17P/212/28 655

Set No. – I

Question Booklet No. .....

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

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

Roll No.

(Write the digits in words) .....

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 OMR Answer Sheet)

1. Within 30 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 also Roll No. and OMR sheet No. on the Question Booklet.
7. Any changes 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 ball-point 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 the 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.

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण-पृष्ठ पर दिये गये हैं।]

Total No. of Printed Pages : 20

FOR ROUGH WORK / रफ कार्य के लिए

17P/212/28(Set-I)

No. of Questions : 120

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

Note : (i) This paper comprises of Two Sections, viz., Section–**A** and Section–**B** having **24** Multiple Choice Questions in Section–**A**, and **96** Multiple Choice Questions in Section–**B** comprising **32** questions of **Biology**, **32** questions of **Chemistry** and **32** questions of **Physics**. A candidate has to attempt all **120** questions.

(ii) 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.

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

SECTION – A

1. Which of the following is ***not*** a keyword ?

(1) class (2) void (3) true (4) public

2. Which of the following is ***not*** a token ?

(1) keywords (2) identifiers (3) statement (4) operators

3. The function call in which the data in actual parameters get changed is known as :

(1) call by value
(2) call by reference
(3) return by value
(4) return by reference

4. Which package should be imported in a Java program for obtaining system date and time ?

(1) Java.IO (2) java.date (3) java.util (4) java.calendar

5. Absence of which statement causes a fall-through in a switch statement ?

(1) continue (2) break (3) stop (4) fall

6. Which of the following is ***not*** a jump statement ?

(1) continue (2) return (3) system.out (4) break

7. Through which access specifier, a class makes its element visible to all ?

(1) public (2) private (3) protected (4) friendly

8. Java resolves duplicate variable name to :

(1) global variable (2) local variable

(3) most local scope variable (4) all of the above

9. If mean of following frequency distribution is 7.5,

x	3	5	7	9	11	13
y	6	8	15	p	8	4

then value of p will be :

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

10. *If 24 is the median of* 11, 12, 14, 18, $x + 2$, $x + 4$, 30, 32, 35 *and 41*, then x will be :

(1) 5 (2) 7 (3) 21 (4) 25

11. The mean of 8 numbers is 15. If each number is multiplied by 2 the new mean will be :

(1) 40 (2) 20 (3) 25 (4) 30

12. The probability of having 53 Sunday in a leap year is :

(1) $\frac{2}{7}$ (2) $\frac{1}{7}$ (3) $\frac{5}{7}$ (4) $\frac{3}{7}$

13. There are m persons sitting in a row. Two of them are selected at random. The probability that the two selected persons are not together is :

(1) $\frac{2}{m}$ (2) $\left(1-\frac{2}{m}\right)$ (3) $\frac{m(m-1)}{(m+1)(m+2)}$ (4) $\frac{m}{(m-1)}$

14. The variance of the first n natural number is :

(1) $\frac{(n+1)}{2}$ (2) $\frac{n(n+1)}{2}$ (3) $\frac{(n^3-1)}{8}$ (4) $\frac{(n^2-1)}{12}$

15. The standard deviation for the following data :

x_i	3	8	13	18	23
f_i	7	10	15	10	6

will be :

(1) 7.21 (2) 6.12 (3) 8.5 (4) 2.4

16. The mode of following distribution :

Marks obtained	10-24	25-39	40-54	55-69	70-84	85-99
Number of students	25	29	23	19	14	10

will be :

(1) 30.6 marks (2) 30 marks (3) 30.5 marks (4) 30.4 marks

17. If $x+iy=\frac{a+ib}{a-ib}$, then :

(1) $x^2+y^2=1$ (2) $x^2+y^2=a^2$ (3) $x^2+y^2=b^2$ (4) $x^2+y^2=0$

18. Which term of the sequence :

$(12+8i), (10+7i), (8+6i), \ldots\ldots\ldots\ldots$ is.

