JEE MAIN- 2024-25
(FULL TEST)
(Physics, Chemistry and Mathematics)

14
FULL TEST

Date :- ..... **Time :- 3:00 Hrs.** **Marks :- 300**

Important Instructions :

1. The test duration is of **3 hours**.
2. The Test Booklet consists of 90 questions. The maximum marks are 300.
3. There are **three** parts in the question paper consisting of **Physics, Chemistry** and **Mathematics** having 30 questions in each part of equal weightage. Each part (subject) has two sections.

   (i) **Section-A:** This section contains 20 multiple choice questions which have only one correct answer. Each question carries **4 marks** for correct answer and **–1 mark** for wrong answer.
   (ii) **Section-B:** This section contains 10 questions. In Section-B, attempt any **five questions out of 10.** The answer to each of the questions is a numerical value. Each question carries **4 marks** for correct answer and **–1 mark** for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

Student's Name :- .....
School Name :- .....

Student's Signature :- ..... **Invigilator's Signature :-** .....

PE

PHYSICS

(SECTION-A)

1. Let the wavelength at which the the spectral emissive power of a black body (at a temperature T) is maximum, be denoted by λ_{max} .As the temperature of the body is increased by 1 K , λ_{max} decreases by 1 percent .The temperature T of the black body is

(A) 100K (B) 200K
(C) 400K (D) 288K

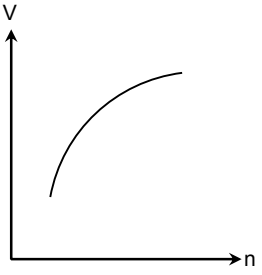
2. If the speed of rotation of earth about its axis increases, then the weight of the body at the equator will -
(A) increase
(B) decrease
(C) remain unchanged
(D) sometimes decrease and sometimes increase

3. In Fraunhofer diffraction due to a narrow slit a screen is placed 2 m away from the lens to obtain the pattern. If the slit width is 0.2 mm and the first minima are 5 mm on either maximum, The wavelength of light is
(A) 2000 Å (B) 3000 Å
(C) 4000 Å (D) 5000 Å

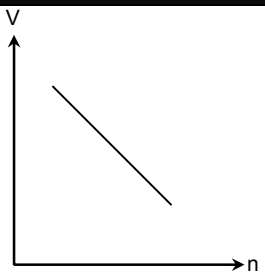
4. An electric dipole has a fixed dipole moment $\vec{p}$, which makes angle θ with respect to x-axis. When subjected to an electric field $\vec{E}_1 = E\hat{i}$, it experiences a torque $\vec{T}_1 = \tau\hat{k}$. When subjected to another electric field $\vec{E}_2 = \sqrt{3}E_1\hat{j}$ it experiences a torque $\vec{T}_2 = -\vec{T}_1$. The angle θ is :
(A) 90° (B) 30° (C) 45° (D) 60°

5. Which of the following curve may represent the speed of the electron lying in n^{th} hydrogen orbit :

(A)



(B)



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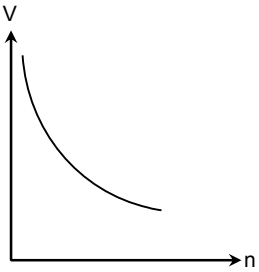

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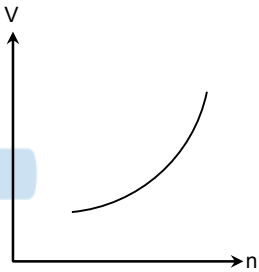
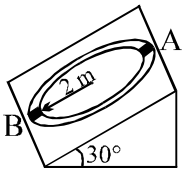


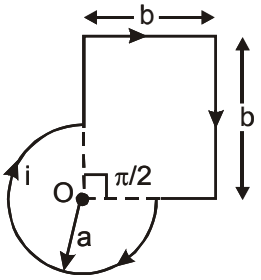
6. A small block of mass m is released from position A, inside the frictionless circular groove of radius 2 m on a fixed inclined plane as shown in figure. The contact force between the block and inclined plane at point B is:



(A) $\frac{\sqrt{3}}{2}$ mg (B) $\frac{5mg}{2}$
(C) $\sqrt{7}$mg (D) mg

7. Poynting vector $\vec{P}$ for an EM wave is-
(A) $\vec{P} = \vec{E} \times \vec{B}$
(B) $\vec{P} = \vec{E} \times \vec{H}$
(C) $\vec{P} = \frac{\vec{E}}{\vec{B}}$
(D) $\vec{P} = \frac{\vec{E}}{\vec{H}}$

