



NTPQ

ALL INDIA TEST SERIES

CODE - A

TEST ID 001935

JEE (Advanced) - 2019

FULL TEST - 6 (Paper-I)

Time : 3 Hours

Maximum Marks : 180

*Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
You are not allowed to leave the Examination Hall before the end of the test.*

INSTRUCTIONS

A. General :

1. This booklet is your Question Paper containing **54 questions**.
2. The Question Paper **CODE & TEST ID** is printed on the right hand top corner of this booklet. This should be entered on the OMR Sheet.
3. Fill the bubbles completely and properly using a **Blue/Black Ball Point Pen** only.
4. No additional sheets will be provided for rough work.
5. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
6. The answer sheet, a machine-readable Optical mark recognition sheet (OMR Sheet), is provided separately.
7. **DO NOT TAMPER WITH / MUTILATE THE OMR OR THE BOOKLET.**
8. Do not break the seals of the question-paper booklet before being instructed to do so by the invigilator.

B. Question Paper Format :

9. The question paper consists of **3 parts (Part I: Physics, Part II: Chemistry & Part III: Maths)**. Each part has **3 sections**.
10. **Section I** contains **6 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), for its answer, out of which **ONE OR MORE** is/are correct.
11. **Section II** contains **8 questions**. The answer to each question is a **numerical value**.
12. **Section III** contains **2 "paragraph" type questions**. Each paragraph describes an experiment, a situation or a problem. Two multiple choice questions will be asked based on this paragraph. Each question has 4 choices (A), (B), (C) and (D), for its answer, out of which **ONLY ONE** is correct.

C. Marking Scheme :

13. For each question in **Section I**, you will be awarded **4 marks** if one the bubble(s) corresponding to the correct option(s) is(are) darkened, and **+1 marks** for darkening a bubble corresponding to each correct option, provided **NO** incorrect option is darkened. In all other cases, **minus one (-2) marks** will be awarded. **Zero marks** if none of the bubbles is darkened.
14. For each question in **Section II**, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answer in this section.
15. For each question in **Section III**, you will be awarded **3 marks** if you darken the bubble(s) corresponding to the correct choice(s) for the answer, and **zero mark** if no bubble is darkened. In all other cases, **minus one (-1) mark** will be awarded.

Name of the Candidate (in Capitals) _____

Test Centre _____

Centre Code _____

Candidate's Signature _____

Invigilator's Signature _____

PART I : PHYSICS

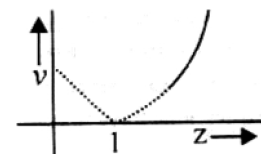
SECTION 1 (Maximum Marks : 24)

- This section contains **SIX** questions.
- Each question has **FOUR** options (a), (b), (c) and (d). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct.
- For each question, darken the bubble(s) corresponding to the correct option(s) in the ORS.
- For each question, marks will be awarded in one of the following categories :

<i>Full Marks</i>	:	+4	If one the bubble(s) corresponding to the correct option(s) is(are) darkened.
<i>Partial Marks</i>	:	+1	For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened.
<i>Zero Marks</i>	:	0	If none of the bubbles is darkened.
<i>Negative Marks</i>	:	-2	In all other cases.
- For example, if (a), (c) and (d) are all the correct options for a question, darkening all these three will result in +4 marks; darkening only (a) and (d) will result in +2 marks; and darkening (a) and (b) will result in -2 marks, as a wrong option is also darkened.

