Set No. 1

18P/212/27

Total No. of Printed Pages : 28

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 .....

Centre Code No.

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.*
3. A separate OMR Answer Sheet is given. *It should not be folded or mutilated. A second OMR Answer Sheet shall not be provided. Only the OMR Answer Sheet will be evaluated.*
4. Write all the entries by blue/black ball pen in the space provided above.
5. **On the front page of the OMR Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, write the Question Booklet Number, Centre Code Number and the Set Number (wherever applicable) in appropriate places.**
6. No overwriting is allowed in the entries of Roll No., Question Booklet No. (and Set No. (if any) on OMR Answer Sheet and also Roll No. and OMR Answer Sheet Serial 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 unfair means.
8. Each question in this Booklet is followed by four alternative answers. *For each question, you are to record the correct option on the OMR Answer Sheet by darkening the appropriate circle* in the corresponding row of the OMR Answer Sheet, by ball-point pen as mentioned in the guidelines given on the first page of the OMR Answer Sheet.
9. For each question, darken only one circle on the OMR 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 mark).
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. On completion of the Test, the Candidate must handover the OMR Answer Sheet to the Invigilator in the examination room/hall. However, candidates are allowed to take away Text Booklet and copy of OMR Answer Sheet with them.
13. Candidates 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.

15. विशेष टिप्पणी अंतिम आवरण-पृष्ठ पर दिये गए हैं।

SPACE FOR ROUGH WORK

रफ़ कार्य के लिए जगह

No. of Questions : 120

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

Note : (1) 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.

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

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

Section—A

1. The condition that the equation $ax^2 + bx + c = 0$ have two roots such that one root is four times of the other is

(1) $4b^2 = 25ac$ (2) $b^2 = 6ac$ (3) $4b^2 = ac$ (4) $2b^2 = 5ac$

2. The number of non empty subsets of a set consisting of 8 elements is

(1) 256 (2) 255 (3) 128 (4) None of these

3. The function $f : R \to R$ defined by $f(x) = (x-1)(x-2)(x-3)$ is

(1) One-one but not onto (2) Onto but not one one

(3) Both one-one and onto (4) Neither one-one nor onto

4. The speed v of a body moving on a straight track varies according to

$$v = \begin{cases} 2t+13 & 0 \le t \le 5 \\ 3t+8, & 5 < t \le 7 \\ 4t+1 & t > 7 \end{cases}$$

The distances are measured in meters and time t in seconds. The distance in meters moved by the particle at the end of 10 seconds is

(1) 127 (2) 247 (3) 186 (4) 313

5. If the sides of a triangle are 7 cm, $4\sqrt{3}$ cm and $\sqrt{13}$ cm, then the smallest angle of the triangle is

(1) 15° (2) 45° (3) 30° (4) None of these

6. If $\frac{x^2+2x+7}{2x+3} < 6, x \in R$, then

(1) $x > 11$ or $x < -3/2$ (2) $x > 11$ or $x < -1$

(3) $-3/2 < x < -1$ (4) $-1 < x < 11$ or $x < -3/2$

7. If $\sin\alpha$ and $\cos\alpha$ are the roots of the equation $px^2 + qx + r = 0$, then

(1) $p^2 - q^2 + 2pr = 0$ (2) $(p+r)^2 = q^2 - r^2$

(3) $p^2 + q^2 - 2pr = 0$ (4) $(p-r)^2 = q^2 + r^2$

8. The real roots of $|x|^3 - 3x^2 + 3|x| - 2 = 0$ are

(1) 0, 2 (2) ± 1 (3) ± 2 (4) 1, 2

9. Consider the following statements

(A) Mode can be computed from histogram.

(B) Median is not independent of change of scale.

(C) Variance is independent of change of origin and scale.

Which of the above is/are correct?

