (D) TEM

41 In light microscopy, which of the following is used as fixatives prior to staining technique?

(A) Osmic acid

(B) Glutaraldehyde

(C) Osmic acid, glutaraldehyde, heat

(D) Heat

42 Which of the following is used in electron microscope?

(A) Electron beams

(B) Magnetic fields

(C) Light waves

(D) Electron beams and magnetic fields

43 The technique used to locate specific genes in chromosomes is

(A) Colony hybridization (B) In situ hybridization

(C) Dot blot technique (D) Western blotting

44 Fluorescent in situ hybridization (FISH) would most likely be used to study ?

(A) In the detection of chromosomal abnormalities

(B) Is used in physical mapping of genomes

(C) Is used in sequence assembly

(D) None of the above

45 Flow cytometry uses _____

(A) Heavy isotope

(B) Radioactive elements

(C) Immunological techniques

(D) Energy content

46 Which fluorescent dye can be used for red fluorescence?

(A) Rhodamine (B) FluoresceinCalmine

(C) DAPI (D) None

47 Which of the following is not a natural stain

(A) Brazilin (B) Carmine

(C) Safranine (D) Hematoxylin

48 Out of following which is in situ hybridization technique?

(A) FISH (B) GISH

(C) Both (A) and (B) (D) None of the above

49 FISH stand for?

(A) Fluorescence in situ hybridization

(B) Fluorescence in situation hybridization

(C) Future in situ hybridization

(D) None of the above

50 Which among the following helps us in getting a three-dimensional picture of the specimen?

(A) Transmission Electron Microscope

(B) Scanning Electron Microscope

(C) Compound Microscope

(D) Simple Microscope

Seat No. _____

PAPER CODE : CCU-8801

M. Sc. (Sem. I) Examination

March – 2022

Botany : BOC - 102

(Plant Taxonomy)

(New Course)

Total Time : **60** Minutes
Total Questions : **50**

Total Marks : **70**
Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 Bentham and Hooker's classification system based on _____.

(A) Phylogenetic characters of plants

(B) Artificial characters of plants

(C) Natural characters of plants

(D) All of above

2 Phylogenetic classification system was first introduced by _____.

(A) Eichler (B) Linnacus

(C) De Jussieu (D) Robert Brown

3 Sexual behaviour of plants are noted first by which scientist ?

(A) Linnaeus (B) Bauhin

(C) Bassey (D) Takhtajan

4 _____ is considered as primitive.

(A) Liliopsida (B) Magnoliopsida

(C) Monocot (D) Asterales

5 Acharya Jagdish Chandra Bose Indian Botanic Garden located at :

(A) Howrah (B) Delhi

(C) Jodhpur (D) Mumbai

6 Where is the Western regional centre of Herbaria ?

(A) Mumbai (B) Ahmedabad

(C) Pune (D) Jaipur

7 The substitute for the newly collected specimen when the original type material is missing in a herbarium is entitled as :

(A) Holotype (B) Neotype

(C) Lectotype (D) Isotype

8 In the five-kingdom system of classification, into which kingdom would you classify nitrogen-fixing organisms and archaea ?

(A) Fungi (B) Plantae

(C) Protista (D) Monera

9 Difference between the natural system of plant classification and artificial system of classification is :

(A) Considers only one vegetative character

(B) Considers all the similarities between plants

(C) Considers only one floral character

(D) All of the above

10 Natural classification system was introduced by _____.

(A) Carl Linnaeus (B) Engler and Prantl

(C) Theophrastus (D) Jean Bauhin

11 Where is the Llyod's Botanical Garden situated ?

(A) Ooty (B) Bengaluru

(C) Darjeeling (D) Dehradun

12 Palynology deals with the study of _____.

(A) Pollen grains (B) Carpels

(C) Leaves (D) Fruits

13 Unique name for each species and maximum information is given in _____ systems.

(A) Artificial (B) Natural

(C) Phylogenetic (D) All of above

14 What is Herbarium ?

(A) Animal specimen preserved in formaldehyde

(B) Dried plant specimen

(C) Fossil specimen

(D) Preserved plant specimen in Formaldehyde

15 Pick the right sequence of taxonomic categories :

(A) division-class-family-tribe-order-genus-species

(B) division-class-family-order-tribe-genus-species

(C) division-class-order-family-tribe-genus-species

(D) division-order-class-family-genus-tribe-species

16 'New Systematics' term was coined by :

(A) Linnaus (B) Bentham and Hooker

(C) A.P. de Candolle (D) Juliane Huxley

17 Choose the right answer for the common characteristic in Plant taxonomy.

(A) Morphology (B) Palynology

(C) Anatomy (D) All of the above

18 _____ is the study of the morphology and physiology of cells.

