Test Booklet Code

E3

NAKHA

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 **E3**. 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 : _____

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Centre Superintendent : _____

1. Which of the following is a basic amino acid ?
   (1) Serine
   (2) Alanine
   (3) Tyrosine
   (4) Lysine

2. 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 $w > 0$

3. Measuring Zeta potential is useful in determining which property of colloidal solution ?
   (1) Viscosity
   (2) Solubility
   (3) Stability of the colloidal particles
   (4) Size of the colloidal particles

4. The calculated spin only magnetic moment of Cr^{2+} ion is :
   (1) 3.87 BM
   (2) 4.90 BM
   (3) 5.92 BM
   (4) 2.84 BM

5. 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), (c)
   (2) (a), (c), (d)
   (3) (b), (c), (d)
   (4) (a), (b), (d)

6. On electrolysis of dil.sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :
   (1) Hydrogen gas
   (2) Oxygen gas
   (3) H_2S gas
   (4) SO_2 gas

7. Which of the following is **not** correct about carbon monoxide ?
   (1) It forms carboxyhaemoglobin.
   (2) It reduces oxygen carrying ability of blood.
   (3) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
   (4) It is produced due to incomplete combustion.

8. Sucrose on hydrolysis gives :
   (1) β-D-Glucose + α-D-Fructose
   (2) α-D-Glucose + β-D-Glucose
   (3) α-D-Glucose + β-D-Fructose
   (4) α-D-Fructose + β-D-Fructose

9. 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)	(iii)	(i)	(ii)	(iv)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(i)	(iii)	(ii)	(iv)

10. An increase in the concentration of the reactants of a reaction leads to change in :
   (1) activation energy
   (2) heat of reaction
   (3) threshold energy
   (4) collision frequency

11. Which of the following is a natural polymer ?
   (1) *cis*-1,4-polyisoprene
   (2) poly (Butadiene-styrene)
   (3) polybutadiene
   (4) poly (Butadiene-acrylonitrile)

12. 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) 100 s

(2) 200 s

(3) 500 s

(4) 1000 s

13. 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) (a), (b) and (c) only

(2) (a) and (c) only

(3) (b) and (c) only

(4) (c) and (d) only

14. 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) 9 bar

(2) 12 bar

(3) 15 bar

(4) 18 bar

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

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

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

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

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

16. 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 :

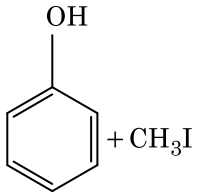
(1) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

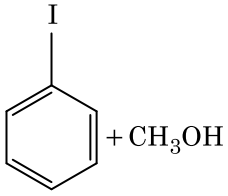
(2) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

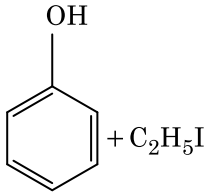
(3) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(3 \times 10^{13})$

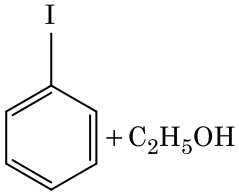
(4) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(4 \times 10^{13})$

17. Anisole on cleavage with HI gives :

(1) 

(2) 

(3) 

(4) 

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

(1) 71, 104 and 71

(2) 104, 71 and 71

(3) 71, 71 and 104

(4) 175, 104 and 71

19. Paper chromatography is an example of :

(1) Adsorption chromatography

(2) Partition chromatography

(3) Thin layer chromatography

(4) Column chromatography

20. Identify the **incorrect** match.

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

(1) (a), (i)

(2) (b), (ii)

(3) (c), (iii)

(4) (d), (iv)

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

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

(2) 1 g of Mg(s) [Atomic mass of Mg = 24]

(3) 1 g of O_2(g) [Atomic mass of O = 16]

(4) 1 g of Li(s) [Atomic mass of Li = 7]

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

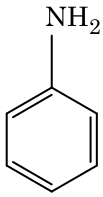
(1) $-$I effect of $-CH_3$ groups

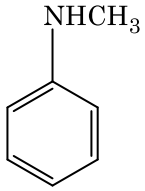
(2) $+$R effect of $-CH_3$ groups

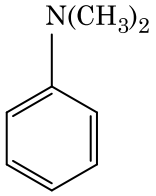
(3) $-$R effect of $-CH_3$ groups

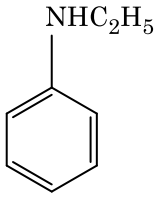
(4) Hyperconjugation

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

(1) 

