CODE

1

SPECTRUM

Key to achieve, what you conceive

PART SYLLABUS TEST [PST- 04]

TARGET : JEE MAIN 2016

CLASS : XII & DROPPERS

Date : 10-1-2016 **Duration : 3 Hours** **Max. Marks : 360**

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

JEE MAIN TEST SERIES

INSTRUCTIONS

A. General :

1. This Question Paper contains 90 questions.
2. **The question paper CODE is printed on the left hand top corner on this sheet of the booklet as well as on each page of the paper. Please check that all the pages have same CODE written on it. If it is not so then change the paper.**
3. No additional sheets will be provided for rough work.
4. Blank paper, clipboard, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are **not** allowed.
5. The answer sheet, a machine-gradable **Objective Response Sheet (ORS)**, is provided separately.
6. Do not open the question-paper booklet before instructed to do so by the invigilators.
7. Write your **Name** and **Roll No.** in the space provided on the front page of this booklet.

B. Instuctions regarding ORS :

8. Write your Roll No., Name and Class and sign with pen in appropriate places. **Do not write these anywhere else.**
9. Darken the appropriate bubbles below your roll number and paper code with **Black/Blue ball pen**.
10. Do not Tamper / mutilate the **ORS** or this booklet.
11. Erasing the filled bubbles are not allowed in any case.
12. Use of Pencil on **ORS** is strictly prohited.
13. ***You are required to strictly follow the instructions for the ORS Sheet, mentioned here.***
14. ***Any instructions provided by the invigilator in the exam-hall will not be valid.***
15. ***Any excuse or mistake in following these instructions for the ORS sheet, will not be considered later on.***

C. Question paper format and Marking scheme :

16. The question paper consists of 3 parts (Physics, Chemistry & Maths)
17. Candidates will be **awarded 4 (four) marks** for correct response of each question in **Part - I, II & III. 1/4 (one fourth) marks** will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

STUDENT NAME : _____ **Roll No. :** _____

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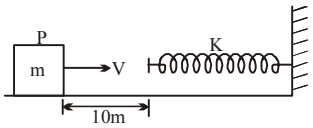
PART – I (PHYSICS)

1. The phase difference between two SHM $Y_1 = 10\sin(10\pi t + \pi/3)$ and $Y_2 = 12\sin(8\pi t + \pi/4)$ at t = 0.5s is:

[1] $\frac{11\pi}{12}$ [2] $\frac{13\pi}{12}$ [3] π [4] $\frac{17\pi}{12}$

2. A block of mass 1 kg kept over a smooth surface is given velocity 2 m/s towards a spring of spring constant 1 N/m at a distance of 10 m. Find after what time block will be passing through P again

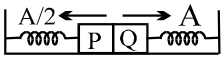


[1] (–10 – π) sec. [2] 10 sec. [3] (10 + 2π)sec. [4] 10 + π sec.

3. Two identical blocks P and Q have mass m each. They are attached to two identical springs initially unstretched as shown. Now the left spring (along with P) is compressed by A/2 and the right spring (along with Q) is compressed by A. Both the blocks are released simultaneously. They collide and stick to each other. The amplitude of oscillation of combined mass is

[1] A/4 [2] A/2

[3] 2A/3 [4] 3A/4



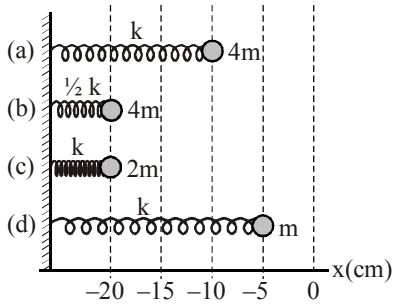
4. Four springs have been compressed from their equilibrium position at x = 0 cm. When released, they will start to oscilate. Rank in order, from highest to lowest, the maximum speeds of the oscillators.

[1] c = b > a > d

[2] a = d > b > c

[3] a > d > b = c

[4] c > b > a = d



(SPACE FOR ROUGH WORK)

5. If the length of a simple pendulum is equal to the radius of the earth, its time period will be

[1] $2\pi\sqrt{\frac{R}{g}}$ [2] $2\pi\sqrt{\frac{R}{2g}}$ [3] $2\pi\sqrt{\frac{2R}{g}}$ [4] ∞

6. A block of mass 1kg is connected to a spring of spring constant π^2 N/m fixed at other end and kept on smooth level ground. The block is pulled by a distance of 1cm from natural length position and released. After what time does the block compress the spring by $\frac{1}{2}$ cm.

