113/2025

Question Booklet Alpha Code **A**

Question Booklet Serial Number

Total No. of questions : 100 Time : 1 Hour 30 Minutes

Maximum : 100 Marks

INSTRUCTIONS TO CANDIDATES

1. The question paper will be given in the form of a Question Booklet. There will be four versions of question booklets with question booklet alpha code viz. A, B, C & D.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the question booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a question booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your question booklet is un-numbered, please get it replaced by new question booklet with same alpha code.
6. The question booklet will be sealed at the middle of the right margin. Candidate should not open the question booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the question booklet supplied to him contains all the 100 questions in serial order. The question booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the question booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball-Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

113/2025

Maximum : 100 marks

Time : 1 hour and 30 minutes

1. Polymorphism is a characteristic feature of which of the following phyla?

(A) Cnidaria (B) Porifera

(C) Echinodermata (D) Placozoa

2. Placoderms are significant in vertebrate phylogeny because they are :

(A) First tetrapods (B) Early jawed vertebrates

(C) Modern amphibians (D) Primitive echinoderms

3. Prototheria includes which of the following animals?

(A) Kangaroos (B) Elephants

(C) Platypus (D) Wolves

4. The Hardy-Weinberg principle helps to predict :

(A) Evolutionary changes in small populations

(B) Stability of allele frequencies in large populations

(C) Mutation rates

(D) Fossil formation

5. The "founder effect" describes a situation in which :

(A) A new species arises

(B) A small group establishes a new population with limited genetic variation

(C) A species undergoes adaptive radiation

(D) An entire population experiences a bottleneck

6. Which unit measures the dose of ionizing radiation absorbed by tissue?

(A) Becquerel (B) Sievert

(C) Curie (D) Farad

7. Which technique is used to separate and analyse DNA, RNA, or protein?

(A) Scintillation counting (B) Flow cytometry

(C) Autoradiography (D) Gel electrophoresis

8. In liquid scintillation counting, scintillation is caused by :

(A) Interaction of radiation with light-sensitive chemicals

(B) Emission of beta particles from a sample

(C) Radioactive decay of alpha particles

(D) Heat generation by cellular enzymes

9. Which among the following has heterocrine function?

(A) Adrenal and salivary gland

(B) Thyroid and Pineal

(C) Pancreas and Gonads

(D) Thymus and Liver

10. Choose which among the following statement is correct relating to hormonal regulation of male reproductive functions:

(i) Testosterone levels are regulated by negative feedback of FSH alone.

(ii) LH stimulates Leydig cells to produce testosterone which in turn supports spermatogenesis.

(iii) FSH and testosterone are together necessary to maintain Sertoli cell function and spermatid maturation.

(iv) Estrogens are merely female hormones and do not have any role in male reproductive physiology.

(A) (i) and (ii)

(B) (iii) and (iv)

(C) (ii) and (iii)

(D) (ii) and (iv)

11. Sometimes after doing physical work we get muscle cramps. This results due to :

(A) non-conversion of glucose to pyruvate

(B) non-conversion of glucose to lactic acid

(C) conversion of pyruvate to lactic acid

(D) conversion of pyruvate to alcohol

12. Which respiratory principle is INCORRECT?

(A) Fick's law states that "the volume of gas per unit time that moves across a sheet of tissue is proportional to the area of the sheet, but inversely proportional to its thickness"

(B) The Bohr effect is "the effect of PCO2 on the O2 dissociation curve due to the action of PCO2 on H+ concentration"

(C) Henry's law states that "the amount of gas dissolved is proportional to the partial pressure of that gas"

(D) The chloride shift is "the diffusion of HCO3 – in to the cell, with the outward diffusion of Cl– ions to maintain electrical neutrality"

13. People living at high altitudes have increased levels of 2,3-bisphosphoglycerate (DPG) in their red blood cells. This high level of DPG will :

(A) Increase the Bohr effect and make oxygen more available to the tissue

(B) Bind to hemoglobin and reduce the amount of oxygen available to the tissue

(C) Bind to hemoglobin and increase the amount of oxygen available to the tissue

(D) Shift the oxygen-hemoglobin dissociation curve to the left and reduce the amount of oxygen available to the tissue

14. Calculate the expiratory reserve volume from the following data : Tidal volume = 525 mL, Inspiratory reserve volume = 3175 mL, Forced Vital capacity = 4975.

