30/04/2024

CODE-A

Aakash
Medical | IIT-JEE | Foundations

Corporate Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

AIM – 720

(*Advanced* INTENSIVE *Mastery for* 720)

MM : 720 **CST-17** **Time : 3 Hrs. 20 Mins.**

Instructions :

(i) There are two sections in each subject, *i.e.* Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.

(ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted questions will be given no marks.

(iii) Use blue/black ballpoint pen only to darken the appropriate circle.

(iv) Mark should be dark and completely fill the circle.

(v) Dark only one circle for each entry.

(vi) Dark the circle in the space provided only.

(vii) Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on the Answer sheet.

CHEMISTRY

Choose the correct answer:

SECTION-A

1. Match List-I and List-II.

	List-I		List-II
(a)	n	(i)	Orientation of orbital
(b)	m_ℓ	(ii)	Orientation of electron spin
(c)	ℓ	(iii)	Size and energy of orbital
(d)	m_s	(iv)	Shape of orbital

Choose the correct answer from the options given below.

(1) a(iii), b(iv), c(i), d(ii) (2) a(iii), b(i), c(iv), d(ii)

(3) a(i), b(iii), c(ii), d(iv) (4) a(iv), b(iii), c(ii), d(i)

2. When zinc reacts with concentrated nitric acid then the gaseous product obtained is

(1) N_2O (2) NO_2

(3) NO (4) N_2

3. Match the compounds of Xe in Column-I with the molecular structure in Column-II.

	Column-I		Column-II
(a)	XeF_6	(i)	Square planar
(b)	XeF_4	(ii)	Square pyramidal
(c)	$XeOF_4$	(iii)	Pyramidal
(d)	XeO_3	(iv)	Distorted octahedral

Choose the correct answer from the options given below.

(1) a(i), b(iii), c(ii), d(iv) (2) a(ii), b(iii), c(iv), d(i)

(3) a(iv), b(i), c(ii), d(iii) (4) a(iii), b(i), c(ii), d(iv)

4. Given below are two statements. One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Solubility of AgCl is more in NH_3 than in pure water.

Reason (R): Ammonia is more polar than water.

In the light of above statements choose the correct answer.

(1) Both (A) and (R) are true and (R) is correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

5. Given below are two statements.

Statement I: Element with atomic number Z = 95 is a transuranium element.

Statement II: Element with atomic number Z = 39 is a representative element.

In light of above two statements choose the correct option.

(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

6. Which of the following electronic configuration has maximum ionization energy?

(1) $[Ne]3s^23p^1$ (2) $[Ne]3s^23p^2$
(3) $[Ne]3s^23p^3$ (4) $[Ar]3d^{10}4s^24p^3$

7. Which of the following is a correct expression?

(1) $\Delta G = \Delta G^\circ + RT\ell n\ Q$ (2) $\Delta G = \Delta G^\circ - RT\ell n\ Q$
(3) $\Delta G = RT\ell n\ K$ (4) $\Delta G = -RT\ell n\ K$

8. Three faradays of electricity were passed through $CuSO_4(l)$, $AlCl_3(l)$ and $AgNO_3(l)$ kept in three different vessels using Pt electrodes. The ratio of the moles of Cu, Al and Ag deposited will be

(1) 3 : 2 : 12 (2) 1 : 2 : 3
(3) 6 : 1 : 3 (4) 3 : 2 : 6

9. Given below are two statements.

Statement I: In case of positive deviation from Raoult's law intermolecular attractive forces between solute-solvent molecules are stronger than those between the solute-solute and solvent-solvent molecules.

Statement II: The solutions that show large negative deviation from Raoult's law form maximum boiling azeotrope at specific composition.

In light of above two statements choose the correct option.

(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

10. The mass of $CaCl_2$ (i = 2.47) dissolved in 3 litre of water such that its osmotic pressure is 0.75 atm at 27°C is

(1) 3.42 g (2) 4.11 g
(3) 5.26 g (4) 2.27 g

11. Formal charge on central oxygen atom in ozone molecule is

(1) 0 (2) +1
(3) +2 (4) –1

12. Hybridisation of PCl_5 in solid state is

(1) sp^3d^2 only (2) sp^3d only
(3) sp^3 and sp^3d (4) sp^3 and sp^3d^2

13. Consider the following reaction

$$xS_2O_3^{2-} + yBr_2 + zH_2O \rightarrow aSO_4^{2-} + bBr^- + cH^+$$

If x, y, z, a, b and c are the stoichiometric coefficients then the ratio of y : z is

(1) 1 : 2 (2) 2 : 3
(3) 4 : 5 (4) 3 : 5

14. The pair of species which can act as both oxidising as well as reducing agent is

(1) Carbon dioxide and nitric acid
(2) Hydrogen peroxide and carbon dioxide
(3) Sulphur dioxide and nitric acid
(4) Sulphur dioxide and hydrogen peroxide

15. Consider the following statements:

Statement I: SiO_2 resists the attack by halogens, dihydrogen and most of the acids and metals even at elevated temperatures.

Statement II: SiO_2 reacts with NaOH to form Na_2SiO_3.

In the light of above statements choose the correct option.

(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

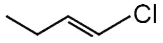
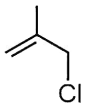
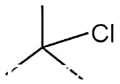
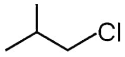
Space for Rough Work

16. Given below are two statements. One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A): Kjeldahl method is not applicable to compounds containing nitrogen in nitro and azo groups.
Reason (R): Nitrogen of nitro and azo compounds does not change to ammonium sulphate under provided conditions.
In the light of above statements choose the correct answer.
(1) Both (A) and (R) are true and (R) is correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is true (R) is false
(4) (A) is false (R) is true

17. The correct IUPAC name of phthalaldehyde is
(1) 2-Methyl-1, 3-dicarbaldehyde
(2) Benzene-1, 3-dicarbaldehyde
(3) 3-Methyl, benzene-1, 2-dicarbaldehyde
(4) Benzene-1, 2-dicarbaldehyde

18. Given below are two statements. One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A): Transition elements exhibit higher enthalpies of atomisation.
Reason (R): Transition elements have a large number of unpaired electrons in their atoms, leading to stronger interatomic interactions.
In the light of above statements choose the correct answer.
(1) Both (A) and (R) are true and (R) is correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is true (R) is false
(4) (A) is false (R) is true

19. Given below are two statements.
Statement I: For most of the ionic compounds, $\Delta_{sol}H^\circ$ is positive and the dissociation process is endothermic.
Statement II: $\Delta_{sol}H^\circ = \Delta_{lattice}H^\circ - \Delta_{hyd}H^\circ$
In the light of the above statements, choose the most appropriate answer from the options given below.
(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

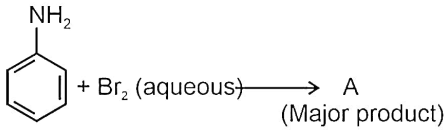
20. Which among the following is the most reactive towards S_N1 reaction?
(1) 
(2) 
(3) 
(4) 

21. Consider the following statements.
Statement I: Haloarenes are less reactive than haloalkanes towards nucleophilic substitution reaction.
Statement II: In haloarenes, presence of an electron withdrawing group at ortho and para positions decreases the reactivity towards nucleophilic substitution reaction.
Choose the correct option.
(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

22. Moles of H_2SO_4 present in 500 mL of 0.5 M H_2SO_4 solution is
(1) 0.1 mole (2) 0.5 mole
(3) 0.25 mole (4) 0.35 mole

23. Equivalent weight of $Mg(OH)_2$ is
(1) 29 (2) 58
(3) 116 (4) 87

24. Which among the following is heteroleptic complex?
(1) $K_4[Fe(CN)_6]$ (2) $[Ni(CO)_4]$
(3) $K_3[Fe(NH_3)_6]$ (4) $K[Co(NH_3)_4Cl_2]$