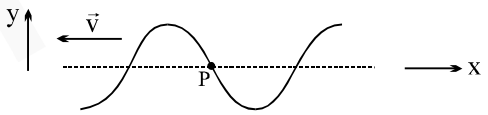
[1] $\frac{2}{3}$sec [2] $\frac{1}{3}$sec [3] $\frac{1}{6}$sec [4] $\frac{1}{12}$sec

7. A simple pendulum is inside a container which is filled with non-viscous liquid of density σ. The density of material of the pendulum bob is ρ. If the container is placed in a lift which is moving down with retardation a_0, then time period of simple pendulum is

[1] $2\pi\sqrt{\frac{L}{g\left(1-\frac{\sigma}{\rho}\right)-a_0}}$ [2] $2\pi\sqrt{\frac{L}{g\left(1-\frac{\sigma}{\rho}\right)+a_0}}$

[3] $2\pi\sqrt{\frac{L}{(g+a_0)\left(1-\frac{\sigma}{\rho}\right)}}$ [4] $2\pi\sqrt{\frac{L}{(g-a_0)\left(1-\frac{\sigma}{\rho}\right)}}$

8. The transverse wave shown is travelling from right to left in a medium. The direction of the instantaneous velocity of a particle of the medium at point P is:



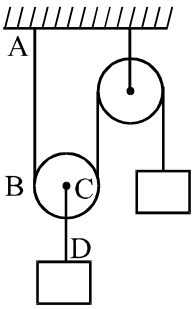
[1] ↑ [2] ↓ [3] ↖ [4] ←

9. A wire having a linear density 0.1kg/m is kept under a tension of 490 N. It is observed that it resonates at a frequency of 400Hz and the next higher frequency 450Hz. Find the length of the wire

[1] 0.4m [2] 0.6m [3] 0.49m [4] 0.7m

(SPACE FOR ROUGH WORK)

10. Both the strings, shown in figure are made of same material and diameter of CD is double that of AB. The pulleys are light. The speed of a transverse wave in the string AB is ν_1 and in CD it is ν_2, then $\frac{\nu_1}{\nu_2}$ is :



[1] 1

[2] 2

[3] $\sqrt{2}$

[4] $\frac{1}{\sqrt{2}}$

11. A composite string is made up by joining two strings of different masses per unit length $\rightarrow \mu$ and 4μ. The composite string is under the same tension. A transverse wave pulse: Y = (6 mm) sin (5t + 40x), where t is in seconds and x in metres, is sent along the lighter string towards the joint. The joint is at x = 0. The equation of the wave pulse reflected from the joint is

[1] (2mm) sin(5t – 40x) [2] (4mm) sin(40x – 5t)

[3] – (2mm) sin(5t – 40x) [4] (2mm) sin(5t – 10x)

12. A string of length 3L is fixed at both ends. It resonates with a tuning fork in third harmonic with amplitude at antinode equal to A_0. At time t = 0, a string element at position of antinode is at half its positive amplitude and moving towards mean position. Displacement of a string element at L/2 is given by

[1] $\frac{A_0}{2}\sin\left(\omega t + \frac{11\pi}{6}\right)$ [2] $\frac{\sqrt{3}A_0}{2}\sin\left(\omega t + \frac{5\pi}{6}\right)$

[3] $A_0 \sin\left(\omega t + \frac{5\pi}{6}\right)$ [4] $\frac{A_0}{2}\sin\left(\omega t + \frac{5\pi}{6}\right)$

13. An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is found to be higher by 100 Hz than the fundamental frequency of the open pipe. The fundamental frequency of the open pipe is

[1] 200 Hz [2] 300 Hz [3] 240 Hz [4] 480 Hz

(SPACE FOR ROUGH WORK)

14. The fundamental frequency of a sonometer wire of length ℓ is n_0. A bridge is now introduced at a distance of $\Delta\ell$ ($<< \ell$) from the centre of the wire. The lengths of wire on the two sides of the bridge are now vibrated in their fundamental modes. Then, the beat frequency nearly is:

[1] $n_0 \Delta\ell / \ell$ [2] $8n_0 \Delta\ell / \ell$ [3] $2 n_0 \Delta\ell / \ell$ [4] $n_0 \Delta\ell / 2\ell$

15. A glass tube of 1.0 meter length is filled with water. The water can be drained out slowly at the bottom of the tube. If a vibrating tuning fork of frequency 500Hz is brought at the upper end of the tube and the velocity of sound is 330m/s then the total number of resonances obtained will be

[1] 4 [2] 3 [3] 2 [4] 1

16. The intensity of sound 10 m from a tornado siren (assume point source) is a very loud 130 db. At what distance would you need to be for the intensity to drop to 90 db ?

