SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

JR JEE MAINS | **WEEK END-3** | **Date: 24-05-2020**

Time: 3 Hours | **Max. Marks: 300**

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

MATHEMATICS

***SYLLABUS:* Quadratic equation, Integration**

1. **The set value of x satisfying the in equation $\sqrt{3x-8}<-2$ is**

A) ϕ B) $[1,2)$ C) $[12,\infty)$ D) $(1,2]$

2. **If $\sqrt{9x^2+6x+1}<(2-x);then:$**

A) $x\in\left(\frac{-3}{2},\frac{1}{4}\right)$ B) $x\in\left(\frac{-3}{2},\frac{1}{4}\right]$ C) $x\in\left[\frac{-3}{2},\frac{1}{4}\right)$ D) $x<\frac{1}{4}$

3. **The least integral value of x for which $33-x(2+3x)>0$ is**

A) 1 B) 2 C) -4 D) -3

4. **If the equation $x^2+ax+b=0\,\&\,x^2+bx+a=0(a\neq b)$ have a common root then $a+b=$**

A) -1 B) 1 C) 3 D) 4

5. **If $\alpha\,and\,\beta$ are the roots of $x^2-2x+4=0,$ then the value of $\alpha^6+\beta^6$ is**

A) 32 B) 64 C) 128 D) 256

6. **For $x\in R$, the least value of $\frac{x^2-6x+5}{x^2+2x+1}$ is:**

A) -1 B) $-1/2$ C) $-1/4$ D) $-1/3$

7. **For real values of x,** the range of $\frac{x^2+2x+1}{x^2+2x-1}$ **is :**

A) $(-\infty,0]\cup[1,\infty)$ B) $\left[1/2,2\right]$ C) $\left(-\infty,-2/9\right)\cup(1,\infty)$ D) $(-\infty,-6)\cup(-2,\infty)$

8. **If both the roots of the quadratic equation $x^2-mx+4=0$ are real & distinct and they lie in the interval $[1,5]$, then m lies in the interval:**

A) $(5,6)$ B) $(4,5)$ C) $(3,4)$ D) $(-5,-4)$

9. **Consider the quadratic equation $(c-5)x^2-2cx+(c-4)=0,c\neq5.Let\,s$ be the set of all integral values of c for which one root of the equation lies in the interval $(0,2)\,\&$ its other root lies in the interval $(2,3)$, then the No. of elements in s is**

A) 11 B) 10 C) 18 D) 12

10. **The value of λ such that the sum of the squares of the roots of the quadratic equation $x^2+(3-\lambda)x+2=\lambda$ has the least value is**

A) $15/8$ B) 2 C) $4/9$ D) 1

11. $\int \left(x^x\right)^2 (1+\log x)\,dx$

A) $\frac{\left(x^x\right)^2}{2}+k$ B) x^x+k C) $\frac{x^x}{2}+k$ D) $\frac{x}{2}+c$

12. $\int \frac{1}{x\sqrt{x^2-16}}dx$

A) $\frac{1}{4}\sec^{-1}\left(\frac{x}{4}\right)+c$ B) $\sec^{-1}\left(\frac{x}{4}\right)+c$ C) $\frac{1}{4}\sec^{-1}(4x)+c$ D) $\frac{1}{4}\cos ec^{-1}\left(\frac{x}{4}\right)+c$

13. $\int e^{3x}\sin 5x\,dx$

A) $\frac{e^{3x}}{34}[3\sin 5x+5\cos 5x]+c$ B) $\frac{e^{3x}}{34}[3\sin 5x-5\cos 5x]+c$

C) $\frac{e^{3x}}{34}[5\sin 5x+3\cos 3x]+c$ D) $\frac{e^{3x}}{34}[5\sin 5x-3\cos 5x]+c$

14. $\int \frac{6x^2-17x-5}{(x-3)(x-2)^2}dx$

A) $\log\frac{(x-2)^2}{(x-3)^4}+\frac{3}{x-2}+c$ B) $\log\left\{(x-2)^4(x-3)^2\right\}+\frac{3}{x-2}+c$

C) $\log\frac{(x-2)^8}{(x-3)^2}-\frac{15}{(x-2)}+c$ D) $\log(x-3)-\frac{1}{x-2}+c$

15. $\int \frac{\sin x}{\cos 3x\cos 2x}dx$

A) $\frac{1}{3}\log\cos 3x+\frac{1}{2}\log\cos 2x+c$ B) $\frac{1}{3}\log|\sec 3x|-\frac{1}{2}\log|\sec 2x|+c$

C) $\frac{1}{3}\log|\tan 3x|-\frac{1}{2}\log|\tan 2x|+c$ D) none

16. $\int \frac{dx}{\sqrt{x^2+2x+10}}dx$

A) $\sinh^{-1}\left(\frac{x+1}{3}\right)+c$ B) $\tanh^{-1}\left(\frac{x+1}{3}\right)+c$ C) $\cosh^{-1}\left(\frac{x+1}{3}\right)+c$ D) $\operatorname{sech}^{-1}\left(\frac{x+1}{3}\right)+c$