(1) Only (A) (2) Only (B)

(3) Both (A) and (B) (4) (A), (B) and (C)

10. Suppose a researcher is concerned with a nominal scale that identifies users versus nonusers of bank credit cards. The measure of central tendency appropriate to this scale is the

(1) Mean (2) Median (3) Mode (4) Average

11. The variance

(1) Is a poor index of the degree of dispersion

(2) Has a major drawback because it reflects a unit of measurement that has been squared

(3) Is the squared root of the standard deviation

(4) Is the average deviation squared

12. Which of the following is not a step in calculation of the chi-square test statistic?

(1) Formulate the null hypothesis and determine the expected frequency of each answer

(2) Determine the appropriate significance level

(3) Prepare ANOVA table

(4) Calculate the chi-square value

13. Which measure of central tendency will be more suitable for following *data set* :

2, 4, 5, 100, 6, 7, 40, 5, 6, 7, 9, 10, 12, 4

(1) Mean (2) Median (3) Mode (4) Harmonic mean

14. If a test was generally very easy so most of the students got high marks except for a few students. The distribution of marks will be

(1) Positively skewed (2) Negatively skewed

(3) Normal (4) None of these

15. Which one of the following can never be negative?

(1) Mean (2) Median (3) Mode (4) Range

16. The age of 5 children are 1, 2, 3, 4, 5 years. Variance of age is

(1) 2 years (2) 3 years^2 (3) 3 years (4) 2 years^2

17. Hexadecimal number system has

(1) Base of 10 (2) Base of 8

(3) Base of 16 (4) None of these

18. Which one of the following is an example of volatile memory?

(1) ROM (2) PROM (3) EPRON (4) RAM

19. Compiler translates

(1) Line by line
(2) Whole program
(3) Using interpreter
(4) None of the above

20. A Laser beam is used to read data from

(1) Magnetic disk
(2) Optical disk
(3) Magnetic tape
(4) None of these

21. RAM is a

(1) Permanent memory
(2) Temporary memory
(3) Both of the above
(4) None of the above

22. Software that is available for free on the Internet

(1) Customized software
(2) Public domain software
(3) Operating system
(4) None of these

23. Which one of the following are components of Central Processing Unit (CPU)?

(1) Arithmetic logic unit, mouse
(2) Arithmetic logic unit, control unit
(3) Arithmetic logic unit, integrated circuits
(4) Control unit, monitor

24. If a computer has more than one processor then it is known as

(1) Uniprocess
(2) Multiprocessor
(3) Multithreaded
(4) Multiprogramming

Section—B

[BIOLOGY]

25. Formation of prokaryotic translation assembly is initiated at

(1) 70S ribosome
(2) 50S ribosome
(3) 30S ribosome
(4) 55S ribosome

26. A poly A tail is found in

(1) SnRNA (2) tRNA (3) tRNS (4) mRNA

27. Formation of 'lariate' configuration is a characteristic of

(1) RNA splicing
(2) Transcription initiation complex
(3) Translation initiation complex
(4) DNA ligase activity

28. During prokaryotic DNA synthesis, the RNA primers at lagging strand are removed by

(1) S1 nuclease
(2) DNA polymerase I
(3) DNA polymerase III
(4) RNase II

29. Which analytical tool was used by Messelson and Stahl to demonstrate that DNA replicates in semi-conservative manner?

(1) Radiotracer technique
(2) X-ray diffraction analysis
(3) Spectrometry
(4) Density gradient centrifugation

30. 2'-deoxy-cytidine is a

(1) Nucleotide
(2) Dinucleotide
(3) Modified base
(4) Nucleoside

31. Equimolar solutions of alanine and lysine were treated with the ninhydrin reagent. Which option is correct about intensity of the colour produced after the reaction?

