Test Booklet Code

H1

KANHA

No. :

This Booklet contains 24 pages.

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **H1.** Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : _____

Roll Number : in figures _____

: in words _____

Centre of Examination (in Capitals) : _____

Candidate's Signature : _____ Invigilator's Signature : _____

Facsimile signature stamp of

Centre Superintendent : _____

1. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, the **correct** option is :

(1) $\Delta_r H < 0$ and $\Delta_r S < 0$

(2) $\Delta_r H > 0$ and $\Delta_r S > 0$

(3) $\Delta_r H > 0$ and $\Delta_r S < 0$

(4) $\Delta_r H < 0$ and $\Delta_r S > 0$

2. Which of the following set of molecules will have zero dipole moment ?

(1) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

(2) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

(3) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene

(4) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

3. The correct option for free expansion of an ideal gas under adiabatic condition is :

(1) $q > 0$, $\Delta T > 0$ and $w > 0$

(2) $q = 0$, $\Delta T = 0$ and $w = 0$

(3) $q = 0$, $\Delta T < 0$ and $w > 0$

(4) $q < 0$, $\Delta T = 0$ and $w = 0$

4. Identify a molecule which does **not** exist.

(1) O_2

(2) He_2

(3) Li_2

(4) C_2

5. Match the following and identify the **correct** option.

(a)	$CO(g) + H_2(g)$	(i)	$Mg(HCO_3)_2 + Ca(HCO_3)_2$
(b)	Temporary hardness of water	(ii)	An electron deficient hydride
(c)	B_2H_6	(iii)	Synthesis gas
(d)	H_2O_2	(iv)	Non-planar structure

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

6. Identify the **correct** statement from the following :

(1) Pig iron can be moulded into a variety of shapes.

(2) Wrought iron is impure iron with 4% carbon.

(3) Blister copper has blistered appearance due to evolution of CO_2.

(4) Vapour phase refining is carried out for Nickel by Van Arkel method.

7. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

(1) 0.60 K

(2) 0.20 K

(3) 0.80 K

(4) 0.40 K

8. Match the following :

	Oxide		**Nature**
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

Which of the following is **correct** option ?

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

9. Hydrolysis of sucrose is given by the following reaction.

$$\text{Sucrose} + H_2O \rightleftharpoons \text{Glucose} + \text{Fructose}$$

If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^{\ominus}$ at the same temperature will be :

(1) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(4 \times 10^{13})$

(2) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

(3) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

(4) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(3 \times 10^{13})$

10. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through Cu^{2+} (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

(1) $CuCO_3 \cdot Cu(OH)_2$

(2) $CuSO_4$

(3) $[Cu(NH_3)_4]^{2+}$

(4) $Cu(OH)_2$

11. Which of the following is a basic amino acid ?

(1) Lysine

(2) Serine

(3) Alanine

(4) Tyrosine

12. Paper chromatography is an example of :

(1) Column chromatography

(2) Adsorption chromatography

(3) Partition chromatography

(4) Thin layer chromatography

13. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

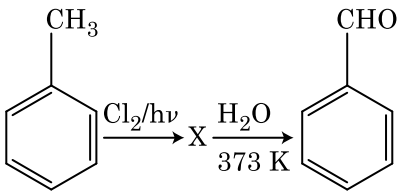
(1) Potassium

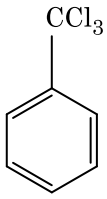
(2) Iron

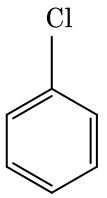
(3) Copper

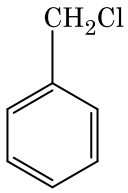
(4) Calcium

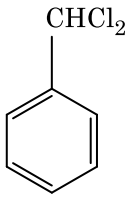
14. Identify compound X in the following sequence of reactions :



(1) 

(2) 

(3) 

(4) 

15. Identify the **correct** statements from the following :

(a) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.

(b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.

(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.

(d) CO is colorless and odourless gas.

(1) (c) and (d) only

(2) (a), (b) and (c) only

(3) (a) and (c) only

(4) (b) and (c) only

16. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

(1) n-Butane

(2) n-Hexane

(3) 2,3-Dimethylbutane

(4) n-Heptane

17. Which of the following is a natural polymer ?

(1) poly (Butadiene-acrylonitrile)

(2) *cis*-1,4-polyisoprene

(3) poly (Butadiene-styrene)

(4) polybutadiene

18. On electrolysis of dil.sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

(1) SO_2 gas

(2) Hydrogen gas

(3) Oxygen gas

(4) H_2S gas

19. Measuring Zeta potential is useful in determining which property of colloidal solution ?

(1) Size of the colloidal particles

(2) Viscosity

(3) Solubility

(4) Stability of the colloidal particles

20. HCl was passed through a solution of $CaCl_2$, $MgCl_2$ and NaCl. Which of the following compound(s) crystallise(s) ?