[1] 14.3 m [2] 31.8 m [3] 210 m [4] 1000 m

17. In a resonance tube experiment, an 80 cm air column is in resonance with a turning fork in first overtone. Which equation can represent correct pressure variation in the air column (x = 0 is the top point of the tube, neglect end correction, speed of sound = 320 m/sec)

[1] A sin $\frac{15\pi}{8} x$ cos $600\pi t$ [2] A cos $\frac{15\pi}{8} x$ sin $600\ \pi t$

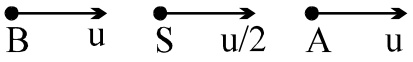
[3] A cos $\frac{15\pi}{8} x$ sin $300\ \pi t$ [4] A sin $\frac{15\pi}{8} x$ sin $300\ \pi t$

18. A car blowing a horn of frequency 350 Hz is moving normally towards a wall with a speed of 5 m/s. The beat frequency heard by a person standing between the car and the wall is (speed of sound in air = 350 m/s)

[1] zero [2] 3.5 Hz [3] 5 Hz [4] 10 Hz

19. A source of sound is moving with velocity u/2 and two observers A and B are moving with velocity u as shown. Find ratio of wavelength received by A and B. Given that velocity of sound is 10 u.

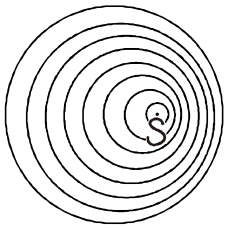
[1] $\frac{19}{21}$ [2] $\frac{17}{21}$



[3] $\frac{21}{23}$ [4] $\frac{17}{23}$

(SPACE FOR ROUGH WORK)

20. In Figure are some wavefronts emitted by a source of sound S. This picture can help us to understand



[1] the phenomenon of beats

[2] doppler effect

[3] standing waves

[4] Interference

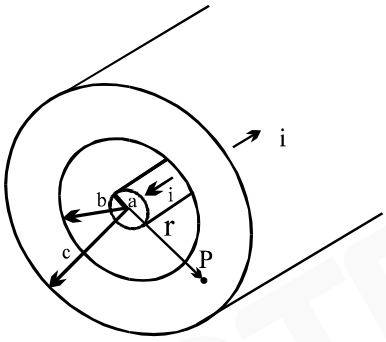
21. A coaxial cable having radius "a" of inner wire and inner and outer radii "b" and "c" respectively of the outer shell carries equal and opposite currents of magnitude *i* on the inner and outer conductors as shown. What is the magnitude of the magnetic induction at point P of the cable at a distance r (b < r < c) from the axis ?

[1] Zero

[2] $\frac{\mu_0 ir}{2\pi a^2}$

[3] $\frac{\mu_0 i}{2\pi r}$

[4] $\frac{\mu_0 i}{2\pi r}\frac{c^2-r^2}{c^2-b^2}$



22. A very long wire carrying current I is fixed along x-axis. Another parallel finite wire carrying a current in the opposite direction is kept at a distance d above the wire in xy plane. The second wire is free to move parallel to itself. The options available for its small displacements are in

(i) +ve x direction (ii) +ve y direction (iii) +ve z direction

Taking gravity in negative y direction, the nature of equilibrium of second wire is

[1] stable for movement in x direction, unstable for movement in y direction, neutral for movement in z direction

[2] stable for movement in y direction, unstable for movement in z direction, neutral for movement in x direction

[3] stable for movement in z direction, unstable for movement in y direction, neutral for movement in x direction

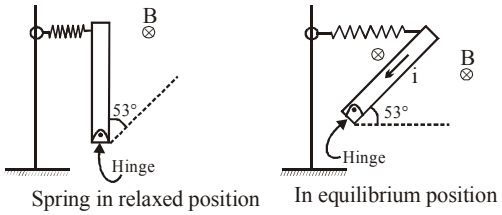
[4] stable for movement in y direction, unstable for movement in x direction, neutral for movement in z direction

(SPACE FOR ROUGH WORK)

23. A thin uniform rod with negligible mass and length ℓ is attached to the floor by a frictionless hinge at point P. A horizontal spring with force constant k connects the other end to wall. The rod is in a uniform magnetic field B directed into the plane of paper what is extension in spring in equilibrium when a current is passed through the rod in direction shown. Assuming spring to be in natural length initially.

[1] $\frac{5i\ell B}{8k}$ [2] $\frac{3i\ell B}{8k}$

[3] $\frac{5i\ell B}{4k}$ [4] $\frac{5i\ell B}{6k}$



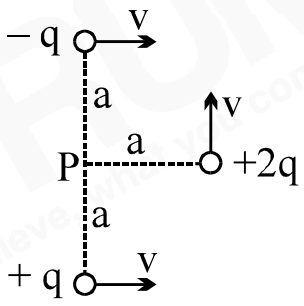
24. A charge +2*q* moves vertically upwards with speed *v*, a second charge – *q* moves horizontally to the right with the same speed *v*, and a third charge + *q* moves horizontally to the right with the same speed *v*. The point P is located a perpendicular distance *a* away from each charge as shown in the figure. The magnetic field at point P is