(1) 6^{th} term (2) 7^{th} term (3) 8^{th} term (4) 9^{th} term

19. Number of solution of the equation :

$\tan x + \sec x = 2\cos x$, lying in the interval $[0, 2\pi]$ is

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

20. Value of $\int_0^{\frac{\pi}{2}} \frac{dx}{(1+\tan^3 x)}$, is :

(1) 0 (2) (3) $\frac{\pi}{2}$ (4) $\frac{\pi}{4}$

21. If vectors $\bar{a} = \hat{i} + \hat{j} + \hat{k}$, $\bar{b} = 4\hat{i} + 3\hat{j} + 4\hat{k}$ and $\bar{c} = \hat{i} + \alpha\hat{j} + \beta\hat{k}$ are linearly dependent and $|\bar{c}| = \sqrt{3}$, then

(1) $(\alpha = 1, \beta = -1)$ (2) $(\alpha = 1, \beta = \pm 1)$ (3) $(\alpha = \pm 1, \beta = 1)$ (4) $(\alpha = 1, \beta = \pm 1)$

22. If $f(x) = \dfrac{(x^2 - 1)}{(x^2 + 1)}$, for every real number x, then minimum value of f will be :

(1) does not exist because f is unbounded

(2) is not attained even though f is bounded

(3) is equal to 1

(4) is equal to (–1)

23. If $f(x) = \begin{vmatrix} 1 & x & (x+1) \\ 2x & x(x-1) & x(x+1) \\ 3x(x-1) & x(x-1)(x-2) & x(x+1)(x-1) \end{vmatrix}$, then value of $f(100)$ will be equal to :

(1) 0 (2) 1 (3) 100 (4) 99

24. If vertices of ΔABC are $A(1, 4)$ $B(2, -3)$, $C(-1, -2)$, then equation of the median through A will be :

(1) $3x - y + 1 = 0$ (2) $13x - y - 9 = 0$ (3) $x + y + 1 = 0$ (4) $x + 13y + 9 = 0$

SECTION – B
[BIOLOGY]