(A) 1275 mL

(B) 1800 mL

(C) 2650 mL

(D) 3700 mL

15. In which test tube would protein digestion occur at the highest rate?

(A) Tube containing pepsinogen and salivary amylase

(B) Tube containing pepsinogen

(C) Tube containing HCl and intestinal amylase

(D) Tube containing HCl and pepsinogen

16. Which of the following statement regarding counter current mechanism is correct?

(i) Ascending limb of Henle's loop actively transports Nacl into the medullary interstitium.

(ii) Descending limb of vasa recta transports Nacl into renal medulla.

(iii) Counter current mechanism increases the osmolarity of the medullary interstitium, facilitating water reabsorption from collecting duct.

(iv) The thin segment of the ascending limb of Henle's loop allows the passage of urea into the medullar interstitium.

(A) Only (i), (ii) and (iv)

(B) Only (i), (iii) and (iv)

(C) Only (ii), (iii) and (iv)

(D) Only (i), (ii) and (iii)

17. Broca's area is located in :

(A) the frontal lobe

(B) the parietal lobe

(C) the temporal lobe

(D) the occipital lobe

18. Lymphatic capillaries resemble blood capillaries because lymphatic capillaries :

(A) have the same permeability as blood capillaries
(B) lead to the vena cava
(C) have a lining of endothelium
(D) are thick-walled tubes

19. Which of the following is not a symptom of Parkinson's disease?

(A) early memory loss
(B) tremors
(C) muscle rigidity
(D) an inability to initiate movement

20. An electrocardiogram (ECG) reveals no P waves. This would indicate that impulses from which one of the following structures are being blocked?

(A) Sinoatrial (SA) node
(B) Bundle of His
(C) Purkinje fibers
(D) Ventricular muscle

21. Identify the correctly matched pair from the list given below:

	A		B
(i)	Disruption of GATA -2 gene	–	Death of the animal in the embryonic stage
(ii)	Transcription factor, Ikaros	–	Essential for erythropoiesis
(iii)	Absence of Transcription factor GATA-1	–	Haematopoietic cells will not differentiate into erythroid progenitor
(iv)	An Oct-2 knock out mice	–	Absence of plasma cells due to the failure of differentiation of B cells

(A) All are correct
(B) (i), (ii) and (iv) are correct
(C) All except (iv) are correct
(D) All except (ii) are correct

22. Assertion [A] : Lipopolysaccharide (LPS) is a potent adjuvant that can be safely used in vaccines.

Reason [R] : LPS, a major component of the outer membrane of Gram-negative bacteria is a TLR-4 agonist that can trigger strong immune response.

Which of the following statements is the most appropriate answer?

(A) Both the assertion and reasons are correct, and the [R] is a correct explanation of the [A]
(B) Both the assertion and reason are correct, but the [R] is not a correct explanation of the [A]
(C) The assertion is correct, but the reason is incorrect
(D) The assertion is incorrect, but the reason is correct

23. Read the statements given below and select the correct option :

(i) Chagas disease is primarily transmitted by the bite of an infected "kissing bug".

(ii) *Trypanosoma cruzi* causes a significant reduction in the expression of the 55-kDa α subunit of the IL-2 receptor in T cells.

(iii) The α subunit of the IL-2 receptor is specific for cytokine binding.

(iv) The reduction in the expression of α subunit of IL2 receptor of T cell can occur only with the direct contact between *T. cruzi and* lymphocytes.

(v) Anti-CD3 monoclonal antibodies typically activate peripheral T cells, but in the presence of *Trypanosoma cruzi* this activation is inhibited.

(A) All are true

(B) All except (iv) are true

(C) All except (iii) and (v) are false

(D) Only (i) is false.