17. $\int 5^{5^{5^x}}5^{5^x}5^x\,dx=$

A) $\frac{5^{5^x}}{(\log 5)^3}+c$ B) $5^{5^x}(\log 5)^3+c$

C) $5^x(\log 5)^3+c$ D) $\frac{5^{5^{5^x}}}{(\log 5)^3}+c$

18. $\int \frac{4e^x+6e^{-x}}{9e^x-4e^{-x}}dx=Ax+B\log\left(9e^{2x}-4\right)+c$ *then*

A) $A=\frac{-19}{36},B=\frac{35}{36},c=0$ B) $A,\frac{35}{36},B,\frac{-19}{36},c=0$

C) $A=\frac{-3}{2},B=\frac{35}{36},c\in R$ D) $A=\frac{35}{36},B=\frac{-19}{36},c\in R$

19. $\int \frac{x\sin^{-1}x}{\sqrt{1-x^2}}dx$

A) $x+\sqrt{1-x^2}\sin^{-1}x+c$ B) $x-\sin^{-1}x+c$

C) $x-\sqrt{1-x^2}\sin^{-1}x+c$ D) $\frac{x^2}{2}\sin^{-1}x-\sqrt{1-x^2}+c$

20. $\int e^{Tan^{-1}x}\left[\frac{1+x+x^2}{1+x^2}\right]dx$

A) $x^2e^{Tan^{-1}x}+c$ B) $xe^{Tan^{-1}x}+c$ C) $e^{Tan^{-1}x}+c$ D) $\frac{1}{2}xe^{Tan^{-1}x}+c$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.
Marking scheme: +4 for correct answer, 0 in all other cases.

21. **If one real root of the quadratic equation $81x^2+kx+256=0$ is cube of the other root, then a value of k is _____**

22. **The number of integral values of m for which the quadratic equation/expression. $(1+2m)x^2-2(1+3m)x+4(1+m), x\in R$ is always positive is _____**

23. **If** $\int \frac{x^{2009}}{(1+x^2)^{1106}}dx=\frac{1}{m}\left(\frac{x^2}{1+x^2}\right)^n+c$ **then** $m+n=$ _____

24. **If** $f(x)=\int x^{27}(1+x+x^2)^6(6x^2+5x+4)dx$ **and** $f(0)=0$ **then** $f(-1)=$ _____

25. **If** $f(x)=\int \frac{x^2+1}{\sqrt[3]{x^3+3x+6}}dx$ **and** $f(-1)=\frac{1}{\sqrt[3]{2}}$ **then** $f(-2)=$ _____

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.
Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

PHYSICS

SYLLABUS: Reflection of waves, Stationary waves, Beats, Doppler Effect

26. **The phase difference between two particles equidistant and which are on either side of a node is**

A) 0^0 B) 45^0 C) 90^0 D) 180^0

27. **In an addition of 75 kg to the vibrating string rises the pitch an octav, calculate the original tension in the string.**

A) 50 kg-wt B) 75 kg-wt C) 25 kg-wt D) 100 kg-wt

28. **Fundamental frequency of an open organ pipe is in resonance with first overtone of a closed pipe. The ratio of their lengths is**

A) 4 : 1 B) 3 : 2 C) 2 : 3 D) 1 : 4

29. **Standing waves are produced in 10m long stretched wire. If the wire vibrates in 5 segments and wave velocity is 20 m/s, then the frequency is**

A) 2 Hz B) 4 Hz C) 5 Hz D) 10 Hz

30. The length of a sonometer wire is 75 cm and frequency of its 2nd overtone is 300 Hz. The velocity of transverse wave that travels in the wire is

A) 150 ms^{-1} B) 200 ms^{-1} C) 100 ms^{-1} D) 300 ms^{-1}

31. A string of length 36cms was in unison with a fork of frequency 256 Hz. It was in unison with another fork when the vibrating length was 48cm, the tension being unaltered. The frequency of second fork is

A) 212 Hz B) 320 Hz C) 384 Hz D) 192 Hz

32. An open pipe 30 cm long and a closed pipe 23cm long, both of the same diameter, are each sounding its first overtone and these are in unison. The end correction of these pipes is

A) 0.5 cm B) 0.3 cm C) 1 cm D) 1.2 cm

33. Two tuning forks A and B give 6 beats for second. A resonates with a closed column of air 15cm long and B with an open column 30.5cm long in their fundamental harmonics. Their frequencies are

A) $n_A = 366Hz, n_B = 360Hz$ B) $n_A = 466Hz, n_B = 460Hz$

C) $n_A = 566Hz, n_B = 560Hz$ D) $n_A = 766Hz, n_B = 760Hz$

34. Two tuning forks have frequencies 450 Hz and 454 Hz on sounding these forks, the time interval between successive maximum intensities will be