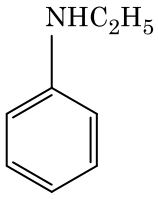
(1) NaCl, $MgCl_2$ and $CaCl_2$

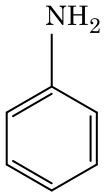
(2) Both $MgCl_2$ and $CaCl_2$

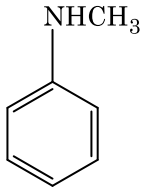
(3) Only NaCl

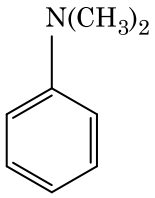
(4) Only $MgCl_2$

21. Which of the following amine will give the carbylamine test ?

(1) 

(2) 

(3) 

(4) 

22. The mixture which shows positive deviation from Raoult's law is :

(1) Chloroethane + Bromoethane

(2) Ethanol + Acetone

(3) Benzene + Toluene

(4) Acetone + Chloroform

23. The calculated spin only magnetic moment of Cr^{2+} ion is :

(1) 2.84 BM

(2) 3.87 BM

(3) 4.90 BM

(4) 5.92 BM

24. An increase in the concentration of the reactants of a reaction leads to change in :

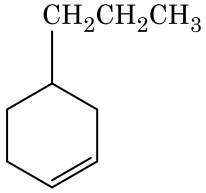
(1) collision frequency

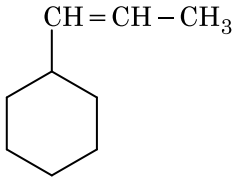
(2) activation energy

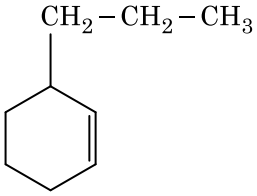
(3) heat of reaction

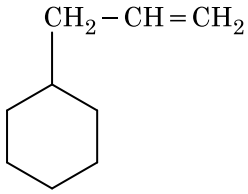
(4) threshold energy

25. An alkene on ozonolysis gives methanal as one of the product. Its structure is :

(1) 

(2) 

(3) 

(4) 

26. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :

(1) $\frac{4}{\sqrt{2}} \times 288$ pm

(2) $\frac{\sqrt{3}}{4} \times 288$ pm

(3) $\frac{\sqrt{2}}{4} \times 288$ pm

(4) $\frac{4}{\sqrt{3}} \times 288$ pm

27. Sucrose on hydrolysis gives :

(1) α-D-Fructose + β-D-Fructose

(2) β-D-Glucose + α-D-Fructose

(3) α-D-Glucose + β-D-Glucose

(4) α-D-Glucose + β-D-Fructose

28. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?

(1) $CN^- < C_2O_4^{2-} < SCN^- < F^-$

(2) $SCN^- < F^- < C_2O_4^{2-} < CN^-$

(3) $SCN^- < F^- < CN^- < C_2O_4^{2-}$

(4) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

29. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is :

(1) 4

(2) 1

(3) 2

(4) 3

30. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

(1) Isobutyl alcohol

(2) Isopropyl alcohol

(3) Sec. butyl alcohol

(4) Tert. butyl alcohol

31. Which of the following oxoacid of sulphur has $-O-O-$ linkage ?

(1) $H_2S_2O_7$, pyrosulphuric acid

(2) H_2SO_3, sulphurous acid

(3) H_2SO_4, sulphuric acid

(4) $H_2S_2O_8$, peroxodisulphuric acid

32. What is the change in oxidation number of carbon in the following reaction ?

$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(l) + 4HCl(g)$

(1) 0 to -4

(2) $+4$ to $+4$

(3) 0 to $+4$

(4) -4 to $+4$

33. Which of the following is a cationic detergent ?

(1) Sodium dodecylbenzene sulphonate

(2) Sodium lauryl sulphate

(3) Sodium stearate

(4) Cetyltrimethyl ammonium bromide

34. A mixture of N_2 and Ar gases in a cylinder contains 7 g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is :

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

(1) 18 bar

(2) 9 bar

(3) 12 bar

(4) 15 bar

35. Identify the **incorrect** statement.

(1) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.

(2) $Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ in water.

(3) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

(4) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

36. Identify the **incorrect** match.

	Name	**IUPAC Official Name**	
(a)	Unnilunium	(i)	Mendelevium
(b)	Unniltrium	(ii)	Lawrencium
(c)	Unnilhexium	(iii)	Seaborgium
(d)	Unununnium	(iv)	Darmstadtium

(1) (d), (iv)

(2) (a), (i)

(3) (b), (ii)

(4) (c), (iii)

37. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

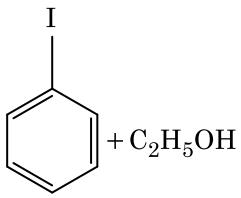
(1) Cross Aldol condensation

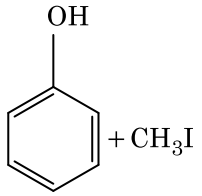
(2) Aldol condensation

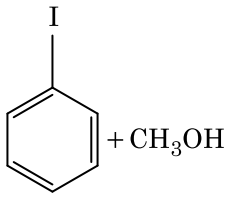
(3) Cannizzaro's reaction

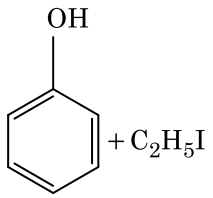
(4) Cross Cannizzaro's reaction

38. Anisole on cleavage with HI gives :

(1) 

(2) 

(3) 

(4) 

39. Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.