8. The magnitude of magnetic field at O (centre of the circular part) of the current carrying coil as shown is:



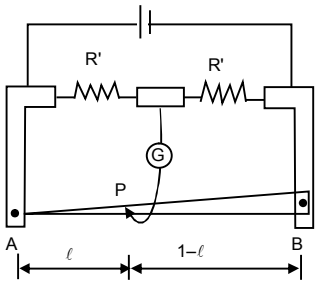
(A) $\frac{\mu_0 i}{4\pi}\left(\frac{3\pi}{a}+\frac{\sqrt{2}}{b}\right)$

(B) $\frac{\mu_0 i}{2\pi}\left(\frac{3\pi}{2a}+\frac{\sqrt{2}}{b}\right)$

(C) $\frac{\mu_0 i}{2\pi}\left(\frac{\pi}{3a}+\frac{3}{\sqrt{2}\,b}\right)$

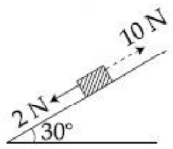
(D) $\frac{\mu_0 i}{4\pi}\left(\frac{3\pi}{2a}+\frac{\sqrt{2}}{b}\right)$

9. In a meter bridge, the wire of length 1m has a non–uniform cross–section such that, the variation $\frac{dR}{d\ell}$ of its resistance R with length ℓ is $\frac{dR}{d\ell}\propto\frac{1}{\sqrt{\ell}}$. Two equal resistances are connected as shown in the figure. The galvanometer has zero deflection when the jockey is at point P. What is the length AP ?



(A) 0.2 m (B) 0.3 m
(C) 0.25 m (D) 0.35 m

10. A block kept on a rough inclined plane, as shown in the figure, remains at rest upto a maximum force 2N down the inclined plane. The maximum external force up the inclined plane that does not move the block is 10 N. The coefficient of static friction between the block and the plane is : (Take g = 10 m/s^2)



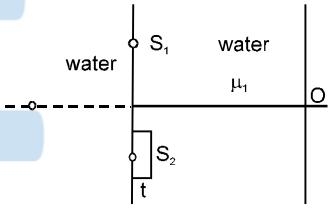
(A) $\frac{\sqrt{3}}{4}$ (B) $\frac{1}{2}$

(C) $\frac{\sqrt{3}}{2}$ (D) $\frac{2}{3}$

11. A 150 m long metal wire connects points A and B. The electric potential at point B is 50 V less than that at point A. If the conductivity of the metal is 60×10^6 mho/m, then magnitude of the current density in the wire is equal to :

(A) 11×10^{-4} A/m^2 (B) 5.5×10^{-3} A/m^2
(C) 4×10^7 A/m^2 (D) 20×10^6 A/m^2

12. A Young's double slit experiment is conducted in water (μ_1) as shown in the figure, and a glass plate of thickness t and refractive index μ_2 is placed in the path of S_2. The magnitude of the phase difference at O is : (Assume that 'λ' is the wavelength of light in air). O is symmetrical w.r.t. S_1 and S_2 .



(A) $\left|\left(\frac{\mu_2}{\mu_1}-1\right)t\right|\frac{2\pi}{\lambda}$

(B) $\left|\left(\frac{\mu_1}{\mu_2}-1\right)t\right|\frac{2\pi}{\lambda}$

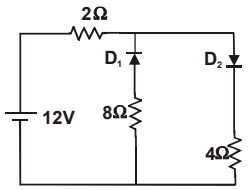
(C) $|((\mu_2-\mu_1)t|\frac{2\pi}{\lambda}$

(D) $|(\mu_2-1)t|\frac{2\pi}{\lambda}$

13. The coercivity of a small magnet where the ferromagnet gets demagnetized is 3×10^3 Am^{-1}. The current required to be passed in a solenoid of length 10 cm and number of turns 100, so that the magnet gets demagnetized when inside the solenoid, is :

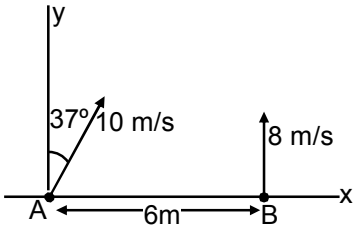
(A) 30 mA (B) 60 mA
(C) 3 A (D) 6 A

14. The current flowing through battery in the given circuit is [diodes are ideal].



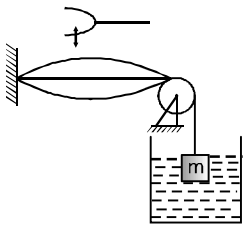
(A) 1.2 A (B) 2 A
(C) 3 A (D) 0.5 A

15. Two balls A and B are projected simultaneously in vertical plane (x-y plane) as shown in the figure. Take g = 10 m/s^2. Choose the correct option out of following:-