A) 0.25 sec B) 0.5 sec C) 1 sec D) 2 sec

35. When two tuning forks A and B are sounded at the same time 3 beats are heard per second. The frequency of 'A' is 512 Hz. When second fork 'B' is filed the beat frequency reduces to 2, the frequency of the fork 'B' is

A) 509 Hz B) 515 Hz C) 510 Hz D) 514 Hz

36. What is the velocity of a listener who is moving away from a stationary source of sound such that the listener notices 5% apparent decrease in frequency of sound (in m/s) (velocity of sound in air = 340 m/s)

A) 12.5 B) 17 C) 25 D) 3

37. The frequency of a radar is 780 MHz. The frequency of reflected wave from an aeroplane is increased by 2.6KHz. The velocity of the aeroplane is

A) 2 km/s B) 1 km/s C) 0.5 km/s D) 0.25 km/s

38. A string fixed at both ends has consecutive standing wave modes for which the distances between adjacent nodes are 18 cm and 16 cm respectively. The minimum possible length of string is

A) 72 cm B) 144 cm C) 108 cm D) 216 cm

39. Two closed organ pipes produces 10 beats between the fundamentals when sounded together. If the length of shorter pipe is 1m, the length of larger pipe is (V=340 m/s)

A) 2.87 m B) 0.87 m C) 1.13 m D) 2.13 m

40. For a certain organ pipe, three successive resonant frequencies are observed at 425, 595 and 765 Hz. The speed of sound in air is 340 m/s. the pipe is a

A) closed pipe of length 1 m B) closed pipe of length 2 m

C) open pipe of length 1 m D) open pipe of length 2 m

41. The apparent wavelength of light from a star moving away from the earth is 0.01% more than the actual wavelength. What is the wave length of star

A) $30KMs^{-1}$ B) $60KMs^{-1}$ C) $90KMs^{-1}$ D) none

42. Two tuning forks of frequencies 250 and 256 Hz produce beats. If maximum is produced now, after how much time the minimum is produced at that same place

A) (1/18)S B) (1/24)S C) (1/6)S D) (1/12)S

43. The length of a sonomenter wire is 65 cm. This wire is made to vibrate in three segments of lengths l_1, l_2, l_3 by keeping 4 bridges in a row what are the lengths l_1, l_2, l_3 if their fundamental frequencies are in the ratio 2 : 3 : 4

A) 15cm, 20 cm, 30 cm B) 30cm, 20 cm, 15 cm

C) 12.5cm, 20 cm, 32.5 cm D) 32.5cm, 20 cm, 12.5 cm

44. A tuning fork of frequency 340 Hz is vibrated just above a cylindrical tube of length120 cm. Water is slowly poured in the tube. If the speed of sound in air is $340ms^{-1}$, then the minimum height of water required for resonance is

A) 25 cm B) 75 cm C) 45 cm D) 95 cm

45. A bat moving at $10ms^{-1}$ towards a wall sends a sound signal of 8000 Hz. towards it. On reflection it hears a sound of frequency of f. The value of f in Hz is close to (speed of sound=320 ms^{-1})

A) 8516 B) 8000 C) 8424 D) 8258

SECTION- II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.
Marking scheme: +4 for correct answer, 0 in all other cases.

46. The equation $y = 4 + 2\sin(6t - 3x)$ represents a wave motion with amplitude of _____

47. A stretched string is in unison with a tuning fork of frequency 392 Hz. If the length of the string is decreased by 2%, the number of beats heard per second is nearly_____

48. A source of sound vibrating with a frequency 510 Hz is in between a stationary observer and a foot wall. If the source is moving towards wall with a velocity $3ms^{-1}$, the number of beats heard by the observer is (v=340m/s)

49. Fork 'A' has frequency 2% more than the standard fork and B has frequency 3% less than the frequency of same standard fork. The for A and B sounded together produce 6 beats/sec the fundamental frequency of A is (in Hz) _____

50. In a resonance pipe first and second resonances are obtained at depths 22.7 cm and 70.2 cm respectively. What will be the end correction _____

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.
Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

CHEMISTRY

SYLLABUS: ***(11-05-2020 to 22-05-2020)***

Solutions:-From Ideal-non ideal solutions upto end of the chapter

Electrochemistry:- Electrode chemical cells, Electro potentials measurements

51. In 0.1 M NaCl and 0.1 M CH_3COOH are kept in separate containers. If there Osmotic Pressures are P_1 and P_2 respectively then what is the correct statement?

A) $P_1 > P_2$ B) $P_1 = P_2$ C) $P_1 < P_2$ D) $P_1 = P_2 = 0$ atm

52. If the elevation in boiling point of a solution of 10 g of solute (mol.wt=100) in 100g of water is ΔT_b, the Ebullioscope constant of water is

A) 10 B) 10 ΔT_b C) ΔT_b D) $\frac{\Delta T_b}{10}$

53. An aqueous solution freezes at -0.186^{0}C $(k_f = 1.86, k_b = 0.512)$ **What is the elevation in boiling point**

A) 0.186 B) 0.512 C) 0.86 D) 0.0512

54. A 5% solution of cane sugar (mol wt=342) is isotonic with 1% solution of substance "X". The molecular weight of "X" is ..