(1) Same for both the amino acids

(2) Double with lysine than alanine

(3) Double with alanine than lysine

(4) No colour would be produced by alanine

32. The two strands of DNA are held together by

(1) Phosphodiester bonds

(2) Phosphoanhydride bonds

(3) Hydrogen bonds

(4) C—C covalent bonds

33. Identify the glycolytic enzyme which is associated with substrate level ATP synthesis?

(1) Phosphofructokinase

(2) Hexokinase

(3) Pyruvate kinase

(4) Enolase

34. The enzymes catalyze a chemical reaction by

(1) Increasing activation energy barrier of the substrate

(2) Decreasing activation energy barrier of the substrate

(3) Bringing all the substrate molecules at ground state level

(4) Bringing all the substrate molecules below the ground state level

35. The kinetics of an enzyme in the presence of increasing concentrations of an inhibitor indicated increased K_m values but with no change in V_{max} of the enzyme. Identify type of the inhibitor used

(1) Competitive

(2) Non-competitive

(3) Un-competitive

(4) Allosteric

36. Identify a non-carbohydrate compound from the options given below

(1) Dihydroxyacetone
(2) Glyceraldehyde
(3) Glycerol
(4) Inulin

37. Clonal selection occurs when a B lymphocyte encounters

(1) Cytokines
(2) An antigen
(3) T lymphocytes
(4) Chemotactic factors

38. Immunological diversity in antibody is generated by

(1) Rearrangement of immunoglobulin genes
(2) RNA editing
(3) Post transcriptional modification
(4) Post translational modification

39. Titin is associated with the structure of

(1) Thick filament
(2) Thin filament
(3) Z-lines
(4) Dystrophin

40. Voltage-gated Na^+-channel is inhibited by

(1) 4-aminopyridine
(2) Tricthanolamine
(3) Saxitoxin
(4) Ouabain

41. The five kingdom system of classification was proposed by

(1) Whittakar (2) Linnaeus (3) John Ray (4) Lamark

42. Industrial waste to be disposed of on land should have BOD level

(1) < 100 ppm
(2) 100-500 ppm
(3) > 100 ppm
(4) 100-1000 ppm

43. Industrial production of citric acid is by

(1) *Acetobacter suboxydans*
(2) *Aspergillus niger*
(3) *Penicillium purpurogenum*
(4) *Streptococcus lactis*

44. Endosperm of angiosperms is

(1) Haploid (2) Diploid (3) Triploid (4) Tetraploid

45. The sum total of all genes and their alleles present in a population means

(1) Gene pool
(2) Gene bank
(3) Gene conversion
(4) Gene recombination

46. Which one of the following is a hallucinogenic drug?

(1) Opium
(2) Caffeine
(3) Morphine
(4) Lysergic acid diethylamide

47. Which one of the following is responsible for the stelar secondary growth in dicot stem?

(1) Cork cambium
(2) Vascular cambium
(3) Procambium
(4) Ground meristem

53. Which one of the following is not a correct statement?

(1) Origin of seed habit began with Bryophytes

(2) *Lycopodium* is homosporous and *Selaginella* is heterosporous

(3) Sporophyte in *Riccia* is simplest consisting of a capsule only

(4) In *Marchantia* antheridia and archegonia are borne on antheridiophores and archegoniophores

54. In photosynthesis how many molecules of ATP and $NADPH_2$ are used

(1) 10 ATP and 12 $NADPH_2$

(2) 12 ATP and 18 $NADPH_2$

(3) 18 ATP and 12 $NADPH_2$

(4) 38 ATP and 20 $NADPH_2$

55. Which one of the following is causative agent of ergot and ergotism?

(1) *Sclerospora*

(2) *Venturia*

(3) *Claviceps*

(4) *Penicillium*

56. In the complete oxidation of one molecule of glucose, there is a net gain of

(1) 2 ATP (2) 8 ATP (3) 12 ATP (4) 36 ATP

48. Who amongest the following is credited with the discovery of haploids from anther culture?

(1) Guha and Maheshwari
(2) Maheshwari and Maheshwari
(3) Sopory and Maheshwari
(4) Maheshwari and Khurana

49. Okazaki fragments are joined by

(1) DNA polymerase III
(2) DNA polymerase I
(3) DNA ligase
(4) Gyrase

50. Aflatoxins production was first reported from

(1) *Trichoderma viride*
(2) *Aspergillus flavus*
(3) *Aspergillus nidulans*
(4) *Aspergillus niger*