[1] Into the page with magnitude $\frac{\mu_0}{4\pi}\frac{2qv}{a^2}$

[2] Into the page with magnitude $\frac{\mu_0}{4\pi}\frac{4qv}{a^2}$

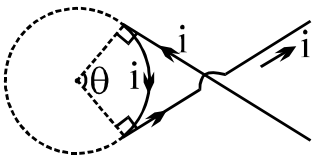
[3] Out of the page with magnitude $\frac{\mu_0}{4\pi}\frac{2qv}{a^2}$

[4] Out the page with magnitude $\frac{\mu_0}{4\pi}\frac{4qv}{a^2}$



25. A wire carrying current I has the configuration shown in figure. Two semi-infinite straight sections, both tangent to the same circle, are connected by a circular arc, of central angle θ, along the circumference of the circle, with all sections lying in same plane. If magnetic field at centre 'O' of the circle is zero then θ is

[1] 2 radian
[2] 4 radian
[3] π / 2
[4] π / 4



(SPACE FOR ROUGH WORK)

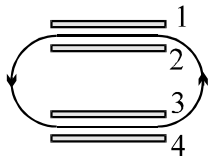
26. Figure shows the path of an electron in a region of uniform magnetic field. The path consists of two straight sections, each between a pair of uniformly charged plates, and two half-circles.The plates are named 1, 2, 3 & 4. Then

[1] 1 and 3 at higher (positive) potential and 2 and 4 at lower (negative) potential

[2] 1 and 3 at lower potential and 2 and 4 at higher potential

[3] 1 and 4 at higher potential and 2 and 3 at lower potential

[4] 1 and 4 at lower potentail and 2 and 3 at higher potential



27. A particle of specific charge σ (q / m) moving with a certain velocity v enters a uniform magnetic field of strength B directed along the negative Z-axis entending from $x = r_1$ to $x = r_2$. The minimum value of v required in order that the particle can just enter the region $x > r_2$ is :

[1] $\sigma r_2 B$ [2] $\sigma r_1 B$ [3] $\sigma(r_2 - r_1) B$ [4] $\sigma\sqrt{r_2^2 - r_1^2}B$

28. A particle of mass m and charge q is accelerate through a potential difference V to a velocity $\vec{v}$ towards the south. The particle enters a region with both a magnetic field $\vec{B}$ (pointing eastwards) and electric field $\vec{E}$ (pointing down). The particle travels at constant velocity through this region. The potential difference V must satisfy, (neglecting gravity)

[1] $V = mE^2/(2qB^2)$

[2] $V = 2mE/(qB)$

[3] $V = E/(qB)$

[4] It is not possible for the particle to be undeflected by these fields

29. Two particles having the same specific charge (q/m) enter a uniform magnetic field with the same speed but at angles of 30° and 60° with the field. Let a, b and c be the ratios of their pitches, radii and periods of their helical paths respectively, then

[1] abc = 1 [2] $a + b = 2\sqrt{c}$ [3] $a^2 = c$ [4] ab = c

30. A bar magnet has coercivity $4 \times 10^3\ Am^{-1}$. It is desired to demagnetise it by inserting it inside a solenoid 12 cm long and having 60 turns. The current that should be sent through the solenoid is

[1] 2 A [2] 4 A [3] 6 A [4] 8 A

(SPACE FOR ROUGH WORK)

31. An element occurring in the bcc structure has 12.08×10^{23} unit cells. The total number of atoms of the element in these cells will be
[1] 24.16×10^{23} [2] 36.18×10^{23} [3] 6.04×10^{23} [4] 12.08×10^{23}

32. In octahedral holes (voids)
[1] A simple triangular void surrounded by four spheres
[2] A bi-triangular void surrounded by four spheres
[3]A bi-triangular void surrounded by six spheres
[4] A bi-triangular void surrounded by eight spheres

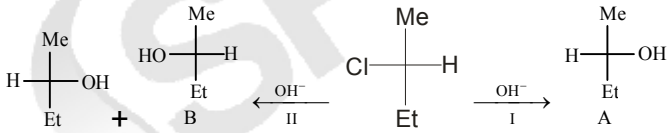
33. If $C+O_2\rightarrow CO_2+94.2\text{kcal}$

$H_2+\frac{1}{2}O_2\rightarrow H_2O+68.3\text{kcal}$

$CH_4+2O_2\rightarrow CO_2+2H_2O+210.8\text{kcal}$

then the possible heat of formation of methane will be
[1] 47.3 *kcal* [2] 20.0 *kcal* [3] 45.9 *kcal* [4] – 47.3 *kcal*

34. One mole of water at 100^oC is converted into steam at 100^oC at a constant pressure of 1 atm. The change in entropy is [heat of vaporisation of water at $100^oC=540\,\text{cal/gm}$]
[1] 8.74 [2] 18.76 [3] 24.06 [4]26.06

35. 