A) 34.2 B) 171.2 C) 68.4 D) 136.8

55. Solute 'A' is ternary Electrolyte and solute 'B' is a non-Electrolyte. If 0.1M solution of solute 'B' produces an Osmotic Pressure of 2P. Then 0.05M solution of 'A' at the same temperature will produce an Osmotic Pressure equal to..

A) 1.5P B) 2P C) 3P D) P

56. 18 g glucose and 6g Urea are dissolved in 1L aqueous solution at 27^{0}C the Osmotic Pressure of the solution will be ?

A) 8.826 atm B) 4.926 atm C) 2.92 atm D) 4.42 atm

57. Which pair from will not form an Ideal solution ?

A) $CCl_4 + SiCl_4$ B) $H_2O + C_4H_9OH$ C) $C_2H_5Br + C_2H_5I$ D) $C_6H_{14} + C_7H_{16}$

58. In case a solute associates in solution , the Van't Hoff factor is

A) i > 1 B) i=1 C) i <1 D) None

59. The Van't Hoff factor for 0.1M Barium Nitrate is 2.74. The percentage of dissociation of Barium Nitrate is

A) 91.3% B) 87% C) 100% D) 74%

60. The depression in Freezing point for 1M urea, 1M glucose and 1M NaCl are in the ratio

A) 1**:** 2 **:** 3 B) 3 **:** 2 **:** 2 C) 1 **:** 1 **:** 2 D) 2 **:** 3 **:** 2

61. In a Galvanic cell electron flow will be from

A) Negative electrode to positive electrode
B) Positve electrode to negative electrode
C) There will be no flow of electrons
D) Cathode to Anode in the external circuit

62. If a salt bridge is not used between two half cells, voltage

A) Drops to zero B) Does not change C) Increases gradually D) Increases rapidly

63. A reversible galvanic cell is connected to an external battery is less than EMF of the galvanic cell current

A) Will not pass through the circuit
B) Flows from the battery into the galvanic cell
C) Flows from the galvanic cell into the battery
D) All the three may take place

64. The correct statement is

A) When a 'Cu' electrode is in combination with N.H.E, 'Cu' electrode is the Anode
B) When a 'Zn' electrode is in combination with N.H.E, 'Zn' electrode is the Anode
C) When 'Ag' electrode is in combination with N.H.E, 'Ag' electrode is the Anode
D) When 'Cl_2' electrode is in combination with N.H.E, 'Cl_2' electrode is the Anode.

65. The electro chemical cell stops working after some time because

A) Electrode potentials of both electrodes become zero
B) Electrode potentials of both electrodes become equal
C) Temperature of the cell increases
D) The reaction starts proceeding in opposite direction

66. The hydrogen electrode potential depends on

A) Nature of metal used as Anode
B) The P^H of the solution
C) Both A and B
D) Nature of the metal used as cathode and the P^H of the solution

67. The Osmotic pressure of a dilute solution of an Ionic compound XYin water is four times that of a solution of 0.01M $BaCl_2$ in water. Assuming complete dissociation of the given Ionic compounds in water. The concentration of XY (in mol L^{-1}) in solution is

A) 4×10^{-2} B) 6×10^{-2} C) 16×10^{-4} D) 4×10^{-4}

68. Molal depression constant for a solvent is 4.0 k kg mol^{-1} . The depression in the Freezing point of the solvent for 0.03 mol kg^{-1} solution of K_2SO_4 is (Assume complete dissociation of the electrolyte)

A) 0.24 K B) 0.12 K C) 0.36 K D) 0.18 K

69. 1g of a non-volatile non-electrolyte solute is dissolved in 100g of two different solvents A and B whose K_b are in the ratio 1 : 5 the ratio in the elevation in their boiling point $\frac{\Delta T_b(A)}{\Delta T_b(B)}$ is

A) 5 : 1 B) 1 : 0.2 C) 10 : 1 D) 1 : 5

70. A solution is prepared by dissolving 0.6g of urea (molar mass =60 g mol^{-1}) and 1.8g of glucose (molar mass =180 g mol^{-1}) in 100 ml of water at 27^0C the Osmotic pressure of the solution is (R=0.08206 L atm K^{-1} mol^{-1})

A) 2.46 atm B) 1.64 atm C) 4.92 atm D) 8.2 atm

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.
Marking scheme: +4 for correct answer, 0 in all other cases.

