Previous Year Question Paper

of

BANARAS HINDU UNIVERSITY

M.Sc. Forensic Science

Entrance Examination

2015

(Original Question Paper)

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Set No. 1

Question Booklet No. 00023

15P/302/3

(To be filled up by the candidate by blue/black ball-point pen)

Roll No. | | | | | | | | | |

Serial No. of OMR Answer Sheet .....

Day and Date .....

.....

(Signature of Invigilator)

INSTRUCTIONS TO CANDIDATES

(Use only ***blue/black ball-point pen*** in the space above and on both sides of the **Answer Sheet**)

1. Within 10 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.
2. Do not bring any loose paper, written or blank, inside the Examination Hall ***except the Admit Card without its envelope***.
3. ***A separate Answer Sheet is given. It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.***
4. Write your Roll Number and Serial Number of the Answer Sheet by pen in the space provided above.
5. ***On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.***
6. ***No overwriting is allowed in the entries of Roll No., Question Booklet no. and Set no. (if any) on OMR sheet and Roll No. and OMR sheet no. on the Question Booklet.***
7. ***Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfairmeans.***
8. ***Each question in this Booklet is followed by four alternative answers. For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet.***
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).*
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit only **OMR *Answer Sheet*** at the end of the Test.
13. You are not permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

Total No. of Printed Pages : 64

(उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण पृष्ठ पर दिये गए हैं)

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15P/302/3

Total No. of Questions : 240

No. of Questions to be attempted : 120

Time : 2 Hours ***Full Marks : 360***

Note : (i) Attempt as many questions as you can. Each question carries **3 (Three)** marks. ***One mark will be deducted for each incorrect answer.*** **Zero** mark will be awarded for each unattempted question.

(ii) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

(iii) This question paper contains **two** Sections, viz : **Section–A** and **Section–B**. Details of **Section–A** and **Section–B** are as follows :

(a) **Section–A** contains **60** questions from General Sciences and **20** questions of General Nature.

(b) **Section–B** contains **four** sub–sections namely : **Biology, Chemistry, Mathematics** and **Physics** with **40** questions in each. The candidate has to select **only one** of the four sub–sections of **Section–B**.

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SECTION–A

01. Ballistics means :

(1) the science of projectiles and firearms
(2) the science of Odontology
(3) the science of DNA matching
(4) the science of tape authentication

02. The team carrying out Narco test comprises :

(1) forensic scientist and anesthetist
(2) forensic chemist and anesthetist
(3) forensic psychologist and anesthetist
(4) public prosecutor and anesthetist

03. The itai–itai diseace is due to :

(1) cadmium poisoning (2) arsenic poisoning
(3) mercury poisoning (4) lead poisoning

04. Atmospheric region in which we live is :

(1) troposphere (2) stratosphere
(3) mesosphere (4) thermosphere

05. Which one is the major culprit contributing the greenhouse effect and global warming :

(1) CO_2 (2) CH_4 (3) N_2O (4) H_2O

06. The theory which advocates the living beings can arise only from other living beings is termed :

(1) Bio–genesis (2) Abio genesis
(3) Catastrophism (4) Cosmozoic

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07. The use of which of the following devices has given the modern biologist a better insight into the internal structure of cells :

(1) Super computer
(2) Spectrophotometer
(3) Electron microscope
(4) Ultra centrifuge

08. Aqueous solution of ammonium chloride is :

(1) acidic
(2) basic
(3) neutral
(4) moderate acidic

09. A genetically engineered form of brinjal, known as the Bt–brinjal has been developed. The objective of this is :

(1) to make it pest resistant
(2) to improve its taste and nutritive qualities
(3) to make it drought resistant
(4) to make its shelf–life longer

10. Widespread resistance of malarial parasite to drug like chloroquine prompted attempts to develop a malarial vaccine to combat malaria Why is it difficult to develop an effective malaria vaccine ?

(1) Malaria is caused by several species of Plasmodium
(2) Man does not develc, immunity to malaria during natural infection
(3) Vaccine can be developed only against bacteria
(4) Man is only an intermediate host and not the definitive host

11. As you go down into the well, your weight :

(1) increases slightly
(2) decreases slightly
(3) remains exactly the same
(4) Nothing definite

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12. At present, scientists can determine the arrangement or relative positions of genes of DNA sequences on a chromosome. How does this knowledge benefit us ?

(a) It is possible to know the pedigree of live stock

(b) It is possible to understand the causes of all human diseases

(c) It is possible to develop disease resistant animal breeds.

Which of the statement given above is /are correct ?

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

13. Small pox is caused by :

(1) Bacteria
(2) Virus
(3) Fungus
(4) Algae

14. Select the one which is **not** a mixture :

(1) Air
(2) Gasoline
(3) LPG
(4) Distilled water

15. Plant cells can usually be distinguished because only plant cells possess :

(1) Cell walls and mitochondria
(2) Golgi bodies and central vacuoles
(3) Cell walls and central vacuoles
(4) Chromosomes and mitochondria

16. With reference to normal human beings, consider the following statements :

(a) In response to presence of Hcl, secretion is produced from deodenum

(b) Enterogastrone is proceeded in the small intestine in response to presence of fatty acid

Which of the above statements is/are correct ?

(1) Only a
(2) Only b
(3) both a & b
(4) neither a nor b

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17. When a gas is turned into liquid, the process is called :

(1) Condensation (2) Deposition

(3) Evaporation (4) Sublimation

18. Earth's seasons are caused by which of the following :

(1) the tilt of the earth's rotation relative to the ecliptic as earth revolves round the sun

(2) the varying amount of sunspot activity

(3) the earth's orbit around the sun is an eclipse rather than a circle.

(4) the rotation of earth during a 24 hr day.

19. The accumulation of stress along boundaries of lithospheric plates results in which of the following :

(1) Earthquakes

(2) Hurricanes

(3) Magnetic reversals

(4) Increased deposition of deep–sea sediments

20. Which of the following items will be attracted to the north pole of a permanent magnet by a magnetic force ?

(1) the north pole of another permanent magnet

(2) the piece of iron that is not a permanent magnet.

(3) A positively charged glass–rod

(4) A negatively charged rubber–rod.

21. The critical temperature of water is higher than that of O_2 because the H_2O molecule has :

(1) fewer electrons than O_2 (2) two covalent bonds

(3) V– shape (4) dipole moment

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22. When cyclohexane is poured in water, it floats, because :
(1) cyclohexane is in 'boat' form
(2) cyclohexane is in 'chair' form
(3) cyclohexane is in 'crown' form
(4) cyclohexane is less dense than water

23. In a college of 300 students, every student reads 5 news paper and every newspaper is read by 60 students. The number of newspapers is :
(1) at least 30
(2) at most 20
(3) exactly 25
(4) none of the above

24. A gas will approach ideal behaviour at :
(1) Low temperature and low pressure
(2) Low temperature and high pressure
(3) High temperature and low pressure
(4) High temperature and light pressure

25. The number of neutrons accompanying the formation of $^{139}_{54}Xe$ and $^{94}_{38}Sr$ from the absorption of a slow neutron by $^{235}_{92}U$ followed by nuclear fission is :
(1) 0 (2) 2 (3) 1 (4) 3

26. In a website, the 'home' page is :
(1) the best page
(2) the last page
(3) the first page
(4) the modest recent page

27. To restart the computer the following combination of keys is used :
(1) Del + ctrl
(2) Backspace + ctrl
(3) Esc + ctrl
(4) Ctrl + Alt + Del

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28. The hardness of water is due to the presence of :

(1) Chlorides of calcium and sodium

(2) Chlorides and carbonates of calcium and magnesium

(3) Chlorides and sulphates of calcium and magnesium

(4) Carbonates of calcium and sodium

29. The cross–section of hair when examined under microscope doest not reveal :

(1) Medulla (2) Cortex

(3) Cuticle (4) Follicle

30. 'Asphyxia' means :

(1) to struggle to consume water through mouth

(2) to struggle to walk on legs

(3) to struggle to climb on the mountain

(4) to struggle to breathe against some kind of interference with respiratory movements

31. When a gas filled in a closed vessel is heated upto 1°c, it increases by 0.4%. The initial temperature of the gas was :