Steps I and II are -
[1] both S_N1 [2] both S_N2 [3] I S_N1, II S_N2 [4] I S_N2, II S_N1

36. *n*-heptane by passing over $(Al_2O_3+Cr_2O_3)$ catalyst at 773 K gives X.Compound X on heating with $KMnO_4/H^+$ forms
[1] Benzene [2] Toluene [3]Benzoic acid [4] Bezaldehyde

37. acetylene and ethylene (ethene) are distinguished by
[1] Alkaline $KMnO_4$ [2] Bromine water
[3] Ammoniacal cuprous chloride [4] Conc. H_2SO_4

SPACE FOR ROUGH WORK

38. The entropy values (in $JK^{-1}\ mol^{-1}$) of $H_{2(g)}$ = 130.6, $Cl_{2(g)}$ = 223.0 and $HCl_{(g)}$ = 186.7 at 298 *K* and 1 *atm* pressure. Then entropy change for the reaction

$H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$ is

[1] + 540.3 [2] + 727.3 [3] – 166.9 [4] + 19.8

39. An exothermic reaction is one in which the reacting substances

[1] Have more energy than the products

[2] Have less energy than the products

[3] Are at a higher temperature than the product

[4] None of the above

40. ΔH°_{f} (298 *K*) of methanol is given by the chemical equation

[1] $CH_4(g) + 1/2O_2(g) \rightarrow CH_3OH(g)$

[2] *C* (graphite) $+1/2O_2(g) + 2H_2(g) \rightarrow CH_3OH(l)$

[3] *C* (diamond) $+1/2O_2(g) + 2H_2(g) \rightarrow CH_3OH(l)$

[4] $CO(g) + 2H_2(g) \rightarrow CH_3OH(l)$

41. The bond dissociation energies of gaseous H_2, Cl_2 and HCl are 104, 58 and 103 *kcal* respectively. The enthalpy of formation of HCl gas would be

[1] – 44 *kcal* [2] 44 *kcal* [3]– 22 *kcal* [4] 22 *kcal*

42. At 300 *K*, the reactions which have following values of thermodynamic parameters occur non spontaneously

[1] $\Delta G^{o} = -400\ kJ\ mol^{-1}$.

[2] $\Delta H^{o} = 200\ kJ\ mol^{-1},\ \Delta S^{o} = -4\ JK^{-1}mol^{-1}$

[3] $\Delta H^{o} = -200\,kJmol^{-1},\ \Delta S^{o} = 4\,JK^{-1}mol^{-1}$

[4] $\Delta H^{o} = 200\,Jmol^{-1},\ \Delta S^{o} = 40\,JK^{-1}mol^{-1}$

43. An ionic compound has a unit cell consisting of *A* ions at the corners of a cube and *B* ions on the centres of the faces of the cube and C ion at octahedral voids. The empirical formula for this compound would be

[1] ABC [2] A_2BC [3] AB_3C_4 [4] AB_3C_2

SPACE FOR ROUGH WORK

44. In CsCl structure, the coordination number of Cs^+ is
[1] Equal to that of Cl^-, that is 6
[2]Equal to that of Cl^-, that is 8
[3] Not equal to that of Cl^-, that is 6
[4] Not equal to that of Cl^-, that is 8

45. What is the correct mode of hybridization of the central atom in the following compounds NO_2^+, SF_4, PF_6^-
[1] sp^2, sp^3, d^2sp^3 [2] sp^3, sp^3d^2, sp^3d^2 [3] sp, sp^3d, sp^3d^2 [4] sp, sp^2, sp^3

46. The correct order of bond angles (smallest first) in H_2S, NH_3, BF_3 and SiH_4 is
[1] $H_2S < NH_3 < SiH_4 < BF_3$ [2] $NH_3 < H_2S < SiH_4 < BF_3$
[3] $H_2S < SiH_4 < NH_3 < BF_3$ [4] $H_2S < NH_3 < BF_3 < SiH_4$

47. 1-butyne reacts with alkaline $KMnO_4$ to produce
[1] CH_3CH_2COOH [2] $CH_3CH_2CH_2COOH$
[3] $CH_3CH_2COOH + CO_2$ [4] $CH_3CH_2COOH + HCOOH$

48. N_2 and O_2 are converted into monoanions N_2^- and O_2^- respectively, which of the following statements is wrong
[1] In N_2, the $N-N$ bond weakens [2]In O_2, the $O-O$ bond order increases
[3] In O_2, bond length increases [4] N_2^- becomes diamagnetic

49. In a reaction

$$CH_2 = CH_2 \xrightarrow[\text{acid}]{\text{Hypochlorous}} M \xrightarrow{R} \begin{matrix} CH_2 - OH \\ | \\ CH_2 - OH \end{matrix}$$