(1) 1×10^{8} M

(2) 2×10^{-13} M

(3) 2×10^{-8} M

(4) 1×10^{-13} M

40. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

(a) β-Elimination reaction

(b) Follows Zaitsev rule

(c) Dehydrohalogenation reaction

(d) Dehydration reaction

(1) (a), (b), (d)

(2) (a), (b), (c)

(3) (a), (c), (d)

(4) (b), (c), (d)

41. The rate constant for a first order reaction is $4.606 \times 10^{-3}\ s^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 1000 s

(2) 100 s

(3) 200 s

(4) 500 s

42. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

(1) Hyperconjugation

(2) $-$I effect of $-CH_3$ groups

(3) $+$R effect of $-CH_3$ groups

(4) $-$R effect of $-CH_3$ groups

43. Which one of the followings has maximum number of atoms ?

(1) 1 g of Li(s) [Atomic mass of Li = 7]

(2) 1 g of Ag(s) [Atomic mass of Ag = 108]

(3) 1 g of Mg(s) [Atomic mass of Mg = 24]

(4) 1 g of O_2(g) [Atomic mass of O = 16]

44. Which of the following is **not** correct about carbon monoxide ?

(1) It is produced due to incomplete combustion.

(2) It forms carboxyhaemoglobin.

(3) It reduces oxygen carrying ability of blood.

(4) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.

45. The number of protons, neutrons and electrons in $^{175}_{71}Lu$, respectively, are :

(1) 175, 104 and 71

(2) 71, 104 and 71

(3) 104, 71 and 71

(4) 71, 71 and 104

46. In water hyacinth and water lily, pollination takes place by :

(1) insects and water

(2) insects or wind

(3) water currents only

(4) wind and water

47. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

(1) Inbreeding

(2) Out crossing

(3) Mutational breeding

(4) Cross breeding

48. Snow-blindness in Antarctic region is due to :

(1) Damage to retina caused by infra-red rays

(2) Freezing of fluids in the eye by low temperature

(3) Inflammation of cornea due to high dose of UV-B radiation

(4) High reflection of light from snow

49. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Eosinophils	(i)	Immune response
(b)	Basophils	(ii)	Phagocytosis
(c)	Neutrophils	(iii)	Release histaminase, destructive enzymes
(d)	Lymphocytes	(iv)	Release granules containing histamine

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

50. Strobili or cones are found in :

(1) *Equisetum*

(2) *Salvinia*

(3) *Pteris*

(4) *Marchantia*

51. Meiotic division of the secondary oocyte is completed :

(1) At the time of fusion of a sperm with an ovum

(2) Prior to ovulation

(3) At the time of copulation

(4) After zygote formation

52. The QRS complex in a standard ECG represents :

(1) Repolarisation of ventricles

(2) Repolarisation of auricles

(3) Depolarisation of auricles

(4) Depolarisation of ventricles

53. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately :

(1) 2.7 meters

(2) 2.0 meters

(3) 2.5 meters

(4) 2.2 meters

54. The plant parts which consist of two generations - one within the other :

(a) Pollen grains inside the anther

(b) Germinated pollen grain with two male gametes

(c) Seed inside the fruit

(d) Embryo sac inside the ovule

(1) (a) and (d)

(2) (a) only

(3) (a), (b) and (c)

(4) (c) and (d)

55. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

(1) 8

(2) 4

(3) 2

(4) 14

56. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	*Clostridium butylicum*	(i)	Cyclosporin-A
(b)	*Trichoderma polysporum*	(ii)	Butyric Acid
(c)	*Monascus purpureus*	(iii)	Citric Acid
(d)	*Aspergillus niger*	(iv)	Blood cholesterol lowering agent

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

57. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

(1) Low concentration of FSH
(2) High concentration of Estrogen
(3) High concentration of Progesterone
(4) Low concentration of LH

58. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

(a) Darwin's Finches of Galapagos islands.

(b) Herbicide resistant weeds.

(c) Drug resistant eukaryotes.

(d) Man-created breeds of domesticated animals like dogs.

(1) only (d)
(2) only (a)
(3) (a) and (c)
(4) (b), (c) and (d)

59. Which of the following statements are **true** for the phylum-Chordata ?

(a) In Urochordata notochord extends from head to tail and it is present throughout their life.

(b) In Vertebrata notochord is present during the embryonic period only.

(c) Central nervous system is dorsal and hollow.

