Paper Code No: B06 Question Booklet No. 030140

ENTRANCE EXAMINATION – 2021 – 22

SET – D

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New Delhi

Roll No. | B | 0 | 6 | 0 | 3 | 1 | 4 | 0 |

..... Signature of Invigilator

Time: 1 Hour 30 Minutes **Total Marks: 100**

Instructions to Candidates

1. Do not write your name or put any other mark of identification anywhere in the OMR Response Sheet. IF ANY MARK OF IDENTIFICATIONS IS DISCOVERED ANYWHERE IN OMR RESPONSE SHEET, the OMR sheet will be cancelled, and will not be evaluated.
2. **This Question Booklet contains the cover page and a total of 100 Multiple Choice Questions of 1 mark each.**
3. Space for rough work has been provided at the beginning and end. Available space on each page may also be used for rough work.
4. There is negative marking in Multiple Choice Questions. For each wrong answer, *0.25 marks will be deducted.*
5. USE/POSSESSION OF ELECTRONIC GADGETS LIKE MOBILE PHONE, *iPhone, iPad, pager* ETC. is strictly PROHIBITED.
6. Candidate should check the serial order of questions at the beginning of the test. *If any question is* found missing in the serial order, it should be immediately brought to the notice of the Invigilator. No pages should be torn out from this question booklet.
   Answers must be marked in the OMR Response sheet which is provided separately. OMR Response sheet must be handed over to the invigilator before you leave the seat.
8. The OMR Response sheet should not be folded or wrinkled. The folded or wrinkled OMR/Response Sheet will not be evaluated.
9. Write your Roll Number in the appropriate space (above) and on the OMR Response Sheet. Any other details, if asked for, should be written only in the space provided.
10. There are four options to each question marked A, B, C and D. Select one of the most appropriate options and fill up the corresponding oval/circle in the OMR Response Sheet provided to you. The correct procedure for filling up the OMR Response Sheet is mentioned below.

CORRECT METHOD
(A) ● (C) (D)

WRONG METHODS					
(A) ⊗ (C) (D)	(A) ✓ (C) (D)	(A) ◐ (C) (D)	(A) ◉ (C) (D)	(A) ● (C) (D)	(A) ● (C) ●

1. Professor Amartya Sen received the Nobel Prize in this field.

A. Chemistry
B. Physics
C. Literature
D. Economics

2. The 'Lady with the Lamp' was the name given to?

A. Queen Elizabeth
B. Florence Nightingale
C. Princess Diana
D. Margret Thacher

3. Who was the commander of 1857 revolt in Rohilkhand?

A. Ahmadullah
B. Jung Bahadur Rana
C. Tantya Tope
D. Begum Hazrat Mahal

4. The metal whose salts are sensitive to light is?

A. Zinc
B. Silver
C. Copper
D. Aluminum

5. Chambal river is a part of -

A. Sabarmati basin
B. Ganga basin
C. Narmada basin
D. Godavari basin

6. Where was the electricity supply first introduced in India –

A. Mumbai
B. Dehradun
C. Darjeeling
D. Chennai

7. Which one of the following ports is the oldest port in India?

A. Mumbai Port
B. Kolkata Port
C. Chennai Port
D. Visakhapatnam Port

8. Hitler party which came into power in 1933 is known as

A. Nazi Party
B. Democratic Party
C. Labour Party
D. Conservative Party

9. The revolutionary like Ashfaqullah Khan, Chandra Shekhar Azad, Ram Prasad Bismil, Roshan Singh and Rajendra Lahiri were all associated with:

A. The Kakori Conspiracy case
B. The Jallianwala Bagh massacre
C. Chauri Chaura Case
D. 1857 freedom revolt

10. The Rowlatt Act was passed in:

A. 1857
B. 1925
C. 1905
D. 1919

11. The bonds present in $CuSO_4.5H_2O$ are

A. electrovalent and coordinate

B. covalent and coordinate

C. covalent and electrovalent

D. covalent, coordinate and electrovalent

12. The process of separating a crystalloid, from a colloid by filtration is called

A. emulsification

B. dialysis

C. coagulation

D. Peptization

13. The mole fraction of the solute in one molal aqueous solution is

A. 0.009

B. 0.018

C. 0.027

D. 0.001

14. Equal volumes of 0.1M $AgNO_3$ and 0.2M NaCl are mixed. The concentration of NO_3^- ions in the mixture will be

A. 0.05M

B. 0.lM

C. 0.2M

D. 0.02 M

15. Which of the species is not paramagnetic?

A. O_2^{2-}

B. O_2

C. N_2^{2-}

D. N_2

16. Pressure has the same dimension as------

A. Energy
B. Energy per unit volume
C. Force
D. Force per unit volume

17. Each of the following solids shows the Frenkel defect except

A. AgI
B. KCl
C. ZnS
D. AgBr

18. The maximum number of electrons which can be present in a subshell can be represented by (I= azimuthal Q. No. and n= principal Q.No.)

A. $2l+1$
B. $2(2l+1)$
C. $n(n+l)$
D. n^2

19. Which of the following oxidation state is common for all alkaline earth metals?

A. +1
B. +2
C. +3
D. +4

20. Which of the following agent is not an oxidising agent?

A. $K_2Cr_2O_7$
B. DDQ
C. Na/NH_3
D. SeO_2

21. With the propagation of longitudinal wave's .through a medium, the quantity transmitted is

A. Energy

B. Matter

C. Energy, matter and momentum

D. Energy and matter

22. The relation between the acceleration and displacement of four particles are given below. Which one of the particles is executing a simple harmonic motion?

A. $a_x = 2x$

B. $a_x = 2x^2$

C. $a_x = -2x^2$

D. $a_x = -2x$

23. The displacement of a particle is simultaneously executing simple harmonic motions in two mutually perpendicular directions is given by $x = a \cos(\omega t)$ and $y = a \sin(\omega t)$. The trajectory of the motion of the particle is

A. an ellipse

B. a parabola

C. a circle

D. a straight line

24. Charles' law is applicable for an

A. adiabatic process

B. isobaric process

C. isothermal process

D. isochoric process

25. Which of the following pairs of physics quantities does not have the same dimensional formula?

A. Force and torque

B. Angular momentum and Planck's constant

C. Linear momentum and impulse

D. Energy and work

26. The horizontal range of a projectile fired at an angle of 15° is 50m. If it is fired with the same speed at an angle of 45°, its range will be,

A. 60m

B. 71m

C. 100m

D. 141m

27. Conservation of momentum in a collision between particle can be understood from

A. conservation of energy

B. Newton's first law only

C. Newton's second law only

D. both Newton's second and third laws

28. A body is falling freely under the action of gravity alone in vacuum. Which of the following quantities remains constant during the fall?

A. total linear momentum

B. total mechanical energy

C. kinetic energy

D. potential energy

29. The density of a non-uniform rod of length 1m is given by $p(x) = a(1+bx^2)$, where a and b are constants and $0 \leq x \leq 1$. The centre of mass of the rod will be at

A. $3(2+b) / 4(3+b)$

B. $4(2+b) / 3(3+b)$

C. $3(3+b) / 4(2+b)$

D. $4(3+b) / 3(2+b)$

30. A positively charged particle is released from rest in a uniform electric field. The electric potential energy of the charge

A. Remains constant because the electric field is uniform

B. increases because the charge moves along the electric field

C. decreases because the charge moves along the electric field

D. decreases because the charge moves opposite the electric field

31. An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true?

A. the electron will be accelerated along the axis

B. the electron path will be circular about the axis

C. the electron will experience a force at 45° to the axis and will move on a helical path

D. the electron will continue to move with uniform velocity along the axis of the solenoid

32. The self-inductance L of a solenoid of length d and cross section area A, with a fixed number of turns N increases as

A. d and A increase

B. d decreases and A increases

C. d increases and A decreases

D. both d and A decrease

33. A charge Q is located at one of the corners of a cube. What is the electric flux of the charge through the surfaces of the cube that are opposite to the charge?