71. The boiling point of 0.1 molal $K_4\left[Fe(CN)_6\right]$ solution will be (given K_b for water $= 0.52\, kg\, mol^{-1}$ _____ ^0C

72. In a 0.2 molal aqueous solution of a weak acid HX the degree of ionization is 0.3. Taking K_f for water as 1.85, the freezing point of the solution will be nearest to _____ ^0C

73. Phenol dimerises in benzene having Vant Hoff factor 0.54. What is the degree of association_____

74. For a cell the cell reaction is $Mg(s) + Cu^{+2}_{(aq)} \rightarrow Cu(s) + Mg^{+2}_{(aq)}$ **if the S.R.P. values of** Mg **and** Cu **are -2.37V and +0.34V respectively, the e.m.f. of the cell is_____**

75. 0.1 formal solution of $NaCl$ **is found to be Isotonic with 1.1% solution of urea calculate apparent degree of Ionization of** $NaCl$ **_____**

SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

JR JEE MAINS | **WEEK END-3** | **Date: 24-05-2020**

Time: 3 Hours | **Max. Marks: 300**

KEY SHEET

MATHEMATICS

1) A	2) A	3) D	4) A	5) C	6) D	7) A	8) B	9) A	10) A
11) A	12) A	13) B	14) C	15) B	16) A	17) D	18) C	19) C	20) B
21) B	22) D	23) 3015	24) 0.14	25) -2					

PHYSICS

26) D	27) C	28) C	29) C	30) A	31) D	32) C	33) A	34) A	35) A
36) B	37) C	38) B	39) C	40) A	41) A	42) D	43) B	44) C	45) A
46) 2	47) 8	48) 3	49) 122.4	50) 1.05					

CHEMISTRY

51) A	52) C	53) D	54) C	55) C	56) B	57) B	58) C	59) B	60) C
61) A	62) A	63) C	64) B	65) A	66) D	67) B	68) C	69) D	70) C
71) 100.262	72) -0.480	73) 0.54	74) +2.71	75) 0.83					

HINTS & SOLUTIONS

MATHEMATICS

1. $\sqrt{x} \geq 0$
2. $\sqrt{9x^2+6x+1} < 2-x \Rightarrow 9x^2+6x+1 \geq 0$

   $2-x>0$

   $\sqrt{9x^2+6x+1} < (2-x)^2$

   $\Rightarrow (3x+1)^2 \geq 0, 2>x$

   $8x^2+10x-3<0 \Rightarrow x<2, (2x+3)(4x-1)<0$

   $\Rightarrow x<2, \frac{-3}{2}<x<\frac{1}{4}$
3. $3x^2+2x-33<0$

   $\Rightarrow \frac{-11}{3}<x<3$ Least integer is -3.
4. 1 is the common root

   $\therefore (a+b)>-1$
5. $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta=4-8=-4$

   $\alpha^6+\beta^6=(\alpha^2+\beta^2)^3-3\alpha^2\beta^2(\alpha^2+\beta^2)=128$
6. $Let \frac{x^2-6x+5}{x^2+2x+1}=y$

   $x^2(1-y)+x(-6-2y)+5-y=0$

   $x\, is\, real \Rightarrow \Delta \geq 0$

   $48y \geq -16 \Rightarrow y \geq -1/3$
7. $y=\frac{x^2+2x+1}{x^2+2x-1}$

   $x^2(y-1)+2x(y-1)-(y+1)=0$

   $\triangle \geq 0$

   $4(y-1)^2+4(y^2-1) \geq 0$

   $(y-1)(y-1+y+1) \geq 0$

   $2y(y-1) \geq 0$

   $y \leq 0\, or\, y \geq 1$

   $(-\infty, 0] \cup [1, \infty)$
8.

$m^2-16>0 \Rightarrow m\in(-\infty,-4)\cup(4,\infty)$

$1<\dfrac{-(-m)}{2}<5 \Rightarrow 2<m<10$

$1-m+4>0 \,\&\, 25-m(5)+4>0$

$\Rightarrow m<5 \,\&\, m<\dfrac{29}{5} \Rightarrow m\in(4,5)$

9.

$f(x)=(c-5)x^2-2cx+(c-4)=0, c\neq 5$

$f(0)+(2)<0 \Rightarrow (c-4)(c-24)<0$

$\Rightarrow c\in(4,24)\rightarrow 1$

$f(2)\,f(3)<0$

$\Rightarrow (c-24)(4c-49)<0$

$\Rightarrow \dfrac{49}{4}<c<24 \rightarrow 2$

$Eq1\cap 2$

$\dfrac{49}{4}<c<24$

$c\in\{13,14,.....23\}\,11 elements$

10.

$x^2+(3-\lambda)x+2=\lambda_{\beta}^{\alpha}$

$f(\lambda)=\alpha^2+\beta^2$

$\Rightarrow (\alpha+\beta)^2-2\alpha\beta=(3-\lambda)^2-2(2-\lambda)$

$\Rightarrow f^1(\lambda)=2\lambda-4=0$ (*for* minimum calue of λ)

$\lambda=2$

11. $x^x=t$

12. $\dfrac{1}{4}\int\dfrac{\frac{1}{4}dx}{\left(\frac{x}{4}\right)\sqrt{\left(\frac{x}{4}\right)^2-1}}=\dfrac{1}{4}\sec^{-1}\left(\dfrac{x}{4}\right)+c$

13.

use the formula

$\int e^{ax}\sin bx dx=\dfrac{e^{ax}}{a^2+b^2}(a\sin bx-b\cos bx)+c$

14.