(1) 25°C (2) 250°C (3) 250°k (4) 350°k

32. The example of non–ohmic resistance is :

(1) Copper wire (2) Carbon resistance

(3) diode (4) tungsten wire

33. The first law of thermodynamics is conserved with the conservation of :

(1) no. of mole (2) energy

(3) temperature (4) no. of molecules

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34. If an ammeter is used in place of a voltmeter, then we must connect with the ammeter of a :

(1) low resistance in parallel (2) high resistance in parallel

(3) high resistance in series (4) low resistance in series

35. Infrared radiations are detected by :

(1) spectrometer (2) pyrometers

(3) nanometer (4) photometer

36. Identify the pair whose dimensions are equal :

(1) torque and work (2) stress and energy

(3) force and stress (4) force and work

37. The energy band gap is maximum in :

(1) metals (2) superconductors

(3) insulators (4) semi conductors

38. 'Cooking gas containers are kept in a lorry moving with uniform speed. The temperature of the gas molecules inside will :

(1) increase

(2) decrease

(3) remain same

(4) decrease for some, while increase for others

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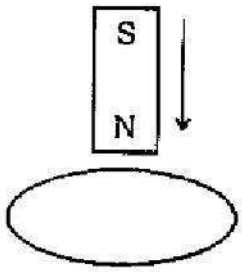
39. The north pole of a magnet is brought near a metallic ring as shown in the figure. The direction of induced current in the ring will be :



(1) clock – wise

(2) anti–clock wise

(3) first clock wise then anticlock wise

(4) first anti–clock wise then clock wise

40. Pitch of a musical note depends on :

(1) its fundamental frequency only

(2) its harmonics only

(3) its amplitude only

(4) the instrument producing the pitch

41. Artificial radioactivity was discovered by :

(1) Pauli (2) Ruther ford

(3) Soddy (4) Curie

42. Which of the following gas is insoluble in water ?

(1) SO_2 (2) NH_3 (3) H_2 (4) CO_2

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43. The compound x, in the reaction is :

$X \xrightarrow{CH_3HgI} Y \xrightarrow{\text{hydrolysis}} Mg(OH)I + CH_3COOH$

(1) CH_3CHO (2) CO_2

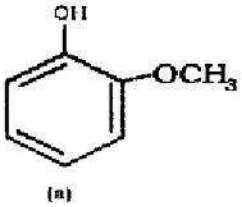
(3) $(CH_3)_2CO$ (4) H CHO

44. The unit of molality is :

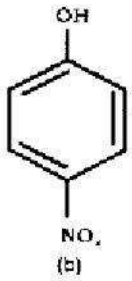
(1) mole/litre (2) mole/kg

(3) mol^{-1}/litre (4) mole litre

45. Phenol is more acidic than :

(1) 

(a)

(2) 

(b)

(3) C_2H_2
(c)

(4) both (a) and (c)

46. The maximum number of electrons in p–orbital with n=5, m=1 is :

(1) 6 (2) 2 (3) 14 (4) 10

47. Solder is an alloy of :

(1) pb+zn+sn (2) pb+zn

(3) pb+sn (4) sn+zn

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48. Which of the following properties show gradual decrease with increase in atomic number across a period in the periodic table :

(1) Electron affinity (2) Ionization potential

(3) Electro negativity (4) Size of atom

49. The pH of 10^{-9} M Hcl is :

(1) 9 (2) 7 (3) 5 (4) 6.9

50. Dual nature of particles was proposed by :

(1) Heisenberg (2) Lowry

(3) De–Broglie (4) Schrodinger

51. Which one is not a pollutant ?

(1) NO_2 (2) SO_2 (3) CO_2 (4) CO

Directions (Questions NO. 52 to 58)

In each of the questions **52–58**, a statement of Assertion [A] is given followed by a corresponding statement of Reason [R] just below it. Of the statements, mark the correct answer as :

(1) If both A and R are true and R is correct explanation of A

(2) If both A and R are true but R is not the correct explanation of A

(3) If A is true but R is false

(4) If both A and R are false

52. [A] : The DNA fingerprinting relies on recombinant DNA technology and can prove the identification of a suspect.

[R] : It is based on the pattern, length and number of DNA repeats and unique for each individual's genetic blue–print DNA

Choose the correct statement :

(1) (2) (3) (4)

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53. [A] : Lysosomes are also known as 'suicidal bags' of the cells

[B] : Lysosomes digest food contents of the phagosomes

Choose the correct statement

(1) (2) (3) (4)

54. [A] : Glycolysis occur in cytoplasm and converts some of the energy stored in glucose to ATP and NADH.

[B] : Glucose, in glycolysis is splitted into two molecules of 3–c compound.

Choose the correct statement

(1) (2) (3) (4)

55. [A] : Division of extra cellular protoplast is called cytokinesis

[B] : This cytokinesis is due to cell plate formation or by cleavage

Choose the correct statement :

(1) (2) (3) (4)

56. [A] : Rate of transpiration is high in low wind velocity

[B] : Wind removes humid air from around the leaf due to which transpiration is high

Choose the correct statement

(1) (2) (3) (4)

57. [A] : Steroid harmones are similar to cholesterol in structure

[B] : Steroids contain phenanthrene ring structure

Choose the correct statement

(1) (2) (3) (4)

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58. [A] : The colour of Flowers in Bouganvillia is due to the coloured bracts

[B] : The flower of Bouganvillia are largest among plant kingdom

Choose the correct statement

(1) (2) (3) (4)

59. At present the average age of a man and his son is 42 years. The ratio of their present ages is 5:2 respectively. What is the son's present age ?

(1) 20 years (2) 22 years (3) 24 years (4) 26 years

60. 'Epidermis' is :

(1) an outer skin layer on fingerprint

(2) an inner skin layer on fingerprint

(3) an illdefined ridge on fingerprint

(4) an illogical impression on finger print

61. Select the related word from the given alternatives :

Command : Order : : Confusion : ?

(1) Discipline (2) Clarity

(3) Chaos (4) Problem

62. If LBAECH is the code for BLEACH, then which of the following is coaded NBOLZKMH ?

(1) BNLOKZHM (2) MANKYJLG

(3) LOBNHMKZ (4) OBNKZLHM

63. A man wears socks of two colours black and brown. He has altogether 20 black socks and 20 brown socks in a drawer. Supposing he has to take out the socks in the dark, how many must he take out to be sure that he has a matching pair ?

(1) 3 (2) 20 (3) 39 (4) 6

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64. In how many different ways can the letters of the word 'TRENDS' be arranged :

(1) 720 (2) 120 (3) 740 (4) 5040

65. A man bought 5kg of rice at the rate of ₹ 22 per kg. Then he bought 12kg of wheet at the rate of ₹18 per kg. What was the difference in the total amount he spend on rice and the amount he spent on wheat ?

(1) ₹108 (2) ₹103 (3) ₹106 (4) ₹104

66. From among the given alternatives, select the word which can be formed by using the letters of the given word :

DECLARATION

(1) DECLINE (2) CLARITY

(3) DONATION (4) DECOR

67. In an examination it is required to get 55% of the aggregate marks to pass. A student gets 520 marks and is declared failed by 5% marks. What are the maximum aggregate marks a student can get ?

(1) 960 (2) 1250

(3) 1040 (4) Can not be determined

68. Six animals are placed in a circle facing the centre. Cat is between dog and rabbit. Hen is between parrot and monkey. Dog is to the left of parrot. Who is the left of rabbit ?

(1) Cat (2) Monkey

(3) Dog (4) Parrot

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69. Find the odd one out in view of collecting biological evidences biological for DNA extraction.

(1) Blood (2) Semen
(3) Fiber (4) Teeth

70. In this question, a statement is given followed by four alternative inferences. Select the one which is most appropriate .

Statement : In order to measure the real investigative ability of the forensic experts, the present investigation system needs to be changed drastically.

Inferences :

(1) The present system of investigation should be abolished
(2) Real ability of the forensic experts is not measured by the present system of investigation
(3) If drastically changed, the investigation procols can increase the real ability of experts.
(4) Real ability of forensic experts need not be measured.

71. Find the missing number :

15	36	28
10	20	24
7	9	11
12	25	?