(2) 

(3) 

(4) 

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

(1) n-Hexane

(2) 2,3-Dimethylbutane

(3) n-Heptane

(4) n-Butane

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

(1) Ethanol + Acetone

(2) Benzene + Toluene

(3) Acetone + Chloroform

(4) Chloroethane + Bromoethane

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

(1) Aldol condensation

(2) Cannizzaro's reaction

(3) Cross Cannizzaro's reaction

(4) Cross Aldol condensation

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

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

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

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

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

28. Which of the following is a cationic detergent ?

(1) Sodium lauryl sulphate

(2) Sodium stearate

(3) Cetyltrimethyl ammonium bromide

(4) Sodium dodecylbenzene sulphonate

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

(1) Isopropyl alcohol

(2) Sec. butyl alcohol

(3) Tert. butyl alcohol

(4) Isobutyl alcohol

30. 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) $CuSO_4$

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

(3) $Cu(OH)_2$

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

31. 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) 1

(2) 2

(3) 3

(4) 4

32. 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 $\Delta_r S < 0$

33. 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) 2×10^{-13} M

(2) 2×10^{-8} M

(3) 1×10^{-13} M

(4) 1×10^{8} M

34. 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) 0.20 K

(2) 0.80 K

(3) 0.40 K

(4) 0.60 K

35. Identify the **incorrect** statement.

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

(2) 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.

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

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

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

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

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

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

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

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

(1) He_2

(2) Li_2

(3) C_2

(4) O_2

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

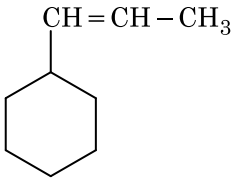
(1) H_2SO_3, sulphurous acid

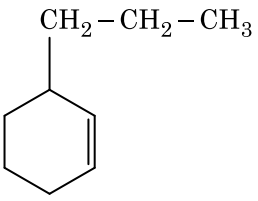
(2) H_2SO_4, sulphuric acid

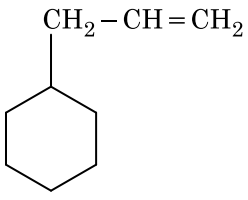
(3) $H_2S_2O_8$, peroxodisulphuric acid

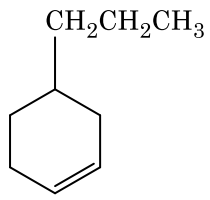
(4) $H_2S_2O_7$, pyrosulphuric acid

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

(1) 

(2) 

(3) 

(4) 

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

(1) Both $MgCl_2$ and $CaCl_2$

(2) Only NaCl

(3) Only $MgCl_2$

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

41. 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)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(ii)	(i)

42. 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) Iron

(2) Copper

(3) Calcium

(4) Potassium

43. 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) $+4$ to $+4$

(2) 0 to $+4$

(3) -4 to $+4$

(4) 0 to -4

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

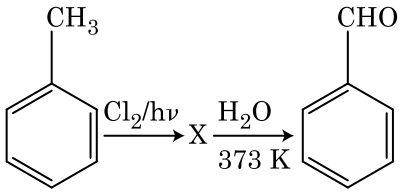
(1) Wrought iron is impure iron with 4% carbon.

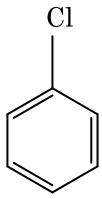
(2) Blister copper has blistered appearance due to evolution of CO_2.

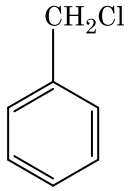
(3) Vapour phase refining is carried out for Nickel by Van Arkel method.

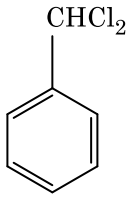
(4) Pig iron can be moulded into a variety of shapes.

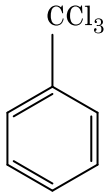
45. Identify compound X in the following sequence of reactions :



(1) 

(2) 

(3) 

(4) 

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

(1) Western Ghats of India
(2) Madagascar
(3) Himalayas
(4) Amazon forests

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

(1) insects or wind
(2) water currents only
(3) wind and water
(4) insects and water

48. The enzyme enterokinase helps in conversion of :

(1) protein into polypeptides
(2) trypsinogen into trypsin
(3) caseinogen into casein
(4) pepsinogen into pepsin

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

(1) Uremia and Ketonuria
(2) Uremia and Renal Calculi
(3) Ketonuria and Glycosuria
(4) Renal calculi and Hyperglycaemia

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

(1) Mendel
(2) Sutton
(3) Boveri
(4) Morgan

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

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

52. Goblet cells of alimentary canal are modified from :

(1) Squamous epithelial cells
(2) Columnar epithelial cells
(3) Chondrocytes
(4) Compound epithelial cells

53. Floridean starch has structure similar to :

(1) Starch and cellulose
(2) Amylopectin and glycogen
(3) Mannitol and algin
(4) Laminarin and cellulose

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

(1) Ileum opens into small intestine.