Where *M* = molecule; *R* = reagent *M* and *R* are
[1] CH_3CH_2Cl and *NaOH* [2] $CH_2Cl - CH_2OH$ and aq. $NaHCO_3$
[3] CH_3CH_2OH and *HCl* [4] $CH_2 = CH_2$ and heat

SPACE FOR ROUGH WORK

50. In which of the following, addition of HBr does not take place against Markownikoff's rule **or** Anti-Markownikoff addition of HBr is not observed for

[1] Propene [2] But-1-ene [3]But-2-ene [4] Pent-2-ene

51. A hydrocarbon *X* adds on one mole of hydrogen to give another hydrocarbon and decolourised bromine water. *X* reacts with $KMnO_4$ in presence of acid to give two moles of the same carboxylic acid. The structure of *X* is

[1] $CH_2 = CH - CH_2CH_2CH_3$ [2] $CH_3CH_2CH_2 - CH = CHCH_3$

[3] $CH_3CH_2CH = CHCH_2CH_3$ [4] $CH_3CH = CHCH_2CH_2CH_3$

52. The product of following reaction

$$CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH = CH_2 \xrightarrow[(ii)\ NaBH_4]{(i)\ Hg(OAc)_2;H_2O} \quad \& \quad CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH = CH_2 \xrightarrow[(ii)\ H_2O_2/OH^-]{(i)\ B_2H_6/THF}$$

are

[1]Identical [2] Chain Isomer [3] Position Isomer [4] Functional Isomer

53. What is the end product of the following sequences of operations $CaC_2 \xrightarrow{H_2O} A \xrightarrow[Hg^{++}]{dil.\ H_2SO_4} B \xrightarrow[H_2]{Ni} C$

[1] Methyl alcohol [2] Acetaldehyde [3] C_2H_5OH [4] C_2H_4

54. Benzene reacts with CH_3COCl in the presence of $AlCl_3$ to give Compound Y . Y when further treated with CH_3COCl in the presence of $AlCl_3$ will give

[1] $C_6H_5COCH_3$ [2] $p-C_6H_4(COCH_3)_2$ [3] $m-C_6H_4(COCH_3)_2$ [4] No reaction

55. Gammexane is obtained from benzene when it reacts with

[1] Br_2 in bright sunlight (in the absence of a catalyst)

[2] Cl_2 in bright sunlight (in the absence of a catalyst)

[3] CH_3Cl in the presence of anhydrous $AlCl_3$

[4] $COCl_2$ in the presence of anhydrous $AlCl_3$

SPACE FOR ROUGH WORK

56. Considering entropy (S) as a thermodynamic parameter, the criterion for the spontaneity of any process is

[1] $\Delta S_{system} > 0$ only [2] $\Delta S_{surroundings} > 0$ only

[3] $\Delta S_{system} + \Delta S_{surroundings} > 0$ [4] $\Delta S_{system} - \Delta S_{surroundings} > 0$

57. The absolute enthalphy of neutralization (magnitude) of the reaction $MgO(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(l)$ will be

[1] Less than $2 \times 57.33\ kJ\,mol^{-1}$ [2] $2 \times 57.33\ kJ\,mol^{-1}$

[3] Greater than $2 \times 57.33\ kJ\,mol^{-1}$ [4] $57.33\ kJ\,mol^{-1}$

58. Due to Frenkel defect, the density of ionic solids

[1] Increases [2] Decreases [3] Does not change [4] Changes

59. Which of the following reactions will not give propane

[1] $CH_3CH_2CH_2Cl \xrightarrow[H_2O]{Mg/ether}$ [2] $CH_3COCl \xrightarrow[H_2O]{CH_3MgX}$

[3] $CH_3CH = CH_2 \xrightarrow[CH_3COOH]{B_2H_6}$ [4] $CH_3\underset{\underset{OH}{|}}{CH} - CH_3 \xrightarrow{P/HI}$

60. In which of the following reaction mechanism no intermediated is formed

[1] E^1 [2] E^2 [3] S_N1 [4] E^1_{cb}

SPACE FOR ROUGH WORK

61. A survey shows that 63% of a population like chees whereas 76% like butter. If x% of the population lik both chees and butter, then
[1] $39 \leq x \leq 63$ [2] $25 \leq x \leq 50$ [3] $51 \leq x \leq 63$ [4] non of these

62. If $\tan x - \tan^2 x = 1$, then the value of $\tan^4 x - 2\tan^3 x - \tan^2 x + 2\tan x + 1$ is
[1] 1 [2] 2
[3] 3 [4] 4

63. Joint equation of pair of lines which passes through origin and are perpendicular to the lines represented the equation :

$y^2 + 3xy - 6x + 5y - 14 = 0$, will be -
[1] $y^2 - 3xy = 0$ [2] $3y^2 - xy = 0$ [3] $x^2 - 3xy = 0$ [3] $3x^2 - xy = 0$