A. Q / ε_0

B. $Q / 6\ \varepsilon_0$

C. $Q / 8\ \varepsilon_0$

D. $Q / 24\ \varepsilon_0$

34. A uniform disc has mass M and radius R. What is its moment of inertia about an axis perpendicular to the axis of the disc and passing through the centre of mass of the disc?

A. $MR^2/4$ B. $MR^2/2$

C. MR^2 D. $MR^2/12$

35. A stone is released from an elevator going up with an acceleration w. The acceleration of the stone after the release is

A. w upward B. g - w upward

C. g - w downward D. g downward

36. The language of discourses of Gautama Buddha was

A. Bhojpuri B. Pali

C. Magadhi D. Magahi

37. The National Chemical Laboratory is located in

A. Mumbai B. Hyderabad

C. Chennai D. Pune

38. Who among the following is the author of the book "The Namesake"

A. Jhumpa Lahiri B. Kiran Desai

C. Arundhati Rai D. Amitabh Ghosh

39. When quit India Resolution was passed in 1942, the Viceroy of India was:

A. Lord Wavell
B. Lord Linlithgow
C. Lord Mountbatten
D. Lord Wavell

40. Grand Slam is used in which of the following games?

A. Lawn Tennis
B. Badminton
C. Cricket
D. Football

41. Which country became the champion of the 2018 FIFA Football World Cup?

A. Croatia
B. France
C. Belgium
D. England

42. Who is the second Indian badminton player after *Prakash Padukone to achieve* the world number.1 ranking in badminton?

A. P.V.Sindhu
B. Kidambi Srikanth
C. Saina Nehwal
D. Parupalli Kashyap

43. The hottest planet in the solar system?

A. Mercury
B. Venus
C. Mars
D. Jupiter

44. Shah Jahan was kept in prison by Aurangzeb at

A. Ajmer
B. Agra
C. Delhi
D. Daulatabad

45. Exposure to sunlight helps a person improve his health because

A. The pigment cells in the skin get stimulated and produce a healthy tan
B. The ultraviolet rays convert skin oil into Vitamin D
C. The infrared light kills bacteria in the body
D. resistance power increases

46. Film and TV institute of India is located at

A Pune
B. Mumbai
C. Lucknow
D. Delhi

47. Federation Cup, World Cup, Allywyn International Trophy and Challenge Cup are awarded to winners of

A. Volleyball
B. Football
C. Cricket
D. Lawn Tennis

48. Each year World Red Cross and Red Crescent Day is celebrated on

A. 8 June
B. 18 June
C. 8 May
D. 18 May

49. The United Nations Organization has its Headquarters at

A. New York, USA
B. Washington DC
C. Bali
D. New Delhi

50. Identify which of the following terms refers to the arrangement of different protein subunits in a multiprotein complex.

A. Primary structure
B. Secondary structure
C. Tertiary structure
D. Quaternary structure

51. A barometer kept in an elevator accelerating upward reads 76cm. The air pressure in the elevator is

A. 76 cm
B. > 76 cm
C. < 76 cm
D. 0

52. If heat is supplied to an ideal gas in an isothermal process

A. The internal energy of the gas will increase
B. The gas will do negative work
C. The gas will do positive work
D. The work done will be zero

53. Two parallel plate capacitors, each of capacitance 40 microfarad are connected in series. The space between the plates of one of the capacitors is filled with a dielectric material of dielectric constant K= 4. What is the equivalent capacitance of the system?