(1) 15 (2) 7
(3) 17 (4) 35

72. Select the related letters from the given alternative :

BEJM : NQRU : : DGLO : ?

(1) BFKL (2) PSTW
(3) NRVZ (4) FJKO

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73. A and B can do a work in 72 days. B and C can do it in 120 days. A and C can do it in 90 days. In what time can A alone do it ?

(1) 80 days (2) 120 days (3) 100 days (4) 150 days

74. A mixture of glycerin and water contains 45% of glycerine. 35g of water by weight is added to 100g of such a mixture. What percentage of glycerine by weight will be there in a new mixture ?

(1) 33 (2) $33\frac{1}{3}$ (3) $40\frac{20}{27}$ (4) 45

75. Find the wrong number in the given series :

0, 3, 9, 12, 36, 39, 42, 120, 360

(1) 12 (2) 39 (3) 42 (4) 360

76. Daya has a brother Anil. Daya is son of Chandra. Biman is Chandra's father. In terms of relationship what is Anil of Biman ?

(1) Grand – uncle (2) Grandson

(3) Son–in–law (4) Brother

77. $(14)^{15}\times(14)^{10} = ?$

(1) $(14)^{150}$ (2) $(14)^{5}$ (3) $(14)^{25}$ (4) $(14)^{1.5}$

78. Which number should replace both the question marks in the following equation ?

$$\frac{?}{169} = \frac{36}{?}$$

(1) 72 (2) 74 (3) 76 (4) 78

79. If 24X is a multiple of a, where X is a digit, then what is the value of X ?

(1) 6 (2) 3 (3) 9 (4) 4

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80. Trupti correctly remembers that the last time she went on leave was before the 16th but after the 11th. Sameer correctly remembers that the last time Trupti went on leave was after the 13th but before the 18th. On which day of month did Trupti definitely go on leave ?

(1) 13th (2) 14th

(3) Either 13th or 14th (4) Either 14th or 15th

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SECTION–B
BIOLOGY

81. Without exception all fungi are :

(1) Chitin containing in their cell wall

(2) Parasite

(3) Saprophyte

(4) Heterotroph

82. What is studied in forensic palynology ?

(1) Fossilised micro–organisms (2) Fossils

(3) Pollens and spores (4) Dust

83. Genes which exists as an alternate expressions at a particular locus is known as :

(1) Loci (2) Antigen

(3) Allele (4) Phenotype

84. Which of the following is a source of Lysergic acid ?

(1) Claviceps purpurea (2) Psilocybe mexicanna

(3) Lophophora williamsie (4) Argimone mexicanna

85. The ovule, in which micropyle and chalaza lie at opposite ends in a straight line is known as :

(1) Orthotropus type (2) Amphitropustype

(3) Hemitropus type (4) Anatropus type

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86. Carbon monoxide is harmful to human being as it :

(1) Create ozone hole in stratosphere

(2) Is a major greenhouse gas

(3) Is a major contributor of acid rain

(4) Has higher affinity for haemoglobin in comparison to oxygen

87. Condition where filament of stamens are free but anther lobes are fused is known as :

(1) Adelphous (2) Monadelphous

(3) Polyadelphous (4) Syngenesious

88. Trabeculae, the characteristic of stem of Selaginella, are modified :

(1) Epidermis (2) Cortex

(3) Endodermis (4) Pericycle

89. Normally glomerular filtrate lacks which of the following ?

(1) Glucose (2) Sodium chloride

(3) Cretinine (4) Albumin

90. Water vascular system is a characteristic feature of phylum :

(1) Porifera (2) Eichinodermata

(3) Coelenterata (4) Both A and B

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91. Normal function of restriction endonuclease in bacteria is :

(1) To excise and remove introns from hn RNA

(2) To polymerise nucleotides during DNA replication

(3) To cleave and modify DNA

(4) To cleave primer from Okazaki fragments

92. Study of cancer is called :

(1) Conchology (2) Chirology

(3) Carcinology (4) Carcinomatology

93. The apparatus used to measure rate of transpiration is called :

(1) Porometer (2) Potometer

(3) Transpirometer (4) Evapometer

94. Enzyme enhances the rate of a chemical reaction by :

(1) Raising activation energy

(2) Lowering activation energy

(3) Changing point of equilibrium

(4) Generating ATP for the reaction

95. Gynoecium represents :

(1) Ovaries with fused stigmas (2) Ovaries with fused styles

(3) A single carpel (4) The whorl of carpels

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96. Taenia solium takes its food through :

(1) Body wall (2) Suckers

(3) Mouth (4) Both A and B

97. Kahna National Park is located in :

(1) Aaasam (2) Rajasthan

(3) Madhya Pradesh (4) Orissa

98. Metagenesis occurs in :

(1) Hydra (2) Obelia

(3) Aurelia (4) Tublipora

99. There are 32 chromosomes in the leaf of a gymnosperm. How many chromosome would occur in its endosperm ?

(1) 16 (2) 32 (3) 48 (4) 64

100. Raphides are chemically made up of :

(1) Calcium phosphate (2) Calcium oxalate

(3) Calcium pectate (4) Calcium carbonate

101. Extrosomes are present in :

(1) Protists (2) Echinodermets

(3) Mollusca (4) Porifera

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102. Which are the specialized structures to distinguish food from the nonfood item in protozoan ?

(1) Teste bud (2) Senory cillia

(3) Chemotoxic response (4) Quality of water

103. The term orthomitosis refer to :

(1) Symmetry of spindle

(2) Spindle fiber that breaks during cell division

(3) Joining of the spindle fiber

(4) Movement of spindle fiber towards the equatorial plate.

104. In which of the following urochordates, no larval stage is found in their life history :

(1) Pyrosomida (2) Enterogona

(3) Doliolida (4) Pleurogona

105. Which of the following reptiles has reduced temporal arches :

(1) Testdines (2) Rhynchocephalia

(3) Squamata (4) Crocodilia

106. The earliest possible evidence of gnathostomes dates back to :

(1) Precambrian period (2) Cambrian period

(3) Mid-ordovician period (4) Silurian period

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107. Which of the following example illustrates multiple allelism ?

(1) Attached ear lobe

(2) Turner syndrome

(3) Sepia eye colour of *Drosophila*

(4) ABO blood group in human

108. Which type of primary sex determination mechanism is followed in human ?

(1) X : A ratio determines the sex

(2) Presence of one or two X chromosome determines the sex

(3) Y–chromosome determines sex

(4) Haplo–diploidy during early embryonic development determines sex

109. c *l B* technique in *Drosophila* is used to detect :

(1) autosomal recessive mutations

(2) autosomal dominant mutations

(3) sex linked recessive lethal mutations

(4) sex linked dominant lethal mutations

110. Deviation from Hardy–Weinberg equilibrium is tested by :

(1) t-test (2) ANOVA

(3) Chi–square method (4) F–test

111. There was considerable loss of fossils during :

(1) Proterozoic era (2) Palaeozoci era

(3) Mesozoic era (4) Cenozoic era

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112. Definition of species under biological specie concept is based on :

(1) Evolutionary lineages (2) Morphological types

(3) Reproductive isolation (4) None of the above

113. Titration of a completely protonated solution of α-Lysine against a base would produce how many pK values ?

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

114. Edman's reagent is preferred for sequence determination of a protein because during one cycle of reaction it :

(1) Modifies and cleaves only– N–terminal amino acid residue

(2) Modifies and cleaves only C–terminal amino acid residue

(3) Cleaves N–terminal amino acid residue in native form

(4) Cleaves C–terminal amino acid residue in native form

115. Which hormone controls the release of milk after parturition :

(1) Vasopressin (2) Oxytocin

(3) Prolactian (4) Relaxin

116. Calcitonin is derived from which of the following gland :

(1) Parathyroid (2) Pituitary

(3) Thyroid (4) Pineal

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117. Hormone required for maintenance of pregnancy is :

(1) Testosterone (2) Aldosterone

(3) Progesterone (4) Corticosterone

118. The secondary plexus of the hypothalamo-hypophysial portal system is locatecd in :

(1) Pars distalis (2) Pars nervosa

(3) Mid-brain (4) Median eminence

119. In Linean hierarchy, which of the following taxonomic category will come between class and order ?

(1) Tribe (2) Cohort

(3) Family (4) Species group

120. A taxonomic level concerned with the characterization and naming of species is known as :

(1) Alpha taxonomy (2) Beta taxonomy

(3) Gamma taxonomy (4) Omega taxonomy

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SECTION-B
CHEMISTRY

121. Electronic spectrum of $[Ti(H_2O)_6]Cl_3$ shows a shoulder at higher energy of the main absorption band becasue of :

(1) Jahn–Teller distortion
(2) Charge transfer transtion
(3) Spin – orbit coupling
(4) Association of vibrational and rotational energy levels with electronic energy levels.