(A) A and B do not collide
(B) A and B collide at a height of 5 m from ground
(C) A and B collide at a height of 4 m from ground
(D) A and B collide at a height of 3 m from ground

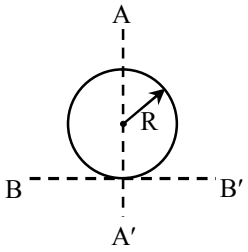
16. The wire shown in the figure is vibrating in its fundamental mode and the block is hanging in air initially. It produces 10 beats/sec. with a 100 Hz tuning fork. When the block is gradually dipped in water, the beat frequency first decreases and then becomes zero when it is completely submerged. The specific density of the block should be : (Assume the wire is vibrating in fundamental mode also in second case)



(A) $\frac{11}{3}$ (B) $\frac{121}{21}$
(C) $\frac{101}{11}$ (D) $\frac{110}{21}$

17. Figure shows a sphere of mass M & radius 'R' let AA′ and BB′ be two axes as shown in figure then

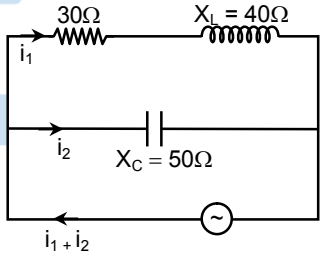
(I) Parallel axes theorem is not applicable between axes AA′ & BB′
(II) $I_{BB'} = I_{AA'} + MR^2$



(A) Both of statement - I and statement - II are correct
(B) Statement - I is correct but statement-II is false
(C) Statement - I is false but statement - II is correct
(D) Both of statement - I and statement - II are false

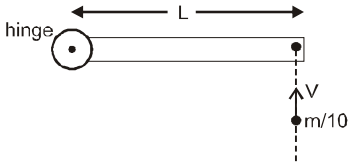
18. The displacement of a particle in simple harmonic motion in one time period is -
(A) A (B) 2A
(C) 4A (D) zero

19. In the given A.C. circuit, if battery voltage is V = $200\sqrt{2}$ sin(100πt), power delivered by battery will have a power factor of :



(A) $\frac{1}{2}$ (B) $\sqrt{\frac{3}{10}}$
(C) $\frac{3}{\sqrt{10}}$ (D) $\frac{1}{\sqrt{10}}$

20. A thin uniform rod of mass 'm' and length 'L' is hinged at one end. This rod is maintained in horizontal position by colliding very tiny balls each of mass m/10 completely elastically 10 times per sec striking at the opposite end as shown in figure. Find the speed of the ball - (g = 10 m/sec^2)

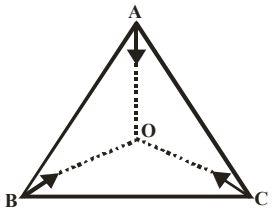


(A) 10 m/sec (B) 2.5 m/sec
(C) 5 m/sec (D) 20 m/sec

(SECTION-B)

21. The molar heat capacity for the process is xR, where R is gas constant, when 10 J of heat added to a monoatomic ideal gas, then gas performs a work of 5 J on its surrounding, then x is.

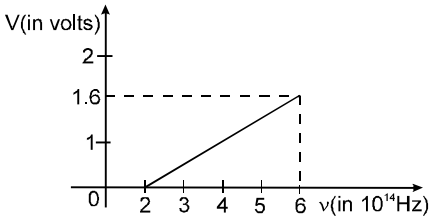
22. Three particles of equal masses are initially at the vertices of equilateral triangle of side $2\sqrt{3}\,m$ in horizontal plane. They start moving towards centriod O with equal speed 2 m/sec. After collision at O, A stops and C retraces its path with same speed. Distance between B and C just after one second of the collision is $\frac{5\alpha}{77}$ m. Here α is



23. In an α-decay the Kinetic energy of α particle is 48 MeV and Q-value of the reaction is 50 MeV. If the mass number of the mother nucleus is 4N. Find N: (Assume that daughter nucleus is in ground state)

24. A simple seconds pendulum is constructed out of a very thin string of thermal coefficient of linear expansion $\alpha = 20 \times 10^{-4}/^{o}C$ and a heavy particle attached to one end. The free end of the string is suspended from the ceiling of an elevator at rest. The pendulum keeps correct time at $0^{o}C$. When the temperature rises to $50^{o}C$, the elevator operator of mass 60kg being a student of Physics accelerates the elevator vertically, to have the pendulum correct time. The apparent weight of the operator when the pendulum keeps correct time at 50 ^{o}C is 25x (in newton) then x is: (Take $g = 10\ m/s^2$)