24. Match the following :

(i)	Membrane attack complex (MAC)	(1)	Can cause Auto antibody mediated thrombopenia
(ii)	Rheumatic fever	(2)	Haemolytic anaemia due to the production of auto immune antibody against RBC
(iii)	Goodpasture's syndrome	(3)	Antibodies against group A streptococci cross-react with Cardiac tissue
(iv)	Phenacetine	(4)	A protein complex formed by complement proteins that can lyse cells.
(v)	Quinine	(5)	Autoimmune antibodies produced attacks the basement membrane of kidneys and lungs.

(A) (i)-(4), (ii)-(3), (iii)-(5), (iv)-(2), (v)-(1)

(B) (i)-(3), (ii)-(4), (iii)-(5), (iv)-(2), (v)-(1)

(C) (i)-(4), (ii)-(5), (iii)-(3), (iv)-(2), (v)-(1)

(D) (i)-(3), (ii)-(4), (iii)-(5), (iv)-(1), (v)-(2)

25. Which of the following is an attenuated whole organism vaccine?

(A) Hepatitis B Vaccine

(B) Polio (Salk) vaccine

(C) BCG vaccine

(D) Tetanus toxoid vaccine

26. Which of the following statements about haptens is/are true?

(i) A hapten can bind to the antigen receptor of CD4 + T cells without being processed by macrophages.

(ii) A hapten is the antigen-binding site in the hypervariable region of IgG.

(iii) Haptens are antigenic but not immunogenic.

(iv) Haptens are neither antigenic nor immunogenic by themselves.

(v) Hapten alone can bind to the IgM receptor on the B-cell surface, but cannot lead to plasma cell formation.

(A) (iii) and (v) only

(B) All except (ii) and (iv)

(C) All except (i) and (ii)

(D) (iii) only

27. Choose the correct options to fill the blanks :

IgG, the most abundant class in serum, constitutes about 80% of the total serum immunoglobulin. There are four human IgG subclasses, distinguished by differences in (i) _____ chain sequence. (ii) _____ is the most effect complement activator while (iii) _____ cannot activate complement at all. All Ig G subclass except (iv) _____ can cross placenta and protect the developing foetus.

(1) γ, (2) α, (3) IgG1, (4) IgG2, (5) IgG3, (6) IgG4

(A) (i)-(2), (ii)-(6), (iii)-(5), (iv)-(4)

(B) (i)-(1), (ii)-(5), (iii)-(3), (iv)-(4)

(C) (i)-(1), (ii)-(5), (iii)-(6), (iv)-(4)

(D) None of these

28. Which of the following statements is correct?

(A) The classical pathway is activated by binding of C1 to the Fc region of IgE antibodies

(B) The alternative pathway does not require antibody for activation

(C) C3b functions primarily as a Chemotactic factor to recruit immune cells

(D) The Membrane Attack Complex (MAC) is composed of C3,C4, C5 and C6 proteins

29. Read the statements and pick out most suitable one from the options given below :

Statement I. IgM can bind antigens more effectively than IgG in certain situations.

Statement II. Affinity of IgM towards antigens is greater than IgG

Statement III. Avidity of IgM is greater than IgG

(A) Statements I, II and III are correct and II and III justifies I

(B) Statements I, II and III are incorrect

(C) Statements I, II and III are correct and only II justifies I

(D) Only the statements I and III are correct and III justifies I

30. Match the following and select most appropriate option:

	Type of Hypersensitivity		Characteristics
(i)	Type I	(1)	T cell-mediated, delayed-type hypersensitivity
(ii)	Type II	(2)	Immune complex-mediated disease
(iii)	Type III	(3)	Antibody-dependent cell-mediated cytotoxicity (ADCC)
(iv)	Type IV	(4)	IgE-mediated immediate hypersensitivity
		(5)	NK cell mediated and delayed type hypersensitivity

(A) (i)-(4), (ii)-(3), (iii)-(2), (iv)-(1)

(B) (i)-(4), (ii)-(3), (iii)-(2), (iv)-(5)

(C) (i)-(5), (ii)-(2), (iii)-(1), (iv)-(3)

(D) None of these

31. What are the major disadvantages of serum in culture media among the following?

(i) Variable composition

(ii) It does not provide trace elements and nutrients.