$\dfrac{6x^2-17x-5}{(x+3)(x-2)^2}=\dfrac{A}{x+3}+\dfrac{B}{(x-2)}+\dfrac{C}{(x-2)^2}$

15. *write* $\sin x=\sin(3x-2x)$

16.

$x^2+2x+10=(x+1)^2+9$

$=(x+1)^2+3^2$

17. $5^{5^x}=t$

18. *Diff on both sides*

19. $Put \sin^{-1} x = t$

20. $Put\ x = Tan\theta$

21.

$81x^2 + kx + 256 = 0$

Let α *be* a root, so other root is α^3

$Hence, \alpha^4 = \frac{256}{81} \Rightarrow \alpha = \pm\frac{4}{3}$

$Also \frac{-k}{81} = \alpha + \alpha^3 \Rightarrow k = -81\left(\alpha + \alpha^3\right)$

$\Rightarrow k = \pm 81\left(\frac{4}{3} + \frac{64}{27}\right) \Rightarrow k = \pm\frac{81(36+64)}{27}$

$= \pm 300$

22.

$D < 0 \,\&\, 1 + 2m > 0 \Rightarrow m > {}^{-1}\!/_{2}$

$4(1+3m)^2 - 4(1+2m)\times 4(1+m) < 0$

$9m^2 + 1 + 6m - 4\left(1 + m + 2m + 2m^2\right) < 0$

$m^2 - 6m - 3 < 0$

$m = 3 \pm \sqrt{12}$

$m \in \left(3 - 2\sqrt{3}, 3 + 2\sqrt{3}\right) \,\&\, m > {}^{-1}\!/_{2}$

$\therefore$ *Integer values of* $m = 0,1,2,3,4,5,6$

23.

$Put \frac{x^2}{1+x^2} = l - \Rightarrow \frac{2x}{\left(1+x^2\right)^2} dx = dl -$

$\int \frac{x^{2009}}{\left(1+x^2\right)^{1006}} dx = \int \left(\frac{x^2}{1+x^2}\right)^{1004} \frac{x}{\left(1+x^2\right)^2} dx = \int t^{1004} \cdot \frac{1}{2} dt$

$= \frac{1}{2}\frac{+1005}{1005} + c = \frac{1}{2010}\left(\frac{x^2}{1+x^2}\right)^{1005} + c$

$m + n = 2010 + 1005 = 3015$

24.

$f(x) = \int \left(x^4 + x^5 + x^6\right)^6 \left(6x^5 + 5x^4 + 4x^3\right) dx$

$x^4 + x^5 + x^6 = t \Rightarrow \left(6x^5 + 5x^4 + 4x^3\right) dx = dt$

$= \int t^6 dt = \frac{t^7}{7} + c = \frac{1}{7}\left(x^6 + x^5 + x^4\right)^7 + c$

$f(0) = 0 \Rightarrow c = 0$

$f(-1) = \frac{1}{7}(1 - 1 + 1)^7 = \frac{1}{7} = 0.14$

25.

$Put\ x^3+3x+6=t^3 \Rightarrow 3\left(x^2+1\right)dx=3t^2dt$

$f\left(x\right)\int\frac{t^2dt}{t}=\frac{t^2}{2}+c\Rightarrow\frac{1}{2}\left(x^3+3x+6\right)^{2/3}+c$

$f\left(-1\right)=\frac{1}{\sqrt[3]{2}}=\frac{1}{2}\left(2\right)^{2/3}+c\Rightarrow\frac{1}{\sqrt[3]{2}}\Rightarrow c=0$

$f\left(x\right)=\frac{1}{2}\left(x^3+3x+6\right)^{2/3}$

$f\left(-2\right)=\frac{1}{2}\left(-8\right)^{2/3}$

$f\left(-2\right)=\frac{1}{2}\left(-8\right)^{2/3}=-2$

PHYSICS

26.

$\Delta\phi=\frac{2\pi}{\lambda}\Delta x-\Delta x=\frac{\lambda}{2}$

$\Delta\phi=\frac{2\pi}{\lambda}\cdot\frac{\lambda}{2}$

$\Delta\phi=\pi\left(or\right)180^0$

27.

$\frac{n_2}{n_1}=\sqrt{\frac{T_2}{T_1}}\left[n\alpha\sqrt{T}\right]$

$\frac{2n_1}{n_1}=\sqrt{\frac{T_1+75}{T_1}}\left[n_2=2^nn_1\right]$

$4=\frac{T_1+75}{T_1}\rightarrow4T_1=T_1+75$

$3T_1=75\rightarrow T_1=25kg-wt$

28.

$n=\frac{v}{2l_1}\&n=\frac{3v}{4l_2}$

$\frac{v}{2l_1}=\frac{3v}{4l_2}\rightarrow4l_2=6l_1$

$\frac{l_1}{l_2}=\frac{4}{6}=\frac{2}{3}$

$l_1:l_2=2:3$

29.