(d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

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

60. Match the following :

(a)	Inhibitor of catalytic activity	(i)	Ricin
(b)	Possess peptide bonds	(ii)	Malonate
(c)	Cell wall material in fungi	(iii)	Chitin
(d)	Secondary metabolite	(iv)	Collagen

Choose the **correct** option from the following :

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

61. The body of the ovule is fused within the funicle at :

(1) Chalaza

(2) Hilum

(3) Micropyle

(4) Nucellus

62. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :

(1) Plasmolysis

(2) Transpiration

(3) Root pressure

(4) Imbibition

63. Which of the following statements about inclusion bodies is **incorrect** ?

(1) These represent reserve material in cytoplasm.

(2) They are not bound by any membrane.

(3) These are involved in ingestion of food particles.

(4) They lie free in the cytoplasm.

64. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Placenta	(i)	Androgens
(b)	Zona pellucida	(ii)	Human Chorionic Gonadotropin (hCG)
(c)	Bulbo-urethral glands	(iii)	Layer of the ovum
(d)	Leydig cells	(iv)	Lubrication of the Penis

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

65. The process of growth is maximum during :

(1) Dormancy

(2) Log phase

(3) Lag phase

(4) Senescence

66. Match the organism with its use in biotechnology.

(a)	*Bacillus thuringiensis*	(i)	Cloning vector
(b)	*Thermus aquaticus*	(ii)	Construction of first rDNA molecule
(c)	*Agrobacterium tumefaciens*	(iii)	DNA polymerase
(d)	*Salmonella typhimurium*	(iv)	Cry proteins

Select the **correct** option from the following :

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

67. Floridean starch has structure similar to :

(1) Laminarin and cellulose

(2) Starch and cellulose

(3) Amylopectin and glycogen

(4) Mannitol and algin

68. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	6 - 15 pairs of gill slits	(i)	*Trygon*
(b)	Heterocercal caudal fin	(ii)	Cyclostomes
(c)	Air Bladder	(iii)	Chondrichthyes
(d)	Poison sting	(iv)	Osteichthyes

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

69. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

(1) Renal calculi and Hyperglycaemia

(2) Uremia and Ketonuria

(3) Uremia and Renal Calculi

(4) Ketonuria and Glycosuria

70. Identify the **incorrect** statement.

(1) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.

(2) Heart wood does not conduct water but gives mechanical support.

(3) Sapwood is involved in conduction of water and minerals from root to leaf.

(4) Sapwood is the innermost secondary xylem and is lighter in colour.

71. Which one of the following is the most abundant protein in the animals ?

(1) Insulin

(2) Haemoglobin

(3) Collagen

(4) Lectin

72. Which of the following is **not** an inhibitory substance governing seed dormancy ?

(1) Para-ascorbic acid

(2) Gibberellic acid

(3) Abscisic acid

(4) Phenolic acid

73. The enzyme enterokinase helps in conversion of :

(1) pepsinogen into pepsin

(2) protein into polypeptides

(3) trypsinogen into trypsin

(4) caseinogen into casein

74. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Gregarious, polyphagous pest	(i)	*Asterias*
(b)	Adult with radial symmetry and larva with bilateral symmetry	(ii)	Scorpion
(c)	Book lungs	(iii)	*Ctenoplana*
(d)	Bioluminescence	(iv)	*Locusta*

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

75. Cuboidal epithelium with brush border of microvilli is found in :

(1) eustachian tube

(2) lining of intestine

(3) ducts of salivary glands

(4) proximal convoluted tubule of nephron

76. Embryological support for evolution was disapproved by :

(1) Oparin

(2) Karl Ernst von Baer

(3) Alfred Wallace

(4) Charles Darwin

77. Experimental verification of the chromosomal theory of inheritance was done by :

(1) Morgan

(2) Mendel

(3) Sutton

(4) Boveri

78. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.

(1) Allele 'i' does not produce any sugar.

(2) The gene (I) has three alleles.

(3) A person will have only two of the three alleles.

(4) When I^A and I^B are present together, they express same type of sugar.

79. Identify the basic amino acid from the following.

(1) Valine

(2) Tyrosine

(3) Glutamic Acid

(4) Lysine

80. Dissolution of the synaptonemal complex occurs during :

(1) Leptotene

(2) Pachytene

(3) Zygotene

(4) Diplotene

81. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of :

(1) G_2 phase

(2) M phase

(3) G_1 phase

(4) S phase

82. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Pituitary gland	(i)	Grave's disease
(b)	Thyroid gland	(ii)	Diabetes mellitus
(c)	Adrenal gland	(iii)	Diabetes insipidus
(d)	Pancreas	(iv)	Addison's disease

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

83. Select the **correct** events that occur during inspiration.

(a) Contraction of diaphragm

(b) Contraction of external inter-costal muscles

(c) Pulmonary volume decreases

(d) Intra pulmonary pressure increases

(1) only (d)

(2) (a) and (b)

(3) (c) and (d)

(4) (a), (b) and (d)

84. The ovary is half inferior in :

(1) Plum

(2) Brinjal

(3) Mustard

(4) Sunflower

85. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :

(1) 1 molecule of 4-C compound and 1 molecule of 2-C compound

(2) 2 molecules of 3-C compound

(3) 1 molecule of 3-C compound

(4) 1 molecule of 6-C compound

86. Which of the following statements is **not correct** ?

(1) Genetically engineered insulin is produced in *E-Coli*.