(iii) It may be a source of contamination.

(iv) Lack of growth promoters.

(A) (i) and (ii) only

(B) (i) and (iii) only

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

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

32. Which of the following statements accurately describes the mechanism of electroporation?

(A) Electroporation uses a high-velocity micro projectile to deliver DNA into cells

(B) Electroporation relies on the natural ability of Agrobacterium to transfer DNA into plant cells

(C) Electroporation involves the use of electric pulses to create temporary pores in the cell membrane, allowing DNA to enter

(D) Electroporation utilises a gene gun to shoot DNA-coated particles into cells

33. Which among the following forms the world's first DNA covid vaccine approved for human use which received emergency use authorization in India in August 2021?

(A) Inovio's INO-4800 (B) VGX-3100

(C) ZyCoV-D (D) pVAC-1

34. What role do monoclonal antibodies play in immunotherapy for cancer?

(i) Immune Checkpoint Inhibition

(ii) Activating immune cells

(iii) Targeted killing

(iv) Blocking Growth Signals

(A) (i) and (ii) only

(B) (i) and (iii) only

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

(D) All (i), (ii), (iii) and (iv)

35. Select incorrect statements regarding the process of cryopreservation :

(A) Dimethyl sulfoxide is commonly used as a cryoprotectant to prevent ice crystal formation during the cryopreservation of cells

(B) During cryopreservation, –150°C to –196°C temperature range is typically used to store biological samples in liquid nitrogen

(C) Vitrification makes no significant improvement in cryopreservation of oocytes

(D) Membrane rupture due to rapid temperature change is a potential damage can occur during the thawing process of cryopreserved cells

36. The primary mechanism of CRISPR-Cas9 gene editing is:

(A) Homologous recombination

(B) Double-stranded DNA breaks and repair

(C) RNA interference

(D) Non-homologous end joining

37. The primary application of Terminator Gene Technology in agriculture is :

(i) To protect intellectual property right

(ii) Seed sterility

(iii) Enhance crop yield

(iv) Pest Control

(A) (i) and (ii)

(B) (ii) and (iii)

(C) (ii), (iii) and (iv)

(D) (i), (ii) and (iii)

38. Which of the following is a characteristic feature of pluripotent stem cells?

(A) They can differentiate into any cell type, including placenta and extra-embryonic tissues

(B) They can differentiate into all cell types of the body but not extra-embryonic tissues

(C) They are committed to forming only a few specific cell types

(D) They are capable of self-renewal but cannot differentiate into other cell types

39. Which of the following statements best defines genomic equivalence?

(A) Differentiated cells have distinct genomes due to gene deletion or amplification

(B) Different cell types have variations in their -genomic DNA sequences

(C) All somatic cells possess identical genomes, regardless of their developmental fate

(D) Genomic equivalence implies that all genes are expressed equally in every cell

40. Select the statements which accurately describe mechanisms by which cytoplasmic determinants influence cell fate and gene expression during embryonic development :

(i) By regulating mRNA stability and localization cytoplasmic determinants influence gene expression in the developing embryo.

(ii) Cytoplasmic determinants establish localized regions within the embryo that influence how cells respond to morphogen gradients.

(iii) Cytoplasmic determinants are partitioned asymmetrically during cell division, leading to differences in cell fate between the daughter cells.

(A) (i) only
(B) (i) and (ii) only
(C) (iii) only
(D) All of the above

41. What is the primary function of genomic imprinting in mammals?

(A) Regulation of gene expression during embryogenesis.
(B) Maintenance of genome stability
(C) Control of X-chromosome inactivation
(D) Repair of DNA damage

42. Which of the following statements is true about cell differentiation?

(i) The process of differentiation is typically irreversible.

(ii) It involves changes in gene expression without altering the DNA sequence.

(iii) All cells retain totipotency throughout development

(iv) It is determined solely by external signals.