25. Consider the following reaction.

The product A is

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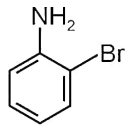
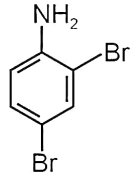
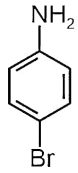
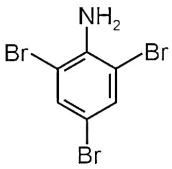
(1) 

(2) 

(3) 

(4) 

26. IUPAC name of valeraldehyde is
(1) Pentanal (2) Butanal
(3) Propanal (4) 2-methylpropanal

27. Given below are two statements.
Statement I: Addition of HCN in acetaldehyde gives optically active product.
Statement II: Acetone gives optically inactive products on nucleophilic addition of HCN.
In the right of above statements choose the correct option.
(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

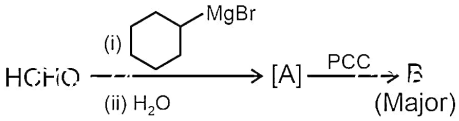
28. On dimerisation of NO_2 if rate of formation of N_2O_4 is 0.1 mol L^{-1} s^{-1} then rate of consumption of NO_2 will be
(1) 0.1 mol L^{-1} s^{-1} (2) 0.05 mol L^{-1} s^{-1}
(3) 0.4 mol L^{-1} s^{-1} (4) 0.2 mol L^{-1} s^{-1}

29. Compound formed in borax bead test of Cu^{2+} in oxidising flame is
(1) Cu (2) $Cu(BO_2)_2$
(3) $CuBO_2$ (4) CuO

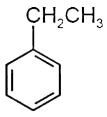
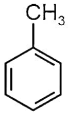
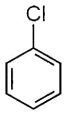
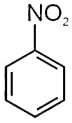
30. Group reagent for Ba^{2+} cation is
(1) $H_2S + NH_4OH$
(2) $(NH_4)_2CO_3 + NH_4OH$
(3) $NH_4OH + NH_4Cl$
(4) HCl (aq)

31. Consider the following statements
(a) Hormones are molecules that act as intercellular messengers .
(b) Hypothyroidism is characterised by lethargyness and obesity.
(c) Glucocorticoids control the carbohydrate metabolism.
(d) Progesterone is responsible for preparing the uterus for implantation of fertilised egg.
The correct statements are
(1) (a), (b) and (c) only
(2) (b), (c) and (d) only
(3) (a) and (b) only
(4) (a), (b), (c) and (d)

32. Consider the following reaction sequence



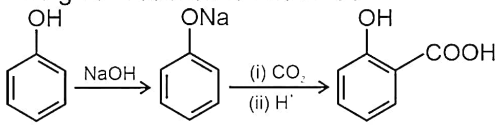
Incorrect statement about B is
(1) It shows keto-enol tautomerism
(2) It undergoes aldol condensation reaction
(3) It reduces Tollen's reagent
(4) It does not give positive iodoform test

33. The compound which will undergo nitration most easily is
(1) 
(2) 
(3) 
(4) 

34. Consider the following statements
(a) Methane reacts with steam at 1273 K in the presence of nickel catalyst to form carbon monoxide and dihydrogen.
(b) n-hexane on heating in the presence of anhydrous $AlCl_3$ and HCl gas isomerise to branched chain alkanes.
(c) n-hexane on heating to 773 K at 10-20 atmospheric pressure in presence of V_2O_5 gives cyclohexane as major product.
The correct statements are
(1) (a) and (b) only (2) (b) and (c) only
(3) (a) and (c) only (4) (a), (b) and (c)

Space for Rough Work

35. The given reaction is known as



(1) Swarts reaction
(2) Stephen reaction
(3) Kolbe's reaction
(4) Reimer-Tiemann reaction

SECTION - B

36. The maximum number of electrons in an atom which can have n = 4 is
(1) 32 (2) 16
(3) 9 (4) 18

37. Match column-I and column-II.

	Column-I (Oxoacids of phosphorous)		Column-II (Oxidation state of phosphorous)
(a)	Hypophosphorous acid	(i)	+4
(b)	Orthophosphoric acid	(ii)	+3
(c)	Pyrophosphorous acid	(iii)	+1
(d)	Hypophosphoric acid	(iv)	+5

Choose the correct answer from the options given below.
(1) a(ii), b(i), c(iv), d(iii) (2) a(i), b(iii), c(iv), d(ii)
(3) a(iv), b(iii), c(ii), d(i) (4) a(iii), b(iv), c(ii), d(i)

38. The electrolytic solution for which molar conductivity is twice of equivalent conductivity is
(1) $AlCl_3$ (2) $BaSO_4$
(3) KCl (4) Na_3PO_4

39. Heterogeneous equilibrium among the following is
(1) $2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$
(2) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
(3) $Ni(s) + 4CO(g) \rightleftharpoons Ni(CO)_4(g)$
(4) $CH_3COOC_2H_5(aq) + H_2O(\ell) \rightleftharpoons CH_3COOH(aq) + C_2H_5OH(aq)$

40. The correct order of hybridisation of the central atom in NH_4^+, $[Ni(CN)_4]^{2-}$ and SF_6 respectively is
(1) sp^2, sp^3d^2, sp^3d
(2) sp^3, sp^3d, sp^3d^2
(3) sp^2, sp^3, sp^3d^2
(4) sp^3, sp^3d^2, sp^3d

41. Which of the following is not an electrophile?
(1) $\overset{\oplus}{C}H_3$ (2) BH_3
(3) Cl^+ (4) $BH_4^{\ominus}$

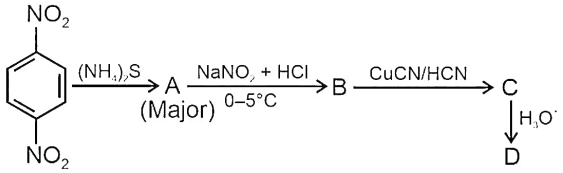
42. Identify compounds A and B respectively for the following reactions of Lanthanoids (Ln).

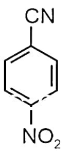
$$A \xleftarrow{\text{Heated with N}} Ln \xrightarrow{\text{Heated with C 2773 K}} B$$

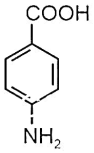
(1) Ln_3N_2 and Ln_2C
(2) Ln_3N_2 and LnC_2
(3) LnN and LnC_2
(4) LnN and Ln_2C

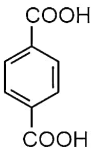
43. For a sample of perfect gas, when it's volume is changed isothermally and reversibly from 2 L to 10 L, the heat absorbed during the expansion will be
(1) $nRT\ell n5$ (2) $-nRT\ell n\frac{2}{5}$
(3) $-nRT\ell n5$ (4) $nRT\ell n\frac{1}{2}$

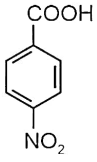
44.