122. Intraligand electronic transitions is allowed for :

(1) u–u (2) $g \rightarrow u$ (3) $g \rightarrow g$ (4) $\Delta s=0$

123. Which of the following gives shape of the molecule/complex ?

(1) Crystal field theory (2) Ligand field theory
(3) Molecular orbital theory (4) Valance bond theory

124. The hydration energies of $Mn(H_2O)_6^{2+}$, $Co(H_2O)_6^{2+}$ and $Zn(H_2O)_6^{2+}$ are 2736, 2916 and 2933 KJ mix respectively. The crystal field stabilization energy for $Co(H_2O)_6^{2+}$ is :

(1) 121.2 (2) 131.2 (3) 101.2 (4) 111.2

125. In ESR spectrum of $K_2[I, Cl_6]$ each signal consists of fifteen signals because of :

(1) Hyperfine coupling (2) Spin–orbit coupling
(3) Super hyperfine splitting (4) Chemical shift

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126. The nephelauxetic parameter is denoted by :

(1) 10Dq (2) υ (3) β (4) μ_s

127. The crystal field splitting energy for an oclahedra complex (i) involving only σ metal–ligand bonding (Δ) (ii) involving filled π–orbitals inaddition to σ metal–ligand bonding (Δ') and (iii) involving filled – as well as vacant II –orbitals in addition to σ metal–ligand bonding (Δ'') are related as :

(1) $\Delta'' > \Delta > \Delta'$ (2) $\Delta > \Delta' > \Delta''$

(3) $\Delta' > \Delta'' > \Delta$ (4) $\Delta > \Delta'' > \Delta'$

128. Lewis acid character of boran trihalides increases in the order : $BF_3 < BCl_3 < B Br_3$ because :

(1) Back bonding increases

(2) Back bonding decreases

(3) Reorganization energy for sp^2 to sp^3 increases

(4) σ bonding increases

129. In which of the following 18–electron rule is **not** statisfied ?

(1) $Cr(CO)_6$ (2) $Fe(CO)_5$ (3) $M_n(CO)_5$ (4) $Cr(C_6H_6)_2$

130. Which of the following has 4c–2e bond ?

(1) $Al_2(C_2H_5)_6$ (2) $Li\ CH_3$ (3) B_2H_6 (4) $Al_2\ Cl_6$

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131. One mole of $KBrO_3$ in bromate–bromide reaction produces :

(1) Zero mole Br_2 (2) One mol Br_2

(3) two moles Br_2 (4) three moles Br_2

132. On dilutions potassium dichromate aqueous solution observes deviation from Beer's law. This could be stopped if :

(1) The solution is made neutral

(2) The monochromatic light is used

(3) the solution is acidified

(4) The solution is buffered

133. Which of the following lamps used in atomic absorption spectroscopy ?

(1) D_2 lamp (2) UV lamp

(3) IR Lamp (4) Hollow cathode lamp

134. If Ka for the reaction :

$$HCN + H_2O \rightleftharpoons H_3O^+ + CN^-$$

is 1×10^{-5}. The K_b could be :

(1) 1×10^{-14} (2) 1×10^{-9}

(3) 0.1×10^{14} (4) 0.1×10^{9}

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135. In complexometric titration of a metal with EDTA, Eriochrome Black-T indicator is not available. What would you suggest ?

(1) Perform the titration with out using Eriochrome Black-T

(2) Perform the titration using an acid indicator, in unbuffered condition

(3) Wait until Eriochrome- black T is purchased

(4) The titration is not feasible in any condition

136. The number of theoretical plates can be obtained from a chromatogram using the expression :

(1) $n = 61\left(\frac{W}{t_R}\right)^2$ (2) $n = 100\left(\frac{t_R}{W}\right)^2$

(3) $n = 16\left(\frac{t_R}{W}\right)^2$ (4) $n = 16\left(\frac{W}{t_R}\right)^2$

137. For the preparation of 2 ppm kcl solution, the amount of Kcl weiged to be :

(1) 20 mg/L (2) 2.0µg/L (3) 2.0 mg/L (4) 2.0 ng/L

138. In reversed phase chromatography, the stationary phase and mobile phase are, respectively :

(1) Polar, nonpolar (2) non-polar, polar

(3) Zwittor ionic, non polar (4) liquid, liquid

139. Ce(iv) is an universal reagent for the redox titrations because it is :

(1) Cheap (2) Highly soluble

(3) Highly stable (4) easily available

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140. Photochemical smog is due to oxidation of :

(1) Aldehyde

(2) Suspended particulate matters

(3) Nitric oxide

(4) Reactive hydrocarbons

141. The IUPAC name of the compound :

is :

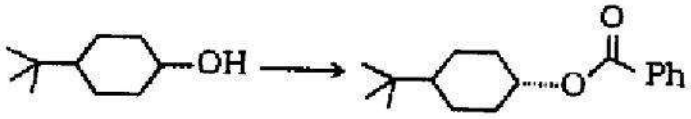
(1) Bicyclo [1.1,1] octanone

(2) Bicyclo [2,2,0] octa –2,6 diene

(3) Bicyclo [2,2,2] octa – 2,6 dione

(4) Bicyclo [2,2,1] octa –2,6 dione

142. The most suitable reagents to bring out the following transformation :



(1) PhCOcl and Pyridine

(2) DCC and PhCOOH

(3) PhBy, CO and $Pd(PPh_3)_4$

(4) Etooc–N=N–COOET, PPh_3 and phCOOH

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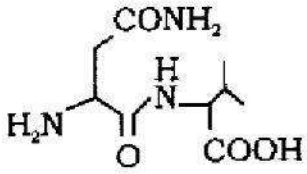
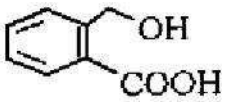
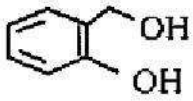
143. The constituent amino acids present in the following dipeptide, respectively are :

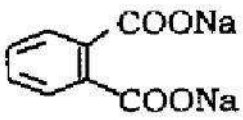


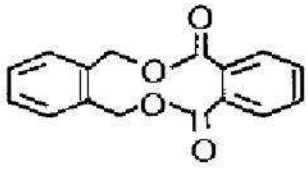
(1) (R) –Asparagine and (S) –Leucine
(2) (S)– Asparagine and (S)– valine
(3) (R) – Glutamine and (S) –Proline
(4) (R) – glutamine and (S) –iso Leucine

144. The major product formed, when phthaladdehyde is treated with NaoH is.:

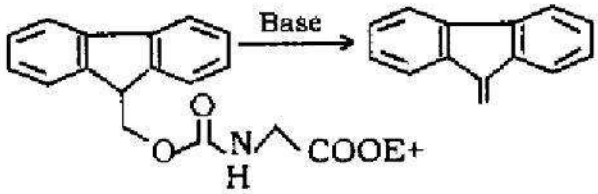
(1) 

(2) 

(3) 

(4) 

145. The base promoted conversion of A to B involves :



(1) Elimination unimoleculer conjugate Mechanism,
(2) Elimination unimolecular Mechanism
(3) Elimination Bimolecular Mechanism
(4) Elimination Radical mechanism

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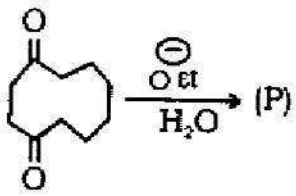
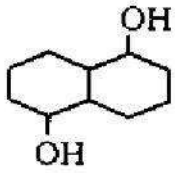
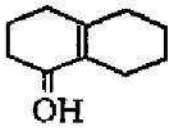
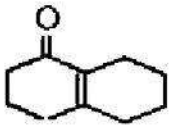
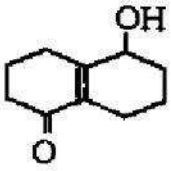
146. The product (P) Formed in the following reaction is :