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

43. Select the roles of organizer in embryonic induction :

(i) Axis Formation

(ii) Promote neural induction

(iii) Organize the formation of extra embryonic tissues

(iv) Regulation of Cell Fate

(A) (i) and (ii)
(B) (i) and (iii)
(C) (i), (ii) and (iv)
(D) All of the above

44. Morphogenetic gradients play a crucial role in:

(A) Cell fate determination
(B) Tissue patterning
(C) Organogenesis
(D) All the above

45. What is the function of the zonapellucida in mammalian fertilization?

(i) It provides nutrients to the sperm.
(ii) It facilitates the transport of sperm through the female reproductive tract.
(iii) Prevention of polyspermy
(iv) Sperm binding and induction of acrosome reaction.

(A) (i) and (iii)
(B) (i) and (ii)
(C) (iii) and (iv)
(D) All of the above

46. What is the significance of the cleavage pattern in determining the developmental fate of the embryo?

(A) It has no significant impact on the embryo's fate
(B) It influences the distribution of cytoplasmic determinants and affects gene expression
(C) It only affects the morphology of the embryo, not its developmental pathways
(D) It is solely determined by the type of egg yolk present

47. A patient presents with features of Turner syndrome, which is characterized by the absence of one X chromosome. What is the typical karyotype associated with this condition?

(A) 47, XX, + 21
(B) 46, XX
(C) 45, X
(D) 46, XY

48. In a pedigree chart, a trait appears in every generation and both males and females are equally affected. What type of inheritance is most likely represented?

(A) Autosomal dominant
(B) Autosomal recessive
(C) X-linked dominant
(D) Mitochondrial inheritance

49. What is the mechanism by which microRNAs regulate gene expression, as discovered by Victor Ambros and Gary Ruvkun (2024 Nobel Prize)?

(A) By altering DNA methylation patterns

(B) By degrading mRNA or blocking its translation

(C) By promoting histone acetylation

(D) By increasing the rate of mRNA splicing

50. Which of the following best describes the mechanism by which *Naegleria fowleri* causes primary amoebic meningoencephalitis (PAM)?

(A) The amoeba secretes toxins that destroy brain tissue

(B) The amoeba enters through the skin and spreads via the bloodstream to the brain

(C) The amoeba enters through the nose and migrates along the olfactory nerve to the brain

(D) The amoeba infects the gastrointestinal tract and spreads to the brain via the vagus nerve

51. Which of the following molecules is not linear?

(A) $SnCl_2$ (B) BeF_2

(C) XeF_2 (D) I_3^-

52. BCl_3 on reduction with $LiAlH_4$ gives:

(A) B_4H_{10} (B) B_2H_6

(C) Boric acid (D) $B_3N_3H_6$

53. Which of the following statements is correct?

(i) Conjugate base of NH_2^- is NH_3

(ii) $AlCl_3$ is an example for Arrhenius acid

(iii) Cu^+ and Pt^{2+} are hard acids

(iv) $FeCl_3$ is a Lewis acid

(A) (i) (B) (ii)

(C) (iii) (D) (iv)

54. Trivalent cation of a transition metal, M forms an octahedral complex with ligands A and B of formula $[MA_4B_2]$. Number of geometrical isomers possible for the complex is :

(A) 2 (B) 3

(C) 4 (D) 0

55. Which of the following statements is correct?

(i) 12-Phosphotungstic acid has Keggin's structure

(ii) $[Cu(H_2O)_6]^{2+}$ has a regular octahedral geometry

(iii) NH_3 has higher *trans effect* than Cl^-

(A) (i) (B) (ii)

(C) (iii) (D) Both (ii) and (iii)

56. The possible number of microstates corresponding to an electronic configuration having the ground state term ^5D is :

(A) 45 (B) 252

(C) 10 (D) 210

57. The electrogenic activity of Na^+/K^+ pump is due:

(A) The development of negative potential inside the cell

(B) The development of positive potential inside the cell

(C) The continuous reduction of negative charge inside the cell

(D) The passive transport

58. The light absorption maxima of chlorophyll in PS II is designated as :

(A) P 450 (B) P 700

(C) P 680 (D) P 650

59. The ^{19}F NMR spectra of PCl_2F_3 in isopentane, the resonances of fluorine at temperatures $\geq -22°C$ are appeared as:

(A) Triplet (B) Singlet

(C) Single doublet (D) Doublet of triplets

60. Which of the following statement is/are correct about Ferrocene?

(i) The crystalline phase of ferrocene at room temperature is Monoclinic

(ii) Ferrocene obeys 18 electron rule

(iii) Ferrocene shows exceptional thermal stability

(A) Only (i)

(B) Only (ii) and (iii)

(C) Only (iii)

(D) All of the above (i), (ii) and (iii)

61. Which of the following statements correctly describes a characteristic or application of inorganic solid-state materials?

(i) Solid Oxide Fuel Cells (SOFC) operate effectively at room temperature due to their high ionic conductivity.

(ii) Metal-rich phases are typically associated with cationic conductivity and are essential in rechargeable battery applications.

(iii) Fullerides are known for exhibiting unique electronic properties due to their molecular structure, making them useful as one-dimensional metals.

(iv) Inorganic phosphors are primarily used in solid-state batteries due to their ability to conduct both electrons and ions.

(A) (i) and (iii)

(B) (ii) and (iv)

(C) (iii) only

(D) (i), (ii), and (iii)

62. In which of the following applications would a material with strong pyroelectric properties be most suitable?

(A) Ultrasound imaging in medical devices

(B) Motion detection in infrared sensors

(C) High-capacitance storage in memory devices

(D) Energy harvesting from mechanical vibrations

63. Which of the following applications of nuclear reactions is primarily associated with the concept of critical size?

(A) Power generation in nuclear fission reactors

(B) Medical imaging using Positron Emission Tomography (PET)

(C) Energy production through controlled fusion in stars

(D) Neutron activation analysis for material characterization

64. Which type of crystal defect is primarily responsible for enhancing the electrical conductivity of semiconductors?

(A) Point defects
(B) Dislocation defects
(C) Grain boundary defects
(D) Vacancy defects

65. Which of the following statements about the temperature dependence of conductivity in semiconductors is most accurate regarding its underlying chemical and physical principles?

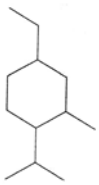
(A) In intrinsic semiconductors, increasing temperature leads to a proportional increase in both carrier density and mobility, resulting in a constant conductivity

(B) The behaviour of p-type and n-type semiconductors at elevated temperatures can be understood through the band theory, where increased temperature reduces the energy gap between the valence and conduction bands

(C) Superconductivity occurs at low temperatures due to Cooper pair formation, which is fundamentally a quantum mechanical phenomenon that does not rely on traditional carrier mobility concepts

(D) Photoconductivity relies on the excitation of electrons from the valence band to the conduction band by photon absorption, with temperature playing a crucial role in the availability of energy states for this transition

66. Give the IUPAC name of the given compound :



(A) 4-Ethyl-1-isopropyl-2-methyl-cyclohexane
(B) 1-Methyl-2 ethyl-4-propyl cyclohexane
(C) 1-Methyl-1-ethyl-4-isopropylcyclohexane
(D) 1-Isopropyl-4-ethyl-6-methyl-cyclohexane

67. The specific kind of isomerism shown by BINOL is :

(A) Stereoisomerism
(B) Optical isomerism
(C) Geometrical isomerism
(D) Atropisomerism

68. Which of the following statement regarding Crams Rule is correct?

(i) It is related Conformers of chiral carbon containing Ketone.

(ii) It is related to conformation of cyclic compounds.

(iii) Predict the stereochemistry of addition reaction of carbonyl compounds.

(iv) It is related to chiral aldehydes.