The product D in the above reaction is
(1) 

(2) 

(3) 

(4) 

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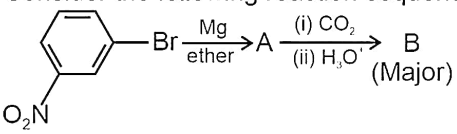
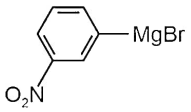
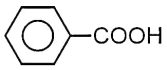
45. Which among the following statement is incorrect?
(1) The crystal field stabilisation energy, depends upon the field produced by the ligand and charge on the metal ion
(2) In octahedral complexes, the energy of two e_g orbitals will decrease by $\left(\frac{3}{5}\right)\Delta_0$ and that of the three t_{2g} will increase by $\left(\frac{2}{5}\right)\Delta_0$
(3) Ligands for which $\Delta_0 < P$ are known as weak field ligands and form high spin complexes
(4) The spin only magnetic moment of $[MnBr_4]^{2-}$ is 5.9 BM

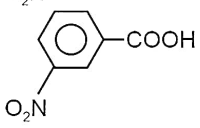
46 Consider the following reaction sequence

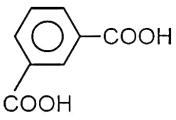


Product B is

(1) 

(2) 

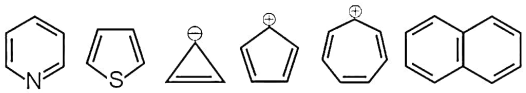
(3) 

(4) 

47. Ratio of $t_{99\%}$ to $t_{99.9\%}$ for first order reaction is
(1) 2 : 3 (2) 3 : 4
(3) 1 : 2 (4) 2 : 5

48. α-D-(+)-Glucopyranose and β-D-(+)-Glucopyranose are
(1) Enantiomers (2) Epimers
(3) Anomers (4) Homomers

49. Among the given species, the number of aromatic species is



(i) (ii) (iii) (iv) (v) (vi)

(1) 4 (2) 5
(3) 3 (4) 6

50. Given below are the two statements.

Statement I: Boiling point of butan-1-ol is more than that of ethoxyethane.

Statement II: Butan-1-ol molecules are associated with each other by intermolecular hydrogen bonding.

In light of the above statements, choose the correct answer.

(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

BOTANY

SECTION-A

51. Select the **incorrectly** matched pair
(1) Bryophytes – Non-vascular plants
(2) *Laminaria* – Source of iodine
(3) Carrageen – Obtained from brown algae
(4) *Spirulina* – Used by space travellers as food supplements

52. In which of the following algae, haplo-diplontic life cycle is present?
(1) *Polysiphonia* (2) *Spirogyra*
(3) *Volvox* (4) *Fucus*

53. Which of the following statements is **incorrect**?
(1) The main sources of biofertilizers are bacteria, fungi and cyanobacteria
(2) *Aulosira* is non-symbiotic nitrogen fixer in rice field in India
(3) *Azospirillum* and *Azotobacter* can fix atmospheric nitrogen while free living in the soil
(4) Ladybird beetle is useful in the control of mosquitoes

Space for Rough Work

54. Read the following statements and select the **correct** option.

Assertion (A) : Carrying capacity is the only biotic parameter to assess impact of environmental factors on population growth.

Reason (R) : The maximum number of individuals of a population which can be supported with optimum resources in a particular ecosystem is carrying capacity.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
(3) (A) is false but (R) is true
(4) (A) is true but (R) is false

55. All of the following are characteristics of anthropogenic ecosystem, **except**
(1) Have little diversity
(2) Do not possess self-regulatory mechanism
(3) Low productivity
(4) Simple food chain

56. Match Column-I with Column-II and select the **correct** option.

	Column-I		**Column-II**
(a)	–CCA terminus	(i)	Ribosomal binding site
(b)	DHU loop	(ii)	mRNA binding site
(c)	TψC loop	(iii)	Aminoacyl synthetase binding site
(d)	Anticodon loop	(iv)	Amino acid binding site

(1) a(i), b(iii), c(iv), d(ii) (2) a(iv), b(iii), c(i), d(ii)
(3) a(ii), b(i), c(iii), d(iv) (4) a(iv), b(ii), c(i), d(iii)

57. How many of the following linkages/bonds can be there in a dinucleotide?
a. Phosphodiester linkage
b. Phosphoester linkage
c. H-bond between nucleotide
d. N-glycosidic linkage
e. Covalent bond
(1) Two (2) Three
(3) Four (4) Five

58. DNA gyrase aids in
(1) Activation of deoxyribonucleotides
(2) Formation of primers
(3) Relieving of tension in DNA double helix created by supercoiling
(4) Joining of discontinuously synthesised strands

59. Introns represent
(1) Intervening sequence that appear in mature mRNA
(2) Reminiscent of antiquity
(3) The sequences that are the component of only tRNA
(4) Polymer of amino acid

60. Which of the following statements supports the fact that chlorophyll *a* is the chief pigment associated with photosynthesis?
(1) It is present in the antennae of photosystem
(2) It consists of a porphyrin head and a phytol tail
(3) It gives bright or blue green colour in the chromatogram
(4) Its absorption spectra closely corresponds to the action spectrum of photosynthesis

61. Which of the following is the cold sensitive enzyme found in C_4 plants that converts a 3C molecule into phosphoenol pyruvate?
(1) PEP Synthetase (2) PEP Carboxylase
(3) RuBisCO (4) Pyruvate kinase

62. The conversion of BPGA to 3-phosphoglyceric acid
(1) Involves removal of two redox equivalents in the form of two hydrogen atoms
(2) Involves formation of NADH + H^+ from NAD^+
(3) Is a condensation reaction
(4) Is an energy yielding step

63. Given below are two statements

Assertion (A) : The recent illegal introduction of the African catfish *Clarias gariepinus* for aquaculture purposes is posing threat to Cichlid fish in our rivers.

Reason (R) : When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct.

Space for Rough Work

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not correct explanation of (A)
(3) (A) is false but (R) is true statement
(4) (A) is true but (R) is false statement

64. The number of _____ species in the world is more than combined total of the species of the fishes, amphibians, reptiles and mammals.
Select the **correct** option to fill in the blank.
(1) Lichens (2) Ferns
(3) Fungi (4) Mosses

65. A true breeding axial violet flowered pea plant is crossed with terminal-white flowered pea plant. If F_1 progeny of this cross is selfed, what percent in F_2 generation would be terminal violet flowered plants?
(1) 6.25% (2) 3%
(3) 18.75% (4) 56.25%

66. How many true breeding pea plants varieties are selected by Mendel for his experiments?
(1) 7 (2) 6
(3) 2 (4) 14

67. The physical association of genes on a chromosome is termed as
(1) Recombination
(2) Genetic map
(3) Linkage
(4) Recombination frequency

68. Grasshopper
(1) Shows female heterogamety
(2) Males have only one X chromosome besides autosomes
(3) Females have ZW sex chromosomes
(4) Show haplo-diploid sex-determination

69. Select in the **incorrect** match

	Taxon		Category
(1)	Mammalia, Insecta, Monocotyledonae	–	Class
(2)	*Solanum, Felis, Petunia*	–	Genus
(3)	Chordata, Arthropoda	–	Phylum
(4)	Poales, Sapindales	–	Family

70. Which of the following features is **not** associated with sub-viral agents?
(1) They are known to cause diseases in plants and animals
(2) Infectious RNA particles which are devoid of protein coat are obligate parasites
(3) Scrapie disease in sheep is caused by an agent which are proteinaceous infectious particles
(4) Molecular weight of these agents is always higher than viruses

71. Which among the following statements is **incorrect** w.r.t. dinoflagellates?
(1) Most of them have two flagella, one lies longitudinally and the other transversely in a furrow between the wall plates
(2) Majority of them are fresh water organisms found in stagnant water
(3) The cell wall has stiff cellulose plate on the outer surface
(4) *Gonyaulax* undergo such rapid multiplication that they make the sea appear red

72. Underground stems of ginger, turmeric and *Colocasia* are modified to
(1) Store food
(2) Protect the plant from browsing animals
(3) Perform photosynthesis
(4) Help plants to climb