64. If $\hat{a}, \hat{b}, \hat{c}$ are three non-coplaner unit vectors, then $[\hat{a}\ \vec{p}\ \vec{q}]\hat{a} + [\hat{b}\ \vec{p}\ \vec{q}]\hat{b} + [\hat{c}\ \vec{p}\ \vec{q}]\hat{c}$ is equal to
[1] $(\hat{a} + \hat{b} + \hat{c}) \times (\vec{p} \times \vec{q})$ [2] $\hat{a} + \hat{b} + \hat{c} + \vec{p} + \vec{q}$
[3] $\vec{p} + \vec{q}$ [4] $\vec{p} \times \vec{q}$

65. Two finite sets have m and n elements respectively. The total number of subsets of first set is 56 more than the total number of subsets of the second set. The values of m and n respectively are
[1] 7,6 [2] 6,3 [3] 5,1 [4] 8,7

66. The minimum value of the expression $3^{\sin^6 x} + 3^{\cos^6 x}$ is
[1] $2.3^{1/8}$ [2] $2.3^{7/8}$ [3] $3.2^{1/8}$ [4] None of these

67. If $\cos 25° + \sin 25° = k$, then $\cos 20°$ is equal to
[1] $\frac{k}{\sqrt{2}}$ [2] $-\frac{k}{\sqrt{2}}$ [3] $\pm\frac{k}{\sqrt{2}}$ [4] None of these

68. A non-zero vector $\vec{a}$ is parallel to the line of intersection of the plane determined by the vectors $\hat{i}, \hat{i} + \hat{j}$ and the plane determined by the vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{k}$, then the angle between $\vec{a}$ and $\hat{i} - 2\hat{j} + 2\hat{k}$ is
[1] $\frac{\pi}{4}$ [2] $\frac{\pi}{2}$ [3] $\frac{\pi}{3}$ [4] $\frac{\pi}{6}$

SPACE FOR ROUGH WORK

69. A and B are two sets having 3 and 4 elements respectively and having 2 elements in common. The number of relations which can be defined from A to B is
[1] 2^5 [2] $2^{10} - 1$ [3] $2^{12} - 1$ [4] 2^{12}

70. Consider the family of lines $(x + y - 1) + \lambda (2x + 3y - 5) = 0$ & $(3x + 2y - 4) + \mu (x + 2y - 6) = 0$, then the equation of a straight line that belongs to both the families is :
[1] $x - 2y - 8 = 0$ [2] $x - 2y + 8 = 0$ [3] $2x + y - 8 = 0$ [4] $2x - y - 8 = 0$

71. Value of $\sin^4\frac{\pi}{8} + \sin^4\frac{3\pi}{8} + \sin^4\frac{5\pi}{8} + \sin^4\frac{7\pi}{8}$ is equal to;
[1] 3/2 [2] 2/3 [3] $\sqrt{3/2}$ [4] $\sqrt{2/3}$

72. The point $(a^2, a + 1)$ lies in the angle between the line $3x - y + 1 = 0$ and $x + 2y - 5 = 0$ containing the origin if -
[1] $a \in (-3, 0) \cap \left(\frac{1}{3}, 1\right)$ [2] $a \in (-\infty, -3) \cup \left(\frac{1}{3}, 1\right)$
[3] $a \in \left(-3, \frac{1}{3}\right)$ [4] $a \in \left(\frac{1}{3}, \infty\right)$

73. If $\bar{a}$ is a unit vector and projection of $\bar{x}$ along $\bar{a}$ is 2 units and $(\bar{a} \times \bar{x}) + \bar{b} = \bar{x}$, then $\bar{x}$ is given by
[1] $\frac{1}{2}\left[\bar{a} - \bar{b} + (\bar{a} \times \bar{b})\right]$ [2] $\frac{1}{2}\left[2\bar{a} + \bar{b} + (\bar{a} \times \bar{b})\right]$ [3] $\left[\bar{a} + (\bar{a} \times \bar{b})\right]$ [4] none of these.

74. The relation R defined on set $A = \{x : |x| < 3, x \in Z\}$ by $R = \{(x, y) : y = |x|\}$ is
[1] $\{(0,0),(1,1),(2,2)\}$
[2] $\{(-2,2),(-1,1),(0,0),(1,1)(2,2)\}$
[3] $\{(-2,2),(-2,-2),(-1,1),(-1,-1)(0,0)(1,-2),(1,2)(2,-1)(2,-2)\}$
[4] none of these

75. If $\tan\theta = \sqrt{n}$, for some non-square natural number n, then $\sec 2\theta$ is
[1] a rational number [2] an irrational number
[3] a positive number [4] none of these

SPACE FOR ROUGH WORK

76. If lines x + 2y – 1 = 0, ax + y + 3 = 0 and bx – y + 2 = 0 are concurrent and let S be the curve denoting locus of (a, b). Then the least distance of S from the origin is.