1. Figure shows the variation of frequency of a characteristic X-ray and atomic number.

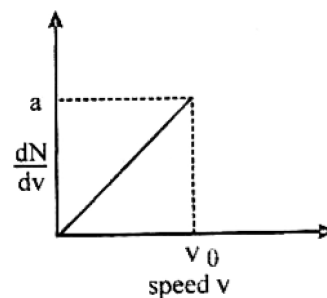
- (a) The characteristic X-ray is K_β
- (b) The characteristic X-ray is K_α



- (c) The energy of photon emitted when this X-ray is emitted by a metal having $Z = 101$ is 204 keV
- (d) The energy of photon emitted when this X-ray is emitted by a metal having $Z = 101$ is 102 keV

2. Graph shows a hypothetical speed distribution for a sample of N gas particle (for $v > v_0$; $\frac{dN}{dv} = 0$)

- (a) The value of (av_0) is $2N$
- (b) The ratio v_{avg} / v_0 is equal to $2/3$
- (c) The ratio v_{rms} / v_0 is equal to $1/\sqrt{2}$



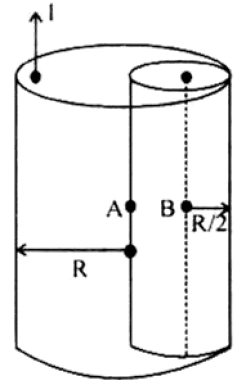
- (d) Three fourth of the total particle has a speed between $0.5v_0$ and v_0 .

3. Standing waves are produced on a stretched string of length L with fixed ends. When there is a node at a distance $L/3$ from one end, then :
- (a) minimum and next higher number of nodes excluding the ends are 2, 5 respectively
 - (b) minimum and next higher number of nodes excluding the ends are 2, 4 respectively
 - (c) frequency produced may be $V/3L$
 - (d) frequency produced may be $3 V/2L$

[V = Velocity of waves in the string]

4. From a cylinder of radius R , a cylinder of radius $R/2$ is removed, as shown.

Current flowing in the remaining cylinder is I . Magnetic field strength is



- (a) Zero at point A
- (b) Zero at point B
- (c) $\frac{\mu_0 I}{3\pi R}$ at point A
- (d) $\frac{\mu_0 I}{3\pi R}$ at point B

5. Suppose the potential energy between electron and proton at a distance r is given by $-\frac{Ke^2}{3r^3}$.

Application of Bohr's theory to hydrogen atom in this case shows that

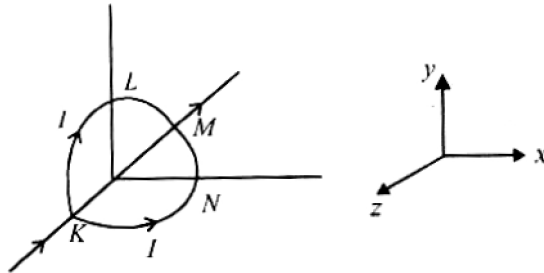
- (a) energy in the n th orbit is proportional to n^6
 - (b) energy is proportional to m^{-3} (m : mass of electron)
 - (c) energy in the n th orbit is proportional to n^{-2}
 - (d) energy is proportional to m^3 (m = mass of electron)
6. Which of the following is/are conservative force(s)?

- (a) $\vec{F} = 2r^3 \hat{r}$
- (b) $\vec{F} = -\frac{5}{r} \hat{r}$
- (c) $\vec{F} = \frac{3(x\hat{i} + y\hat{j})}{(x^2 + y^2)^{3/2}}$
- (d) $\vec{F} = \frac{3(y\hat{i} + x\hat{j})}{(x^2 + y^2)^{3/2}}$

SECTION 2 (Maximum Marks : 24)

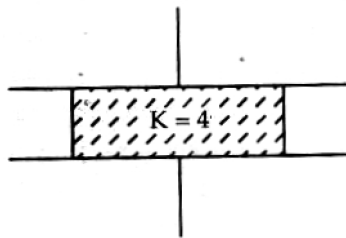
- This section contains **EIGHT (08)** questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme :
Full Marks : +3 If **ONLY** the correct numerical value is entered as answer.
Zero Marks : 0 In all other cases.