73. Consider the following statements and select the appropriate option
a. The leaf is attached to the stem by the leaf base.
b. Pedicel helps holding the leaf blade to light and allow them to flutter in wind.
c. Veins provide rigidity to the leaf blade and act as channels of transport for water, minerals and food materials.
d. The lamina is a lateral small leaf like structures which may be present at leaf base.
e. In palmately compound leaves the leaflets are attached at a common point as in silk cotton.
(1) a, c and d are correct
(2) a, b and d are correct
(3) a, c and e are incorrect
(4) b and d are incorrect

Space for Rough Work

74. Which of the following pairs are **wrongly** matched?
a. Australian acacia – Phyllode
b. Sunflower – Opposite phyllotaxy
c. Gulmohur – Imbricate aestivation
d. *Argemone* – Free central placentation
(1) a and c (2) b and d
(3) a and d (4) b and c

75. Tissues having capacity of active cell division are called
(1) Meristematic tissues (2) Complex tissues
(3) Simple tissues (4) Permanent tissues

76. Select the **correctly** matched pair.
(1) Cork – Impervious to water
(2) Monocot stem – Presence of starch sheath
(3) Bundle sheath cells – Large, empty colourless cells in grasses
(4) Xylem parenchyma – Made up of dead cells

77. Which of the following plant hormone is a synthetic auxin?
(1) IAA (2) IBA
(3) NAA (4) Kinetin

78. Which of the following plant is **not** pollinated by water?
(1) *Vallisneria* (2) *Hydrilla*
(3) Water lily (4) *Zostera*

79. In the light of the given statements, choose the **correct** option.
Statement I : Proximal end of filament of stamen is always attached to the ovary.
Statement II : The number and length of stamens are fixed in flowers of different species.
(1) Both statements are correct
(2) Both statements are incorrect
(3) Only statement I is correct
(4) Only statement II is correct

80. The membranous structure which is site of respiration in bacteria is
(1) Mitochondria (2) Mesosome
(3) Chromatophore (4) Peroxisome

81. The term 'Glycocalyx' is used for
(1) Cell wall of bacteria
(2) Innermost layer followed by cell membrane
(3) A layer present between cell wall and cell membrane of bacteria
(4) Outermost layer of cell envelope followed by cell wall in bacteria

82. Read the following statements and choose the **correct** option.
Statement A: The cell wall is selectively permeable in nature and interacts with the outside world.
Statement B: Plasma membrane in prokaryotes is similar structurally to that of eukaryotes.
(1) Only statement A is correct
(2) Only statement B is correct
(3) Both the statements are correct
(4) Both the statements are incorrect

83. The sub-stage of prophase-I during which separation of the recombined homologous chromosomes from each other begins except in crossing over region is
(1) Diplotene (2) Pachytene
(3) Diakinesis (4) Zygotene

84. Diakinesis represents transition to
(1) Prophase (2) Metaphase I
(3) Prophase I (4) Metaphase II

85. A cell at pachytene stage has 2n = 24. Regarding chromosomes, which of the following is said to be **not** true at this stage?
(1) 12 pairs of homologous chromosomes
(2) 12 bivalents
(3) 12 tetrads
(4) 24 chromatids

SECTION-B

86. *Dryopteris* belongs to class
(1) Psilopsida (2) Lycopsida
(3) Sphenopsida (4) Pteropsida

87. Which of the following organic acid is used in preparation of vinegar?
(1) Acetic acid
(2) Lactic acid
(3) Citric acid
(4) Butyric acid

Space for Rough Work

88. Which of the following statements is **not** correct regarding impact of parasites on host?
(1) They may reduce the survival of host
(2) Parasites never affect the host population density
(3) They may also reduce the growth and reproduction of host
(4) They render host more vulnerable to predation by making it physically weak

89. During primary succession in pond, pioneer species are
(1) Lichens (2) Phytoplanktons
(3) Submerged plant (4) Forest

90. Lactose acts as an (A) in *lac* operon. Select the **correct** option to fill in the blank (A).
(1) Inducer (2) Repressor
(3) Inhibitor (4) Operator

91. The method for determination of amino acid sequence in proteins is developed by
(1) Alec Jeffreys (2) Francis Crick
(3) James Watson (4) Frederick Sanger

92. How many CO_2 molecules are released during complete oxidation of a pyruvate molecule by the stepwise removal of all the hydrogen atoms?
(1) Six (2) Three
(3) Five (4) Two

93. Sickle cell anaemia differs from thalassemia as the former
(1) Is an autosome linked recessive blood disease
(2) Involves reduced rate of synthesis of one of the the globin molecules
(3) Involves change in the shape of the RBC from biconcave shape
(4) Is controlled by closely related gene on sex chromosome

94. Read the following statements w.r.t. general characteristics of fungi.
a. The hyphae may be aseptate and multinucleate, and termed as coenocytic hyphae.
b. *Claviceps* is a source of many alkaloids and LSD.
c. Yeasts have filamentous bodies with long thread-like hyphae.
d. The imperfect fungi which are decomposers of litter and help in mineral cycling belong to Deuteromycetes.
e. *Penicillium* is multicellular and produces antibiotics.
The **correct** ones are
(1) a, b and d only (2) c, d and e only
(3) a, c, d and e (4) a, b, d and e

95. The floral formula $Br \oplus \male\!\!\female K_{\text{pappus or 0}} \overset{\frown}{C_{(5)}\ A_{(5)}}\ \overline{G}_{(2)}$ is of
(1) Wheat
(2) Disc florets of sunflower
(3) Pea
(4) Cotton

96. Read the following features of unknown transverse section of a plant part.
a. Outermost layer is epiblema
b. Four xylem and phloem patches
c. Small or inconspicuous pith
d. Parenchymatous cells lie between xylem and phloem
Select the **correct** option for the plant part _____ most likely to be.
(1) Monocot stem (2) Dicot stem
(3) Dicot root (4) Dicot leaf

97. A plant growth regulator which was isolated from autoclaved herring sperm DNA
(1) Occur naturally in plants
(2) Is derivative of carotenoids
(3) Has specific effects on cytokinesis
(4) Promotes apical dominance

98. State **True (T)** or **False (F)** to the given statements.
a. Watermelon has only one ovule in an ovary.
b. Pollen consumption has been claimed to increase the performance of athletes.
c. Pollen grains of wheat maintain viability for several months after their release.
d. The placenta in flowering plants is located inside the ovarian cavity.
Choose the **correct** option

	(a)	**(b)**	**(c)**	**(d)**
(1)	T	T	T	F
(2)	F	T	T	F
(3)	T	F	T	T
(4)	F	T	F	T

Space for Rough Work

99. Extensive compartmentalisation of cytoplasm do not occur in
(1) Bacteria
(2) Algae
(3) Lower plants
(4) Higher plants

100. Which of the following events does **not** occur in prophase of mitosis?
(1) Spindle fibres start assembling
(2) Condensation of chromatin
(3) Centrioles begin to move towards opposite poles
(4) Nuclear envelope and nucleolus reappear

ZOOLOGY

SECTION-A

101. The collection of methods that allows correction of a gene defect diagnosed in a child is
(1) ELISA (2) PCR
(3) Gene therapy (4) Autoradiography

102. How many highly coiled tubules are present in each lobule of a human testis in which sperms are produced?
(1) 200-300 (2) 1-3
(3) 4-5 (4) 500-1500

103. Impulse transmission across an electrical synapse is always
(1) Dependent upon excitatory neurotransmitters
(2) Dependent upon inhibitory neurotransmitters
(3) Slower than that across a chemical synapse
(4) Faster than that across a chemical synapse

104. In humans, the structure supported by ligaments attached to the pelvic wall and uterus is
(1) Kidney (2) Testis
(3) Ovary (4) Clitoris