51. The transfer of energy from one trophic level to the next trophic level is called

(1) Nutrient mobilization
(2) Caloriefic value
(3) Food chain
(4) Gross primary productivity

52. Select the incorrect statement

(1) *Batrachospermum* is a marine alga
(2) *Vaucheria* produces multiflagellate synzoospores
(3) *Chlamydomonas nivalis* causes 'Red snow'
(4) The red colouration of red sea is due to a blue green alga *Trichodesmium erythraeum*

[CHEMISTRY]

57. The total number of orbitals in a shell with principal quantum number n is

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

58. In which one of the following molecules the bond angle is greatest?

(1) CH_4 (2) BF_3 (3) NH_3 (4) H_2O

59. The extent of hydrogen bonding is maximum in the following

(1) Diethyl ether (2) acetone

(3) Acetic acid (4) Triethylamine

60. Which one of the following molecules/ions has trigonal shape?

(1) H_2S (2) NH_2^- (3) $(CH_3)_3B$ (4) $(CH_3)_3N$

61. The number of ionisable hydrogen atoms in hypophosphorous acid is

(1) One (2) Two (3) Three (4) None of these

62. In the coordination compound, $K_4[Ni(CN)_4]$, the oxidation state of nickel is

(1) Zero (2) +1 (3) −1 (4) +2

63. In the complex ion, $Co(NH_3)_6^{3+}$, the central metal atom utilizes sp^3d^2 hybrid orbitals. What geometry is expected for the above complex?

(1) Tetrahedral (2) Trigonal pyramidal

(3) Trigonal planar (4) Octahedral

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

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

65. *In the reaction given below*

$$3Cl_2 + 6OH^- \longrightarrow 5Cl^- + ClO_3^- + 3H_2O$$

(1) Chlorine is reduced

(2) Chlorine is oxidized

(3) Chlorine is neither oxidized nor reduced

(4) Chlorine is oxidized as well as reduced

66. Which one of the following is the correct equivalent weight of $KMnO_4$ in strongly alkaline medium? (K = 39, Mn = 55, O = 16).

(1) 31·6 (2) 52·6 (3) 158·0 (4) None of these

67. In which mode of expression, the concentration of a solution remains independent of temperature?

(1) Molality (2) Molarity (3) Normality (4) Formality

68. The rate at which a substance reacts, depends on its?

(1) Molecular mass (2) Active mass

(3) Equivalent weight (4) Total volume

69. The equilibrium constant, K for the following reaction $3A + 2B \rightleftharpoons C$ will be

(1) $K = \frac{[3A][2B]}{[C]}$ (2) $K = \frac{[C]}{[3A][2B]}$

(3) $K = \frac{[C]}{[A]^2[B]^2}$ (4) $K = \frac{[C]}{[A]^3[B]^2}$

70. Rate constant and rate of a reaction have the same unit. The reaction is

(1) Zero order (2) First order

(3) Second order (4) Third order

71. Which one of the following is a first order reaction?

(1) $2NO + O_2 \longrightarrow 2NO_2$ (2) $2HI \longrightarrow H_2 + I_2$

(3) $NH_4NO_2 \longrightarrow N_2 + H_2O$ (4) $2NO_2 \longrightarrow 2NO + O_2$

72. The pH of a solution obtained by mixing 50 ml of 0·20 M HCl with 50 ml of 0·10 M NaOH will be (Take $k_w = 10^{-14}$)

(1) 3·3 (2) 2·3 (3) 1·3 (4) 0·3

73. The correct relation between standard Gibbs free energy change ($\Delta G°$) and equilibrium constant (K) of a reversible reaction is

(1) $\Delta G° = -RT \ln K$ (2) $\Delta G° = (T\Delta S° - \Delta H°)K$

(3) $K = e^{-RT/\Delta G°}$ (4) $K = e^{-RT\,\Delta G°}$

74. Which one of the following statements is not correct?

(1) A catalytic poison destroys the activity of the catalyst wholly or partially.