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

(3) Ileum is a highly coiled part.

(4) Vermiform appendix arises from duodenum.

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

(1) Nutritive value

(2) Growth response

(3) Defence action

(4) Effect on reproduction

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

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

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

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

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

57. Identify the **incorrect** statement.

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

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

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

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

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

(1) Cytokinin

(2) Gibberellin

(3) Ethylene

(4) Abscisic acid

59. The first phase of translation is :

(1) Binding of mRNA to ribosome

(2) Recognition of DNA molecule

(3) Aminoacylation of tRNA

(4) Recognition of an anti-codon

60. Embryological support for evolution was disapproved by :

(1) Karl Ernst von Baer

(2) Alfred Wallace

(3) Charles Darwin

(4) Oparin

61. Dissolution of the synaptonemal complex occurs during :

(1) Pachytene

(2) Zygotene

(3) Diplotene

(4) Leptotene

62. Meiotic division of the secondary oocyte is completed :

(1) Prior to ovulation

(2) At the time of copulation

(3) After zygote formation

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

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

(1) *Laminaria* and *Sargassum*

(2) *Gelidium* and *Gracilaria*

(3) *Anabaena* and *Volvox*

(4) *Chlorella* and *Spirulina*

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

(1) Chitin, cholesterol

(2) Glycerol, trypsin

(3) Cellulose, lecithin

(4) Inulin, insulin

65. Strobili or cones are found in :

(1) *Salvinia*
(2) *Pteris*
(3) *Marchantia*
(4) *Equisetum*

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

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

67. The ovary is half inferior in :

(1) Brinjal
(2) Mustard
(3) Sunflower
(4) Plum

68. 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)	(ii)	(iii)	(i)	(iv)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(iv)	(ii)	(i)	(iii)
(4)	(i)	(ii)	(iv)	(iii)

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

(1) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
(2) When ready-made antibodies are directly given, it is called "Passive immunity".
(3) Active immunity is quick and gives full response.
(4) Foetus receives some antibodies from mother, it is an example for passive immunity.

70. 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) M phase
(2) G_1 phase
(3) S phase
(4) G_2 phase

71. Select the **correct** statement.

(1) Glucocorticoids stimulate gluconeogenesis.
(2) Glucagon is associated with hypoglycemia.
(3) Insulin acts on pancreatic cells and adipocytes.
(4) Insulin is associated with hyperglycemia.

72. 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)	(i)	(iii)	(ii)	(iv)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(ii)	(i)	(iii)	(iv)
(4)	(iv)	(i)	(ii)	(iii)

73. Select the **correct** match.

(1)	Haemophilia	-	Y linked
(2)	Phenylketonuria	-	Autosomal dominant trait
(3)	Sickle cell anaemia	-	Autosomal recessive trait, chromosome-11
(4)	Thalassemia	-	X linked

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

(1) Endoplasmic reticulum

(2) Peroxisomes

(3) Golgi bodies

(4) Polysomes

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

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

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

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

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

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

(1) More water reabsorption due to undersecretion of ADH

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

(3) Atrial natriuretic factor causes vasoconstriction

(4) Decrease in secretion of renin by JG cells

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

(1) DNA synthesis or replication takes place.

(2) Reorganisation of all cell components takes place.

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

(4) Nuclear Division takes place.

78. 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 (a)

(2) (a) and (c)

(3) (b), (c) and (d)

(4) only (d)

79. 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) only

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

(3) (c) and (d)

(4) (a) and (d)

80. 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)	(ii)	(iii)	(iv)	(i)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(i)	(ii)	(iii)	(iv)

81. The QRS complex in a standard ECG represents :

(1) Repolarisation of auricles

(2) Depolarisation of auricles

(3) Depolarisation of ventricles

(4) Repolarisation of ventricles

82. 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) Transpiration

(2) Root pressure

(3) Imbibition

(4) Plasmolysis

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

(1) 1.5 million

(2) 20 million

(3) 50 million

(4) 7 million

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

(1) Acetocarmine in bright blue light

(2) Ethidium bromide in UV radiation

(3) Acetocarmine in UV radiation

(4) Ethidium bromide in infrared radiation

85. 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)	(ii)	(i)	(iv)	(iii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iv)	(i)	(ii)	(iii)