25. Figure is the plot of the stopping potential versus the frequency of the light used in an experiment on photoelectric effect. If the work function is $\frac{x}{42}$ (in eV) then value of x is. (h = 6.4×10^{-34} Js)



26. A quantity x is defined as $x = \frac{a^3 - b^2}{\sqrt{c+d}}$. Value of a, b, c and d are reported as a = 3 ± 0.001, b = 5 ± 0.0013, c = 6 ± 0.24 and d = 10 ± 0.4. Percentage error in x will be -

27. A light ray in medium (RI = 5/3) enters another medium at an angle 30º. The angle in other medium is $\sin^{-1}$ (5/6). How many minimum degrees the incident angle must be increased such that the ray is completely reflected.

28. Find the density of $^{12}_{6}C$ nucleus in 10^{17} kg/m^3.

29. The shortest wavelength of the Brackett series of a hydrogen like atom of atomic number Z is same as the shortest wavelength of the Balmer series of hydrogen atom, then the value of Z is -

30. A capacitor has charge 50μC. When the gap between the plate is filled with glass wool, then 120μC charge flows through the battery to capacitor. The dielectric constant of glass wool is……

31. Which one of the following pairs of elements is most likely to form an ionic compound?

(A) B and Cl_2 (B) K and O_2

(C) O_2 and Cl_2 (D) Al and I_2

32. Effective overlapping will be shown by :

(A) ⊕⊖+⊕⊖ (B) 

(C) ⊕⊖+⊖⊕ (D) All the above

33. Which of the following contains more than one peroxy linkage?

(A) H_2SO_5 (B) $H_2S_2O_8$

(C) $H_4P_2O_8$ (D) CrO_5

34. Which of the following are bidentate monoanion ligands ?

(a) Dimethylglyoximato

(b) Oxalato ion

(c) Bis(ethane-1,2-diamine)

Select the correct answer using the codes given below :

(A) a only (B) a and c only

(C) c only (D) b and c only

35. Consider the following :

Complex	**Coordination number**
(A) $[CuCl_2]^-$	(i) 6
(B) $Ni(CO)_4$	(ii) 5
(C) $[PtCl_6]^{4-}$	(iii) 4
(D) $[Ni(NH_3)_6]^{2+}$	(iv) 2

Proper matching is :

(A) A(i), B(ii), C(iii), D(iv)

(B) A(iii), B(iv), C(ii), D(iv)

(C) A(iv), B(iii), C(i), D(i)

(D) A(i), B(iii), C(ii), D(iv)

36. Conformational changes in a molecule leads to change in

(A) torsional angle (B) bond angle

(C) bond length (D) all of the above

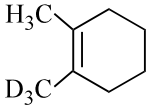
37. IUPAC Name of $CH_3-CH_2-\underset{\displaystyle H}{\underset{|}{N}}-CHO$ is

(A) N-ethyl aminoethanal

(B) N-formyl aminoethane

(C) N-ethyl methanamide

(D) ethanaminal

38.  This compound shows:

(A) geometrical isomerism

(B) optical isomerism

(C) both

(D) none

39. Which of the followings is most acidic.

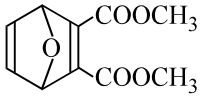
(A) $HC^{\circ}C-CH_2-COOH$

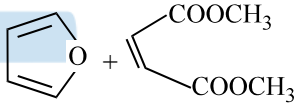
(B) $H_3C-CH_2-CH_2-COOH$

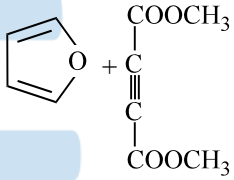
(C) $H_2C=CH-CH_2-COOH$

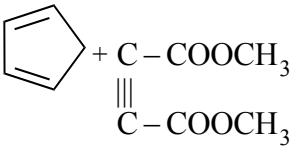
(D) $H_3C-CH_2-CH_2-CH_3$

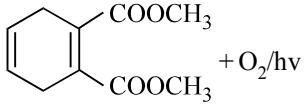
40. Which one of the following pairs will yield compound (A)



(A) 

(B) 

(C) 

(D) 