A. 20 microfarad
B. 200 microfarad
C. 50 microfarad
D. 32 microfarad

54. A proton, a deuteron and an alpha particle with equal kinetic energies enter perpendicularly into a magnetic field. If r_p, r_d and r_a are their respective radii, then the radii are in the ratio

A. $r_p: r_d: r_a :: 1: \sqrt{2} : 1$
B. $r_p: r_d: r_a :: 1: \sqrt{2} : 2$
C. $r_p: r_d: r_a :: 1: 2: 4$
D. $r_p: r_d: r_a :: 1: 2 : 1$

55. A rod of length d rotates with a uniform angular velocity ω about its perpendicular bisector. A uniform magnetic field B exists parallel to the axis of rotation. The potential difference between the centre of the rod and one of the ends is

A. 0
B. $\omega Bd^2/8$
C. $\omega Bd^2/2$
D. ωBd^2

56. An LCR circuit with L = 100 mH, C = 100 μF and R = 120 Ω is connected to an AC source of emf E = 30 sin (100t) volts. What is the impedance Z in the circuit?

A. $Z = 120\ \Omega$ B. $Z = 50\ \Omega$

C. $Z = 240\ \Omega$ D. $Z = 150\ \Omega$

57. The amplitude of the electric field of a plane electromagnetic wave in vacuum is 600 N/C. The wave is in the x direction and the electric field is in the y direction. What is the amplitude of the magnetic field?

A. 2×10^{6} T B. 6×10^{-6} T

C. 2×10^{-6} T D. 3×10^{-6} T

58. p and E denote the momentum and energy of a photon. If the wavelength is decreased,

A. Both p and E decrease

B. both p and E increase

C. p decreases and E increases

D. p increases and E decreases

59. What is the ground state radius of Lithium ions (Li^{++}) assuming Bohr's model to be applicable? (Assume first Bohr radius to be $a_o = 540$)

A. 180 nm

B. 60 nm

C. 1320 nm

D. 4860 nm

60. The mass number of nucleus is equal to

A. the number of neutrons in a nucleus

B. the number of protons in a nucleus

C. the number of nucleons in a nucleus

D. none of the above

61. Which of the following is the empty set?

A. $\{x: x \text{ is real number and } x^2 - 1 = 0\}$

B. $\{x: x \text{ is real number and } x^2 + 1 = 0\}$

C. $\{x: x \text{ is real number and } x^2 - 9 = 0\}$

D. $\{x: x \text{ is real number and } x^2 = x + 2\}$

62. If a relation R is defined on the set Z of integers as follows:

$$(a, b) \varepsilon R \Leftrightarrow a^2 + b^2 = 25$$

Then, *Domain (R)* =

A. {3, 4. 5}

B. {0, 3, 4, 5}

C. {0. ±3. ±4, ±5}

D. {0, 3, 4, 5, 7}

63. If R is a relation on a finite set having η elements, then the number of relations on A is

A. 2^n B. n^2

C. n^n D. 2^{nZ}

64. $i^2 + i^4 + i^6 + \ldots$ (2n + 1)terms =

A. -1 B. 1

C. -I D. i

65. The conjugate of a complex number is $\frac{1}{i-1}$. Then, the complex number is

A. $\frac{-1}{i+1}$ B. $\frac{1}{i-1}$

C. $\frac{-1}{i-1}$ D. $\frac{1}{i+1}$

66. The square matrix A = [a_{ij}] given by $a_{ij} = (i - j)^3$ is a

A. Diagonal matrix

B. hermitian matrix

C. symmetric matrix

D. skew-symmetric matrix

67. If $A=\begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then the value of $|adj\ A|$, is

A. a3

B. a^9

C. a^6

D. a^2

68. The value of x for which the matrix $\begin{bmatrix} -x & x & 2 \\ 2 & x & -x \\ x & -2 & -x \end{bmatrix}$ will be non-singular, are