(A) Cytology (B) Molecular biology

(C) Genetics (D) Anatomy

19 The document that includes all the information related to a particular genus or plant family is termed as :

(A) Monograph
(B) Record
(C) Revision
(D) Plant Module

20 Systematic Biology is the term used to refer :

(A) Phenetics + Plant Taxonomy
(B) Phylogenetic + Biology
(C) Systematics + Plant Taxonomy
(D) Dendrogram + Biology

21 Bentham and Hooker classified Gymnosperms as _____.

(A) Division
(B) Class
(C) Series
(D) Sub class

22 Who was the first-ever philosopher to classify living organisms ?

(A) Whittaker
(B) Aristotle
(C) Linnaeus
(D) Charles Darwin

23 Types of stomata are given by _____.

(A) Linnaeus
(B) Takhtajan
(C) Bentham and Hooker
(D) Metcalf and Chalk

24 Major disadvantage of artificial classification system is :

(A) Cannot describe evolution
(B) Cannot describe habit
(C) Cannot describe leaf type
(D) Cannot describe sexuality of plants

25 Non porous wood is the characteristic of _____ plants.

(A) Angiospermous (B) Symnospermous

(C) Monocot (D) Dicot

26 What type of plants does the Brassicaceae family have ?

(A) Lianas (B) Shrubs

(C) Trees (D) Herbs

27 ICBN is associated with nomenclature of :

(A) Animals (B) Plants

(C) Bacteria (D) Virus

28 Name of the Author :

(A) should be written in italics

(B) should be written in lined

(C) should be written in roman

(D) should be written in bold font

29 Unilacunar node is present in _____.

(A) Annonaceae (B) Meliaceae

(C) Chenopodiaceae (D) Apiaceae

30 Organisms with largest number of similarities will be present in :

(A) Kingdom (B) Order

(C) Division (D) Class

31 Which family is identified by hairs on seeds ?

(A) Malvaceae (B) Rutaceae

(C) Salvadoraceae (D) Lamiaceae

32 Basic unit of classification is :

(A) Family
(B) Order
(C) Series
(D) Species

33 Polyadelphous condition is found in :

(A) Rutaceae
(B) Liliaceae
(C) Poaceae
(D) Cyperaceae

34 Classical Taxonomy is termed as :

(A) Beta taxonomy
(B) Systematics
(C) Descriptive taxonomy
(D) Experimental taxonomy

35 Which is the term given to a duplicate specimen of original type ?

(A) Isotype
(B) Holotype
(C) Lectotype
(D) Neotype

36 Organizing taxonomic information in logical classification is called _____.

(A) Phonetic
(B) Systematics
(C) Dendogram
(D) Phylogenetic

37 In _____ stipule characters are very important.

(A) Rosaceae
(B) Meliaceae
(C) Manispermaceae
(D) Poaceae

38 Trimerous flowers is the characteristics of _____ family.

(A) Casuarinaceae
(B) Amaranthaceae
(C) Rutaceae
(D) Menispermaceae

39 Casuarinaceae family belongs to :

(A) Glumacae
(B) Unisexuales
(C) Curvembrae
(D) Coronerae

40 On the basis of trichomes _____ family can be separated by genus level.

(A) Umbelliferae
(B) Oleaceae
(C) Portulacaceae
(D) Asteraceae

41 Monadelphous stamens are found in :

(A) Meliaceae
(B) Menispermaceae
(C) Poaceae
(D) Oleaceae

42 Hesperidium fruit is found in _____ family.

(A) Meliaceae
(B) Rutaceae
(C) Capparaceae
(D) Cyperaceae

43 Liliaceae family having :

(A) Bulb
(B) Corm
(C) Tuber
(D) Rhizome

44 Glumes are present in _____ family.

(A) Amaryllidaceae
(B) Commelinaceae
(C) Liliaceae
(D) Poaceae

45 *Euphorbia* having :

(A) Hypenthodium inflorescence
(B) Cyathium inflorescence
(C) Verticillaster inflorescence
(D) Spike inflorescence