41. Select the correct statement(s) regarding BrF_5 molecule?

(A) It has square pyramidal shape

(B) All ∠FBrF bond angles are equal to 90°

(C) All Br–F bond lengths are equal

(D) All of these

42. The substrate which has maximum rate of hydrolysis, is:

(A) CCl_4 (B) $SiCl_4$

(C) SF_6 (D) PCl_5

43. Which intermediate products form during Hoffmann bromamide reaction?

(A) $R-\underset{\underset{O}{\|}}{C}-NH-Br$ (B) $R-\underset{\underset{H}{|}}{C}=N=O$

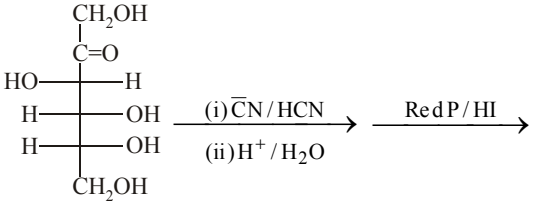
(C) $R-\underset{\underset{O}{\|}}{C}-\underset{\underset{H}{|}}{\overset{\square}{N}}Br$ (D) $R-N=C=O$

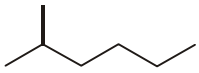
44. Which of the following α-amino acid has thiol group?

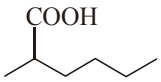
(A) Methionine (B) Cysteine

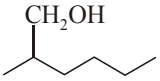
(C) Tyrosine (D) Lysine

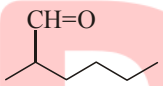
45.



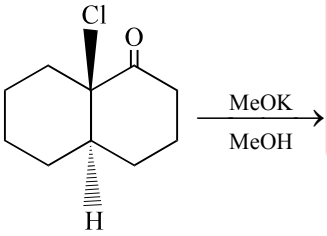
(A) 

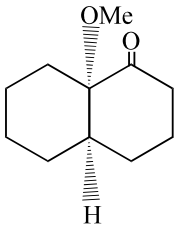
(B) 

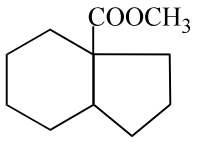
(C) 

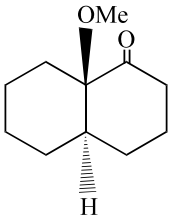
(D) 

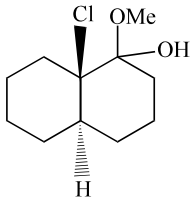
46. Major product of this reaction is



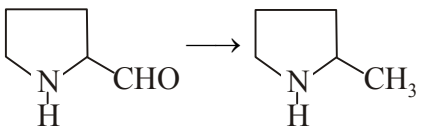
(A) 

(B) 

(C) 

(D) 

47.

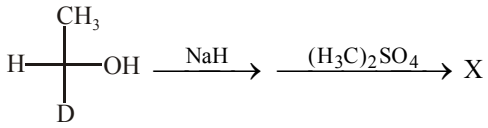


Suitable reagent to carry out above conversion is:

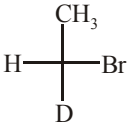
(A) $LiAlH_4$ (B) $ZnHg$, HCl

(C) N_2H_4 ,EtONa (D) H_2 Ni

48.

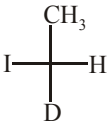


Which statement is correct about X.

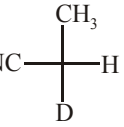
(A) It can be prepared by reaction of 

with $\overset{\square}{O}CH_3$

(B) X gives CH_3–Br as major product on reaction with 1 eq. of HBr

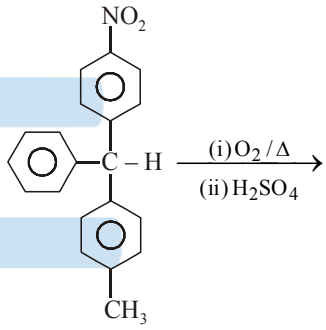
(C) X gives 

on reaction with NaI / acetone

(D) X gives 

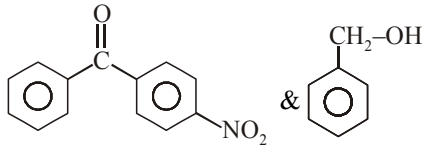
on reaction with KCN / DMSO

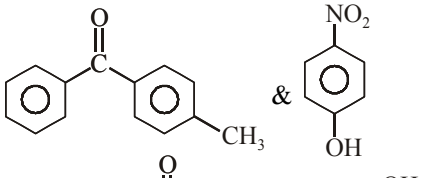
49.