A. $-2 \leq x \leq 2$

B. $x \geq 2$

C. $x \leq -2$

D. for all x other than 2 and -2

69. If $20_{c_r} = 20_{c_{r-10}}$, then 18_{c_r} is equal to

A. 896

B. 816

C. 163 2

D. 1618

70. The number of divisors of 4200 is

A. 32

B. 36

C. 42

D. 48

71. In the binomial expansion of $(a-b)^n$, $n \geq 5$, the sum of the 5^{th} and 6^{th} terms a

Zero. Then, $\frac{a}{b}$ equals

A. $\frac{n-5}{6}$

B. $\frac{n-4}{5}$

C. $\frac{5}{n-4}$

D. $\frac{6}{n-5}$

72. The sum of numerical coefficients in the expansion of $(1+\frac{x}{3}+\frac{2y}{3})^{12}$, is

A. 2^8 B. 2^{10}

C. 2^{12} D. 2^{14}

73. Three numbers are in A. P, such that their sum is 18 and sum of their squares is 158.The greatest among them is _

A. 10 B. 11

C. 12 D. 13

74. If $3+\frac{1}{4}(3+d)+\frac{1}{4^2}(3+2d)+\ldots$ to $\infty = 8$, then the value of d is

B. 7

C. 5 D. 3

75. $\lim_{x\to 3}([x-3]+[3-x]-x)$, Where $[\bullet]$ denotes the greatest integer function, is equal to

A. -1 B. -2

C. -3 D. -4

76. If $f(x) = \frac{1-\sin x}{(\pi-2x)^2}$, when $x \neq \frac{\pi}{2}$ and $f\left(\frac{\pi}{2}\right) = \lambda$, then $f(x)$ will be continuous function at $x = \frac{\pi}{2}$ when $\lambda =$

A. $\frac{1}{8}$ B. $\frac{1}{8}$

C. $\frac{1}{2}$ D. $\frac{1}{6}$

77. If a function f (x) is defined for all $x > 0$ and satisfies f $(x^2) = x^3$ for all $x > 0$, then $f'(4) =$

A. 3 B. 4

C. 5 D. 6

78. $\int e^{3\log x}\,(x^4+1)^{-1}\,dx$ is equal

A. $\log(x^4+1)+C$ B. $\frac{1}{4}\log(x^4+1)+C$

C. $-\log(x^4+1)+C$ D. $-4\log(x^4+1)+C$

79. If $I_n = \int_0^{\pi/4} tan^n\,\theta\,d\theta$, then $I_8 + I_6$ equals

A. $\frac{1}{4}$ B. $\frac{1}{5}$

C. $\frac{1}{6}$ D. $\frac{1}{7}$

80. The solution of the differential equation $\frac{dy}{dx} + 1 = e^{x+y}$, is

A. $(x + y)\, e^{x+y} = 0$

B. $(x + C)\, e^{x+y} = 0$

C. $(x - C)\, e^{x+y} = 1$

D. $(x + C)\, e^{x+y} + 1 = 0$

81. The line $\frac{x}{a} - \frac{y}{b} = 1$ cuts the x-axis at P. The equation of line through P perpendicular to the given line, is

A. $x + y = ab$

B. $x + y = a + b$

C. $ax + by = a^2$

D. $bx + ay = b^2$

82. If (0, 4) and (0, 2) are respectively the vertex and focus of a parabola, then its equation is

A. $x^2 + 8y = 32$

B. $y^2 + 8x = 32$

C. $x^2 - 8y = 32$

D. $y^2 - 8x = 32$

83. If $\vec{a} = 2\hat{i} - 3\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} + 4\hat{j} - 2\hat{k}$, then $\vec{a} \times \vec{b}$ is