(2) A promoter enhances the activity of the catalyst by making its surface more uneven.

(3) A catalyst enroutes the reaction through a path which involves lower value of energy of activation

(4) A catalyst can catalyse all types of reactions

75. For an adiabatic process, which one of the following is correct?

(1) $P\Delta V = 0$ (2) $q = 0$ (3) $\Delta E = q$ (4) $q = tw$

76. The equation which gives pH of buffer solution is

(1) $\text{pH} = \log K_a + \log \frac{[\text{acid}]}{[\text{salt}]}$ (2) $\text{pH} = \frac{1}{2} \text{p}K_\text{a} + \log \frac{[\text{salt}]}{[\text{acid}]}$

(3) $\text{pH} = \text{p}K_\text{a} - \log \frac{[\text{salt}]}{[\text{acid}]}$ (4) $\text{pH} = \text{p}K_\text{a} + \log \frac{[\text{salt}]}{[\text{acid}]}$

77. An exothermic reaction is the one in which the reactants

(1) Have same energy as the products

(2) Have less energy than the products

(3) Have more energy than the products

(4) Are at higher temperature than the products

78. Rank the following compounds in order of decreasing acidity

$(CH_3)_2CHOH$ (I) $(CF_3)_2CHOH$ (II) $(CCl_3)_2CHOH$ (III) CCl_3CH_2OH (IV)

(1) (III) > (IV) > (II) > (I)
(2) (II) > (III) > (IV) > (I)
(3) (III) > (II) > (IV) > (I)
(4) (II) > (III) > (I) > (IV)

79. In this transformation

$$A \xrightarrow[\text{acetone}]{H_2O} CH_3CH_2\underset{\displaystyle OH}{\underset{|}{C}}(CH_3)_2$$

What is the best structure for *A*?

(1) $BrCH_2CH_2CH(CH_3)_2$

(2) $CH_3CH_2\underset{\displaystyle CH_3}{\underset{|}{C}}Br$

(3) $CH_3CH_2\underset{\displaystyle CH_2Br}{\underset{|}{CH}}$

(4) $CH_3\underset{\displaystyle Br}{\underset{|}{C}}HCH(CH_3)_2$

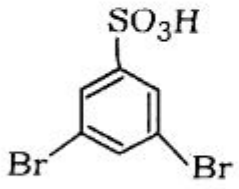
80. The major product obtained on treatment of 2-bromobutane with hot conc. alcoholic KOH is

(1) 1-butene
(2) *cis*-2-butene
(3) *trans*-2-butene
(4) 2-butanol

81. Which one of the following compounds will give a positive iodoform test?

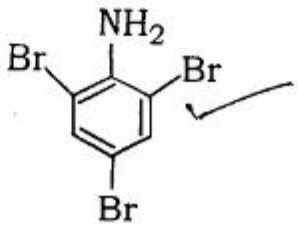
(1) 2-Pentanol
(2) 3-Pentanone
(3) Cyclohexanol
(4) Propiophenone

82. When, sulphanilic acid is treated with excess of bromine water, it gives

(1) 

(2) 

(3) 

(4) 

83. Consider the following statements about conformational isomers

(I) They are interconverted by rotation about single bond.

(II) The energy barrier separating them is less than 15 kcal/mole.

(III) They are best represented by means of Fischer projection formulae.

Of these correct statements are

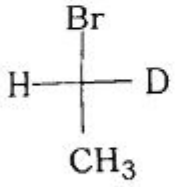
(1) All I, II and III

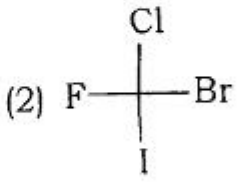
(2) I and II both

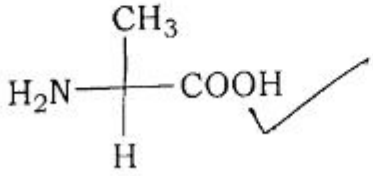
(3) II and III both

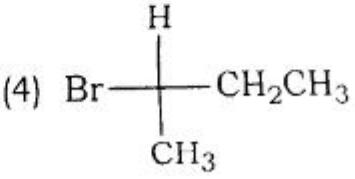
(4) I and III both

84. Which one of the following molecules has *S*-configuration?

(1) 