25. Which metal acts as cofactor in nitrogenase ?

(1) *Zn* (2) *Mo* (3) *Mg* (4) *Fe*

26. Suicidal bags are also called :

(1) Lysosomes (2) Golgibodies (3) Mitochondria (4) Ribosomes

27. Which of the following is ***not*** a six-carbon sugar ?

(1) Fructose (2) Mannose (3) Deoxyribose (4) Galactose

28. Coralloid root is present in :

(1) *Zamia* (2) *Taxus* (3) *Gnetum* (4) *Pinus*

29. Which of the following is an example of isozyme ?

(1) Urease (2) Lactic dehydrogenase

(3) Acetylcholine esterase (4) Ribozyme

30. Haemocyanin is present in the blood plasma of :

(1) Annelids (2) Human (3) Birds (4) Molluscus

31. Heterotrichous form is :

(1) *Volvox* (2) *Fritschiella* (3) *Oedogonium* (4) *Alternaria*

32. Homosporous fern is :

(1) *Equisetum* (2) *Isoetes* (3) *Selaginella* (4) *Marsilea*

33. Oxyntic glands are present in :

(1) Stomach (2) Oesophagus (3) Pancrease (4) Small intestine

34. The elevated red cell count is called :

(1) Anaemia (2) Thalassemia

(3) Polycythemia (4) Hypoglycemia

35. Columella is absent in :

(1) *Funaria* (2) *Riccia* (3) *Pogonatum* (4) *Anthoceros*

36. Ectoparasite is :

(1) *Phytophthora* (2) *Agaricus* (3) *Erysiphe* (4) Puccinia

37. Which of the following does *not* occur during DNA replication ?

(1) Unwinding of the parent double helix

(2) Complementary base pairing

(3) Polymerization in the direction from 3′ to 5′

(4) Formation of short pieces that are united by DNA ligase

38. Which plant is source of anti-malerial drug ?

(1) *Ginkgo* (2) *Artemisia* (3) *Taxus* (4) *Catharanthus*

39. In F_2 generation phenotypic ratio 9 : 7 is result of :

(1) Duplicate gene action (2) Inhibitory gene action

(3) Complementary gene action (4) Gene mutation

40. Green ear disease of bajra is caused by :

(1) *Phytophthora infestans* (2) *Sclerospora graminicola*

(3) *Erysiphe pisi* (4) *Helminthosporium oryzae*

41. Which of the following stimulates stem cells in the bone marrow to produce red blood cells ?

(1) Erythropoietin (2) Fibrinogen (3) Plasminogen (4) Platelets

42. The AIDS virus is :

(1) Bacterial virus (2) Myxovirus (3) Retrovirus (4) Pox virus

43. Which of the following forms the highest fraction of immunoglobulins ?

(1) I_gA (2) I_gG (3) I_gM (4) I_gD

44. Plant of medicinal value belongs to family Acanthaceae is :

(1) *Argemone mexicana* (2) *Adhatoda vasika*

(3) *Cuscuta reflexa* (4) *Polygonum barbatum*

45. Mycorrhiza helps in :

(1) Phosphate solubilisation (2) Transpiration

(3) Photosynthesis (4) N_2-fixation

46. The vagus nerve fibres inhibit the heart rate by releasing :

(1) adrenaline (2) noradrenaline (3) acetylcholine (4) sympathin

47. Excretion in amphibians is :

(1) Ammonotelic (2) Aminotelic (3) Ureotelic (4) Uricotelic

48. Which of the following layer is formed at last during gastrulation ?

(1) Ectoderm (2) Mesoderm (3) Endoderm (4) Epidermis

49. DNA aberration is caused by :

(1) UV (2) EMS (3) X-ray (4) ABA

50. Golden rice is rich with :

(1) β-carotene (2) L-Lysine

(3) Iron (4) Cyanocobalamine

51. Which of the following hormone increases Na-reabsorption in the kidney ?

(1) Thyroxine (2) Aldosterone

(3) ADH (4) Atrial natriuretic peptide

52. Which of the following hormone induces callus formation ?

(1) 2, 4-D (2) BAP (3) IBA (4) ABA

53. In a typical marine animal, the ion fraction in the cell is dominated by :

(1) Potassium (2) Sodium (3) Chloride (4) Iron

54. Relaxin is produced by :

(1) Testes (2) Ovary (3) Liver (4) Kidney

55. Trisomy is denoted by :

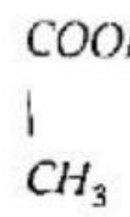
(1) $2n-1$ (2) $2n+1$ (3) $2n-1-1$ (4) $2n+2$

56. Which hormone regulates spermatogenesis ?

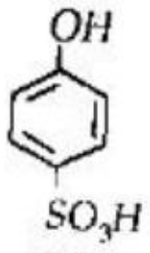
(1) FSH (2) Oxytocin (3) Androgen (4) Thyrotropin

[CHEMISTRY]

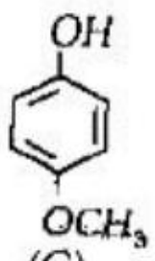
57. Rank the following compounds in order of descending acidity :



(A)



(B)



(C)

(D)

(1) A > B > C > D (2) B > A > D > C (3) B > A > C > D (4) D > C > A > B

58. Which of the following compunds are aromatic ?

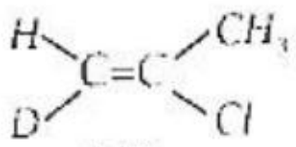
(1)

(2)

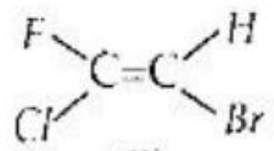
(3)

(4)

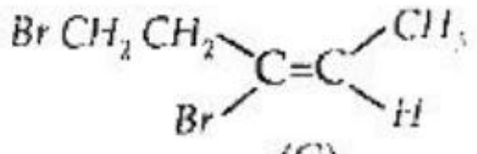
59. Which of the following compounds have Z-configuration ?



(A)



(B)



(C)

(1) A and B (2) B and C (3) A and C (4) All of the above

60. Arrage the following in increasing order of their basicity :

(I) OH (II) $C_6H_5O^-$ (III) CH_3O^- (IV) $HCOO^-$

(1) I < II < III < IV (2) IV < III < II < I

(3) IV < II < I < III (4) II < III < I < IV

61. Arrange the following alcohols in order of their reactivity toward acid-catalyzed dehydration :

1–Pentanol (A) 2–Methyl-2-butanol (B) 3-Methyl-2-butanol (C)