$\frac{5\lambda}{2}=10\rightarrow\lambda=4m$

$n=\frac{v}{\lambda}=\frac{20}{4}=5Hz$

30.

$3n = 300 \rightarrow n = 100Hz$

$\frac{\lambda}{2} = 75cm \rightarrow \lambda = 1.5cm$

$v = n\lambda = 150m/s$

31. $n\alpha \frac{1}{l} \rightarrow \frac{n_1}{n_2} = \frac{l_2}{l_1}$

32. $2\left[\frac{v}{2(l_1 + 2c)}\right] = 3\left[\frac{v}{4(l_2 + c)}\right]$

33.

$n_1 = \frac{v}{4l_1} \rightarrow n_1 = \frac{v}{4 \times 15} = \frac{v}{60}$

$n_2 = \frac{v}{2l_2} \rightarrow n_2 = \frac{v}{2 \times 30.5} = \frac{v}{61}$

$\Delta_n = \frac{v}{4l_1} - \frac{v}{2l_2} = \frac{v}{60} - \frac{v}{61}$

$6 = \frac{v}{60} - \frac{v}{61} \rightarrow v = 21960$

$n_1 = \frac{21960}{60} = 366Hz$

$n_2 = \frac{21960}{61} = 360Hz$

34.

$n_1 = 450Hz, n_2 = 454Hz$

$t = \frac{1}{n_1 \sim n_2} = \frac{1}{454 - 450} = \frac{1}{4}$

$t = 0.25\sec$

$n_A = 512Hz$

35. $\Delta_n = 3$

$n_B = n_A - \Delta_n = 512 - 3 = 509Hz$

36.

$n^1 = n\left(\frac{v - v_0}{v}\right]$

$\frac{95n}{100} = \left[\frac{v - v_0}{v}\right]$

$\frac{95}{100} = \left[1 - \frac{v_0}{340}\right]$

$\frac{v_0}{340} = 1 - \frac{95}{100} \rightarrow \frac{v_0}{340} = \frac{5}{100}$

$v_0 = 17m/s$

37.

$\Delta_n = \frac{2nvs}{c}\left[c = 3\times10^8 m/\sec\right]$

$2.6\times10^3 = \frac{2\times780\times10^6\times v_6}{3\times10^6}$

$v_s = 0.5km/\sec$

38.

$n_1\times18 = l \therefore n_2\times16 = l$

$n_2 = n_1 + 1$

$\Rightarrow \frac{(n_1+1)16}{n_1\times18} = \frac{l}{l}$

$\Rightarrow (n_1+1)16 = n_1\times18$

$16n_1 + 16 = 18n_1$

$16 = 2n_1 \Rightarrow n_1 = 8$

$n_1\times = l$

$8\times18 = l$

$144 = l$

39.

$n = \frac{v}{4l}$ *for closed pipe.*

$n_1 \sim n_2 = \Delta n$

$\frac{v}{4l_1} - \frac{v}{4l_2} = \Delta n \Rightarrow \frac{v}{4}\left[\frac{1}{l_1} - \frac{1}{l_2}\right] = \Delta n$

$\frac{340}{4}\left[\frac{1}{1} - \frac{1}{l_2}\right] = 0$

$l_2 = 1.13m$

40.

frequency ratio $= 5:7:9$

It is closed pipe.

$425 = \frac{5v}{40} \Rightarrow 425 = \frac{5\times340}{4l}$

$l = 1m$

41.

$\lambda^1 = \left(\frac{c+v_s}{c}\right)\lambda$

$\frac{100.01}{100}\lambda = \left(\frac{c+v_s}{c}\right)\lambda$

$\frac{100.01}{100} = 1 + \frac{v_s}{c}$

$\frac{\cdot01}{100} = \frac{v_s}{c} \Rightarrow v_s = \frac{\cdot01}{100}\times c$

$v_s = 10^{-4}\times3\times10^8 = 30km/\sec$

42.

$$t = \frac{1}{2\left(n_1 \sim n_2\right)}$$

$$t = \frac{1}{2\left(256-250\right)}$$

$$t = \frac{1}{2\times 6} = \frac{1}{12}\sec$$

43.

$$l\alpha \frac{1}{n}$$

$$l_1 : l_2 : l_3 = \frac{1}{n_1} : \frac{1}{n_2} : \frac{1}{n_3} = 6:4:3$$

$$l_1 = \left(\frac{6}{6+4+3}\right)65$$

$$= \frac{6}{13}\times 65 = 30cm$$

$$l_2 = \frac{4}{13}\times 65 = 20cm$$

$$l_3 = \frac{3}{13}\times 65 = 15cm$$

44.

$$n = \frac{v}{4l} \Rightarrow l = \frac{v}{4n}$$

$$l_1 = \frac{v}{4n} = \frac{340}{4\times 340} = \frac{1}{4} = 25cm$$

$$l_2 = \frac{3v}{4n} = 3\times 25cm = 75cm$$

$$\therefore \min length of\ \ water\ is 120-75cm = 45cm$$

45.