[1] $\frac{5}{\sqrt{57}}$ [2] $\frac{5}{\sqrt{51}}$ [3] $\frac{5}{\sqrt{58}}$ [4] $\frac{5}{\sqrt{59}}$

77. If $0 < \alpha < \frac{\pi}{6}$ then $\alpha(\text{cosec } \alpha)$ is

[1] less than $\frac{\pi}{6}$ [2] greater than $\frac{\pi}{6}$

[3] less than $\frac{\pi}{3}$ [4] greater than $\frac{\pi}{3}$

78. $\tan \frac{\pi}{8}$ is the root of the equation

[1] $x^4 + 6x^2 + 1 = 0$ [2] $x^4 - 6x^2 + 1 = 0$

[3] $x^4 - 6x^2 - 1 = 0$ [4] none of these

79. The following relation r is defined on the set of real number i.e., a r b iff |a - b| > 0. R is

[1] only symmetric [2] only reflexive

[3] Only transitive [4] equivalence

80. If the vectors $\vec{a} = -4\hat{i} + 3\hat{k}$ and $\vec{b} = 14\hat{i} + 2\hat{j} - 5\hat{k}$ have same initial point then, the angle bisector $\vec{d}$ of magnitude $\sqrt{6}$ is

[1] $\hat{i} + \hat{j} + 2\hat{k}$ [2] $\hat{i} - \hat{j} + 2\hat{k}$

[3] $\hat{i} - \hat{j} - 2\hat{k}$ [4] none of these

81. N is the set of positive integers and R be a relation in N × N defined by (a,b) R (c,d) if ad = bc. Then relation R is

[1] Only reflexive [2] only anti-symmetric

[3] Only symmetric [4] equivalence

82. The line 3x – 4y + 7 = 0 is rotated through an angle $\frac{\pi}{4}$ in the clockwise direction about the point (–1, 1). The equation of the line in its new position is-

[1] 7y + x – 6 = 0 [2] 7y – x – 6 = 0

[3] 7y + x + 6 = 0 [4] 7y – x + 6 = 0

SPACE FOR ROUGH WORK

83. $\sin x + \cos x = y^2 - y + a$ has no value of x for any y if 'a' belongs to

[1] $(0, \sqrt{3})$ [2] $(-\sqrt{3}, 0)$

[3] $(-\infty, -\sqrt{3})$ [4] $(\sqrt{3}, \infty)$

84. A straight line L with negative slope passes through the points (8, 2) and cuts the positive coordinate axes at points P and Q. As L varies the absolute minimum value of OP + OQ is (O is origin) –

[1] 28 [2] 15 [3] 18 [4] 10

85. The length of the longer diagonal of the parallelogram constructed on $5\vec{a} + 2\vec{b}$ and $\vec{a} - 3\vec{b}$, if it is given that $|\vec{a}| = 2\sqrt{2}, |\vec{b}| = 3$ and angle between $\vec{a}$ and $\vec{b}$ is $\pi/4$, is

[1] $\sqrt{473}$ [2] $\sqrt{593}$ [3] $\sqrt{474}$ [4] $\sqrt{594}$

86. Let A = [-1,1], B = [-1,1], C = $[0,\infty)$

Let $R_1 = \{(x,y) \in A \times B : x^2 + y^2 = 1\}$ and

$R_2 = \{(x,y) \in A \times C : x^2 + y^2 = 1\}$

[1] R_1 defines a function from A into B

[2] R_1 defines a function from A onto C

[3] R_2 defines a function from A into C

[4] R_2 defines a function from A onto C

87. The values of k, for which the system of equations $\cos x \cos 2y = (k^2 - 4)^2 + 1$ and $\sin x \sin 2y = k + 2$ holds, is (are) given by

[1] $k = \pm 2$ [2] $k = -2$ [3] $k = 2$ [4] none of these

88. The vertices of a triangle are A(–1, –7), B(5, 1) and C(1, 4). The equation of the bisector of the angle $\angle ABC$ is -

[1] $x + 7y + 2 = 0$ [2] $x - 7y + 2 = 0$ [3] $x - 7y - 2 = 0$ [4] $x + 7y - 2 = 0$

89. If $\vec{a}$ and $\vec{b}$ are two unit vectors inclined at an angle 60° to each other, then

[1] $|\vec{a} + \vec{b}| > 1$ [2] $|\vec{a} + \vec{b}| < 1$ [3] $|\vec{a} - \vec{b}| > 1$ [4] $|\vec{a} - \vec{b}| < 1$

90. The set $(A \cap B^c)^c \cup (B \cap C)$ is equal to

[1] $A^c \cup B \cup C$ [2] $A^c \cup B$ [3] $A^c \cup C^c$ [4] none of these

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