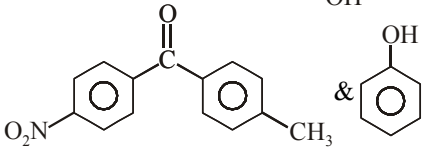


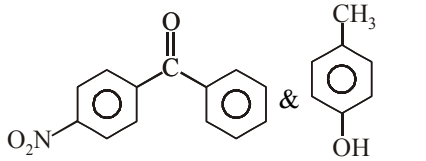
P + Q (Phenolic compound)

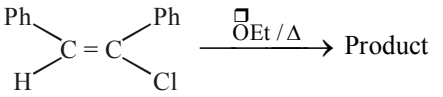
P and Q are respectively.

(A) 

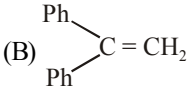
(B) 

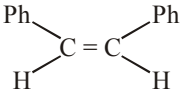
(C) 

(D) 

50. 

(A) Ph – C ≡ C – Ph

(B) 

(C) 

(D) No reaction

SECTION-B

51. A flask containing 0.5 atm of $A_2(g)$ contains some solid AB which undergoes dissociation according to $2AB(s) \rightleftharpoons A_2(g) + B_2(g)$. $K_p = 0.06\ atm^2$ Calculate the total pressure (in atm) at equilibrium.

52. For a reaction $A + B \rightleftharpoons C + D$, $\mathbf{K_{eq}}$ represents equilibrium constant. The graph of $\ln K_{eq}$ v/s $\frac{1}{T}$ is a **straight line** with a **slope equal to 300**. Also at T = 300 K, the reaction is at equilibrium with [A] = [B] = [C] = 1 M and [D] = 10 M. Calculate the value of (1000 × ΔS°) in Cal / Kelvin.
[R = 2 Cal/mol K]

53. Find the Bond enthalpy **(in kJ/mol)** of one "three centre two electron bond" in B_2H_6 {B–H–B → 2B(g) + H(g)} from the given data.

ΔH_f^0 [$BH_3(g)$] = 100 kJ/mole

ΔH_f^0 [$B_2H_6(g)$] = 36 kJ/mole

ΔH_{atm} [B(s)] = 565 kJ/mole

ΔH_{atm} = [$H_2(g)$] = 218 kJ/mole

54. 1 mole of an ideal monoatomic gas initially at 1 atm & 300 K experiences a process by which pressure is doubled. The nature of the process is unspecified but ΔU = 900 cal. Calculate final volume (in litre).
[Given : R = 0.08 atm lit. / mol/K = 2 Cal / K/ mol]

55. Consider the following nuclear reaction :

$$^{238}_{92}X \longrightarrow {}^{A}_{Z}Y + {}^{4}_{2}He + 232.75\,MeV$$

ab = 100 × loss in mass in amu during above nuclear reaction.

cd = Value of 'Z'. Find **'abcd'**.**[Given : 1amu = 931MeV]**

56. An element A form two oxides. The weight ratio of A and O in oxides are x : y and y : x respectively. If equivalents weight of A in first oxide is $\frac{32}{3}$. What is equivalent weight of A in second oxides?

57. The osmotic pressure of 0.5 M monobasic acid solution is 0.6 RT at T Kelvin. What is its pH value?

58. The law constant for $O_2(g)$ and $N_2(g)$ in water at 0°C are 2.5×10^4 bar and 5.0×10^4 bar respectively. Calculate ΔT_f of solution made by dissolving air at 1 bar pressure.
Given : mole % of O_2 in air = 20 & mole % of N_2 in air = 80
K_f of H_2O = 1.86 K kg mol^{-1}
[Write your answer by multiplying with 10^5]

59. On passing electricity through nitrobenzene solution, it is converted into azobenzene. Calculate the mass of azobenzene (in mg) if same quantity of electricity produces oxygen just sufficient to burn 96 mg of fullerene (C_{60}).

60. A particular transition in hydrogen atom from a higher level 'A' to lower level 'B' causes a change in de-Broglie wavelength which is 3 times the de-broglie wavelength in first Bohr orbit. Calculate total different wavelength possible if all possible transition between level 'A' and level 'B' occur.