$$n^1 = \left(\frac{320+10}{320-10}\right)8000$$

$$= 8516Hz$$

46.

$$y = 98m\left(wt-kx\right)$$

$$\therefore a = 2units$$

47.

$$n\alpha \frac{1}{l}$$

$$\frac{n_1}{n_2} = \frac{l_1}{l_2} \Rightarrow \frac{n_2}{n_1} = \frac{l_1}{l_2}$$

$$l_2 = l_1 - 2\% \quad l_1 = \frac{98l_1}{100}$$

$$\frac{\Delta n}{n_1} = \frac{100}{98} - 1 = \frac{2}{98}$$

$$\Delta n = n_1 \times \frac{2}{98} = 392\times \frac{2}{98} = 8$$

48. $\Delta n = \dfrac{2nvs}{v}$

49.

$n_A - n_B = \Delta n$

$n_A = \dfrac{102k}{100}; n_B = \dfrac{97k}{100}$

$\dfrac{102k}{100} - \dfrac{97k}{100} = 6$

$k = \dfrac{600}{5}$

$\therefore n_A = \dfrac{102}{100} \times \dfrac{600}{5} = 122.4$

50. $e = \dfrac{l_2 - 3l_1}{2}$

CHEMISTRY

51. $iNaCl > iCH_3COOH$.

52.

$\Delta T_b = K_b \cdot m$

$K_b = \dfrac{\Delta T_b}{m} = \dfrac{\Delta T_b}{1}, m = \dfrac{10 \times 1000}{100 \times 100} = 1$

53.

$\Delta Tf = Kf \times molality$

$\Delta Tb = Kb \times molality$

$\dfrac{\Delta Tf}{\Delta Tb} = \dfrac{Kf}{Kb}$

54. $\dfrac{W_1}{M_1} = \dfrac{W_2}{M_2}$

55.

$\pi = i.C.S.T$

$\pi \alpha c$

$\dfrac{\pi_1}{c_1} = \dfrac{\pi_2}{c_2}$

56. $\pi v = \left(n_1 + n_2\right) RT$

57. Conceptual

58. $K_4\left[Fe\left(CN\right)_6\right] \rightarrow 4K^{\oplus} + \left[Fe\left(CN\right)_6\right]^{-4}$

59.

$Ba\left(NO_3\right)_2 \rightarrow Ba^{+2} + 2NO_3^-$

$\therefore no.of\ ions = 3 = n$

$i = 2.74$

$\alpha = \dfrac{i-1}{n-1} \times 100$

60. $\Delta Tf = i.kf.m$

61. Conceptual

62. Conceptual

63. Conceptual
64. Conceptual
65. Conceptual
66. Conceptual

67.

$\pi_{XY} = 4\pi_{BaCl_2}$

$2X\left[XY\right] = 4\times 3\times 0.01$

$\left(\text{Assuming } same\, temperature\right)$

$\Rightarrow \left[XY\right] = 0.06M$

68.

$kf = 4k - kg/mol$

$m = 0.03\, mol/kg$

$i = 3$

$\Delta Tf = i\times kf\times m$

$\Delta Tf = 3kf\, 4\times 0.03 = 0.36k$

69.

$\Delta T_b = k_b \times m\left(m_A = m_B\right)$

$\therefore \dfrac{\Delta T(A)}{\Delta T(B)} = \dfrac{1}{5}$

70. $\pi = \dfrac{\left(\dfrac{0.6}{60} + \dfrac{1.8}{180}\right)}{0.1}\times 0.08206\times 300$

$\pi = 4.9236\, atm$

71.

$\Delta T_b = i\times k_b \times m$

$K_4\left[\, fe\left(CN\right)_6\right] \rightarrow 4K^+ + \left[Fe\left(CN\right)_6\right]^{-4}$

$i = 5$

$T_b - 100 = 5\times 0.52\times 0.1$

$T_b = 100 + 0.262 = 100.262$

72.

$\Delta Tf = i.kf.m$

$\underset{1-\alpha}{HX} \rightarrow \underset{\alpha}{H^+} + \underset{\alpha}{X^-}$

$i = 1 + (n-1)\alpha\; n = 2$

$i = 1 + \alpha = 1 + 0.3 = 1.3$

$T_0 - Tf = ikf.m$

$Tf = T_0 - ikf.m = 0 - i - kf.m$

$= -ikfm$

73. $i = 1 - \frac{x}{2}, i = 0.54$

74. Electrodes with low S.R.P is always taken as Anode(L.H.S)

75. $\pi_1 = \pi_2$

Paper Setters:

SNO	Subject	Name of the Paper Setter	Phone No	Branch
1	PHYSICS	L RAMAKRUSHNA	9989687292	HYDECIL
2	CHEMISTRY	P MAHIPAL REDDY	9032000537	HYDECIL
3	MATHS B	A PRAVEENA CHARY	9399992264	HYDECIL
4	MATHS A	R PRAKASH	9949438865	HYDECIL