105. Which of the following structures does **not** constitute the human female accessory reproductive ducts?
(1) Ovary (2) Oviduct
(3) Uterus (4) Vagina

106. In humans, the inner part of cerebral hemispheres gives an opaque white appearance due to/as
(1) Neuronal cell bodies are concentrated here
(2) Presence of cell processes called dendrites
(3) Presence of nerve tracts formed by myelinated nerve fibres
(4) Presence of unmyelinated nerve fibres

107. Number of fatty acid(s) required for the formation of a triglyceride is/are
(1) Two (2) One
(3) Three (4) Five

108. How many of the below mentioned function(s) is/are related to hormone secreted by the gland present on the anterior part of each kidney?
(a) Suppression of the immune responses
(b) Involvement in maintaining the cardiovascular system as well as the kidney functions
(c) Production of anti-inflammatory reactions
(d) Stimulation of Ca^{2+} reabsorption by the renal tubules
Select the **correct** option.
(1) Three
(2) Two
(3) Four
(4) One

109. Which of the following is an example of basic amino acids?
(1) Tyrosine
(2) Lysine
(3) Valine
(4) Tryptophan

110. Select the **incorrect** match w.r.t types of bonds.

(1)	Between adjacent nucleotides	–	Phosphodiester bond
(2)	Between adjacent amino acids	–	Peptide bond
(3)	Between adjacent monosaccharides	–	Glycosidic bond
(4)	Between complementary nitrogen bases in a double stranded DNA	–	Ester bond

Space for Rough Work

111. Match Column I with Column II and select the **correct** option.

	Column I		Column II
a.	Ammonotelic	(i)	*Ornithorhynchus*
b.	Ureotelic	(ii)	Land snail
c.	Uricotelic	(iii)	*Clarias*

(1) a-(i), b-(ii), c-(iii)
(2) a-(iii), b-(i), c-(ii)
(3) a-(ii), b-(i), c-(iii)
(4) a-(i), b-(iii), c-(ii)

112. The value of pO_2 under normal conditions in a man is more than 45 mm Hg in
(1) Systemic arteries (2) Pulmonary artery
(3) Systemic veins (4) Vena cava

113. Select the **correct** option to complete the analogy w.r.t joints in humans.
Hinge joint : Between femur and tibia : : Pivot joint : _____
(1) Between the carpals
(2) Between atlas and axis
(3) Shoulder joint
(4) Hip joint

114. Choose the **incorrect** statement w.r.t. humans.
(1) The role of calcium in muscle relaxation is to stimulate the transmission of action potential across the neuromuscular junction.
(2) Muscle cells are stimulated by neurotransmitters released from the axon terminal of motor neurons.
(3) Low levels of calcium directly affect the mechanism of muscle contraction.
(4) Myosin is not the part of thin filament of a muscle cell.

115. All of the following are aquatic mammals, **except**
(1) Sea cows (2) Shrews
(3) Seals (4) Whales

116. Consider the given features:
(a) Cranial capacity more than *Homo erectus*
(b) Used hides to protect their body
(c) Buried their dead
All the above given features are applicable to
(1) *Australopithecines* (2) *Homo habilis*
(3) Neanderthal man (4) *Dryopithecus*

117. Choose the **incorrect** match w.r.t. convergent evolution of Australian marsupials and placental mammals.
(1) Lemur – Spotted cuscus
(2) Anteater – Numbat
(3) Bobcat – Tasmanian tiger cat
(4) Flying phalanger – Sugar glider

118. Scientists at CDRI, Lucknow, developed a contraceptive which is **not**
(1) 'Once a week' pill
(2) A non-steroidal preparation
(3) Prepared from progestogens
(4) An oral contraceptive pill

119. Read the following statements.
Statement (A): Human kidneys normally produce urine nearly four times diluted than the initial filtrate formed.
Statement (B): The functioning of the kidneys is efficiently monitored and regulated by hormonal feedback mechanisms.
Select the most appropriate option.
(1) Both statements (A) and (B) are correct
(2) Only statement (A) is incorrect
(3) Both statements (A) and (B) are incorrect
(4) Only statement (B) is incorrect

120. All of the following are different types of contraceptives, **except**
(1) Vaults (2) IUT
(3) IUDs (4) Implants

121. Read the following statements w.r.t. a standard ECG.
(a) The machine used to obtain an ECG is known as electrocardiogram.
(b) The P-wave represents the electrical excitation of the atria.
(c) The ventricular contraction starts shortly after Q-wave and marks the beginning of the ventricular systole.
Select the **correct** option.
(1) Only statements (a) and (b) are correct
(2) Only statements (b) and (c) are correct
(3) Statements (a), (b) and (c) are correct
(4) Only statements (a) and (c) are incorrect

Space for Rough Work

122. How many blood group antigens present on the surface of RBCs are taken into consideration to determine the blood groups based on ABO grouping?
(1) Four (2) Five
(3) One (4) Two

123. Select the **incorrect** option w.r.t. tegmina in cockroaches.
(1) Opaque, dark and leathery
(2) When at rest, they cover the hind wings
(3) They are not used for flying
(4) Also called metathoracic wings

124. Select the **incorrect** statement w.r.t. cancer.
(1) UV rays cause DNA damage leading to neoplastic transformation.
(2) Cancer causing viruses called oncogenic viruses have genes called viral oncogenes.
(3) CT (Computed Tomography) uses strong magnetic fields to accurately detect cancer.
(4) Cancer cells lose the property of contact inhibition.

125. The drug obtained from the plant *Erythroxylum coca* interferes with the transport of the neuro-transmitter
(1) Acetylcholine (2) GABA
(3) Dopamine (4) Norepinephrine

126. Eli Lilly prepared two DNA sequences corresponding to 'A' and 'B' chains of human insulin and introduced them in ____ to produce insulin chains. Select the **correct** option to fill in the blank.
(1) Cytoplasm of *Salmonella*
(2) Cytoplasm of *Rhizobium*
(3) Plasmids of *E.coli*
(4) Plasmids of *Agrobacterium*

127. The columnar cells with microvilli are present on the free surface of the epithelial lining of
(1) Bronchioles (2) Oesophagus
(3) PCT (4) Intestine

128 The effect of natural selection in which, more individuals acquire value other than the mean character value is
(1) Stabilizing change (2) Disruptive change
(3) Directional change (4) Genetic equilibrium

129. Which of the following sets of animals have pinnae?
(1) *Petromyzon*, *Ascidia*, *Branchiostoma*
(2) *Pteropus*, *Equus*, *Felis*
(3) *Struthio*, *Exocoetus*, *Bufo*
(4) *Pavo*, *Ichthyophis*, *Calotes*

130. How much O_2 can be delivered by 500 mL of oxygenated blood to the tissues under normal physiological conditions in humans?
(1) 5 mL (2) 20 mL
(3) 25 mL (4) 40 mL

131. Gel electrophoresis is used to check the
(1) Progression of restriction enzyme digestion
(2) Effect of DNA ligation in a cloning vector
(3) Efficiency of the transformation technique
(4) Progress of downstream processing

132. Organism 'X' is characterised by the presence of pseudometamerism and hermaphroditism. It is an intestinal pathogenic endoparasite found in the body of humans.
Identify 'X' and select the **correct** option.
(1) *Planaria* (2) *Ascaris*
(3) *Hirudinaria* (4) *Taenia*

133. Consider the following features w.r.t cloning vectors.
(a) Multiple cloning sites for a single restriction enzyme
(b) A selectable marker
(c) A sequence to initiate the replication process
(d) At least one recognition site of a restriction enzyme
An ideal cloning vector should have
(1) (a), (b) and (c) (2) (b), (c) and (d)
(3) (a), (c) and (d) (4) (a), (b) and (d)

134. How many of the feature(s) given in the box below is/are associated with ctenophores?

Diploblasty, Bioluminescence, Spiny body, Absence of coelomic cavity, Asymmetry

Select the **correct** option.
(1) Two (2) Three
(3) One (4) Four

135. Migration and isolation of a section of population from one place to another if occurs by chance, is known as
(1) Genetic drift (2) Mutation
(3) Gene flow (4) Gene migration

Space for Rough Work

SECTION-B

136. The *lac*-Z gene is responsible for the synthesis of β-galactosidase. If *lac*-Z gene is inserted into a cloning vector pHP342 along with the gene of interest then, the outcome after addition of chromogenic substrate would be that
(1) The recombinants will produce white coloured colonies.
(2) The non-transformants will produce blue coloured colonies.
(3) The recombinant colonies will be blue in colour.
(4) The non-recombinants will not produce white coloured colonies.