7. Find the self inductance (in henry) of a coil in which an e.m.f. of 10 V is induced when the current in the circuit changes uniformly from 1 A to 0.5 A in 0.2 sec.
8. A circular loop of radius R is bent along a diameter and given a shape as shown in the figure. One of the semicircles (KNM) lies in the x - z plane and the other one (KLM) in the y - z plane with their centres at the origin. Current I is flowing through each of the semi-circles as shown in figure.

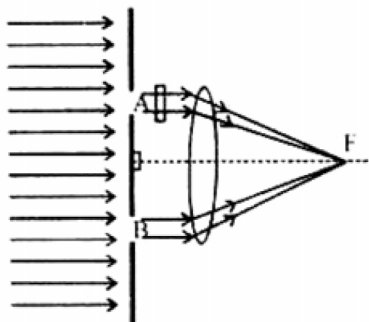


A particle of charge q is released at the origin with a velocity $\vec{v} = -v_0 \hat{j}$. Find the magnitude of instantaneous force \vec{F} on the particle if $\mu_0 q v_0 I = 8R$. Assume that space is gravity free.

9. Consider a parallel plate capacitor of capacity $10 \mu F$ with air filled in the gap between the plates. Now one half of the space between the plates is filled with a dielectric of dielectric constant $K = 4$ as shown in figure. If the new capacitance of the capacitor (in μF) is 5^x , find the value of x ?



10. 0.05 kg steam at 373 K and 0.45 kg of ice at 253 K are mixed in an insulated vessel. Find the equilibrium temperature (in degree celcius) of the mixture. Given, $L_{\text{fusion}} = 80 \text{ cal/g} = 336 \text{ J/g}$, $L_{\text{vaporization}} = 540 \text{ cal/g} = 2268 \text{ J/g}$, $S_{\text{ice}} = 2100 \text{ J/kg K} = 0.5 \text{ cal/gK}$ and $S_{\text{water}} = 4200 \text{ J/kg K} = 1 \text{ cal/gK}$
11. In a resonance tube experiment to determine speed of sound, air column in the pipe is made to resonate with a given tuning fork of frequency 480 Hz. The diameter of the pipe is 5 cm and it is open at one end. The smallest resonating length is observed to be 16 cm. The speed of sound in m/s from the given experimental data is found to be $(330 + z)$. Find the value of z .
12. A block slides down a smooth inclined plane to the ground when released at the top, in time t seconds. Another block is dropped vertically from the same point, in the absence of the inclined plane and reaches the ground in $t/2$ second. The angle of inclination of the plane with the vertical is $\frac{\pi}{y}$. Find the value of y .
13. A doubly ionised Lithium atom is hydrogen-like with atomic number 3. If the wavelength of the radiation required to excite the electron in Li^{++} from the first to the third Bohr orbit is expressed as $(120 - K) \text{ \AA}$, what is the value of K ?
(Ionisation energy of the hydrogen atom equals 13.6 eV, $hC = 12403.2 \text{ \AA eV}$)
14. In a modified Young's double slit experiment, a monochromatic, uniform and parallel beam of light of wavelength 6000 \AA and intensity $(10/\pi) \text{ W m}^{-2}$ is incident normally on two circular apertures A and B of radii 0.001 m and 0.002 m respectively. A perfectly transparent film of thickness 2000 \AA and refractive index 1.5 for the wavelength of 6000 \AA is placed in front of aperture A , see fig. Calculate the power (in micro watts) received at the focal spot F of the lens.
- The lens is symmetrically placed with respect to the apertures. Assume that 10% of the power received by each aperture goes in the original direction and is brought to the focal spot.



SECTION 3 (Maximum Marks : 12)

- This section contains **TWO (02)** paragraphs. Based on each paragraph, there are **TWO (02)** questions.
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PARAGRAPH

If the current flowing through the coil is i and the flux linked with each turn is ϕ , then the total flux linkage is $N\phi$.

$$N\phi \propto i \text{ or } N\phi = Li$$

where L is a constant called the 'coefficient of self-induction' or 'self-inductance' of the coil. By the above equation, we have $L = N\phi/i$.