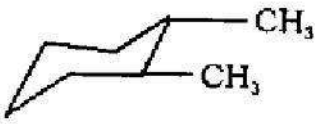
(1) 

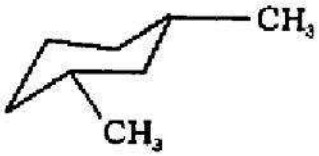
(2) 

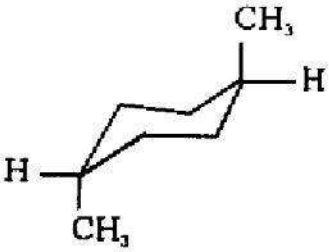
(3) 

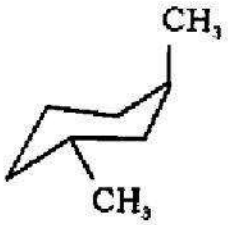
(4) 

147. Which of the following is a cis–isomer ?

(1) 

(2) 

(3) 

(4) 

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148. Pick out the correct match

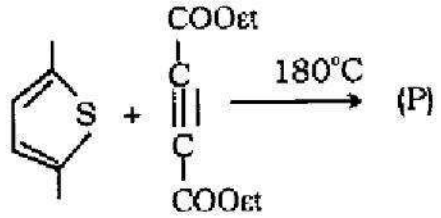
Reduction	**Reducing Agent**
(1) demesne Reduction	(i) NH_2NH_2/OH
(2) Wolf-kishner Reduction	(ii) zn/Hg^1 Hcl
(3) Meerwein-Pondorf-verley	(iii) Aluminium Iso proxide
(4) Rosenmund's Reduction	(iv) H_2 Pd/$BaSO_4$, Quinoline

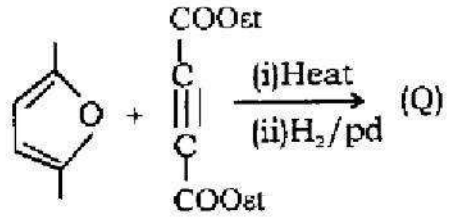
Code :

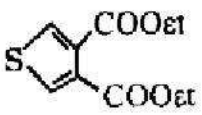
(1) A-(i), B-(ii), C-(iv), D-(iii) (2) A-(iv), B-(iii), C-(i), D-(ii)

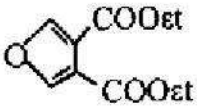
(3) A-(ii), B-(i), C-(iii), D-(iv) (4) A-(iv), B-(i), C-(ii), D-(iii)

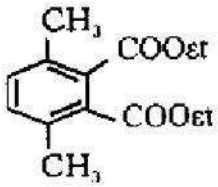
149. The major Product formed in the following reactions is :

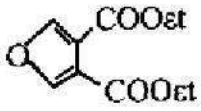
(i) 

(ii) 

(1) P = 

, Q = 

(2) P = 

, Q = 

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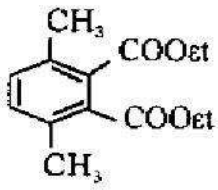
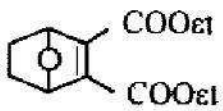
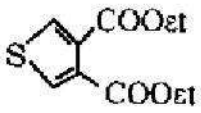
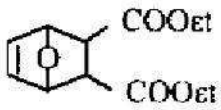
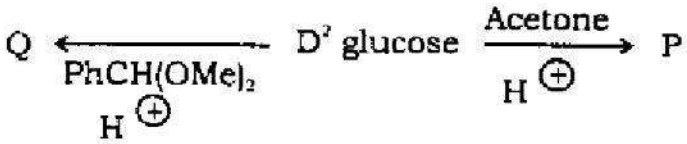
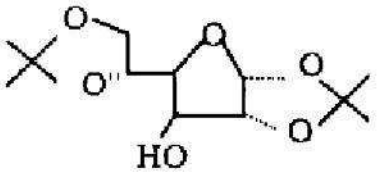
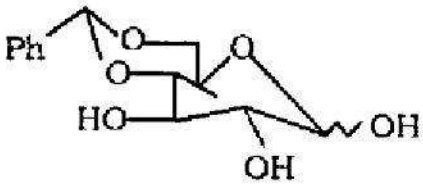
(3) P =  , Q = 

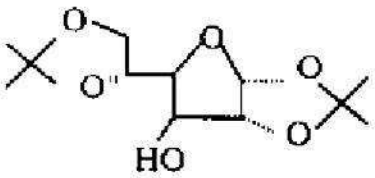
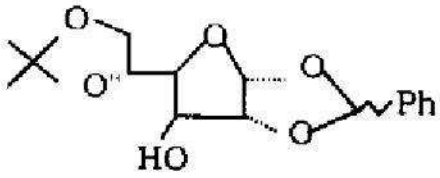
(4) P =  , Q = 

150. In the reaction given below :



(1)  and 

(P) (Q)

(2)  and 

(P) (P)

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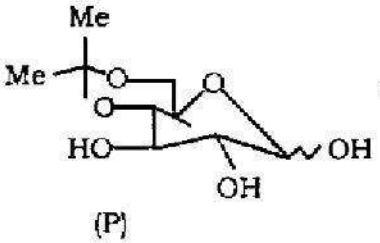
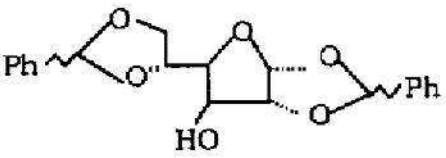
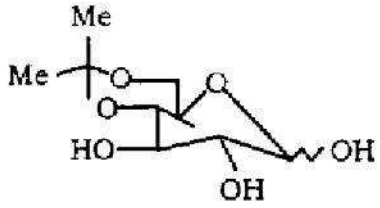
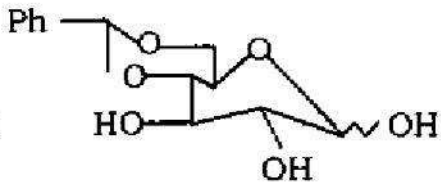
(3)  and 

(P) (Q)

(4)  and 

(P) (Q)

151. To prepare a saturated solution of silver compound with highest concentration of silver ion, which one of the following compounds will be the best ?

$K_{sp}(AgCl) = 1.8 \times 10^{-10}$, $K_{sp}(AgBr) = 5.0 \times 10^{-13}$, $K_{sp}(Ag_2CrO_4) = 2.4 \times 10^{-12}$

(1) AgCl (2) AgBr

(3) Ag_2CrO_4 (4) None of these

152. 0.1 mole of CH_3NH_2 ($K_b = 5 \times 10^{-4}$) is mixed with 0.08 mole of HCL and diluted to 1L. What will be the H+ concentration in the solution?

(1) 8.0×10^{-2} M (2) 8.0×10^{-11}M

(3) 1.6×10^{-11} M (4) 8.0×10^{-5}

153. N_2 and H_2 in 1 : 3 molar ratio are heated in a closed container having a catalyst. When the following equilibrium $N_2(g) + H_2(g) \Leftrightarrow 2NH_3(g)$ is attained, the total pressure is 10 atm and mole fraction of NH3 is 0.6. The equilibrium constant Kp for dissociation of NH_3 is :

(1) 1.33 atm^{-2} (2) 1.33 atm^2 (3) 0.75atm^2 (4) 0.75atm^{-2}

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154. What is the freezing point of a solution containing 8.1 g HBr in 100g water assuming the acid to be 90% ionized ? (kf for water = 1.86 k kg mol^{-1})

(1) 0.85°C (2) 0°C (3) -3.53°C (4) -0.35°C

155. A current of 12 A is passed through an electrolytic cell containing aqueous $NiSO_4$ solution. Both Ni and H_2 gas are formed at the cathode. The current efficiency is 60%. What is the mass of nickel deposited on the cathode per hour ?