137. Which of the following restriction enzymes produces blunt ends?
(1) *Bam*HI (2) *Eco*RV
(3) *Sal*I (4) *Eco*RI

138. Select the **incorrect** statement.
(1) PCR stands for Polymerase Chain Reaction.
(2) The sticky ends produced by restriction enzymes facilitate the action of the DNA ligase.
(3) Plasmids do not carry any vital gene necessary for the cell.
(4) For denaturation of nucleic acids, temperature less than 40°C is required during PCR.

139. Select the **correct** match among the following.
(1) Ideal contraceptive – Irreversible with side-effects
(2) 2011 census report – Population growth rate was 25/1000/year
(3) Introduction of sex education in schools – To encourage children for not believing in myths
(4) Induced abortion – Legalised in India in 1972

140. Which of the following represents normal concentration of haemoglobin in a healthy adult man?
(1) 10-20 gms/200 mL of blood
(2) 50-60 gms/300 mL of blood
(3) 48-64 gms/400 mL of blood
(4) 92-100 gms/500 mL of blood

141. How many statement(s) given below is/are **correct** w.r.t AIDS?
(a) It is associated with opportunistic infections leading to diseases.
(b) It spreads through body fluids.
(c) There is no time-lag between the infection and appearance of symptoms.
(d) After getting into the body of a person, DNA genome of the HIV virus replicates to form a viral RNA. This viral RNA gets incorporated into host cell's DNA.
Choose the **correct** option.
(1) Three
(2) One
(3) Two
(4) Four

142. Select the **correct** statement w.r.t frogs.
(1) Hind-brain consists of medulla oblongata only.
(2) Eyes are a pair of spherical structures situated in the orbit in skull.
(3) RBCs are enucleated.
(4) The lymph consists of RBCs.

143. A single stranded DNA or RNA, tagged with radioactive molecule is allowed to hybridise to its complementary DNA/RNA in a clone of cells followed by detection using
(1) Polymerase chain reaction
(2) Gel electrophoresis
(3) Chromatography
(4) Autoradiography

144. Select the **incorrect** match w.r.t. structure of neurons.
(1) Synaptic vesicle – Contains neurotransmitters
(2) Axon – Contains cytoplasm and Nissl's granules
(3) Synaptic knob – Present at the axon terminal
(4) Dendrite – Transmits impulses towards the cell body

Space for Rough Work

TG :- @RAJHARSH77

145. Match Column I with Column II w.r.t. humans and select the **correct** option.

	Column I		Column II
(a)	Part of female external genitalia	(i)	Testes
(b)	Female copulatory organ	(ii)	Mons pubis
(c)	Primary sex organs in male	(iii)	Characteristic of female mammals
(d)	Functional mammary glands	(iv)	Vagina

(1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
(2) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
(3) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

146. Select the **incorrect** statement.
(1) The acid-insoluble fraction has only four types of organic compounds, *i.e.,* proteins, nucleic acids, polysaccharides and lipids.
(2) All the organic compounds present in the retentate have molecular weights in the range of ten thousand daltons and above.
(3) The molecules in the acid-insoluble fraction with the exception of lipids are polymeric substances.
(4) Lipids are not strictly macromolecules.

147. **Assertion (A):** The gland located between lungs behind sternum on the ventral side of aorta plays a major role in the development of the immune system.
Reason (R): Thymosins play a major role in the differentiation of T-lymphocytes that provide mainly humoral immune responses.
In the light of above statements, choose the **correct** option.
(1) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(2) Both (A) and (R) are true and (R) is the correct explanation of (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

148. The following diseases cannot be detected by amniocentesis, **except**
(1) Diphtheria (2) Haemophilia
(3) Typhoid (4) Pneumonia

149. Enzyme involved in the transport of CO_2 in blood is
(1) Carbonic anhydrase (2) Catalase
(3) Carboxylase (4) Carboxypeptidase

150. In humans, which of the following cells show the property of both excitability and contractility?
(1) Skin cells
(2) Hepatocytes
(3) Muscle cells
(4) Neurons

PHYSICS

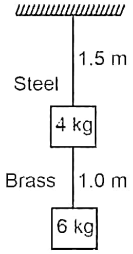
SECTION-A

151. A flywheel has moment of inertia 4 kg m^2 and has kinetic energy of 200 J. Calculate the number of revolutions it makes before coming to rest if a constant opposing torque of 5 N m is applied to the flywheel.
(1) 12.8 rev (2) 24 rev
(3) 6.4 rev (4) 16 rev

152. For a system to be in rotational equilibrium, the torques acting on it must balance. This is true only if the torques are taken about
(1) The centre of the system
(2) The centre of mass of the system
(3) Any point on the system
(4) Any point on the system or outside it

153. Two wires of diameter 0.25 cm, one made of steel and other made of brass are loaded as shown. The unloaded length of steel wire is 1.5 m and that of brass wire is 1 m. Young's modulus of steel is 2×10^{11} Pa and that of brass is 0.91×10^{11} Pa. The elongation of steel wire will be approximately

Space for Rough Work

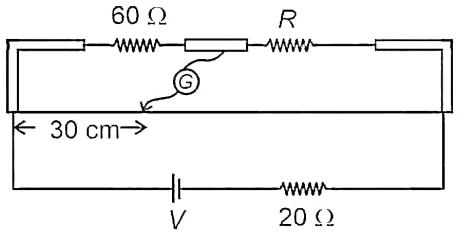


(1) 0.15 mm (2) 2.5 mm
(3) 40 mm (4) 5 mm

154. If suddenly the gravitational force of attraction between earth and a satellite revolving around it becomes zero then the satellite will
(1) Continue to move in its orbit with same velocity
(2) Move tangentially to the original orbit with the same speed
(3) Become stationary in its orbit
(4) Move toward the earth

155. For a conductor, fractional increase in resistivity per unit change in temperature is defined as
(1) Resistance
(2) Drift velocity
(3) Thermal coefficient of resistivity
(4) Conductivity

156. A meter bridge set up with null deflection in the galvanometer is shown in the figure. The value of the unknown resistance R is



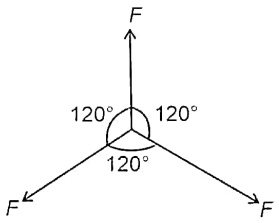
(1) 100 Ω (2) 140 Ω
(3) 70 Ω (4) 30 Ω

157. In a uniform magnetic field, if initial velocity of a charged particle has both parallel and perpendicular components with magnetic field, then the path followed by the charged particle will be
(1) Circular (2) Elliptical
(3) Helical (4) Linear