In this equation, if $i = 1$, then $L = N\phi$. Hence the coefficient of self-induction of a coil is equal to the number of flux-linkages in the coil when unit current is flowing in the coil.

Alternatively, the coefficient of self inductance can be defined as twice of the work done in establishing a flow of one ampere current in the circuit. This energy is stored in the magnetic field of the inductor.

15. A long coaxial cable consists of two concentric cylinders of radii a and b . The central conductor of the cable carries a steady current i and the outer conductor provides the return path of the current. The self inductance of this length ℓ of the cable is

(a) $\frac{\mu_0 \ell}{2\pi} \log_e \left(\frac{b}{a} \right)$ (b) $\frac{\mu_0 \ell}{\pi} \log_e \left(\frac{b}{a} \right)$ (c) $\frac{\mu_0 \ell}{2\pi} \log_e \left(\frac{a}{b} \right)$ (d) $\frac{\mu_0 \ell}{\pi} \log_e \left(\frac{a}{b} \right)$

16. Calculate the self inductance per unit length of a current loop formed by joining the ends of two long parallel wires of radius r separated by a distance d between their axes, neglecting the end effects and magnetic flux within the wires.

(a) $\frac{\mu_0}{2\pi} \log_e \frac{d-r}{r}$ (b) $\frac{\mu_0}{2\pi} \log_e \frac{d+r}{r}$ (c) $\frac{\mu_0}{\pi} \log_e \frac{d-r}{r}$ (d) None of these

PARAGRAPH

If the container filled with liquid gets accelerated horizontally or vertically, pressure in liquids gets changed. In case of horizontally accelerated liquid (a_x), the free surface has the slope $\frac{a_x}{g}$. In case of vertically accelerated liquid (a_y) for calculation of pressure, effective g is used. A closed box with horizontal base 6m by 6m and a height 2m is half filled with liquid. It is given a constant horizontal acceleration $g/2$ and vertical downward acceleration $g/2$.

17. The angle of the free surface with the horizontal is equal to
- (a) 30° (b) $\tan^{-1}(2/3)$ (c) $\tan^{-1}(1/3)$ (d) 45°
18. Length of exposed portion of top of box is equal to
- (a) 2 m (b) 3 m (c) 4 m (d) 2.5 m

PART II : CHEMISTRY

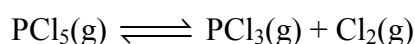
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19. Which of the following statement/s with regard to quantum number is/are correct
- (a) The azimuthal quantum number gives the contribution of energy due to angular momentum towards the total energy of the electron
 - (b) The azimuthal quantum number gives the relative of energies of subshells belonging to the same shell
 - (c) The orbital angular momentum is given by azimuthal quantum number which is equal to $\frac{h}{2\pi} \sqrt{\ell(\ell+1)}$
 - (d) The orbital angular momentum depends on the value of 'n'