86. Flippers of Penguins and Dolphins are examples of :

(1) Adaptive radiation

(2) Convergent evolution

(3) Industrial melanism

(4) Natural selection

87. 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) 2.0 meters

(2) 2.5 meters

(3) 2.2 meters

(4) 2.7 meters

88. 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)	(ii)	(iv)	(i)	(iii)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(iv)	(iii)	(i)	(ii)

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

(1) Transport of Genetically modified organisms from one country to another

(2) Emission of ozone depleting substances

(3) Release of Green House gases

(4) Disposal of e-wastes

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

(1)	Ligases	-	Join the two DNA molecules
(2)	Polymerases	-	Break the DNA into fragments
(3)	Nucleases	-	Separate the two strands of DNA
(4)	Exonucleases	-	Make cuts at specific positions within DNA

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

(1) They are not bound by any membrane.

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

(3) They lie free in the cytoplasm.

(4) These represent reserve material in cytoplasm.

92. Ray florets have :

(1) Inferior ovary

(2) Superior ovary

(3) Hypogynous ovary

(4) Half inferior ovary

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

(1) Gibberellic acid

(2) Abscisic acid

(3) Phenolic acid

(4) Para-ascorbic acid

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

(1) Insect pests

(2) Fungal diseases

(3) Plant nematodes

(4) Insect predators

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

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

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

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

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

96. Bilaterally symmetrical and acoelomate animals are exemplified by :

(1) Ctenophora

(2) Platyhelminthes

(3) Aschelminthes

(4) Annelida

97. 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)	(iv)	(i)	(ii)	(iii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(i)	(ii)	(iii)	(iv)

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

(1) Out crossing

(2) Mutational breeding

(3) Cross breeding

(4) Inbreeding

99. 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)	(iii)	(iv)	(ii)	(i)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(ii)	(i)	(iii)	(iv)

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

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

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

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

(4) Adenine does not pair with thymine.

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

(1) Trophozoites

(2) Sporozoites

(3) Female gametocytes

(4) Male gametocytes

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

(1) Hilum

(2) Micropyle

(3) Nucellus

(4) Chalaza

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

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

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

(3) High reflection of light from snow

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

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

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

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

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

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

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

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

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

(3) They are useful in genetic engineering.

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

106. 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)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(ii)	(iv)	(iii)	(i)

107. 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) (d) and (c)

(2) (c) and (a)

(3) (a) and (b)

(4) (b) and (c)

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

(1) They have RNA with protein coat.

(2) They have free RNA without protein coat.

(3) They have DNA with protein coat.

(4) They have free DNA without protein coat.

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

(1) 5' - GAATTC - 3'
3' - CTTAAG - 5'

(2) 5' - GGAACC - 3'
3' - CCTTGG - 5'

(3) 5' - CTTAAG - 3'
3' - GAATTC - 5'

(4) 5' - GGATCC - 3'
3' - CCTAGG - 5'

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

111. 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)	(iv)	(iii)	(i)	(ii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(ii)	(i)	(iv)	(iii)

112. 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)	(ii)	(iii)	(iv)	(i)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iv)	(ii)	(iii)	(i)
(4)	(i)	(iv)	(iii)	(ii)

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

(1) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

(2) the cockroach does not have nervous system.

(3) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

(4) the head holds a $1/3^{rd}$ of a nervous system while the rest is situated along the dorsal part of its body.

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

(1) 4
(2) 2
(3) 14
(4) 8

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

(1) lining of intestine
(2) ducts of salivary glands
(3) proximal convoluted tubule of nephron
(4) eustachian tube

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

(1) Selectable marker
(2) Ori site
(3) Palindromic sequence
(4) Recognition site

117. 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)	(ii)	(iv)	(iii)	(i)
(2)	(iv)	(iii)	(i)	(ii)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(iii)	(iv)	(i)	(ii)

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

(1) PS-II to $Cytb_6f$ complex

(2) $Cytb_6f$ complex to PS-I

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

(4) PS-I to ATP synthase

119. The process of growth is maximum during :

(1) Log phase

(2) Lag phase

(3) Senescence

(4) Dormancy

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

(1) Ammonia alone

(2) Nitrate alone

(3) Ammonia and oxygen

(4) Ammonia and hydrogen

121. 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)	(i)	(iii)	(ii)	(iv)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(iii)	(ii)	(i)	(iv)
(4)	(ii)	(i)	(iii)	(iv)