158. The resistance of an ideal voltmeter is
(1) Zero (2) Finite and low
(3) Finite and high (4) Infinity

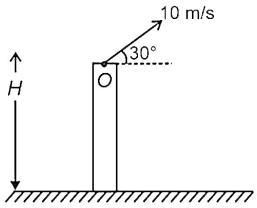
159. Which of the following is true for a bar magnet?
(1) Magnetic field due to a bar magnet is in form of concentric circles
(2) Its poles cannot be separated
(3) It points in geographical north-south directions when suspended freely
(4) Magnetic field lines due to a bar magnet does not form closed loops

160. A particle moving with velocity $\vec{v}$ is acted by three forces as shown.



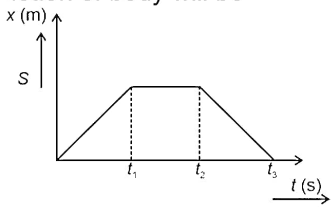
The velocity of the particle will
(1) Decrease
(2) Increase
(3) Remain constant
(4) Insufficient information

161. A ball is projected from a point O as shown in figure. If the ball strikes the ground after 4 s then the value of H is



(1) 60 m (2) 50 m
(3) 75 m (4) 42 m

162. The displacement-time graph of a body is shown in figure. The corresponding velocity-time graph for the motion of body will be



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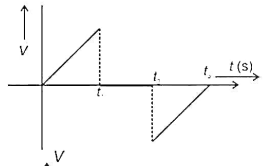
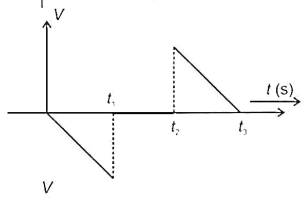
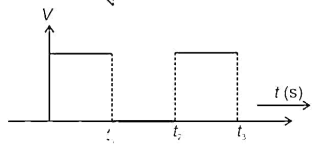
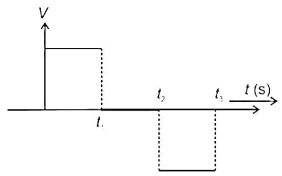
(1) 

(2) 

(3) 

(4) 

163. A particle moves so that its position vector varies with time as $\vec{r} = A\cos(\omega t)\hat{i} + A\sin(\omega t)\hat{j}$. The magnitude of initial velocity of particle is
(1) $A^2\omega$ (2) $A\omega$
(3) Zero (4) $A\omega^2$

164. The amplitude of the magnetic field of an electromagnetic wave in a vacuum is B_0 = 420 nT. The amplitude of electric field of the wave is
(1) 14 N/C (2) 126 N/C
(3) 140 N/C (4) 140 × 10^{-17} N/C

165. The distance between the first and the fifth minima in the diffraction pattern of a single slit is 0.4 mm. The screen is 1 m away from the slit. If the wavelength of light used is 5000 Å, then the slit width will be
(1) 0.4 mm (2) 0.5 mm
(3) 5 mm (4) 5 cm

166. Total internal reflection of a ray of light is possible when (i_c = critical angle and i = angle of incidence)
(1) Ray goes from denser medium to rarer medium and $i < i_c$
(2) Ray goes from denser medium to rarer medium and $i > i_c$
(3) Ray goes from rarer medium to denser medium and $i < i_c$
(4) Ray goes from rarer medium to denser medium and $i > i_c$

167. Two thin prism of flint glass, with refracting angles of 2° and 7° respectively, possess dispersive powers in the ratio
(1) 2 : 7 (2) 7 : 2
(3) 1 : 1 (4) 3 : 7

168. If the electric flux entering and leaving an enclosed surface respectively are ϕ_1 and ϕ_2, the electric charge inside the surface will be
(1) $(\phi_1 + \phi_2)\varepsilon_0$ (2) $(\phi_2 - \phi_1)\varepsilon_0$
(3) $\frac{\phi_1 + \phi_2}{\varepsilon_0}$ (4) $\frac{\phi_2 - \phi_1}{\varepsilon_0}$

169. In bringing an electron towards a fixed proton, electrostatic potential energy of the system
(1) Increases (2) Decreases
(3) Remains same (4) Becomes zero

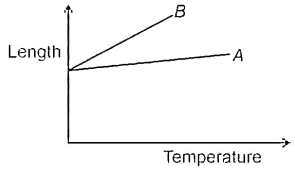
170. The displacement of a particle varies according to relation $x = 4[\cos\pi t + \sin\pi t]$. The maximum velocity of the particle will be
(1) 4π (2) $2\sqrt{2}\,\pi$
(3) $4\sqrt{2}\,\pi$ (4) 2

171. If a resonance tube is sounded with a tuning fork of frequency 256 Hz, resonance occurs at 35 cm and 105 cm. The velocity of sound is about
(1) 359 m/s (2) 512 m/s
(3) 524 m/s (4) 400 m/s

172. The equation of a stationary wave is $y = 2A\sin\left(\frac{2\pi vt}{\lambda}\right)\cos\left(\frac{2\pi x}{\lambda}\right)$. Which of the following statement is incorrect? (Symbol have their usual meaning)
(1) Dimensions of $\frac{2\pi v}{\lambda}$ is same as that of $\frac{2\pi x}{\lambda t}$
(2) Dimensions of vt is same as that of x
(3) Dimensions of $\frac{v}{\lambda}$ is same as that of $\frac{x}{\lambda}$
(4) λ and x both have same dimensions

173. Length v/s temperature graph of two materials A and B is given below. The relation between α_A and α_B is (Symbols have usual meaning)

Space for Rough Work



(1) $\alpha_A > \alpha_B$
(2) $\alpha_A = \alpha_B$
(3) $\alpha_A < \alpha_B$
(4) Cannot be determined

174. Choose the incorrect statements among the following
(1) Blood is more viscous than water
(2) The blood pressure in humans is greater at the feet than at the brain
(3) The angle of contact of mercury with glass is obtuse while that of water with glass is acute
(4) A spinning cricket ball in air follows a rectilinear trajectory

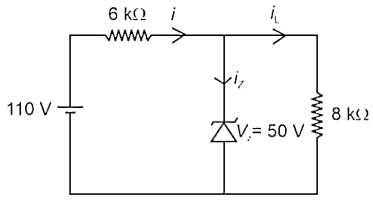
175. If P, Q and R denote respectively the heat added, change in internal energy and work done in a closed cyclic process respectively, then
(1) $P = 0$ (2) $P = R = 0$
(3) $R = 0$ (4) $Q = 0$

176. The amount of heat that must be supplied to 5.6×10^{-2} kg of nitrogen (at room temperature) to raise its temperature by 45°C at constant pressure is nearly (Molecular mass of N_2 = 28 g/mol, R = 8.3 J K^{-1} mol^{-1})
(1) 1000 J (2) 1500.5 J
(3) 2614.5 J (4) 1750.5 J

177. The de-Broglie wavelength of a particle having kinetic energy E is λ. How much extra energy must be given to this particle so that the de-Broglie wavelength reduces to 60% of the initial value?
(1) $\frac{7E}{9}$ (2) $\frac{E}{2}$
(3) $\frac{E}{4}$ (4) $\frac{16E}{9}$

178. In $_{82}Pb^{207}$ nucleus there are
(1) 125 protons and 82 neutrons
(2) 82 protons and 125 neutrons
(3) 80 electrons and 125 neutrons
(4) 82 neutrons and 82 protons

179. In the circuit shown below



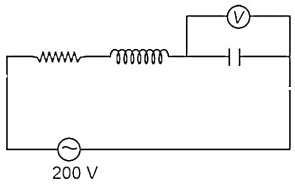
(a) The value of i is 10 mA
(b) The value of i_L is 7.25 mA
(c) The value of i_z is 3.75 mA
Choose the correct option.
(1) Only (a) is correct
(2) (a), (b) and (c) all are correct
(3) Both (a) and (b) are correct
(4) Both (a) and (c) are correct