(1) 7.883g (2) 3.941g (3) 5.91g (4) 23.645g

156. KCl crystallizes in the same type of lattice as does NaCl. Given that $\frac{r_{Na^+}}{r_{Cl^-}} = 0.55$ and $\frac{r_{K^+}}{r_{Cl^-}} = 0.74$. Calculate the ratio of the side of the unit cell for KCl to that of NaCl.

(1) 1.1226 (2) 0.0891 (3) 1.414 (4) 0.414

157. The density of the gold is 19g/cm^3. If 1.9×10^{-4}g of gold is dispersed in 1 L of water to give a sol having spherical gold nano-particles of radius 10nm, then the number of gold particles per mm^3 of the sol will be :

(1) 1.9×10^{12} (2) 6.3×10^{14}

(3) 6.3×10^{10} (4) 2.38×10^{6}

158. The number of α and β particles emitted in the nuclear reaction $_{90}Th^{228} \rightarrow {}_{83}Bi^{212}$ is :

(1) 4 α and 1 β (2) 8 α and 1 β

(3) 3 α and 7β (4) 4 α and 7 β

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159. Standard entropy of X_2, Y_2 and XY_3 are 60, 40, and 50 JK^{-1}, respectively. For the reaction $\frac{1}{2}X_2 + \frac{3}{2}Y_2 = XY_3, \Delta H = -30$ kJat equilibrium, the temperature will be :

(1) 500 K (2) 750 K (3) 1000 K (4) 1250 K

160. The translational molecular partition function of a He atom at 298 K in a container of volume 1.00 m^3 is :

(1) 2.25×10^{28} (2) 5.5×10^{29}

(3) 7.75×10^{30} (4) 1.25×10^{31}

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SECTION-B
MATHEMATICS

161. The general term of the expression $\frac{x^2+7x+3}{x^2+7x+10}$ when expanded in ascending powers of X is :

(1) $(-1)^r \frac{3}{7}\left[\frac{1}{2^{r+1}} - \frac{1}{5^{r+1}}\right]x^r$

(2) $(-1)^r \frac{7}{3}\left[\frac{1}{5^{r+1}} - \frac{1}{2^{r+1}}\right]x^r$

(3) $(-1)^r \frac{11}{3}\left[\frac{1}{2^{r+1}} + \frac{1}{5^{r+1}}\right]x^r$

(4) $(-1)^r \frac{7}{11}\left[\frac{1}{5^{r+1}} + \frac{1}{2^{r+1}}\right]x^r$

162. If x, y and z are real and different and :

$u = x^2 + 4y^2 + 9z^2 - 6yz - 3zx - 2xy$

then u is always :

(1) non-negative

(2) zero

(3) non-positive

(4) None of these

163. If a, b and c are three positive real numbers, then minimum value of the expression $\frac{b+c}{a} + \frac{c+a}{b} + \frac{a+b}{c}$ is :

(1) 1

(2) 2

(3) 3

(4) None of these

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164. If $a \neq b \neq c$, one value of x which satisfy the equation :

$$\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$$

is given by :

(1) $x = a$ (2) $x = b$ (3) $x = c$ (4) $x = 0$

165. The value of the determinant

$$\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$$

is :

(1) -2 (2) $x^2 + 2$

(3) 2 (4) $x^3 + 6x^2 + 70$

166. If x, y, z are all different and if :

$$\begin{vmatrix} x & x^2 & 1+x^2 \\ y & y^2 & 1+y^2 \\ z & z^2 & 1+z^2 \end{vmatrix} = 0$$

then xyz is equal to :

(1) 1 (2) -1 (3) 2 (4) 3

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167. If the roots of $ax^2 + bx + c = 0$ are in the ration m : n then :

(1) $mna^2 = (m + n)\, c^2$ (2) $mnb^2 = (m + n)\, ac$

(3) $mnb^2 = (m + n)^2\, ac$ (4) None of these

168. For the equation $x^2 + |x| - 6 = 0$

(1) there is only one root (2) the sum of roots is +1

(3) the sum of roots is 0 (4) the product of roots is +4

169. If the roots of :

$$(x-A)(x-B) + (x-B)(x-C) + (x-C)(x-A) = 0$$

Where A,B,C, are real numbers are equal then

(1) $A = B = C$ (2) $A + B + C = 0$

(3) $B^2 - 4AC = 0$ (4) None of these

170. If α,β,γ are the roots of $x^3 + ax^2 + b = 0$ then $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ is equal to :

(1) $-a^3$ (2) $a^3 - ab$ (3) a^3 (4) $a^3 - 3b$

171. The expansion of $\frac{2a\sin\theta}{1 - 2a\cos\theta + a^2}$ in a series of ascending powers of a is:

(1) $2a\sin\theta + 2a^2\sin 2\theta + 2a^3\sin 3\theta +$ —— ad inf.

(2) $1+2a\sin\theta + 2a^2\sin 2\theta + 2a^3\sin 3\theta +$ —— ad inf.

(3) $1+2a\cos\theta + 2a^2\cos 2\theta + 2a^3\cos 3\theta +$ —— ad inf.

(4) None of these

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172. The expansion of $\frac{1+a\cos\theta}{1+2a\cos\theta+a^2}$ in an infinite series is :

(1) $1+a\cos\theta+a^2\cos 2\theta+a^3\cos 3\theta+\ldots\ldots$ adinf.

(2) $1-a\cos\theta+a^2\cos 2\theta-a^3\cos 3\theta+\ldots\ldots$ adinf.

(3) $1+a\sin\theta+a^2\sin 2\theta+a^3\sin 3\theta+\ldots\ldots$ adinf.

(4) None of these

173. The expansion of $\tan^{-1}\left(\frac{a\sin\theta}{1-a\cos\theta}\right)$ in an infinite series is :

(1) $a\sin\theta+\frac{1}{2}a^2\sin 2\theta+\frac{1}{3}a^3\sin 3\theta+\ldots\ldots$ adinf.

(2) $a\cos\theta+\frac{1}{2}a^2\cos 2\theta+\frac{1}{3}a^3\cos 3\theta+\ldots\ldots$ adinf.

(3) $a\sin\theta-\frac{1}{2}a^2\sin 2\theta+\frac{1}{3}a^3\sin 3\theta+\ldots\ldots$ adinf.

(4) $a\cos\theta-\frac{1}{2}a^2\cos 2\theta+\frac{1}{3}a^3\cos 3\theta+\ldots\ldots$ adinf.

174. The expansion of $\frac{1}{2}\tan^{-1}(\sin\alpha\tan 2\beta)$ in an infinite series is :

(1) $\cos\alpha\tan\beta+\frac{1}{3}\cos 3\alpha\tan^3\beta+\frac{1}{5}\cos 5\alpha\tan^5\beta+\ldots\ldots$adinf.

(2) $\sin\alpha\cot\beta+\frac{1}{3}\sin 3\alpha\cot^3\beta+\frac{1}{5}\sin 5\alpha\cot^5\beta+\ldots\ldots$adinf.

(3) $\sin\alpha\tan\beta+\frac{1}{3}\sin 3\alpha\tan^3\beta+\frac{1}{5}\sin 5\alpha\tan^5\beta$ ——+.....adinf.

(4) None of these

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175. The expansion of $\frac{1-a^2}{1-2a\cos\theta+a^2}$ in a series of ascending powers of a is:

(1) $1+2a\cos\theta+2a^2\cos2\theta+2a^2\cos3\theta+....$adinf.

(2) $1+2a+2a^2+2a^3+.....$adinf.

(3) $1+2a\sin\theta+2a^2\sin2\theta+2a^3\sin3\theta+....$adinf.