(1) B > C > A (2) C > B > A (3) B > A > C (4) C > A > B

62. In the reaction sequence shown, the product 'Y' is :

$$(CH_3)_2CO \xrightarrow{HCN} X \xrightarrow[H_2SO_4]{CH_3OH} Y$$

(1) $(CH_3)_2 C(OH) COOH$ (2) $CH_2 = C(CH_3) COOH$

(3) $CH_2 = C(CH_3) COOCH_3$ (4) $CH_3 CH = CH COOH$

63. Which of the following proposed reactions would take place quickly under mild conditions ?

(1) $CH_3CONH_2 + NaCl \rightarrow CH_3COCl + NaNH_2$

(2) $C_6H_5 COCl + CH_3 NH_2 \rightarrow C_6H_5CONHCH_3 + HCl$

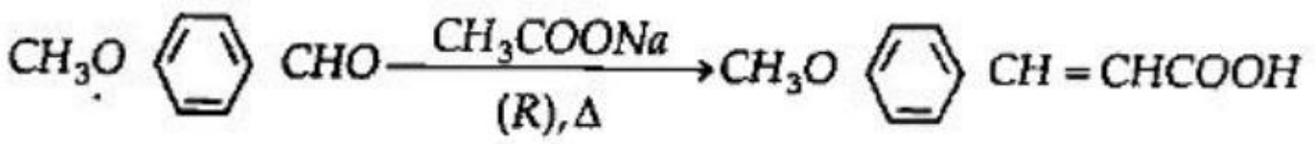
(3) $CH_3CH_2COCl + CH_3 COOH \rightarrow CH_3CH_2 \underset{\underset{O}{\|}}{C}O\underset{\underset{O}{\|}}{C}CH_3 + HCl$

(4) $(CH_3)_2 CHCONH_2 + CH_3OH \rightarrow (CH_3)_2 CHCOOCH_3 + NH_3$

64. Which of the following compounds reduces Tollens' reagent ?

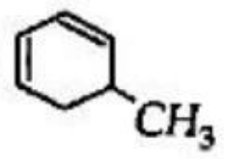
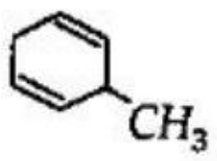
(1) Methanol (2) Acetic acid (3) Sucrose (4) Glucose

65. In the following transformation, the reagent (R) is :



(1) CH_3COOH (2) $CH_2(COOH)_2$ (3) $(CH_3CO)_2O$ (4) $HCOOH$

66. Which common analytical method will most clearly and rapidly distinguish (A) from (B) ?

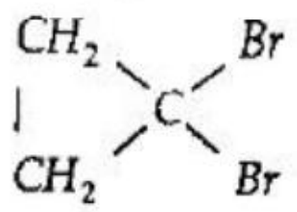
(A)  (B) 

(1) IR spectroscopy (2) Chromatography

(3) NMR spectroscopy (4) UV spectroscopy

67. Which one of the following compounds will show a doublet as part of its ^1H NMR spectrum ?

(1) CH_3CH_2Cl (2) $(CH_3)_2CHCl$

(3) $CH_3CH_2CH_3$ (4) 

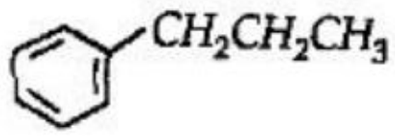
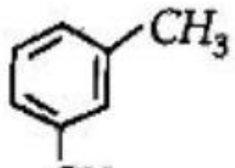
68. In the UV spectrum of cyclohex-2-enone, the absorption at λ_{max} 215 nm is due to the transition :

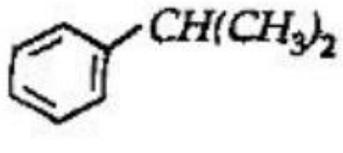
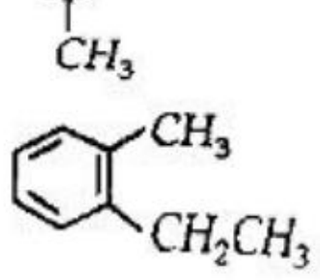
(1) $\sigma \rightarrow \sigma^*$ (2) $n \rightarrow \sigma^*$ (3) $\pi \rightarrow \pi^*$ (4) $n \rightarrow \pi^*$

69. Which of the following compouds has a vibration that is infrared inactive ?

(1) Acetone (2) Water (3) 1-Butyne (4) 2-Butyne

70. The ^1H NMR spectrum of an unknown compound shows absorptions at (multiplicities ***not*** given) δ = 7.3 (5H), 2.3 (1H) and 0.9 (6H) ppm. Which one of the following structures satisfies these data ?