20. PCl_5 dissociates into PCl_3 and Cl_2 thus

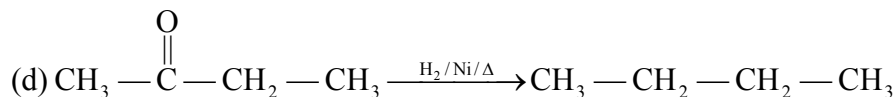
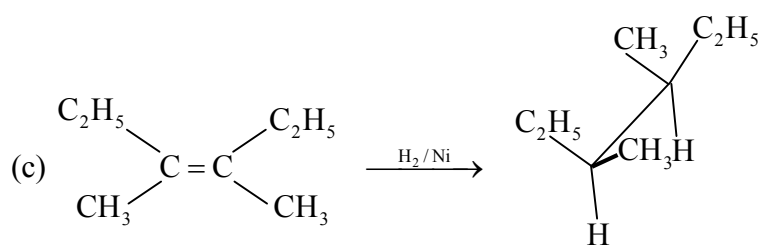
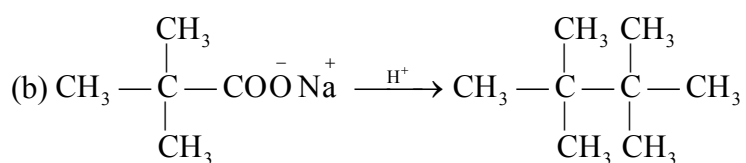
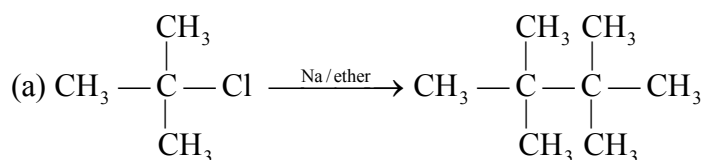


If the total pressure of the system in equilibrium is P at a density ρ and temperature T. The vapour density of the gas mixture at equilibrium has the value of 62 when the temperature is 230°C.

Correct options are

- | | |
|-------------------------------------|--------------------------------|
| (a) Degree of dissociation = 0.68 | (b) Value of $P/\rho = 0.3327$ |
| (c) Degree of dissociation = 0.3327 | (d) Value of $P/\rho = 0.68$ |

21. Which of the following statements are not correct
- A meso compound has chiral centres but exhibits no optical activity
 - A meso compound has no chiral centres and thus are optically inactive
 - A meso compound has molecules which are superimposable on their mirror images even though they contain chiral centres
 - A meso compound is optically inactive because the rotation caused by any molecule is cancelled by an equal and opposite rotation caused by another molecules that is the mirror image of the first.
22. Choose the correct statements
- Vacancy defects lower the density of the substance
 - Interstitial defects increase the density of the substance
 - Schottky defects, preserve the electrical neutrality of the crystal
 - Frenkel defects do not affect the density of the crystal
23. Which of the following is wrong



24. The enthalpy of formation of ethane, ethylene and benzene from the gaseous atoms are -2839.2 , -2275.2 and -5536 kJ mol^{-1} respectively. The bond enthalpy of C – H bond is given as equal to 410.87 kJ mol^{-1} .

Correct options are

- (a) Bond enthalpy of C – C bond = 373.98 kJ mol^{-1}
 (b) Bond enthalpy of C = C bond = 631.72 kJ mol^{-1}
 (c) resonance energy compared to Kekule structure = -53.68 kJ mol^{-1}
 (d) Bond enthalpy of C – C bond = 631.72 kJ mol^{-1}

SECTION 2 (Maximum Marks : 24)

- This section contains **EIGHT (08)** questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, -0.33 , -30 , 30.27, -127.30) using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
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25. One molal solution of a carboxylic acid in benzene shows the elevation of boiling point of 1.518 K . If the degree of association of the acid in benzene in percent is expressed as $40A$ then find the value of 'A'. (K_b for benzene = 2.53 K kg mol^{-1}) :
26. A compound of metal ion M^{x+} ($Z = 24$) has a spin only magnetic moment of $\sqrt{15}$ B.M. Find the number of unpaired electrons in the compound.
27. Sulfuryl chloride (SO_2Cl_2) reacts with water to give a mixture of H_2SO_4 and HCl . How many moles of baryta would be required to neutralize the solution formed by adding 1 mol of SO_2Cl_2 to excess of water?
28. A mixture of Pu^{239} and Pu^{240} has specific activity of 6×10^9 dis sec^{-1} . The half-lives of isotopes are 2.44×10^4 and 6.58×10^3 years respectively. If the percent of Pu^{239} in the mixture is expressed as $20x - 61$ then find the value of x .
29. The density of solid water (i.e. ice) at 25°C is 0.98 g cm^{-3} while that of liquid mercury at the same temperature is 13.60 g cm^{-3} . If the percentage of height of the ice above the surface of a container filled with mercury is expressed as $100 - A$ then find the value of 'A'.