(4) None of these

176. Three forces P, Q, R act along the sides BC, CA, AB of a triangle ABC respectively. If their resultant passes through the circumcentre of the triangle ABC then,

(1) P sec A +Q sec B + R sec C = 0

(2) P cos A + Q cos B + cos C = 0

(3) P sin A + Q sin B+ R sin C =0

(4) P cosec A + Q cosec B + R cosec C = 0

177. If the algebraic sum of the moments of a system of Coplanar forces in zero about each of the points (2,0), (0,3) and (2,3) then the system can be reduced to a force R and a couple G such that :

(1) R = 0 and G $\neq$ 0

(2) R $\neq$ 0 and G = 0

(3) R = 0 and G = 0

(4) R $\neq$ 0 and G $\neq$ 0

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178. If the algebraic sum of the moments of a system of Coplanar forces is zero about each of the points (0,1) and (1,2) and the algebraic sum of the resolved parts of the forces along x-axis is also zero then the system can be reduced to a force and a couple G such that :

(1) $R \neq 0, G \neq 0$ (2) $R = 0, G = 0$

(3) $R \neq 0, G = 0$ (4) $R = 0, G \neq 0$

179. Four equally uniform rods one jointed to form a rhombus ABCD, which is placed in a vertical plane with AC vertical and A resting on a horizontal plane. The rhombus is kept in the position in which <BAC is θ by a light string joining B and D. If w is the weight of a rod then the tension in the string is :

(1) $4 W \tan\theta$ (2) $4 W \cot\theta$

(3) $2 w \tan\theta$ (4) $2 w \cot\theta$

180. If a particle at the point (2,3) is displaced to the point (3,4) under the application of the force (2,3) then the work done by the force during the displacement in the units of work is :

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

181. If a string of length 10 units ad weight 40 units is hanging in the form of a calenary y=cos h(x) then the tension at the point (0,1) is :

(1) 4 units (2) 20 units (3) 10 units (4) 2 units

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182. If 0 is the centre and G is the centre of gravity of a uniform circular wire of radius a, in the form of a quadrant of a circle then OG is equal to :

(1) $\frac{2a}{\pi}$ (2) $\frac{(\sqrt{2})a}{\pi}$ (3) $\frac{(2\sqrt{2})a}{\pi}$ (4) $\frac{a}{2\pi}$

183. If a particle is executing a simple harmonic motion in a straight line then its average acceleration (in magnitude) is obtained by multiplying its maximum value by :

(1) $\frac{1}{\pi}$ (2) π (3) $\frac{2}{\pi}$ (4) $\frac{\pi}{2}$

184. If the time in which a projectile reaches a point p in its path is 10 seconds and the time from P till it reaches the horizontal plane through the point of projection is 15 seconds then the height of the point P above the horizontal plane is :

(1) 25g units (2) 50g units

(3) 75 g units (4) 150 g units

Where g is the acceleration due to grarity.

185. If a heavy particle of mass m in slides down a smooth cycloid starting from rest at the cusp the axis being vertical and vertex downwards then the reaction of the curve on the particle when it arrives at the vertex is :

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

Where g is the acceleration due to grarity.

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186. If $\frac{dy}{dx} + 2y \tan x = \sin x$ and $y\left(\frac{\pi}{3}\right) = 0$ then , the maximum value of y is:

(1) $\frac{1}{8}$ (2) -1

(3) $-\frac{1}{2}$ (4) None of these

187. The integrating factor of the differential equation

$x^2y\,dx - (x^3+y^3)\,dy = 0$

is

(1) $-1/y^4$ (2) x/y^4

(3) $-1/x^4$ (4) $1/x^4$

188. Particular integral of the differential equation $\frac{d^2y}{dx^2} - \frac{dy}{dx} = (x^2 + 2x + 4)$ is :

(1) $-\left(\frac{x^3}{3} + 2x^2 + 8x + 8\right)$ (2) $\frac{x^3}{3} + 2x^2 + 8x + 8$

(3) $x^3 + x^2 + x + 1$ (4) None of these

189. The solution of differential equation $\frac{d^4y}{dx^4} + \frac{d^2y}{dx^2} = 0$ with intial conditions $y(0) = y'(0) = y''(0) = 0, y'''(0) = 1$ is :

(1) $y = 1 + \sin x$ (2) $y = x - \sin x$

(3) $y = x + \sin x$ (4) $y = x + \cos x$

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190. The particular integral of the differential equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^x \cos x$ is :

(1) $\frac{e^x}{20}(3\sin 2x + \cos 2x)$ (2) $-\frac{e^x}{20}(3\sin 2x + \cos 2x)$

(3) $e^x(\sin 2x + \cos 2x)$ (4) $e^x(\sin 2x - \cos 2x)$

191. The general solution of the differential equation $\frac{d^2y}{dx^2} = \left[1 - \left(\frac{dy}{dx}\right)^2\right]^{1/2}$ is :

(1) $y = \cos h\,(x+c_1) + c_2$ (2) $y = c_2 - \cos(x+c_1)$

(3) $y = \sin h\,(x+c_1) + c_2$ (4) $y = \sin(x+c_1) + c_2$

192. The general solution of the differential equation $y\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^2 + y^2 \log x = 0$ is :

(1) $\log y = c_1 e^x + c_2 e^{-x}$ (2) $\log y = c_1 \sin x + c_2 \cos x$

(3) $y = \log(c_1 e^x + c_2 e^{-x})$ (4) $y = \log(c_1 \sin x + c_2 \cos x)$

193. The integral equation corresponding to the initial value problem $\frac{d^2y}{dx^2} + y = 0,\ y(0) = y'(0) = 0$ is :

(1) $y(x) = -\int_0^x (x-t)\,y(t)\,dt$ (2) $y(x) = \int_0^x (x+t)\,y(t)\,dt$

(3) $y(x) = \int_0^\infty (x+t)\,y(t)\,dt$ (4) None of these

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194. The solution of the integral equation $y(x)=\frac{1}{1+x^2}-\int_0^x \frac{t}{1+x^2} y(t)\,dt$ is :

(1) $y(x)=(1+x^2)^{-1/2}$ (2) $y(x)=(1+x^2)^{-1/2}$

(3) $y(x)=(1+x^2)^{1/2}$ (4) None of these

195. The integral equation $y(x)=\int_0^x (x-t)y(t)\,dt-\int_0^1 x(1-x)\,y(t)\,dt$ is corresponding to the boundary value problem :

(1) $y''+y=0, y(0)=y'(0)=0$ (2) $y''+y=0,\ y(0)=y(1)=0$

(3) $y''-y=0,\ y(o)=y(1)=0$ (4) $y''-y=0,\ y(0)=y'(0)=1$

196. The laplace transform of $t^{1/2}$ is :

(1) $\left(\frac{\pi}{s}\right)^{1/2}$ (2) $(\pi s)^{1/2}$

(3) $\left(\frac{s}{\pi}\right)^{1/2}$ (4) πs

197. If the laplace transform of cos(at) is $s/(s^2+a^2)$ then the laplace transform of t cos(at) is :

(1) $\frac{s-a}{(s^2+a^2)^2}$ (2) $\frac{s^2-a^2}{(s^2+a^2)^2}$

(3) $\frac{s^2-a^2}{s^2+a^2}$ (4) $\frac{s^2}{s^2-a^2}$

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198. The inverse laplace transform of $\frac{s}{(s^2+1)(s^2+4)}$ is :

(1) $\frac{1}{3}(\cos t - \cos 2t)$ (2) $\cos t - \cos 2t$

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

199. If the laplace trans from of f(t) is F(s) then the laplace transform of f(t–a)u(t–a) is :

(1) e^{-as} F(s) (2) e^{as} F(s)

(3) e^{-as} (4) F(s–a)

200. If the laplace transform of y(t) is y(s) then application of laplace transform in initial value problem $y'' + y = \sin 3t$, $y(0) = y'(0) = 0$ results as :

(1) $y(s) = \frac{3}{(s^2+1)(s^2+9)}$ (2) $y(s) = \frac{5}{(s^2+1)(s^2+9)}$

(3) $y(s) = \frac{1}{s^2+1}$ (4) $y(s) = \frac{1}{s^2+9}$

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SECTION–B

PHYSICS

201. A car travels 90.0 meters north in 15.0 seconds. Then the car turns around and travels 40.0 meters south in 5.0 seconds. What is the magnitude of the average velocity of the car during this 20.0 seconds interval ?

(1) 2.5 m/sec (2) 5.0 m/sec

(3) 6.5 m/sec (4) 7.0 m/sec

202. Radiocarbon is produced in the atmosphere as a result of :

(1) collision between fast neutrons and nitrogen nuclei present in the atmosphere

(2) action of ultraviolet light from the sun on atmospheric oxygen

(3) action of solar radiations particularly cosmic rays on carbon dioxide present in the atmosphere

(4) lightning discharge in atmosphere

Direction (Questions No. **203–204**) An electron and a positron, each of mass 9.1×10–31 kilogram, are in the same general vicinity and have very small initial speeds. They then annihilate each other, producing two photons.