A. $10\hat{i} + 2\hat{j} + 11\hat{k}$

B. $10\hat{i} + 3\hat{j} + 11\hat{k}$

C. $10\hat{i} - 3\hat{j} + 11\hat{k}$

D. $10\hat{i} - 3\hat{j} - 10\hat{k}$

84. A dice is tossed twice. The probability of having a number greater than 4 on each toss is

A. $\frac{1}{3}$ B. $\frac{1}{9}$

C. $\frac{2}{3}$ D. $\frac{1}{12}$

85. If $\cos^{-1}x + \cos^{-1}y + \cos^{-1}z = 3\pi$, then $xy + yz + zx$ is equal to

A. -3 B. 0

C. 3 D. -1

86. Two of the great Mughals wrote their own memories. They were

A. Baber and Jahangeer B. Baber and Hmayun

C. Akbar and Jahangeer D. Jahangeer and Auragzeb

87. Which of the following functional groups is most likely to participate in a dipole-dipole interaction?

A. Aromaticring B. Ketone

C. Alcohol D. Alkene

88. Which of the following elements is less electronegative than carbon?

A. Nitrogen B. Silicon

C. Fluorine D. Oxygen

89. Which of the following does not have the ground-state configuration $1s^2 2s^2 2p^6$?

A. F^-

B. Na^+

C. Ne

D. cl^-

90. Brine is used for the industrial production of:

A. NaOH

B. $HN0_3$

C. H_2SQ_4

D. Bleaching Powder

91. Ionic compounds don't conduct electricity in

A. Solution

B. In molten state

C. In Solid state

D. In pure crystalline solid form

92. The percentage of ionic character of a bond is calculated by the difference in

A. ionization energy

B. Atomic radii

C. Electronegativity

D. Electron gain enthalpy

93. Most basic species among the following is:

A. Aniline

B. Cyclohexyl amine

C. Guanidine

D. Ammonia

94. The Strecker synthesis of a- amino acids begins with the reaction of an aldehyde with ammonium chloride and potassium cyanide. This is followed by an acid-catalyzed hydrolysis that gives the amino acid. What functional group is hydrolyzed in the second step?

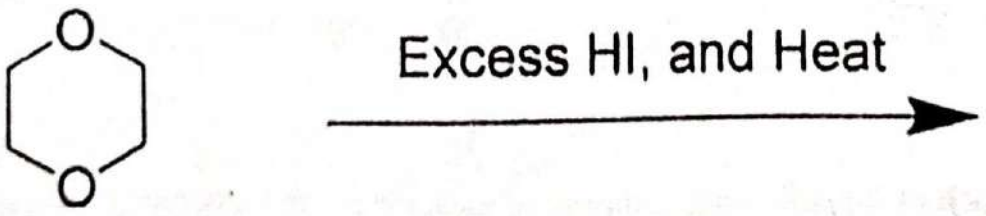
A. An ester
B. an nitrile
C. An amide
D. an imine derivative

95. Aldehydes and ketones are example of:

A. functional group isomers
B. position isomers
C. metamers
D. stereoisomers

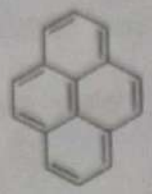
96. What product(s) are expected from the following reaction?

Excess HI, and Heat .....



A. $2ICH_2CH_2I$
B. $2CH_3CH_2I$
C. $CH_3CH_2I + CH_3CH_2OH$
D. $2CH_3CH_2OH$

97. Anti-Aromatic species among the following is

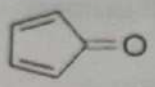
A. 

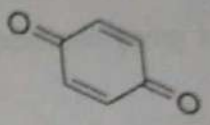
B 

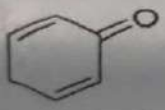
C. 

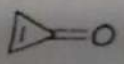
D 

98. Which of the following compounds will show highest dipole moment?

A. 

B. 

C 

D. 

99. Which one is an Ambident ligand

A. H_20

B. NH_3

C. CN^-

D. PH_3

100. Which of the following complex adopt square planar geometry?

A. $[Ni(Cl)_4]^{2-}$

B. $[Ni(CN)_4]^{2-}$

C. $[Ni(C0)_4]$

D. $[Ni(Br_4)]^{2-}$