(A) (i) and (ii) (B) (ii) and (iii)

(C) (i), (iii), (iv) (D) All the above

69. When alcohol is treated with thionyl chloride the product formed is/are _____ and the mechanism it follows is _____.

(A) R-SO_3H and S_N2 (B) R-SO-Cl and S_N1

(C) R-Cl and $S_N i$ (D) RSO_3H , R-SO-Cl and S_N2

70. The intermediate formed in Reimer-Tiemann reaction :

(A) Carbocation (B) Free radicle

(C) Nitrene (D) Dichloro carbene

71. _____ is not a rearrangement reaction.

(A) Lossen (B) Heck

(C) Favorskii (D) Demjanov

72. Which of the following is the correct statement when alkene is treated with the reagent diimide?

(A) It form a cyclic transition state

(B) It involves addition reaction

(C) Diimide act as a reducing agent

(D) All the above

73. When isotopic substitution is done at the position where the bond being broken then it belongs to _____ effect.

(A) Primary isotopic (B) Secondary Isotopic effect

(C) Kinetic effect (D) Inverse isotopic effect

74. The method of finding the starting material from the target molecule is called _____ and the symbol used to represent it is _____.

(A) Metathesis $\Rightarrow$ (B) Retrosynthesis $\Longrightarrow$

(C) Metathesis  (D) Retrosynthesis 

75. The metal present in Tebbe's reagent :

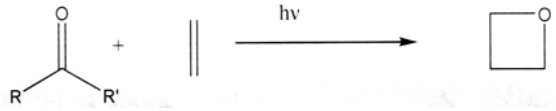
(A) Cd
(B) Al and Ti
(C) Cd and Pd
(D) Ti

76. Parallel synthesis is a method related to :

(A) CADD
(B) Solid state peptide synthesis
(C) Combinatorial synthesis
(D) Synthesis of supra molecules

77. Orlon is a monomer of :

(A) Caprolactum
(B) Acylonitrile
(C) Adipic acid
(D) Oleic acid

78. 

Name the above reaction

(A) Photo Fries
(B) Loffler-Freytag
(C) Paterno-Buchi
(D) Barton reaction

79. How many H^1 NMR signal is observed for DIethyl succinate?

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

80. Which of the following can be used to identify Enantiomers?

(A) ORD
(B) Chiral Column
(C) CD
(D) Both ORD and CD

81. The entropy change (ΔS) is one mole of an ideal gas during its heating from initial temperature T_1 to final temperature T_2 under isobaric condition is :

(A) $\Delta S = C_V \ln T_2/T_1$
(B) $\Delta S = C_P \ln T_1/T_2 - R \ln P_2/P_1$
(C) $\Delta S = C_P \ln T_2/T_1$
(D) $\Delta S = C_V \ln T_2/T_1 - R \ln P_2/P_1$

82. The van der Waals constants (a and b) are related to the Boyle temperature (T_B) as :

(A) $a/b\ R = T_B$
(B) $b/a\ R = T_B$
(C) $2\,b/a\ R = T_B$
(D) $b\ R/a = T_B$

83. Maxwell relation, which is derived from thermodynamic relation $dG = -SdT + VdP$ is :

(A) $\left(\frac{\vartheta S}{\vartheta P}\right)T = \left(\frac{\vartheta V}{\vartheta T}\right)P$

(B) $\left(\frac{\vartheta S}{\vartheta V}\right)P = -\left(\frac{\vartheta P}{\vartheta T}\right)V$

(C) $\left(\frac{\vartheta T}{\vartheta V}\right)S = \left(\frac{\vartheta P}{\vartheta S}\right)V$

(D) $\left(\frac{\vartheta S}{\vartheta P}\right)T = -\left(\frac{\vartheta V}{\vartheta T}\right)P$

84. The yellow colour developed in NaCl, when it is heated in sodium vapour is due to :

(A) Na^+ ion vacancies filled with Cl^- ions

(B) Cl^- ion vacancies filled with electrons

(C) Excess of Cl^- ions in the crystal

(D) The formation pf Schottky defect

85. The Sucker-Tetrode equation is used to obtain the entropy of :

(A) Monatomic ideal gas

(B) Monatomic real gas

(C) Diatomic ideal gas

(D) Real gases at high pressure

86. Which of the following characterization method belongs to scanning probe microscopy?

(A) Atomic Force Microscopy

(B) Scanning Electron Microscopy

(C) Auger Electron Spectroscopy

(D) Transmission Electron Microscopy

87. In the Debye-Huckel limiting law, the logarithm of mean ionic activity coefficient $(\log \gamma \pm)$ is related to :