(1)  (2) 

(3)  (4) 

71. When NH_3 reacts with BF_3, the resulting bond is called :

(1) dative bond (2) ionic bond

(3) hydrogen bond (4) dipole-dipole interaction

72. The number of unpaired electrons in $Ni(CO)_4$ is :

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

73. The covalent radii of Nb and Ta are almost the same because of :

(1) their similar electronic configuration

(2) their being presence in 4d and 5d series

(3) lanthanide contraction effect

(4) their being transition elements

74. The wave character of electrons was experimentally verified by :

(1) Einstein (2) Davisson and Germer

(3) Max Planck (4) Louis de Broglie

75. The shape of ClF_3 molecule is :

(1) T-shaped (2) Tetrahedral

(3) Square planar (4) Trigonal planar

76. Which one among the following molecules will show dipole moment ?

(1) BF_3 (2) CO_2 (3) $BeCl_2$ (4) NH_3

77. The ionization energies of F, N, O and C decrease in the order :

(1) $F > N > O > C$ (2) $C > N > F > O$ (3) $N > C > O > F$ (4) $O > C > N > F$

78. The transition metal complex used in homogeneous catalysis is :

(1) $Ru(CO)_5$ (2) $Cu(PPh_3)_3Br$ (3) $RhCl(PPh_3)_3$ (4) $(Cp)_2Fe$

79. Which one has very similar chemistry to that of Al^{3+} ?

(1) Mg^{2+} (2) Be^{2+} (3) B^{3+} (4) Ga^{3+}

80. Which of the following statements is ***false*** ?

(1) Helium is less soluble in water than Xenon.

(2) The electron affinity of inert gases is zero.

(3) Argon was discovered by Rayleigh and Ramsay.

(4) Compounds of Xenon are less stable than those of other inert gases.

81. Which one of the following metal ions is important for the photosynthesis in plants ?

(1) Li^{+} (2) Mg^{2+} (3) Cu^{2+} (4) Ca^{2+}

82. First law of thermodynamics is a statement of :

(1) Conservation of heat (2) Conservation of work

(3) Conservation of momentum (4) Conservation of energy

83. A process is spontaneous at all temperatures when :

(1) $\Delta H > 0$ and $\Delta S < 0$ (2) $\Delta H < 0$ and $\Delta S > 0$

(3) $\Delta H = 0$ and $\Delta S = 0$ (4) $\Delta H < 0$ and $\Delta S = 0$

84. In a zero-order reaction :

(1) the concentrations of the reactants do not change with time

(2) the rate is affected by concentration

(3) the reactants do not react

(4) one of the reactants is in large excess

85. The overall rate of reaction is governed by :

(1) the rate of fastest intermediate step

(2) sum total of the rates of all intermediate steps

(3) the average of the slowest intermediate step

(4) the rate of the slowest intermediate step

86. A finely devided state of the catalyst is more efficient because in this state :

(1) more energy is stored in the catalyst

(2) positive charge is required

(3) more surface area is available

(4) negative charge is required

87. $k = Ae^{-E/RT}$ is known as :

(1) Eyring equation
(2) Arrhenius equation
(3) Lindemann equation
(4) Gibbs equation

88. Hydrolysis constant K_h for a salt made from weak acid and strong base is given by :

(1) $K_h = \frac{K_w}{K_a}$ (2) $K_h = \frac{K_b}{K_w}$ (3) $K_h = \frac{K_w}{K_b}$ (4) $K_h = \frac{K_a}{K_w}$

[PHYSICS]

89. For overlap interaction, between nearest neighbours, of the type $\Phi(r) = B \exp\left(-\frac{r}{\rho}\right)$, B and ρ are constants, the equilibrium spacing, r_0 in terms of B and ρ is :

(1) $\rho \log_e B$ (2) ρ/B (3) B/ρ (4) ρB

90. The shortest wavelength emitted by an X-ray tube if 50 KV is applied across it is given by :

(1) 0.25Å (2) 2.5Å (3) 25Å (4) 5Å

91. If a charged particle having charge q and mass m is accelerated through a potential difference of V volts, the de-Broglie wave length associated with the particle is :