180. If a semiconductor photodiode can detect a photon with a maximum wavelength of 4960 Å, then its band energy gap is
(1) 1.5 eV (2) 3 eV
(3) 2.5 eV (4) 1.8 eV

181. The potential energy of a particle of mass 1 kg moving in x-y plane is given by $U = (-3x + 4y)$ J, where x and y are in meters. If the particle starts from origin at t = 0, then magnitude of displacement of the particle at t = 2 s is
(1) 5 m (2) 10 m
(3) 15 m (4) 20 m

182. A bomb of mass 10 kg at rest is exploded into two piece of masses 6 kg and 4 kg. If velocity of 6 kg mass is 4 m s^{-1}, then kinetic energy of 4 kg mass is
(1) 72 J (2) 36 J
(3) 18 J (4) 9 J

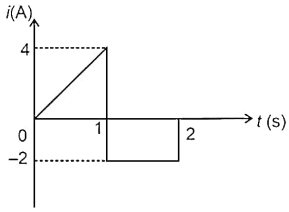
183. If the reading of the voltmeter in the circuit at resonance is 150 V, then the quality factor of the circuit is



(1) $\frac{4}{3}$ (2) $\frac{3}{4}$
(3) Zero (4) 3

Space for Rough Work

184. In a coil of resistance 10 Ω, the induced current developed by changing magnetic flux through it, is shown in figure given below. The magnitude of change in magnetic flux for t = 0 to t = 2 s is given by



(1) Zero (2) 2 Wb
(3) 4 Wb (4) 8 Wb

185. The mean free path of gas molecule is directly proportional to n^{th} power of diameter of molecules. Here n is

(1) $\frac{1}{2}$ (2) $\frac{-1}{2}$
(3) –2 (4) $\frac{1}{3}$

SECTION - B

186. Two circular loops P and Q are made from a uniform wire of same material. The radii of P and Q are r_1 and r_2 respectively, and their moments of inertia are I_1 and I_2 respectively. If $\frac{I_1}{I_2} = 4$, then $\frac{r_2}{r_1}$ equals

(1) $4^{2/3}$ (2) $4^{1/3}$
(3) $4^{-2/3}$ (4) $4^{-1/3}$

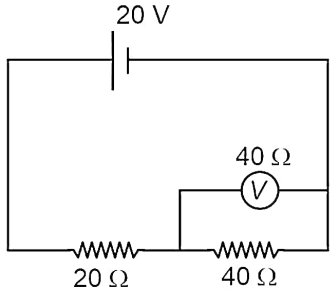
187. The ratio of acceleration due to gravity at a height $2R$ above earth's surface to the acceleration due to gravity on the surface of the earth is (R = radius of earth)

(1) $\frac{2}{3}$ (2) $\frac{1}{3}$
(3) $\frac{2}{9}$ (4) $\frac{1}{9}$

188. A 5 kg block is projected upwards along inclined plane of inclination 30° from horizontal with an initial speed of 10 m s^{-1} from the bottom. If μ_k = 0.2 then how far does the block move up the plane?

(1) 6.7 m (2) 7.46 m
(3) 8.32 m (4) 5.82 m

189. In the adjoining circuit the emf of the cell is 20 V and the internal resistance is negligible. The resistance of the voltmeter is 40 Ω. The reading of the voltmeter will be



(1) 10 V (2) 5 V
(3) 20 V (4) 15 V

190. A ray of light enters a rectangular glass slab of refractive index $\sqrt{3}$ at an angle of incidence 60°.It travels a distance of 4 cm inside the slab and emerges out of the slab. The perpendicular distance between the incident and the emergent rays is

(1) 4 cm (2) 2 cm
(3) $4\sqrt{3}$ cm (4) $2\sqrt{2}$ cm

191. In a double-slit experiment, instead of taking slits of equal width, one slit is made twice as wide as the other. Then, in the interference pattern

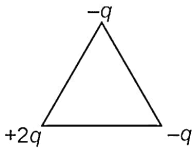
(1) The intensities of both maxima and minima increase
(2) The intensity of the maxima increases and the minima has zero intensity
(3) The intensity of the maxima decreases and that of the minima increases
(4) The intensity of the maxima decreases and the minima has zero intensity

192. A conducting sphere of radius R, and carrying a charge q is joined by conducting wire to a distant conducting sphere of radius $2R$ having charge $3q$. The magnitude of charge flow between them will be

(1) $\frac{2q}{3}$ (2) $\frac{q}{3}$
(3) $\frac{3q}{4}$ (4) $\frac{q}{4}$

Space for Rough Work

193. Three charges are arranged on the vertices of an equilateral triangle of side length d as shown in figure. The magnitude of dipole moment of the system will be $\left(d = \sqrt{3}\times10^{-3}\text{m}, q = 2\times10^{-3}\text{C}\right)$



(1) 3 μC m (2) 4 μC m
(3) 6 μC m (4) 8 μC m

194. Match the physical quantities given in column-I with the units given in column- II and tick the correct option.

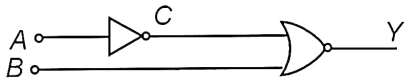
	Column-I		Column-II
(A)	Rate of change in linear momentum	(P)	N C^{-1}
(B)	Velocity gradient	(Q)	N m C^{-1}
(C)	Electromotive force	(R)	kg m s^{-2}
(D)	Electric field intensity	(S)	s^{-1}

(1) (A) → (P) ; (B) → (Q) ; (C) → (S); (D) → (R)
(2) (A) → (R) ; (B) → (S) ; (C) → (P); (D) → (Q)
(3) (A) → (R) ; (B) → (S) ; (C) → (Q); (D) → (P)
(4) (A) → (R) ; (B) → (P) ; (C) → (Q); (D) → (S)

195. Regarding heat, the correct statements is/are
A. It is a form of energy transferred between two bodies by virtue of temperature difference.
B. Heat automatically flows from a body at higher temperature towards body at lower temperature.
C. When a body receives heat, physical changes can take place in body
(1) Statements A and B are correct
(2) Statements B and C are correct
(3) All statements are correct
(4) All statements are incorrect

196. The net force acting on the window of area 10 cm × 10 cm of a submarine at the depth of 1000 m in an ocean if the interior of submarine is maintained at sea-level atmospheric pressure ($\rho_{\text{sea water}}$ is 1.03 × 10^3 kg/m^3 , g = 10 m/s^2)
(1) 2.03 × 10^3 N (2) 4.03 × 10^8 N
(3) 1.03 × 10^5 N (4) 2.03 × 10^6 N

197. In the following digital circuit, what will be the output at 'Y', when the input (A, B) are (0,1), (1,1)?



(1) 0, 1 (2) 1, 1
(3) 1, 0 (4) 0, 0

198. The time period of revolution of electron in its first excited state is 12.8 × 10^{-16} s. The frequency of revolution of the electron in its second excited state is
(1) 2.3 × 10^{16} s^{-1} (2) 2.3 × 10^{12} s^{-1}
(3) 2.3 × 10^{14} s^{-1} (4) 2.3 × 10^{10} s^{-1}

199. The power factor is $\frac{1}{4}$ in series RC circuit. If R = 100 Ω, then capacitive reactance is
(1) $100\sqrt{5}$ Ω (2) $100\sqrt{15}$ Ω
(3) $100\sqrt{3}$ Ω (4) 100 Ω

200. A wire of fixed length is wound on a solenoid of length l and radius r. Its self inductance is found to be L. Now the same wire is wound on a solenoid of length $2l$ and radius $\frac{r}{2}$, then self inductance
(1) $2L$ (2) $\frac{L}{2}$
(3) $3L$ (4) $4L$

❑ ❑ ❑

Space for Rough Work