(SECTION-A)

61. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ & $\vec{a}.\vec{b} = 1$ & $\vec{a} \times \vec{b} = \hat{j} - \hat{k}$ then $\vec{b}$ is equal to -

(A) $2\hat{i}$ (B) $\hat{i} - \hat{j} + \hat{k}$

(C) $\hat{i}$ (D) $2\hat{j} - \hat{k}$

62. The real value of m for which the substitution $y = u^m$ will transform the differential equation $2x^4y \dfrac{dy}{dx} + y^4 = 4x^6$ in to a homogeneous equation is

(A) m = 0 (B) m = 1

(C) m = 3/2 (D) m = 2/3

63. If a is *a* positive integer, then the number of values of a satisfying

$$\int_0^{\pi/2} \left\{ a\left(\frac{\cos 3x}{4} + \frac{3}{4}\cos x\right) + a\sin x - 20\cos x \right\} dx \le \frac{a^2}{3}$$ are -

(A) one (B) two

(C) three (D) four

64. The eccentric angle of a point on the ellipse $9x^2 + 4y^2 = 36$ at a distance $\dfrac{\sqrt{31}}{2}$ units from the centre of the ellipse is 'θ', then the value of $|12\cos\theta|$ is -

(A) 2 (B) 4 (C) 6 (D) 8

65. If the line ax + by = 1 passes through point of intersection of $y = x\tan\alpha + p\sec\alpha$, $y\sin(30^\circ - \alpha) - x\cos(30^\circ - \alpha) = p$ and is inclined at 30° with $y = \tan\alpha x$, then the value of $a^2 + b^2$ can be-

(A) $\dfrac{1}{p^2}$ (B) $\dfrac{2}{p^2}$

(C) $\dfrac{3}{2p^2}$ (D) $\dfrac{3}{4p^2}$

66. If α, β are the eccentric angles of the extremities of a focal chord of an ellipse, then the eccentricity of the ellipse is -

(A) $\dfrac{\cos\alpha + \cos\beta}{\cos(\alpha + \beta)}$ (B) $\dfrac{\sin\alpha - \sin\beta}{\sin(\alpha - \beta)}$

(C) $\dfrac{\cos\alpha - \cos\beta}{\cos(\alpha - \beta)}$ (D) $\dfrac{\sin\alpha + \sin\beta}{\sin(\alpha + \beta)}$

67. $\displaystyle\int \frac{(1 - \tan^2 x)\cdot \operatorname{cosec} 2x\, dx}{\sec^2 x}$ is equal to

(A) $\dfrac{\ell n|\sin 2x|}{2} + C$

(B) $\dfrac{\ell n|\cos 2x|}{2} + C$

(C) $\dfrac{\ell n(\tan x)}{2} + C$

(D) $\dfrac{\ell n|\cos x + \sin x|}{2} + C$

68. If $f(x) = \lim\limits_{t\to 0} \tan^{-1}\left(\dfrac{e^{xt} - 1}{t}\right)$, then the value of $\lim\limits_{t\to 0} \dfrac{f(x) - x}{x^3}$ is equal to -

(A) $\dfrac{1}{2}$ (B) $-\dfrac{1}{2}$ (C) $\dfrac{1}{3}$ (D) $-\dfrac{1}{3}$

69. Let there be two sets A & B, such that A = {a, b} & n(B) = 4, then total number of possible relations defined from set B to set A is -

(A) 2^2 (B) 2^3 (C) 2^6 (D) 2^{2^3}

70. Find the variance for the given data : 8,12,13,15,22.

(A) 21.2 (B) 23

(C) 24.3 (D) 25.5

71. Solution of inequality $\log_{\log_2\left(\frac{x}{2}\right)} (x^2 - 10x + 22) > 0$ is -

(A) $(-\infty, 3)$

(B) $(5 - \sqrt{3}, 3) \cup (5 + \sqrt{3}, 7)$

(C) $(0, 5 - \sqrt{3}) \cup (3, 4)$

(D) $(7, \infty)$

72. If $\int (\cos x)^4 dx = Ax + B\sin 2x + C\sin 4x$ then {A, B, C} equals-

(A) $\left\{\frac{3}{8}, \frac{1}{4}, \frac{1}{32}\right\}$ (B) $\left\{\frac{3}{8}, \frac{1}{2}, \frac{1}{6}\right\}$

(C) $\left\{\frac{3}{4}, \frac{1}{4}, \frac{1}{16}\right\}$ (D) $\left\{\frac{3}{8}, \frac{1}{4}, \frac{1}{32}\right\}$

73. Let α, β, γ be distinct complex numbers such that $\dfrac{\alpha}{1-\beta} = \dfrac{\beta}{1-\gamma} = \dfrac{\gamma}{1-\alpha} = \lambda$, then λ is

(A) ω (B) ω^2

(C) $-\omega^2$ (D) none of these

74. The probability that a man can hit a target is $\frac{3}{4}$, he tries 5 times. The probability that he will hit the target at least three times is