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

(1) Haemoglobin

(2) Collagen

(3) Lectin

(4) Insulin

123. Identify the basic amino acid from the following.

(1) Tyrosine

(2) Glutamic Acid

(3) Lysine

(4) Valine

124. 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)	(iii)	(iv)	(ii)	(i)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(iv)	(iii)	(ii)	(i)

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

(1) High concentration of Estrogen

(2) High concentration of Progesterone

(3) Low concentration of LH

(4) Low concentration of FSH

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

(1) 2 molecules of 3-C compound

(2) 1 molecule of 3-C compound

(3) 1 molecule of 6-C compound

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

127. Select the option including all sexually transmitted diseases.

(1) Gonorrhoea, Syphilis, Genital herpes

(2) Gonorrhoea, Malaria, Genital herpes

(3) AIDS, Malaria, Filaria

(4) Cancer, AIDS, Syphilis

128. 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) Monocotyledonous stem

(2) Monocotyledonous root

(3) Dicotyledonous stem

(4) Dicotyledonous root

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

(1) Zero

(2) One

(3) Two

(4) Three

130. 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)	(iv)	(iii)	(i)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(ii)	(iii)	(i)	(iv)

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

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

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

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

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

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

(1) ZIFT and IUT

(2) GIFT and ZIFT

(3) ICSI and ZIFT

(4) GIFT and ICSI

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

(1) Primary sludge

(2) Floating debris

(3) Effluents of primary treatment

(4) Activated sludge

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

(1) DNA ligase

(2) DNA helicase

(3) DNA polymerase

(4) RNA polymerase

135. 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)	(iv)	(iii)	(i)	(ii)
(2)	(i)	(iv)	(ii)	(iii)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(ii)	(iii)	(iv)	(i)

136. 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) $0.5\ kg/m^3$

(2) $0.2\ kg/m^3$

(3) $0.1\ kg/m^3$

(4) $0.02\ kg/m^3$

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

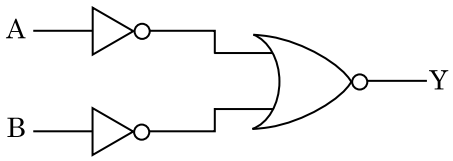
(1) $^{144}_{56}Ba$

(2) $^{91}_{40}Zr$

(3) $^{101}_{36}Kr$

(4) $^{103}_{36}Kr$

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



(1)

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

(2)

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

(3)

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

(4)

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

139. 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) 2.5 g

(2) 5.0 g

(3) 10.0 g

(4) 20.0 g

140. 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 V

(2) 10^2 V

(3) 10^3 V

(4) 10^4 V

141. 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) zero

(2) 0.5 N/C

(3) 1 N/C

(4) 5 N/C

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

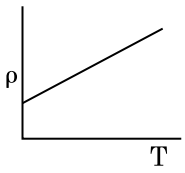
(1) $\frac{1}{2} k_B T$

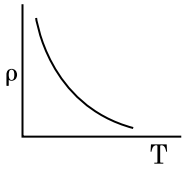
(2) $\frac{3}{2} k_B T$

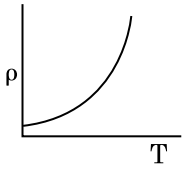
(3) $\frac{5}{2} k_B T$

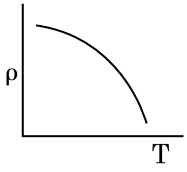
(4) $\frac{7}{2} k_B T$

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

(1)


(2)


(3)


(4)


144. 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) 50 V

(2) 200 V

(3) 400 V

(4) zero

145. 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) 10×10^3 J

(2) 12×10^3 J

(3) 24×10^3 J

(4) 48×10^3 J

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

(1) $0° < i_b < 30°$

(2) $30° < i_b < 45°$

(3) $45° < i_b < 90°$

(4) $i_b = 90°$

147. 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 :