(2) 

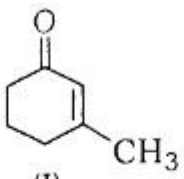
(3) 

(4) 

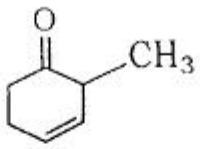
85. Which one of the following is a chromophore group?

(1) >C=O (2) —OH (3) $-NH_2$ (4) —Cl

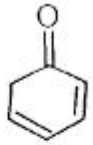
86. Rank the compounds in order of their decreasing λ_{max}



(I)



(II)



(III)

(1) (II) > (I) > (III) (2) (III) > (II) > (I)

(3) (I) > (II) > (III) (4) (III) > (I) > (II)

87. The NMR spectrum of the compound $C_3H_5Cl_3$ showed two signals, one a doublet and the other a quintet. The structure of the compound is

(1) $Cl_2CHCH_2CH_2Cl$ (2) $CH_3CCl_2CH_2Cl$

(3) $ClCH_2CHClCH_2Cl$ (4) $Cl_3CCH_2CH_3$

88. Which one of the following compounds will give 4 signals in its NMR spectrum?

(1) $(CH_3)_2CHCH_2Br$ (2) $(CH_3)_3COCH_3$

(3) $CH_3COOCH_2CH_3$ (4) $CH_3CHClCH_2CH_3$

[PHYSICS]

89. What is the physical variable represented by the slope of a distance-time graph?

(1) Displacement (2) Acceleration

(3) Velocity (4) Speed

90. If the equation of motion of a particle is $y = px^3 + q \log x$, then the acceleration of the particle is

(1) $6px + 2\frac{q}{x}$ (2) $6px^2 - \frac{2q}{x^2}$ (3) $6px - \frac{q}{x^2}$ (4) $6px + \frac{q}{x^2}$

91. Impulse has dimension of

(1) Force (2) Pressure (3) Momentum (4) Energy

92. The distance between a crest and an adjacent trough of a wave is (wavelength = λ)

(1) λ (2) $\frac{\lambda}{2}$ (3) $\frac{\lambda}{4}$ (4) 2λ

93. In a Carnot's engine, the type of thermodynamic processes that take place are

(1) Isothermal and isobaric (2) Isentropic and isobaric

(3) Isentropic and isothermal (4) Isentropic and isobaric

94. The number of degrees of freedom of a gas molecule consisting of 2 atoms in 3 dimensions is

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

95. In photoelectric effect, the Kinetic Energy (K.E.) of the emitted electron is (given incident light frequency = ν, threshold frequency = ν_0)

(1) K.E. = $h(2\nu - \nu_0)$

(2) K.E. = $h(\nu - \nu_0)$

(3) K.E. = $h(\nu - 2\nu_0)$

(4) K.E. = $h(\nu_0 - \nu)$

96. The speed of sound waves in different mediums can be related by

(1) $v_{solid} < v_{gas} < v_{liquid}$

(2) $v_{solid} > v_{gas} > v_{liquid}$

(3) $v_{solid} > v_{liquid} > v_{gas}$

(4) $v_{liquid} > v_{gas} > v_{solid}$

97. Which one of the following is actually unitless?

(1) $\frac{kg \times metre}{s^2 \times Newton}$

(2) $\frac{kg}{metre^3}$

(3) $\frac{s^2 \times Newton}{kg^2 \times metre}$

(4) None of the above

98. How does acceleration due to gravity (g) change when an object is taken higher than ground and deep in earth?

(1) Remains unchanged in both cases

(2) Increases in both cases

(3) Decreases in first case where as increases in second

(4) Decreases in both cases

99. If the wavelength of a photon is doubled, then the momentum of the photon becomes

(1) doubled

(2) remains unchanged

(3) becomes half

(4) None of the above

100. An object of mass m at rest is dropped from a height h towards the ground. What is the kinetic energy of that object at a height x from ground?