30. H_2 and D_2 gases at a pressure of 1 atm each at 25°C are in equilibrium with a solution containing H^+ and D^+ ions. If $E_{\text{D}^+/\text{D}_2}^\circ = -0.296\text{ V}$, calculate $\log [\text{D}^+]/[\text{H}^+]$.
31. In a reaction at 31°C , $10^{-3}\%$ reactant molecules manage to cross over the barrier of transition state. What will be energy of these molecules in excess of the average value. ($R = 2\text{ cal K}^{-1}\text{ mol}^{-1}$):
32. Find the number of stereoisomers obtained by bromination of *trans*-2-butene.

SECTION 3 (Maximum Marks : 12)

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PARAGRAPH

When anions and cation approach each other, the valence shell of anions are pulled towards a cation, is known as polarisation and ability of the cation to polarize the anion is called as polarising power of cation. Due to polarisation, sharing of electrons occurs between two ions to some extent and bond shows some covalent character. Fajan's suggested following factors on which polarisation depend.

- As the charge on cation or anion increases polarisation increases.
- Size of cation decreases or size of anion increases, polarisation increases.
- Cation with pseudo noble gas configuration shows highest polarisation power.

33. Which is most covalent in nature

- (a) NaCl (b) MgCl_2 (c) AlCl_3 (d) CaCl_2

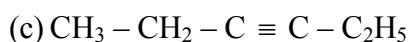
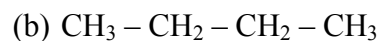
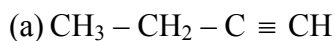
34. Which is having highest melting point?

- (a) LiF (b) LiCl (c) LiBr (d) LiI

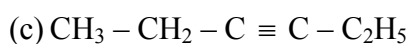
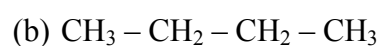
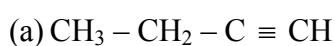
PARAGRAPH

A hydrocarbon (a) of molecular weight 54 reacts with excess of Br_2 in CCl_4 to give a compound (b) whose molecular weight is 593% more than that of (a). However, on catalytic hydrogenation with excess of hydrogen, (a) forms (c) whose molecular weight is only 7.4% more than that of (a). (a) reacts with $\text{CH}_3\text{CH}_2\text{Br}$ in the presence of NaNH_2 to give another hydrocarbon (d), which on ozonolysis yields diketone (E), (E) on oxidation gives propanoic acid.

35. Structure of A is



36. Structure of C is



PART III : MATHS

SECTION 1 (Maximum Marks : 24)

- This section contains **SIX** questions.
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37. If $f(x_1 - x_2)$, $f(x_1)f(x_2)$ & $f(x_1 + x_2)$ are in A.P for all x_1, x_2 and $f(0) \neq 0$ then
 (a) $f'(5) = f(-5)$ (b) $f(5) = f(-5)$ (c) $f'(5) - f'(-5) = 0$ (d) $f'(5) + f'(-5) = 0$
38. Consider a sequence $\{a_n\}$ with $a_1 = 2$ & $a_n = \frac{a_{n-1}^2}{a_{n-2}}$ for all $n \geq 3$, terms of the sequence being distinct. If a_2 & a_5 are +ve integers and $a_5 \leq 162$, then the possible value (s) of a_5 can be
 (a) 162 (b) 64 (c) 32 (d) 2
39. If $f_n(x) = e^{f_{n-1}(x)} \forall n \in N$ & $f_0(x) = x$, then $\frac{d}{dx} f_n(x)$ is equal to
 (a) $f_n(x) \frac{d}{dx} (f_{n-1}(x))$ (b) $f_n(x) f_{n-1}(x)$
 (c) $f_n(x) f_{n-1}(x) \dots f_2(x) f_1(x)$ (d) None of the above
40. Let $\hat{u}, \hat{v}, \hat{w}$ be three unit vectors such that $\hat{u} + \hat{v} + \hat{w} = \hat{a}$, $\hat{a} \cdot \hat{u} = \frac{3}{2}$, $\hat{a} \cdot \hat{v} = \frac{7}{4}$ & $|\hat{a}| = 2$, then
 (a) $\hat{u} \cdot \hat{v} = \frac{3}{4}$ (b) $\hat{u} \cdot \hat{w} = 0$ (c) $\hat{u} \cdot \hat{v} = \frac{1}{4}$ (d) $\hat{u} \cdot \hat{w} = -\frac{1}{4}$