46 Gynostegium is found in :

(A) *Calotropis*
(B) *Euphorbia*
(C) *Capparis*
(D) *Heliotropium*

47 Tetramerous flowers :

(A) *Salvadora*
(B) *Tinospora*
(C) *Ocimum*
(D) *Foeniculum*

48 Verticillaster inflorescence is found in _____.

(A) Liliaceae
(B) Lamiaceae
(C) Lemnaceae
(D) Leguminosae

49 Which of these is the most advanced phylogenetically among the dicotyledonous families ?

(A) Scrophulariaceae
(B) Acanthaceae
(C) Umbelliferae
(D) Compositae

50 Fruit morphology is useful in the identification of _____.

(A) Order
(B) Genera
(C) Division
(D) Series

Seat No. _____

PAPER CODE : CCU-8792

M. Sc. (Sem. I) Examination

March – 2022

Botany : BOC - 101

(Biology & Diversity - I) (New Course)

Total Time : **60** Minutes
Total Questions : **50**

Total Marks : **70**
Students need to Tick only : **35**

Students need to tick only **35** questions. If more than **35** questions are ticked, the first **35** questions will only be evaluated.

1 The genetic material of viruses is covered with protein coat, which was known as ?

(A) Virion
(B) Capsid
(C) Peplomers
(D) Capsomers

2 Out of following, which are the components of Virus ?

(A) Protein coat and nucleic acid
(B) Protein coat and mitochondria
(C) Nucleic acid and cell membrane
(D) Nucleic acid, cell wall and cell membrane

3 Size of viruses' range between :

(A) 100 mm to 150 mm
(B) 30 nm to 300 nm
(C) 300 nm to 3000 nm
(D) 3 nm to 30 nm

4 Tobacco mosaic virus (TMV) is an example of :

(A) Helical Virus
(B) Circular Virus
(C) Linear Virus
(D) None

5 Viruses are ?

(A) Obligate parasites (B) Free living

(C) Both free living and parasitic (D) None of these

6 A fully formed infectious viral particle is called as :

(A) Viroid (B) Virusoid

(C) Virion (D) capsid

7 Gram positive bacteria have which colour ?

(A) Violet colour (B) Green colour

(C) Pink-red colour (D) Black colour

8 Which of these is a cocci occurring in a single or pairs ?

(A) Diplococci (B) Streptococci

(C) Tetracocci (D) None of the above

9 The cell wall of bacteria is made up of :

(A) Chitin (B) Cellulose

(C) Dextran (D) Peptidoglycan

10 Which type of bacteria have symbiotic association with legume plants ?

(A) Azatobacter (B) Clostridium

(C) Rhizobia (D) Frankia

11 Peptidoglycan is also known as :

(A) N-acetyl muramic acid (B) Murein mucopeptide

(C) N acetylglucosamine (D) Aminopimetic acid

12 The structure responsible for motility of bacteria is :

(A) Pilli
(B) Flagella
(C) Sheath
(D) Capsules

13 Out of following which one is a example of colonial alga ?

(A) Ulothrix
(B) Spirogyra
(C) Volvox
(D) Chlorella

14 Plants which are not differential into roots, stems and leaves are grouped under :

(A) Thallophytes
(B) Gymnosperms
(C) Pteriodophytes
(D) Spermatophyte

15 Which one is a great source of Agar ?

(A) Fungi
(B) Algae
(C) Bryophytes
(D) Gymnosperms

16 Which type of sexual reproduction found in Chlorophyceae ?

(A) Oogamous
(B) Anisogamous
(C) Isogamous
(D) All of the above

17 What is the shape of chloroplast in Chlamydomonas ?

(A) Cup-shaped
(B) Spiral
(C) Stellate
(D) Collar-shaped

18 In which group of algae sexual reproduction is absent ?

(A) Green algae
(B) Blue green algae
(C) Red algae
(D) Brown algae

19 Carrageenan is used as a _____.

(A) Emulsifier
(B) Solidifying agent
(C) Binder
(D) Emulsifier and binder

20 What is the storage product of most algae ?

(A) Cellulose
(B) Glycogen
(C) Starch and oil
(D) FAT

21 Fucoxanthin pigment is present in which group of algae ?

(A) Rhodophycophyta
(B) Xanthophycophyta
(C) Phaeophycophyta
(D) Chlorophycophyta

22 Ability to fix atmospheric nitrogen is found in which algae ?

(A) Leaves of some crop plants
(B) Chlorella
(C) Some marine red algae
(D) Some blue green algae