(2) In man insulin is synthesised as a proinsulin.

(3) The proinsulin has an extra peptide called C-peptide.

(4) The functional insulin has A and B chains linked together by hydrogen bonds.

87. Which of the following pairs is of unicellular algae ?

(1) *Chlorella* and *Spirulina*

(2) *Laminaria* and *Sargassum*

(3) *Gelidium* and *Gracilaria*

(4) *Anabaena* and *Volvox*

88. Choose the **correct** pair from the following :

(1) Exonucleases - Make cuts at specific positions within DNA

(2) Ligases - Join the two DNA molecules

(3) Polymerases - Break the DNA into fragments

(4) Nucleases - Separate the two strands of DNA

89. Identify the **wrong** statement with reference to immunity.

(1) Foetus receives some antibodies from mother, it is an example for passive immunity.

(2) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

(3) When ready-made antibodies are directly given, it is called "Passive immunity".

(4) Active immunity is quick and gives full response.

90. Which of the following would help in prevention of diuresis ?

(1) Decrease in secretion of renin by JG cells

(2) More water reabsorption due to undersecretion of ADH

(3) Reabsorption of Na^+ and water from renal tubules due to aldosterone

(4) Atrial natriuretic factor causes vasoconstriction

91. The transverse section of a plant shows following anatomical features :

(a) Large number of scattered vascular bundles surrounded by bundle sheath.

(b) Large conspicuous parenchymatous ground tissue.

(c) Vascular bundles conjoint and closed.

(d) Phloem parenchyma absent.

Identify the category of plant and its part :

(1) Dicotyledonous root

(2) Monocotyledonous stem

(3) Monocotyledonous root

(4) Dicotyledonous stem

92. Ray florets have :

(1) Half inferior ovary

(2) Inferior ovary

(3) Superior ovary

(4) Hypogynous ovary

93. Select the **correct** statement.

(1) Insulin is associated with hyperglycemia.

(2) Glucocorticoids stimulate gluconeogenesis.

(3) Glucagon is associated with hypoglycemia.

(4) Insulin acts on pancreatic cells and adipocytes.

94. Which of the following statements is **correct** ?

(1) Adenine does not pair with thymine.

(2) Adenine pairs with thymine through two H-bonds.

(3) Adenine pairs with thymine through one H-bond.

(4) Adenine pairs with thymine through three H-bonds.

95. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?

(1) Activated sludge

(2) Primary sludge

(3) Floating debris

(4) Effluents of primary treatment

96. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

(1) Abscisic acid

(2) Cytokinin

(3) Gibberellin

(4) Ethylene

97. The roots that originate from the base of the stem are :

(1) Lateral roots
(2) Fibrous roots
(3) Primary roots
(4) Prop roots

98. The specific palindromic sequence which is recognized by EcoRI is :

(1) 5' - GGATCC - 3'
3' - CCTAGG - 5'
(2) 5' - GAATTC - 3'
3' - CTTAAG - 5'
(3) 5' - GGAACC - 3'
3' - CCTTGG - 5'
(4) 5' - CTTAAG - 3'
3' - GAATTC - 5'

99. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Floating Ribs	(i)	Located between second and seventh ribs
(b)	Acromion	(ii)	Head of the Humerus
(c)	Scapula	(iii)	Clavicle
(d)	Glenoid cavity	(iv)	Do not connect with the sternum

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

100. If the head of cockroach is removed, it may live for few days because :

(1) the head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.
(2) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.
(3) the cockroach does not have nervous system.
(4) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

101. Match the following diseases with the causative organism and select the **correct** option.

	Column - I		**Column - II**
(a)	Typhoid	(i)	*Wuchereria*
(b)	Pneumonia	(ii)	*Plasmodium*
(c)	Filariasis	(iii)	*Salmonella*
(d)	Malaria	(iv)	*Haemophilus*

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

102. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

(1) Polysomes
(2) Endoplasmic reticulum
(3) Peroxisomes
(4) Golgi bodies

103. Which of the following is **not** an attribute of a population ?

(1) Species interaction
(2) Sex ratio
(3) Natality
(4) Mortality

104. The number of substrate level phosphorylations in one turn of citric acid cycle is :

(1) Three
(2) Zero
(3) One
(4) Two

105. Montreal protocol was signed in 1987 for control of :

(1) Disposal of e-wastes
(2) Transport of Genetically modified organisms from one country to another
(3) Emission of ozone depleting substances
(4) Release of Green House gases

106. Bilaterally symmetrical and acoelomate animals are exemplified by :

(1) Annelida

(2) Ctenophora

(3) Platyhelminthes

(4) Aschelminthes

107. Identify the **wrong** statement with reference to transport of oxygen.

(1) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.