(1) $\frac{h}{\sqrt{2meV}}$ (2) $\frac{h}{\sqrt{2mqV}}$ (3) $\frac{h}{\sqrt{2qV}}$ (4) $\frac{h}{\sqrt{2mV}}$

92. The magnetic moment associated with electron in first orbit of H-atom is :

(1) 9.27×10^{-24} amp-m^2
(2) 5×10^{-22} amp-m^2
(3) 9.27×10^{-20} amp-m^2
(4) 2 Bohr-magneton

93. The distance between (100) planes in a simple cubic crystal with unit cell side a is :

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

94. The term value of a state is given by :

(1) $\frac{E}{Ch}$ (2) $-\frac{E}{hC}$ (3) $\frac{E}{2\pi Ch}$ (4) $-\frac{E}{2\pi Ch}$

95. Which of the following best describes the relation between orbital angular momentum and correrponding magnetic moment of electron in an atom ?

(1) $\vec{p}_l = -\frac{2m}{e}\vec{\mu}_l$ (2) $\vec{p}_l = \frac{2m}{e}\vec{\mu}_l$ (3) $\vec{p}_l = \frac{2m}{h}\vec{\mu}_l$ (4) $\vec{p}_l = -\frac{2m}{h}\vec{\mu}_l$

96. Larmor frequency is given by :

(1) $\nu_L = \frac{eB}{4\pi m}$ (2) $\nu_L = \frac{eB}{2m}$ (3) $\nu_L = \frac{eB}{4\pi mh}$ (4) $\nu_L = \frac{eB}{m}$

97. μ-mesons are produced, if γ-ray energy is above :

(1) 1.02 MeV (2) 10 MeV (3) 150 MeV (4) 50 MeV

98. If one state is occupied (or allowed) for one microparticle and is denied for other particles, the particles are :

(1) Bosons (2) Fermions (3) Phonons (4) Photons.

99. The main component responsible for the fall of gain of an RC-coupled amplifier in low-frequency range is :

(1) The active device itself
(2) Stray shunt capacitance
(3) Coupling capacitance C_C
(4) The grid-leak resistance R_G

100. Compared to a CB amplifier, the CE amplifier has :

(1) Lower input resistance
(2) Higher output resistance
(3) Lower current amplification
(4) Higher current amplification

101. The activity of one g_m radium $^{226}_{88}Ra$, whose half life is 1622 years will approximately be :

(1) 1 Curie (2) 4 Curie (3) 1 m Curie (4) 1.66 Curie

102. Nuclei with even mass number have :

(1) Zero or integral spin
(2) Half integral spin
(3) Imaginary spin
(4) None of these

103. In Mosley's law $\sqrt{\nu} = a(Z-b)$, the screening constent 'b' for K series is :

(1) 1 (2) 7.4 (3) 19.6 (4) 16

104. For crystal having two atoms of masses m_1 and m_2 per primitive cell, square of angular frequency of lattice vibration given by $w^2 = \frac{c/2}{m_1 + m_2} . K^2a^2$ corresponds :

(1) to optical branch

(2) to acoustical branch

(3) to both acoustical and optical branches

(4) magnetic vibrations

105. An ideal revercible heat engine exhausting heat at 27°C is to have 25% efficiency. It must take heat at :

(1) 127°C (2) 227°C (3) 327°C (4) 673°C

106. If the radius of a black body radiation enclosure is halved, temperature will become (assuming adiabatic process) :

(1) Four times (2) Eight times (3) Doubled (4) Sixteen times

107. In an electromagnetic field, which one of the following remains invariant under Lorentz transformation ?

(1) $\vec{E} \times \vec{B}$ (2) $E^2 - C^2B^2$ (3) B^2 (4) E^2

108. A copper wire of uniform corss-sectional area, $1.0 \times 10^{-6}\ m^2$ carries a current of 1A. Assuming that each copper atom contributes one electron to the electron gas, the drift velocity of the free electrons (density of copper is $8.94 \times 10^3\ kg/m^3$ and its atomic mass is 1.05×10^{-25} kg) is :

(1) 7.4×10^{-4} m/s (2) 74×10^{-4} m/s (3) 74×10^{-3} m/s (4) 7.4×10^{-5} m/s

109. The temperature of the surface of the sun is approximately 6000 K. If we take a big lens and focus the sun rays and produce a temperature of 8000 K. This will violate which law of thermodynamics ?