203. What is the approximate energy of each emerging photon?

(1) 0.511 MeV (2) 2.032 MeV

(3) 1.067 MeV (4) 3.126 MeV

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204. What is the angle between the paths of the emerging photons ?

(1) 0^0 (2) 90^0 (3) 140^0 (4) 180^0

205. Hydrogen atom excites energy level from fundamental state to n =3. Number of spectrum lines according to Bohr, is :

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

206. Which rectifier requires four diodes ?

(1) Half – wave voltage doublers (2) Full – wave voltage doublers

(3) Full – wave bridge circuit (4) Half – wave bridge circuit

207. Sum of these is unity :

(1) Reflectivity + Transmitivity

(2) Reflectivity + Refractivity

(3) Reflectivity + Refractivity + Transmitivity

(4) Above all

208. The line integral of $u = yi - xj + zk$ around a circle of radius R in the xy – plane with centre at the origin is equal to :

(1) 0 (2) $2\pi R^2$ (3) $\pi R^2/2$ (4) $\pi R^2/4$

209. Sky looks blue because the sun light is subjected to :

(1) Rayleigh scattering (2) Compton scattering

(3) Dispersion (4) Refraction

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210. Out of 10.0 mg of a radioactive sample, 1.25 mg remains un–decayed after 6 hours. The mean life of the sample in hours is :

(1) 0.693 (2) 2/0.693 (3) 4/0.693 (4) 0.693/4

211. A physically reasonable wave function $\psi(x)$, for a one–dimensional system must :

(1) be defined at few points in space

(2) be continuous at some points in space

(3) be single valued

(4) obey all the constraints listed above

212. The laws of photo electric emission :

(1) are explained by Maxwell's theory of light

(2) state that emission is inversely proportional to the intensity of the incident light

(3) State that increasing the intensity of the incident light increases the kinetic energy of the photoelectrons

(4) state that increasing the frequency of the incident light increases the kinetic energy of the photoelectrons

213. An alternating emf V=6Cos 100t is applied across a series LR circuit of 3 Mh inductance and 4 Ω resistance. The amplitude of the current is :

(1) 0.6A (2) 1.2A (3) 1.4A (4) 1.8A

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214. How many truth table entries are necessary for a four-input circuit ?

(1) 4 (2) 12 (3) 16 (4) 8

215. Sound produced at a point is heard by a person after 5 seconds, while the same sound is heard by another person after 6 seconds. If the speed of sound is 300m/sec, what could be the maximum and minimum distances between the two persons ?

(1) 1.8km, 0.15km (2) 2.2km, 0.20km

(3) 2.8 km, 0.25 km (4) 3.3 km, 0.30 km

216. The image produced by a concave lens is :

(1) always virtual and enlarged

(2) always virtual and reduced in size

(3) always real

(4) sometimes real, sometimes virtual

217. If a particle moves in a plane so that its position is described by the functions $x = A \cos \omega t$ $y = A \sin \omega t$, the particle is :

(1) moving with constant speed along a circle

(2) moving with varying speed along a circle

(3) moving with constant acceleration along a straight line

(4) oscillating back and forth along a straight line

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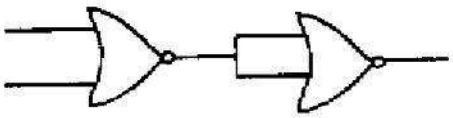
218. Various types of cancer are treated by :

(1) Cobalt –60 (2) Strontium –90

(3) Carbon –14 (4) Nickel –63

219. Identify the logic operation performed by the circuit given below :



(1) NOT (2) NAND (3) OR (4) NOR

220. Oscillators operate on the principle of :

(1) Positive feedback (2) Negative feedback

(3) Attenuation (4) All of above

221. The radius of the first (lowest) orbit of the hydrogen atom is a_0. The radius of the second (next higher) orbit will be:

(1) $2a_0$ (2) $4a_0$ (3) $6a_0$ (4) $8a_0$

222. Refractive index of materials is approximately equal to square root of :

(1) relative permittivity

(2) relative permeability

(3) product of relative permittivity and relative permeability

(4) susceptibility

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223. Splitting of spectral lines when atoms are subjected to strong electric feild is called :

(1) Zeeman effect
(2) Stark effect
(3) Photo electric effect
(4) None of above

224. Which dominates the atmosphere of Venus ?

(1) Nitrogen
(2) Carbon dioxide
(3) Oxygen
(4) Ozone

225. The electrical entity inductance can be compared to the mechanical entity :

(1) Energy
(2) Impulse
(3) Momentum
(4) Inertia

226. From the following, pick out the most suitable energy of neutrons which will produce nuclear fission in a reactor :

(1) 0.04eV (2) 0.40eV (3) 4.00eV (4) 40.0 eV

227. The phenomenon where the frequency of waves are compressed when the body emitting the waves is moving towards you and stretched when the body emitting the waves is moving away from you ?

(1) Interference
(2) Doppler effect
(3) Blackbody radiation
(4) Parallax

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228. In the spectrum of hydrogen atom, the ratio of the longest wavelength in Lyman series to the longest wavelength in the Balmer series is :

(1) 5/27 (2) 4/9 (3) 1/93 (4) 3/5

229. An ideal differential amplifiers common mode rejection ratio is :

(1) Infinite (2) Zero

(3) Unity (4) Undetermined

230. Where should an object be placed so that a real and inverted image of the same size is obtained, using a convex lens ?

(1) Between O and F (2) at 2F

(3) at infinity (4) at F/2

231. The number of non–zero rows in an echlon form is called ?

(1) Reduced echlon form (2) Rank of a matrix

(3) Conjugate of a matrix (4) Cofactor of a matrix

232. The longest wavelength X–ray that can undergo Bragg diffraction in a crystal for a given family of planes of spacing d is :

(1) d/4 (2) d/2 (3) 2d (4) 4d

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233. The Fermi temperature of Cu is about 80,000k. Which of the following is most nearly equal to the average speed of a conduction electron in Cu ?

(1) 1.6×10^{6} m/s (2) 3.7×10^{-4} m/s

(3) 9.5×10^{7} m/s (4) 4.6×10^{3} m/s

234. Solid Argon is held together by which of the following bonding mechanism ?

(1) Ionic bond

(2) Van der Waals bond

(3) Covalent bond

(4) Partly covalent and partly ionic bond

235. An electron in a metal has an effective mass (m^*) $=0.1\ m_e$, where m_e is the rest mass of electron. If this metal is placed in a magnetic field of magnitude 1 Tesla, the cyclotron resonance frequency, ω_c is most nearly :

(1) 930 rad/sec (2) 2.7×10^{11} rad/sec

(3) 1.8×10^{12} rad/sec (4) 3.3×10^{9} rad/sec

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236. A series RLC circuit is used in a radio to tune to an FM station broadcasting at 103.7 MHz. The resistance in the circuit is 10ohms and the inductance is 2.0 μH. What is the best estimate of the capacitance that should be used :

(1) 2.3 pF (2) 1.0 pF (3) 0.2 pF (4) 7.6 pF

237. The de-Broglie wavelength of a particle moving with a velocity 2.25×10^8 m/s is equal to the wavelength of photon. The ratio of kinetic energy of the particle to the energy of the photon is (velocity of light is 3×10^8m/s) :

(1) 1/8 (2) 3/8 (3) 5/8 (4) 7/8

238. The ratio of the energies of the K characteristic X-rays of Carbon (Z=6) to those of Magnesium (Z=12) is most nearly :

(1) 1/4 (2) 1/2 (3) 1/16 (4) 1/8

239. The fictitious force, which acts on a particle in motion, relative to a rotating frame of reference is called :

(1) Coriolis force (2) Newtonian force

(3) Pseudo force (4) Nuclear force

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240. What is the kinematic viscosity of a liquid that has a density of 1.2g cm^{-3} and a dynamic viscosity of 2 cP ?

(1) $1.67\times10^{-6}m^2/s$ (2) $4.30\times10^{-7}m^2/s$

(3) $9.92\times10^{-8}\ m^2/s$ (4) $6.13\times10^{-3}\ m^2/s$

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