(1) mgx (2) mgh (3) $mg(h-x)$ (4) $mg(h-2x)$

101. The speed of light in free space is

(1) 3×10^{8} cm/s (2) 3×10^{8} m/s

(3) 3×10^{10} m/s (4) 3×10^{6} m/s

102. Consider a particle with mass 10 gm is projected with a fixed velocity 6 m/s with an angle 45° with respect to the horizontal surface. When the particle passes the highest point of its trajectory, component of upward and forward velocities are respectively (given $g = 10\ m/s^2$)?

(1) 0 m/s and 3·5 m/s (2) 1·8 m/s and 4·24 m/s

(3) 0·77 m/s and 2·45 m/s (4) 0 m/s and 4·24 m/s

103. Considering the above problem, when the particle passes the highest point of its trajectory, the direction of its velocity and acceleration are

(1) parallel to each other

(2) anti-parallel to each other

(3) 90° to each other

(4) inclined to each other at an angle of 45°

104. If $\vec{r} = 3\hat{i} - 5\hat{j}$ and the angular velocity with respect to the origin $\vec{w} = 2\hat{i} + \hat{j} + 4\hat{k}$, then what is the linear velocity $\vec{v}$ of the particle?

(1) $20\hat{i} - 12\hat{j} + 13\hat{k}$ (2) $-20\hat{i} - 2\hat{j} + 13\hat{k}$

(3) $-20\hat{i} - 12\hat{j} + 13\hat{k}$ (4) $20\hat{i} + 12\hat{j} - 13\hat{k}$

105. The moment of inertia of a circular disk of mass M and radius R with respect to the axis passing through its diameter is

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

106. Consider a block of mass m is connected to a spring of spring constant k. If the spring is compressed for a length of x units, when released the velocity of the block will be

(1) $\sqrt{\frac{k}{m}}\,x$ (2) $\sqrt{\frac{k}{x}}\,m$ (3) $\sqrt{\frac{m}{k}}\,x$ (4) $\sqrt{\frac{k}{m}}\,x^2$

107. In case of a non-relativistic inelastic collision, which one of the following option is wrong?

(1) Linear momentum is conserved (2) Angular momentum is conserved

(3) Kinetic energy is conserved (4) Mass is conserved

108. An electromagnetic wave propagates with a speed v in a free space. What will be the speed when it is transmitted through a medium of refractive index μ ?

(1) $\frac{v}{\mu}$ (2) $\frac{\mu}{2}v$ (3) $v\mu$ (4) $\mu^2 v$

109. An ideal diatomic gas at pressure P is adiabatically compressed so that its volume becomes $\frac{1}{n}$ times the initial value. The final pressure of the gas will be

(1) $n^{\frac{7}{2}}P$ (2) $n^{\frac{7}{5}}P$ (3) $n^{-\frac{7}{5}}P$ (4) $n^{\frac{5}{3}}P$

110. A non metallic hollow sphere of radius R has a charge q placed at its center. What is the electric field at a distance $r\,(< R)$ from the center of the sphere?

(1) $\frac{q^2}{4\pi\varepsilon_0 r}$ (2) $\frac{q}{4\pi\varepsilon_0 r}$ (3) $\frac{q}{4\pi\varepsilon_0 r^2}$ (4) 0

111. A particle of mass m and charge q is moving with a velocity v in a magnetic field B perpendicular to the plane of the motion. What should be the value of v such that the particle execute a circular path of radius r?