41. Consider the integral $I_1 = \int_1^e (1+x)(x+\ln x)^{100} dx$ $I_2 = \int_{\sin^{-1}(1/e)}^{\pi/2} (1+e \sin x + \ln \sin x)^{101} \cos x dx$

If $I_1 + \frac{e}{101} I_2 = \frac{e(1+e)^{101} - k}{101}$ then $k \geq$

- (a) 0 (b) 1 (c) 2 (d) -1

42. If the equation $\left(2^{\left(\frac{1}{\cos^{-1}x}\right)}\right)^{2\pi} - \left(a + \frac{1}{2}\right) \left(2^{\left(\frac{1}{\cos^{-1}x}\right)}\right)^\pi - a^2 = 0$ has only one real solution then subsets of values of 'a' are

- (a) (-3, 1) (b) $(-\infty, -3]$ (c) $[1, \infty)$ (d) $[-3, \infty)$

SECTION 2 (Maximum Marks : 24)

- This section contains **EIGHT (08)** questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme :
Full Marks : +3 If **ONLY** the correct numerical value is entered as answer.
Zero Marks : 0 In all other cases.

43. A tosses 2 fair coins & B tosses 3 fair coins after game is won by the person who throws greater number of heads. In case of a tie, the game is continued under identical rules until someone finally wins the game. The probability that A finally wins the game is $\frac{K}{11}$, then K
44. The vertices of a triangle OBC are $O(0, 0)$, $B(-3, -1)$, $C(-1, -3)$. Equation of line parallel to BC & intersecting the sides OB & OC whose perpendicular distance from the point (0, 0) is $\frac{1}{\sqrt{2}}$ is $ax + by + 2 = 0$ then the value of $\frac{a^4 + b^4}{4}$ is
45. Straight lines $3x - 4y = \frac{4}{\pi} \sin^{-1}(a^8 + 1) + 2 \cos^{-1}(a^{12} + 1) - \sec^{-1}(a^2 + 1)$, $a \in R$ & $6x - 8y = 7$ are tangents to a circle then the length of arc of this circle which makes an angle of $\frac{40}{3}$ at its centre is

46. If $f(x)$ be a twice differentiable function from $R \rightarrow R$ such that $t^2 f(x) - 2t f'(x) + f''(x) = 0$ has two equal values of $t \forall x$ & $f(0) = 1, f'(0) = 2$ then $\lim_{x \rightarrow 0} \left(\frac{f(x) - 1}{x} - \frac{t}{2} \right)$ is
47. If θ is acute angle of intersect between two curves $x^2 + 5y^2 = 6$ and $y^2 = x$, then $\tan \theta$ is equal to
48. If $f(x) = \sum_{i=1}^{\infty} \frac{x}{\{(i-1)x+1\}(ix+1)}$, then $f(2017) + f\left(\frac{1}{2017}\right)$ is equal to
49. There are “ n ” married couples at a party each parson shakes hand with every person other than her or his spouse then number of handshakes is $f(n), \left(\sum_{n=4}^{\infty} \frac{1}{f(n)} \right) = ?$
50. If x is root of $(1+x^4) = 7(1+x)^4$ then summation of all value of $\left| x + \frac{1}{x} \right| = ?$

SECTION 3 (Maximum Marks : 12)

- This section contains **TWO (02)** paragraphs. Based on each paragraph, there are **TWO (02)** questions.
- Each question has **FOUR** options. **ONLY ONE** of these four options corresponds to the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :
Full Marks : +3 If **ONLY** the correct option is chosen.
Zero Marks : 0 If none of the option is chosen (i.e. the question is unanswered).
Negative Marks : -1 In all other cases.