(2) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2.

(3) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.

(4) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

108. Identify the **wrong** statement with regard to Restriction Enzymes.

(1) Sticky ends can be joined by using DNA ligases.

(2) Each restriction enzyme functions by inspecting the length of a DNA sequence.

(3) They cut the strand of DNA at palindromic sites.

(4) They are useful in genetic engineering.

109. Which of the following is **correct** about viroids ?

(1) They have free DNA without protein coat.

(2) They have RNA with protein coat.

(3) They have free RNA without protein coat.

(4) They have DNA with protein coat.

110. The sequence that controls the copy number of the linked DNA in the vector, is termed :

(1) Recognition site

(2) Selectable marker

(3) Ori site

(4) Palindromic sequence

111. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Organ of Corti	(i)	Connects middle ear and pharynx
(b)	Cochlea	(ii)	Coiled part of the labyrinth
(c)	Eustachian tube	(iii)	Attached to the oval window
(d)	Stapes	(iv)	Located on the basilar membrane

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

112. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :

(1) CH_3, H_2, NH_3 and water vapor at 600°C

(2) CH_4, H_2, NH_3 and water vapor at 800°C

(3) CH_3, H_2, NH_4 and water vapor at 800°C

(4) CH_4, H_2, NH_3 and water vapor at 600°C

113. Which of the following regions of the globe exhibits highest species diversity ?

(1) Amazon forests

(2) Western Ghats of India

(3) Madagascar

(4) Himalayas

114. Identify the **correct** statement with reference to human digestive system.

(1) Vermiform appendix arises from duodenum.

(2) Ileum opens into small intestine.

(3) Serosa is the innermost layer of the alimentary canal.

(4) Ileum is a highly coiled part.

115. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :

(1) Insect predators

(2) Insect pests

(3) Fungal diseases

(4) Plant nematodes

116. Select the **correct** match.

(1) Thalassemia - X linked

(2) Haemophilia - Y linked

(3) Phenylketonuria - Autosomal dominant trait

(4) Sickle cell anaemia - Autosomal recessive trait, chromosome-11

117. The infectious stage of *Plasmodium* that enters the human body is :

(1) Male gametocytes

(2) Trophozoites

(3) Sporozoites

(4) Female gametocytes

118. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :

(1) Ammonia and hydrogen

(2) Ammonia alone

(3) Nitrate alone

(4) Ammonia and oxygen

119. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Bt cotton	(i)	Gene therapy
(b)	Adenosine deaminase deficiency	(ii)	Cellular defence
(c)	RNAi	(iii)	Detection of HIV infection
(d)	PCR	(iv)	*Bacillus thuringiensis*

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

120. In light reaction, plastoquinone facilitates the transfer of electrons from :

(1) PS-I to ATP synthase

(2) PS-II to $Cytb_6f$ complex

(3) $Cytb_6f$ complex to PS-I

(4) PS-I to $NADP^+$

121. According to Robert May, the global species diversity is about :

(1) 7 million

(2) 1.5 million

(3) 20 million

(4) 50 million

122. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

(1) Ethidium bromide in infrared radiation

(2) Acetocarmine in bright blue light

(3) Ethidium bromide in UV radiation

(4) Acetocarmine in UV radiation

123. Name the enzyme that facilitates opening of DNA helix during transcription.

(1) RNA polymerase

(2) DNA ligase

(3) DNA helicase

(4) DNA polymerase

124. Match the following concerning essential elements and their functions in plants :

(a)	Iron	(i)	Photolysis of water
(b)	Zinc	(ii)	Pollen germination
(c)	Boron	(iii)	Required for chlorophyll biosynthesis
(d)	Manganese	(iv)	IAA biosynthesis

Select the **correct** option :

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

125. Identify the **correct** statement with regard to G_1 phase (Gap 1) of interphase.

(1) Nuclear Division takes place.

(2) DNA synthesis or replication takes place.

(3) Reorganisation of all cell components takes place.

(4) Cell is metabolically active, grows but does not replicate its DNA.

126. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :

(1) Effect on reproduction

(2) Nutritive value

(3) Growth response

(4) Defence action

127. Flippers of Penguins and Dolphins are examples of :

(1) Natural selection

(2) Adaptive radiation

(3) Convergent evolution

(4) Industrial melanism

128. The first phase of translation is :

(1) Recognition of an anti-codon

(2) Binding of mRNA to ribosome

(3) Recognition of DNA molecule

(4) Aminoacylation of tRNA

129. Goblet cells of alimentary canal are modified from :

(1) Compound epithelial cells

(2) Squamous epithelial cells

(3) Columnar epithelial cells

(4) Chondrocytes

130. Select the option including all sexually transmitted diseases.

(1) Cancer, AIDS, Syphilis

(2) Gonorrhoea, Syphilis, Genital herpes

(3) Gonorrhoea, Malaria, Genital herpes

(4) AIDS, Malaria, Filaria

131. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?