(A) Ionic strength, I

(B) Square root of ionic strength, $\sqrt{I}$

(C) Reciprocal of ionic strength, $\frac{1}{I}$

(D) Square of ionic strength, I^2

88. The reversal of direction of electroosmotic flow can be achieved by :

(A) Adding a neutral electrolyte

(B) Reducing the dielectric constant of solvent

(C) Increasing viscosity of the solvent

(D) Changing the polarity of the electrodes

89. The primary kinetic salt effect becomes significant in solution-phase reactions when :

(A) Both reactants are ions

(B) One reactant is ionic while the other is neutral

(C) Both reactants are neutral molecules

(D) The reaction occurs in a medium of negligible polarity

90. In enzyme catalysis, the turnover number is defined as :

(A) The maximum rate of the reaction at saturating substrate concentration

(B) The binding constant between enzyme and substrate

(C) The substrate molecules converted per active site per second

(D) The enzyme concentration giving half of maximum velocity

91. The de Broglie wavelengths of an electron when accelerated by potential differences of 100 V and 1000 V are λ_1 and λ_2 respectively. How λ_1 and λ_2 are related?

(A) $\lambda_1 = \frac{\lambda_2}{10}$ (B) $\lambda_1 = 10\,\lambda_2$

(C) $\lambda_1 = \sqrt{10}\,\lambda_2$ (D) $\lambda_1 = \frac{\lambda_2}{\sqrt{10}}$

92. The wave functions of Simple Harmonic Oscillator (SHO) are obtained in terms of :

(A) Legendre polynomials (B) Associated Legendre functions

(C) Laguerre polynomials (D) Hermite polynomials

93. Excluding the J values, the ground state term symbols for vanadium $\left(V^{2+}\right)$ and cobalt $\left(Co^{2+}\right)$ cations are respectively :

(A) ^4F and ^4F (B) ^2D and ^3F

(C) ^3F and ^2D (D) ^3F and ^4F

94. According to Dulong and Petit's law, the molar heat capacity at constant volume of most of solid elements at room temperature is approximately :

(A) $8.314\ J\ K^{-1}\ mol^{-1}$ (B) $6\ cal\ K^{-1}\ mol^{-1}$

(C) $4.184\ J\ K^{-1} mol^{-1}$ (D) $4\ cal\ K^{-1} mol^{-1}$

95. Which of the following correctly describes the line pattern observed in the rotational spectrum of a rigid diatomic molecule? (B represents the rotational constant)

(A) Lines are equally spaced by 4 B

(B) Lines are unequally spaced

(C) Lines are equally spaced by B

(D) Lines are equally spaced by 2 B

96. Which of the following statement is correct for Eriochrome black T?

(A) It is red in its deprotonated form

(B) It is widely used in titrations of solutions more acidic than pH 6.5

(C) It is most effective in the pH range of 8.1 – 12.4.

(D) It is compatible with strong oxidizing and reducing agents.

97. In thermogravimetric analysis :

(A) Conductivity is plotted against temperature

(B) The mass of a sample is measured over time as the temperature changes

(C) Weight change is plotted against conductivity

(D) Weight change is plotted against resistance

98. After molecular recognition and complex formation takes place

(A) ΔH of the complex should be positive

(B) ΔH of the complex should be negative

(C) ΔG of the complex should be positive

(D) ΔS of the complex should be negative

99. Which of the following is not involved in the principles of green chemistry proposed by Anastas and Warner?

(A) Prevention

(B) Atom economy

(C) Volatile Solvents

(D) Real-time analysis for pollution prevention

100. The metal used in the first successful magnetic refrigerator device :

(A) Gadolinium (B) Vanadium

(C) Iron (D) Aluminium

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