PARAGRAPH

If the sum of three terms of a strictly increasing G.P. is αS and sum of the squares of these term is S^2 .

51. α^2 lies :
- (a) $\left(\frac{1}{3}, 2\right)$ (b) (1, 2) (c) $\left(\frac{1}{3}, 3\right)$ (d) none of these
52. If $\alpha^2 = 2$, then value of r equals :
- (a) $\frac{1}{2}(5 - \sqrt{3})$ (b) $\frac{1}{2}(3 + \sqrt{5})$ (c) $\frac{1}{2}(\sqrt{5} + \sqrt{3})$ (d) $\frac{1}{3}(\sqrt{3} + \sqrt{5})$

PARAGRAPH

In m, n, r are positive integers and if $r < m; r < n$, then

$$\begin{aligned} & {}^m C_r + {}^m C_{r-1} {}^n C_1 + {}^m C_{r-2} {}^n C_2 + \dots + {}^n C_r \\ &= \text{coefficient of } x^r \text{ in } (1+x)^m (1+x)^n \\ &= \text{coefficient of } x^r \text{ in } (1+x)^{m+n} \\ &= {}^{m+n} C_r \end{aligned}$$

53. If $S_n = {}^n C_0 \cdot {}^n C_1 + {}^n C_1 \cdot {}^n C_2 + \dots + {}^n C_{n-1} \cdot {}^n C_n$ and if $\frac{S_{n+1}}{S_n} = \frac{15}{4}$, then n equals :

- (a) 2, 4 (b) 4, 6 (c) 6, 8 (d) 8, 10

54. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \dots + C_n x^n$ and n is odd then the value of $C_0^2 - C_1^2 + C_2^2 - C_3^2 + \dots + (-1)^n C_n^2$ is :

- (a) 0 (b) $2^n C_n$ (c) $(-1)^n 2^n C_{n-1}$ (d) $2^n C_{n-2}$

ANSWER KEY

PHYSICS

- | | | | |
|-------------|-----------------------|-------------|-------------|
| 1. (b), (d) | 2. (a), (b), (c), (d) | 3. (a), (d) | 4. (c), (d) |
| 5. (a), (b) | 6. (a), (b), (c) | 7. (4) | 8. (2) |
| 9. (2) | 10. (0) | 11. (6) | 12. (3) |
| 13. (6) | 14. (7) | 15. (a) | 16. (c) |
| 17. (d) | 18. (c) | | |

CHEMISTRY

- | | | | |
|-------------------|-------------------|--------------|------------------------|
| 19. (a), (b), (c) | 20. (a), (b) | 21. (b), (c) | 22. (a), (b), (c), (d) |
| 23. (a), (c) | 24. (a), (b), (c) | 25. (2) | 26. (3) |
| 27. (2) | 28. (5) | 29. (7) | 30. (5) |
| 31. (7) | 32. (1) | 33. (c) | 34. (a) |
| 35. (a) | 36. (b) | | |

MATHS

- | | | | |
|-------------------|--------------|--------------|--------------|
| 37. (b), (d) | 38. (a), (c) | 39. (a), (c) | 40. (a), (d) |
| 41. (a), (b), (d) | 42. (b), (c) | 43. (3) | 44. (8) |
| 45. (2) | 46. (1) | 47. (0.33) | 48. (2) |
| 49. (0.17) | 50. (4.67) | 51. (c) | 52. (b) |
| 53. (a) | 54. (a) | | |