(1) GIFT and ICSI

(2) ZIFT and IUT

(3) GIFT and ZIFT

(4) ICSI and ZIFT

132. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

(1) There is no relationship between Gross primary productivity and Net primary productivity.

(2) Gross primary productivity is always less than net primary productivity.

(3) Gross primary productivity is always more than net primary productivity.

(4) Gross primary productivity and Net primary productivity are one and same.

133. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

(1) Inulin, insulin

(2) Chitin, cholesterol

(3) Glycerol, trypsin

(4) Cellulose, lecithin

134. Match the trophic levels with their **correct** species examples in grassland ecosystem.

(a)	Fourth trophic level	(i)	Crow
(b)	Second trophic level	(ii)	Vulture
(c)	First trophic level	(iii)	Rabbit
(d)	Third trophic level	(iv)	Grass

Select the **correct** option :

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

135. Match the following with respect to meiosis :

(a)	Zygotene	(i)	Terminalization
(b)	Pachytene	(ii)	Chiasmata
(c)	Diplotene	(iii)	Crossing over
(d)	Diakinesis	(iv)	Synapsis

Select the **correct** option from the following :

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

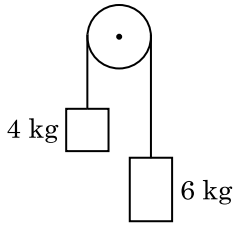
136. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

(1) 10^4 V
(2) 10 V
(3) 10^2 V
(4) 10^3 V

137. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

(1) one-fourth
(2) double
(3) half
(4) four times

138. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



(1) g/10
(2) g
(3) g/2
(4) g/5

139. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

(1) $1 : c^2$
(2) $c : 1$
(3) $1 : 1$
(4) $1 : c$

140. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

(1) $\frac{1}{\sqrt{2}\, n^2 \pi^2 d^2}$
(2) $\frac{1}{\sqrt{2}\, n\pi d}$
(3) $\frac{1}{\sqrt{2}\, n\pi d^2}$
(4) $\frac{1}{\sqrt{2}\, n^2 \pi d^2}$

141. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :

(1) -1.0
(2) zero
(3) 0.5
(4) 1.0

142. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to :

(1) $\frac{\mu A}{2}$
(2) $\frac{A}{2\mu}$
(3) $\frac{2A}{\mu}$
(4) μA

143. Taking into account of the significant figures, what is the value of 9.99 m − 0.0099 m ?

(1) 9.9 m
(2) 9.9801 m
(3) 9.98 m
(4) 9.980 m

144. For which one of the following, Bohr model is **not** valid ?

(1) Singly ionised neon atom (Ne^+)

(2) Hydrogen atom

(3) Singly ionised helium atom (He^+)

(4) Deuteron atom

145. When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and :

(1) $^{103}_{36}Kr$

(2) $^{144}_{56}Ba$

(3) $^{91}_{40}Zr$

(4) $^{101}_{36}Kr$

146. In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

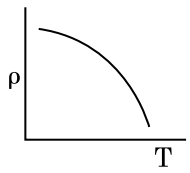
(1) 5 N/C

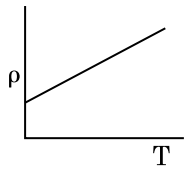
(2) zero

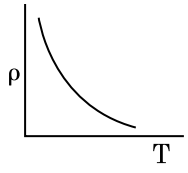
(3) 0.5 N/C

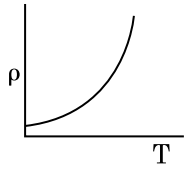
(4) 1 N/C

147. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

(1) 

(2) 

(3) 

(4) 

148. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :

(1) isobaric

(2) isothermal

(3) adiabatic

(4) isochoric

149. A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

(1) 1.5×10^{-2} m

(2) 1.0×10^{-2} m

(3) 1.0×10^{-1} m

(4) 1.5×10^{-1} m

150. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio :

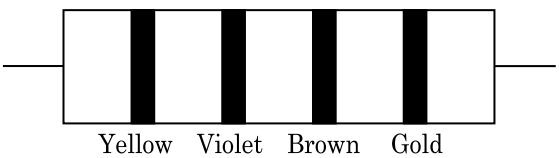
(1) $\frac{5}{3}$

(2) $\frac{27}{8}$

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

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

151. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

(1) 470 Ω, 5%

(2) 470 kΩ, 5%

(3) 47 kΩ, 10%

(4) 4.7 kΩ, 5%

152. The solids which have the negative temperature coefficient of resistance are :

(1) insulators and semiconductors

(2) metals

(3) insulators only

(4) semiconductors only

153. For transistor action, which of the following statements is **correct** ?

(1) The base region must be very thin and lightly doped.

(2) Base, emitter and collector regions should have same doping concentrations.