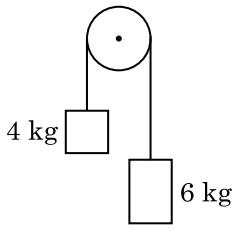
(1) isothermal

(2) adiabatic

(3) isochoric

(4) isobaric

148. 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

(2) g/2

(3) g/5

(4) g/10

149. 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) double

(2) half

(3) four times

(4) one-fourth

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

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

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

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

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

151. 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) 3.66×10^{-7} rad

(2) 1.83×10^{-7} rad

(3) 7.32×10^{-7} rad

(4) 6.00×10^{-7} rad

152. 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) 1.0×10^{-2} m

(2) 1.0×10^{-1} m

(3) 1.5×10^{-1} m

(4) 1.5×10^{-2} m

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

(1) 4.5×10^{16} J

(2) 4.5×10^{13} J

(3) 1.5×10^{13} J

(4) 0.5×10^{13} J

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

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

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

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

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

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

(1) 6

(2) 0.6

(3) 0.06

(4) 0.006

156. 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) $6\hat{i}$ N m

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

(3) $-6\hat{i}$ N m

(4) $6\hat{k}$ N m

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

(1) forward bias only

(2) reverse bias only

(3) both forward bias and reverse bias

(4) increase in forward current

158. 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) c : 1

(2) 1 : 1

(3) 1 : c

(4) $1 : c^2$

159. 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) 1.28×10^4 N/C

(2) 1.28×10^5 N/C

(3) 1.28×10^6 N/C

(4) 1.28×10^7 N/C

160. Dimensions of stress are :

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

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

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

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

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

(1) π rad

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

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

(4) zero

162. 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) zero

(2) 0.5

(3) 1.0

(4) -1.0

163. 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) 1.7 A

(2) 2.05 A

(3) 2.5 A

(4) 25.1 A

164. 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) 523 Hz

(2) 524 Hz

(3) 536 Hz

(4) 537 Hz

165. 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 :

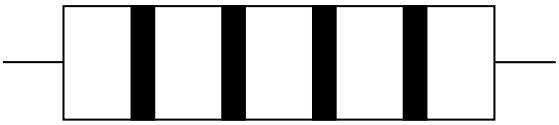
(1) $\frac{A}{2\mu}$

(2) $\frac{2A}{\mu}$

(3) μA

(4) $\frac{\mu A}{2}$

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



The values of resistance and tolerance, respectively, are :

(1) 470 kΩ, 5%

(2) 47 kΩ, 10%

(3) 4.7 kΩ, 5%

(4) 470 Ω, 5%

167. 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) 0.44×10^{-13} C^2 N^{-1} m^{-2}

(2) 1.77×10^{-12} C^2 N^{-1} m^{-2}

(3) 0.44×10^{-10} C^2 N^{-1} m^{-2}

(4) 5.00 C^2 N^{-1} m^{-2}

168. 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) 33 cm

(2) 50 cm

(3) 67 cm

(4) 80 cm

169. 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) 2.5×10^{6}

(3) 2.5×10^{-6}

(4) 2.25×10^{-15}

170. 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) 360 m

(2) 340 m

(3) 320 m

(4) 300 m

171. The solids which have the negative temperature coefficient of resistance are :
(1) metals
(2) insulators only
(3) semiconductors only
(4) insulators and semiconductors

172. 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) doubled
(2) four times
(3) one-fourth
(4) zero

173. 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) $\frac{27}{8}$
(2) $\frac{9}{4}$
(3) $\frac{3}{2}$
(4) $\frac{5}{3}$

174. 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) 48 N
(2) 32 N
(3) 30 N
(4) 24 N

175. Taking into account of the significant figures, what is the value of 9.99 m – 0.0099 m ?
(1) 9.9801 m
(2) 9.98 m
(3) 9.980 m
(4) 9.9 m

176. 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) 0.01 mm
(2) 0.25 mm
(3) 0.5 mm
(4) 1.0 mm

177. For which one of the following, Bohr model is **not** valid ?
(1) Hydrogen atom
(2) Singly ionised helium atom (He^+)
(3) Deuteron atom
(4) Singly ionised neon atom (Ne^+)

178. 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) $\frac{MgL_1}{AL}$
(2) $\frac{Mg(L_1 - L)}{AL}$
(3) $\frac{MgL}{AL_1}$
(4) $\frac{MgL}{A(L_1 - L)}$

179. 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) 6.28×10^{-4} T
(2) 3.14×10^{-4} T
(3) 6.28×10^{-5} T
(4) 3.14×10^{-5} T

180. 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) $2.4\pi \times 10^{-4}$ T m A^{-1}
(2) 8.0×10^{-5} T m A^{-1}
(3) $2.4\pi \times 10^{-5}$ T m A^{-1}
(4) $2.4\pi \times 10^{-7}$ T m A^{-1}

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Space For Rough Work

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