(A) $\frac{291}{364}$ (B) $\frac{371}{464}$

(C) $\frac{471}{502}$ (D) $\frac{459}{512}$

75. Number of solutions of the equation $[y + [y]] = 2\cos x$ is, where $y = \frac{1}{3}[\sin x + [\sin x + [\sin x]]]$ and [.] denotes the greatest integer function

(A) 1 (B) 2

(C) 3 (D) none of these

76. Let g(x) be a function defined on [–1, 1]. If the area of the equilateral triangle with two of its vertices at (0, 0) and (x, g(x)) is equal to $\sqrt{3}/4$, then the function g(x) is

(A) $\pm\sqrt{1-x^2}$ (B) $\sqrt{1-x^2}$

(C) $-\sqrt{1+x^2}$ (D) None

77. If for an A.P. $a_1, a_2, a_3, \ldots, a_n$; $a_1 + a_3 + a_5 = -12$ and $a_1a_2a_3 = 8$, then $a_2 + a_4 + a_6$ is

(A) –12 (B) –16 (C) –18 (D) –2

78. The general solution of equation $4\cot 2\theta = \cot^2\theta - \tan^2\theta$ is -

(A) $n\pi \pm \frac{2\pi}{3}$ (B) $n\pi \pm \frac{\pi}{3}$

(C) $n\pi \pm \frac{\pi}{4}$ (D) None of these

79. Let $f(x) = \begin{cases} 2x^2 + 2/x^2 & ; \quad 0 < |x| \le 2 \\ 1 & ; \quad x = 0 \end{cases}$

Then f(x) has

(A) least value 4 but no greatest value

(B) greatest value 4

(C) neither greatest or least value

(D) least value 1 but no greatest value

80. The coefficients of 3 consecutive terms in the expansion of $(1 + x)^n$ are in the ratio 1 : 7 : 35, then value of 'n' is

(A) 35 (B) 46

(C) 23 (D) none of these

(SECTION-B)

81. If $\sin 2x\cos y = (a^2 - 1)^2 + 1$ and $\cos 2x\sin y = a + 1$, where $x, y \in [0, \pi]$ and $a \in R$, then number of ordered pairs (x, y) is

82. Let $y = \operatorname{cosec} x - \cot x$ such that $\frac{\frac{d^2y}{dx^2}}{y} = \lambda \sec^2\frac{x}{2}$, then 1000λ is equal to

83. If two circles $x^2 + y^2 + 2n_1x + 2y + \frac{1}{2} = 0$ and $x^2 + y^2 + n_2x + n_2y + n_1 = \frac{1}{2}$, intersect each other orthogonally where $n_1, n_2 \in I$, then number of possible of ordered pairs (n_1, n_2) is

84. Number of terms in the expansion of $(x^{1/3} + x^{2/5})^{40}$ with integral power of x is equal to

85. If $D = \begin{bmatrix} 0 & a\alpha^2 & a\beta^2 \\ b\alpha + c & 0 & a\gamma^2 \\ b\beta + c & (b\gamma + c) & 0 \end{bmatrix}$ is a skew symmetric matrix (where α, β, γ are distinct) & the value of $\begin{vmatrix} (a+1)^2 & (1-a) & (2-c) \\ (3+c) & (b+2)^2 & (b+1)^2 \\ (3-b)^2 & b^2 & (c+3) \end{vmatrix}$ is λ then |10 λ | is equal to

86. The number of arrangements of the word 'PARABOLA' under the condition that consonants and vowels alternate is

87. The number of solution of $\cos(2\sin^{-1}(\cot(\tan^{-1}(\sec(6\operatorname{cosec}^{-1}x))))) + 1 = 0$ where $x > 0$ is

88. Suppose x, y, z > 0 & different from one and $\ell n\, x + \ell n\, y + \ell n\, z = 0$, then value of $x^{\frac{1}{\ell ny}+\frac{1}{\ell nz}} \cdot y^{\frac{1}{\ell nz}+\frac{1}{\ell nx}} \cdot z^{\frac{1}{\ell nx}+\frac{1}{\ell ny}}$ is e^{-k} then k equals .....

89. If the system of following equations in x & y

$2x + 3y + 4 = 0$; $3x + 5y + 6 = 0$;

$2x^2 + 6xy + 5y^2 + 8x + 12y + 1 = t$

consists of a solution. Then find the numeric value of t^4.

90. A purse contains 4 copper and 3 silver coins & another purse contains 6 copper & 2 silver coins. One coin is drawn from any one of these purses. The probability that it is a copper coin is $\frac{\alpha}{\beta}$ (α, β ∈ N & are coprime), then $\frac{100\,\alpha}{\beta + 18}$ is