(1) zeroth law (2) first law

(3) second law (4) third law

110. For a thermodynamic system, work done in a process depends upon :

(1) The path
(2) State of the system
(3) External pressure
(4) Nature of the system

111. Boyle's law can be expressed in differential form as :

(1) $\frac{dv}{dp}=1$
(2) $\frac{dv}{dp}=\frac{v}{p}$
(3) $\frac{dv}{dp}=\frac{p}{v}$
(4) $\frac{dv}{dp}=-\frac{v}{p}$

112. The equation of state of a dilute gas at very high temperature is described by $\frac{PV}{KT}=1+\frac{B(T)}{V}$, where, V is the volume per particle and $B(T)$ is a negative quantity. One can conclude that this is a property of :

(1) a Van der waals gas
(2) an ideal Fermi-gas
(3) an ideal Bose gas
(4) an ideal inert gas

113. A system of N non-interacting classical point particle is constrained to move on the two-dimensional surface of a sphere. The internal energy of the system is :

(1) $\frac{3}{2}NK_BT$
(2) $\frac{1}{2}NK_BT$
(3) NK_BT
(4) $\frac{5}{2}NK_BT$

114. Which of the following relations between the particle number density n and temperature T must hold good for a gas consisting of non-interacting particles to be described by quantum statistics ?

(1) $\frac{n}{T^{1/2}}<<1$
(2) $\frac{n}{T^{3/2}}<<1$
(3) $\frac{n}{T^{3/2}}>>1$
(4) $\frac{n}{T^{1/2}}$ and $\frac{n}{T^{3/2}}$ can have any value

115. At room temperature, molar heat capacity of solids is approximately equal to :

(1) $10\ J\ mole^{-1}\ K^{-1}$
(2) $20\ J\ mole^{-1}\ K^{-1}$
(3) $25\ J\ mole^{-1}\ K^{-1}$
(4) $8.31\ J\ mole^{-1}\ K^{-1}$

116. Which one of the following is a first order phase transition ?

(1) Vaporization of a liquid at its boiling point

(2) Ferromagnetic to paramagnetic transition

(3) Normal liquid He to super fluid He transition

(4) Superconducting to normal state transition

117. The increase in entropy when 10 kg water at 100°C is converted to water vapour is approximately :

(1) 14,500 Joule/K (2) 14,500 Cal/K

(3) 14.5×10^6 Cal/K (4) 14.5×10^6 K Cal/K

118. A Carnot engine has an efficiency of 30% when the temperature of the sink is 27°C. What must be the approximate change in temperature of the source to make its efficiency 50% ?

(1) 600 K (2) 171 K (3) 428 K (4) 155°C

119. At what temperature, pressure remaining unchanged, will the molecular velocity (rms) of hydrogen atom will be double of its value at NTP ?

(1) 819°C (2) 819 K (3) 1092°C (4) 82 K

120. The mean free path of molecules of a certain gas at pressure P and temperature T is 2×10^{-5} cm. The mean free path at pressure $P \times 10^{-6}$ and temperature T will be :

(1) 2 cm (2) 20 cm (3) 2 m (4) 20 m

FOR ROUGH WORK / रफ कार्य के लिए

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा ओ०एम०आर० उत्तर-पत्र के दोनों पृष्ठों पर केवल ***नीली/काली बाल-प्वाइंट पेन*** से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 30 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।
2. परीक्षा भवन में ***लिफाफा रहित प्रवेश-पत्र के अतिरिक्त,*** लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. उत्तर-पत्र अलग से दिया गया है। ***इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा। केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।***
4. अपना ***अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से*** निर्धारित स्थान पर लिखें।
5. ***उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।***
6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक संख्या और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।
7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।
8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। ***प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार बाल-प्वाइंट पेन से गाढ़ा करना है।***
9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।
10. ***ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है।*** यदि आप किसी प्रश्न का ***उत्तर नहीं देना चाहते हैं,*** तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।
11. रफ कार्य के लिये इस पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा अंतिम खाली पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त ***केवल ओ० एम० आर० उत्तर-पत्र*** ही परीक्षा भवन में जमा करें।
13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।
14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की भागी होगा/होगी।