(1) $\frac{qmr}{B}$ (2) $\sqrt{\frac{qmr}{B}}$ (3) $\frac{qBr^2}{m}$ (4) $\frac{qBr}{m}$

112. What is the dimension of universal gravitational constant G?

(1) $M^{-1}L^3T^{-2}$ (2) $M^{-2}L^3T^{-1}$ (3) ML^3T^{-2} (4) $M^{-1}L^2T^{-2}$

113. A force $\vec{F} = a\hat{i} + b\hat{j} + c\hat{k}$ is acting upon a body of mass m. If the body starts from rest and was at the origin initially. It's new coordinate after time t is

(1) $\frac{at^2}{2m}, \frac{2bt^2}{m}, \frac{ct^2}{2m}$ (2) $\frac{at^2}{2m}, \frac{bt^2}{2m}, \frac{ct^2}{2m}$

(3) $\frac{at^2}{m}, \frac{bt^2}{m}, \frac{ct^2}{m}$ (4) None of these

114. A stone is projected upwards and it returns to ground in a parabolic path. Which one of the following remains constant?

(1) Vertical component of velocity (2) Horizontal component of velocity

(3) Speed of the stone (4) None of the above

115. The angle between $\vec{A} \times \vec{B}$ and $\vec{B} \times \vec{A}$ is

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

116. If velocity of a positively charged particle is directed vertically upward a magnetic field is directed towards west, the direction of force acting on t particle is along

(1) north (2) east (3) west (4) south

117. The two ends of a train moving with uniform acceleration pass a certain po with velocities u and v. The velocity with which the middle point of the tra passes the same point is

(1) $\sqrt{u+v}$ (2) $\frac{u^2+v^2}{2}$ (3) $\sqrt{\frac{u^2+v^2}{2}}$ (4) $\frac{u+v}{2}$

118. The magnetic flux ϕ (in Weber) in a closed circuit of resistance 10 Ohm var with time t (in second) as $\phi = 4t^2 - 8t + 6$. The magnitude of induced current $t = 0{\cdot}5$ sec is

(1) 1·0 A (2) 0·4 A (3) 0·2 A (4) 1·4 A

119. n alpha particles per second are emitted from N nuclei of a radioactive eleme The half life of radioactive element is

(1) $\frac{n}{N}$ sec (2) $\frac{N}{n}$ sec (3) $\frac{0{\cdot}693\,N}{n}$ sec (4) $\frac{0{\cdot}693\,n}{N}$ sec

120. In a n-type semiconductor, minority carriers of current are

(1) hole (2) neutron (3) proton (4) electron

★★★

SPACE FOR ROUGH WORK

रफ़ कार्य के लिए जगह

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 पृष्ठ या 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 प्रवेश-पत्र के अतिरिक्त, लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. ओ०एम०आर० उत्तर-पत्र अलग से दिया गया है। ***इसे न तो मोड़ें और न ही विकृत करें। दूसरा ओ०एम०आर० उत्तर-पत्र नहीं दिया जायेगा। केवल ओ०एम०आर० उत्तर-पत्र का ही मूल्यांकन किया जायेगा।***
4. सभी प्रविष्टियां प्रथम आवरण-पृष्ठ पर नीली/काली बाल पेन से निर्धारित स्थान पर लिखें।
5. **ओ०एम०आर० 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 एवं केन्द्र कोड नम्बर तथा सेट का नम्बर उचित स्थानों पर लिखें।**
6. ओ०एम०आर० उत्तर-पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक सं० और ओ०एम०आर० उत्तर-पत्र सं० की प्रविष्टियों में उपांगलेखन 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 ओ०एम०आर० उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को ओ०एम०आर० उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार 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 प्रश्न-पुस्तिका के मुखपृष्ठ के अन्दर वाले पृष्ठ तथा अंतिम पृष्ठ का प्रयोग करें।
12. परीक्षा की समाप्ति के बाद अभ्यर्थी अपना ओ०एम०आर० उत्तर-पत्र परीक्षा कक्ष/हाल में कक्ष निरीक्षक को सौंप दें। अभ्यर्थी अपने साथ प्रश्न-पुस्तिका तथा ओ०एम०आर० उत्तर-पत्र की प्रति ले जा सकते हैं।
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।