23 Zygotic meiosis is a characteristic feature of :

(A) Algae
(B) Bryophytes
(C) Pteridophytes
(D) Gymnosperms

24 Out of following which one is Parasitic algae ?

(A) Ulothrix
(B) Cephaleuros
(C) Spirogyra
(D) Chlamydomonas

25 Mannitol is a reserved food found in which type of algae ?

(A) Gracillaria
(B) Porphyra
(C) Chara
(D) Fucus

26 Which division of fungi lacks flagella ?

(A) Mastigomycota (B) Amastigomycota

(C) Gymnomycota (D) Basidiomycetes

27 Fruiting bodies of Penicillium :

(A) Acervulus (B) Cleistothecium

(C) Apothecium (D) Perithecium

28 Mode of reproduction is fungi is :

(A) Sexual (B) Asexual

(C) Both A and B (D) None of the above

29 Which kind of thallus is found in fungi ?

(A) Plasmodium (Plasmodiophora)

(B) Unicellular (yeast)

(C) Multicellular/filamentous/mycelial

(D) All of the above

30 Zygomycota are also known as :

(A) Bread moulds (B) Sac fungi

(C) Club fungi (D) Fungi imperfect

31 The mode of nutrition of Rhizopus, Yeast and Penicillium is :

(A) Parasitic (B) Saprophytic

(C) Symbiotic (D) Autotrophic

32 Which fungi division is also known as Club fungi ?

(A) Zygomycota (B) Deuteromycotta

(C) Basidiomycota (D) Ascomycota

33 The fungi which derive their food directly from dead organic matter are known as :

(A) Predators
(B) Saprophytes
(C) Mutualists
(D) Parasitic fungi

34 What does 'Perfect Stage' of a fungus indicate ?

(A) Indicates that it can reproduce asexually
(B) Indicates that it is perfectly health
(C) Indicates that it is able to form perfect sexual spores
(D) All of the above

35 Absorptive heterotrophic nutrition is exhibited by :

(A) Fungi
(B) Algae
(C) Pteridophytes
(D) Bryophytes

36 Heterothallism was first discovered by whom ?

(A) Blakeslee
(B) Mehta
(C) Pasteur
(D) Alexopolous

37 In fungi, spores in sporangia are produced by which type reproduction process ?

(A) Sexual
(B) Asexual
(C) Both of these
(D) None of these

38 How many ascospores present in one ascus after completion of miosis ?

(A) 1
(B) 2
(C) 4
(D) 8

39 Name the disease of plant in which large yellow spot appears on the leaves ?

(A) Bacterial Blight
(B) Bacterial Spot
(C) Aphids
(D) Botrytis

40 In which disease of plant white mildew appears typically on underside of leaves ?

(A) Cylindrocladium
(B) Angular leaf Spot
(C) Downy Mildew
(D) Black arm of Cotton

41 Sulphur fungicides are very effective in the control of :

(A) Anthracnose disease
(B) Wilts
(C) Powdery mildews
(D) Downy mildews

42 Which of the following is a chemical plant defence ?

(A) Producing antibacterial substances
(B) Thorns and spikes
(C) Layers of dead cells
(D) Mimicry

43 Out of following which is not type of physical plant defence ?

(A) Nutrient deprivation
(B) Thorns
(C) Tough waxy cuticles
(D) Spikes

44 Plant diseases are broadly classified into which category ?

(A) Nonparasitic
(B) Parasitic
(C) Both (A) and (B)
(D) None of the above

45 Which of the following is not related to Necrosis ?

(A) Curling of leaves

(B) Death of tissues

(C) A common symptom of fungal diseases

(D) Discolouration of leaves

46 Plant pathogenic bacteria are :

(A) Phototrophs (B) Autotrophs

(C) Chemotrops (D) Heterotrophs

47 Which of the following is not a common symptom of plant disease ?

(A) Necrosis (B) Leaf curls

(C) Perfect flowering (D) Chlorosis

48 Tikka disease is related with the crop :

(A) Groundnut (B) Paddy

(C) Mustard (D) All of these

49 Bacterial blight of paddy is caused by :

(A) *Phytophthora infastans*

(B) *Pythium aphanidermatum*

(C) *Xanthomonas oryzae* pv. oryzae

(D) None of the above

50 Powdery mildew of Cucurbits is caused by :

(A) *Erysiphe cichoracearum* (B) Sphaerotheca fuliginea

(C) Both (A) and (B) (D) None