(3) Base, emitter and collector regions should have same size.

(4) Both emitter junction as well as the collector junction are forward biased.

154. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 1.28×10^7 N/C

(2) 1.28×10^4 N/C

(3) 1.28×10^5 N/C

(4) 1.28×10^6 N/C

155. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

(1) zero

(2) doubled

(3) four times

(4) one-fourth

156. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

(1) 80 cm

(2) 33 cm

(3) 50 cm

(4) 67 cm

157. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :

(1) $\frac{MgL}{A(L_1 - L)}$

(2) $\frac{MgL_1}{AL}$

(3) $\frac{Mg(L_1 - L)}{AL}$

(4) $\frac{MgL}{AL_1}$

158. A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} Vm^{-1}, has a mobility in m^2 V^{-1} s^{-1} of :

(1) 2.25×10^{-15}

(2) 2.25×10^{15}

(3) 2.5×10^6

(4) 2.5×10^{-6}

159. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1) 6.00×10^{-7} rad

(2) 3.66×10^{-7} rad

(3) 1.83×10^{-7} rad

(4) 7.32×10^{-7} rad

160. Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

(1) $6\hat{k}$ N m

(2) $6\hat{i}$ N m

(3) $6\hat{j}$ N m

(4) $-6\hat{i}$ N m

161. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2. The energy received by the surface during time span of 1 minute is :

(1) 48×10^3 J

(2) 10×10^3 J

(3) 12×10^3 J

(4) 24×10^3 J

162. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

(1) 1.0 mm

(2) 0.01 mm

(3) 0.25 mm

(4) 0.5 mm

163. The capacitance of a parallel plate capacitor with air as medium is 6 μF. With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is :

($\epsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2})

(1) 5.00 C^2 N^{-1} m^{-2}

(2) 0.44×10^{-13} C^2 N^{-1} m^{-2}

(3) 1.77×10^{-12} C^2 N^{-1} m^{-2}

(4) 0.44×10^{-10} C^2 N^{-1} m^{-2}

164. The energy equivalent of 0.5 g of a substance is :

(1) 0.5×10^{13} J

(2) 4.5×10^{16} J

(3) 4.5×10^{13} J

(4) 1.5×10^{13} J

165. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

(1) 24 N

(2) 48 N

(3) 32 N

(4) 30 N

166. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ($g = 10$ m/s^2)

(1) 300 m

(2) 360 m

(3) 340 m

(4) 320 m

167. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is :

(1) 20.0 g

(2) 2.5 g

(3) 5.0 g

(4) 10.0 g

168. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

(1) 537 Hz

(2) 523 Hz

(3) 524 Hz

(4) 536 Hz

169. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) increase in forward current

(2) forward bias only

(3) reverse bias only

(4) both forward bias and reverse bias

170. Dimensions of stress are :

(1) $[ML^{-1}T^{-2}]$

(2) $[MLT^{-2}]$

(3) $[ML^2T^{-2}]$

(4) $[ML^0T^{-2}]$

171. A short electric dipole has a dipole moment of 16×10^{-9} C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) zero

(2) 50 V

(3) 200 V

(4) 400 V

172. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

(1) zero

(2) π rad

(3) $\frac{3\pi}{2}$ rad

(4) $\frac{\pi}{2}$ rad

173. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

(1) 25.1 A

(2) 1.7 A

(3) 2.05 A

(4) 2.5 A

174. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) $2.4\pi \times 10^{-7}$ T m A^{-1}

(2) $2.4\pi \times 10^{-4}$ T m A^{-1}

(3) 8.0×10^{-5} T m A^{-1}

(4) $2.4\pi \times 10^{-5}$ T m A^{-1}

175. The Brewsters angle i_b for an interface should be :

(1) $i_b = 90°$

(2) $0° < i_b < 30°$

(3) $30° < i_b < 45°$

(4) $45° < i_b < 90°$

176. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

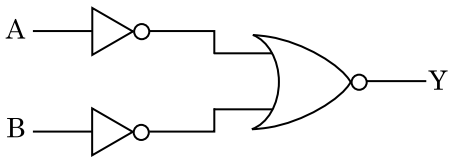
(1) 3.14×10^{-5} T

(2) 6.28×10^{-4} T

(3) 3.14×10^{-4} T

(4) 6.28×10^{-5} T

177. For the logic circuit shown, the truth table is :



(1)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(2)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(3)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(4)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

178. The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T, absolute temperature)

(1) $\frac{7}{2} k_B T$

(2) $\frac{1}{2} k_B T$

(3) $\frac{3}{2} k_B T$

(4) $\frac{5}{2} k_B T$

179. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly :

(1) 0.006

(2) 6

(3) 0.6

(4) 0.06

180. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.
Its density is : ($R = 8.3$ J mol^{-1} K^{-1})

(1) 0.02 kg/m^3

(2) 0.5 kg/m^3

(3) 0.2 kg/m^3

(4) 0.1 kg/m^3

- o 0 o -