CODE

1

SPECTRUM

Key to achieve, what you conceive

PART SYLLABUS TEST [PST- 05]

TARGET : JEE MAIN 2016

CLASS : XII & DROPPERS

Date : 17-1-2016 **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. :** _____

Address : R-24, Opp. Railway Track, Zone-II, M.P. Nagar, Bhopal (M.P.) Pin : 462011
Phone No. : 0755 - 3197700 / 3196999

url: www.spectrum.ac.in **email: info@spectrum.ac.in**

PART – I (PHYSICS)

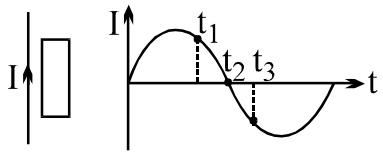
1. The current I in the straight conductor varies sinusoidally with time as shown. (A positive value of I is in the direction indicated). At time t_1 the induced current in the rectangular loop is clockwise. What is the current in the rectangular loop at time t_2 and time t_3 respectively ?

[1] zero; clockwise

[2] zero; counterclockwise

[3] clockwise; clockwise

[4] clockwise; counterclockwise



2. The dimensions of magnetic flux is

[1] ML^2T^2I [2] $ML^{-2}T^2I^{-1}$

[3] MT^2I^{-1} [4] $ML^2T^{-2}I^{-1}$

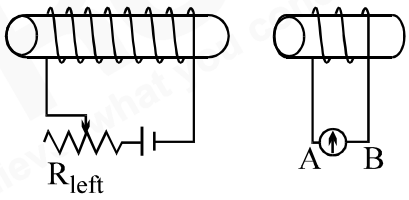
3. For the solenoids shown in the diagram (which are assumed to be close to each other), the resistance of the left-hand circuit is slowly increased. In which direction does the current flow through galvanometer in the right-hand circuit ?

[1] B to A

[2] A to B

[3] there is no current

[4] cannot be determined



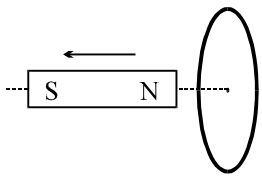
4. A bar magnet with its north (N) and south (S) poles as shown is initially moving to the left, along the axis of and away from a circular conducting loop. A current *I* is induced in the loop and acceleration of magnet is *a* due to this current. As seen from the magnet looking in the direction of the loop.

[1] I runs clockwise and *a* points to the left

[2] I runs counterclockwise and *a* points to the right

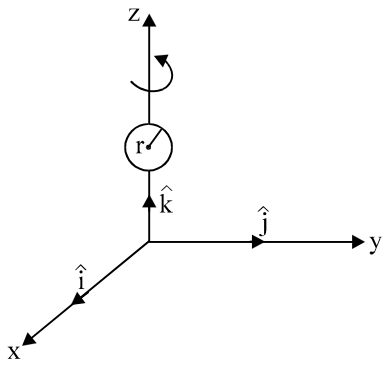
[3] I runs clockwise and *a* points to the right

[4] I runs counterclockwise and *a* points to the left



(SPACE FOR ROUGH WORK)

5. A circular loop wire of radius r rotates about the z-axis with angular velocity ω. The normal to the loop is always perpendicular to the z-axis. At time t = 0, the normal is parallel to the y-axis. An external magnetic field $\vec{B} = B_y\hat{j} + B_z\hat{k}$ is applied. The EMF $\varepsilon(t)$ induced in the loop is :



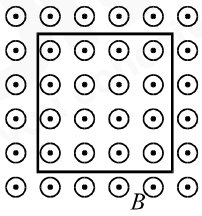
[1] $\pi r^2\omega B_y \sin \omega t$

[2] $\pi r^2\omega B_z \cos \omega t$

[3] $\pi r^2\omega B_z \sin \omega t$

[4] $\pi r^2\omega B_y \cos \omega t$

6. A uniform magnetic field *B* is directed out of the page. A metallic wire has the shape of a square frame and is placed in the field as shown. While the shape of the wire is steadily transformed into a circle in the same plane, the current in the frame:



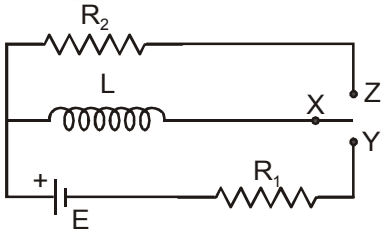
[1] is directed clockwise

[2] does not appear

[3] is directed counterclockwise

[4] is alternating

7. In the circuit shown, X is joined to Y for a long time, and then X is joined to Z. The total heat produced in R_2 is



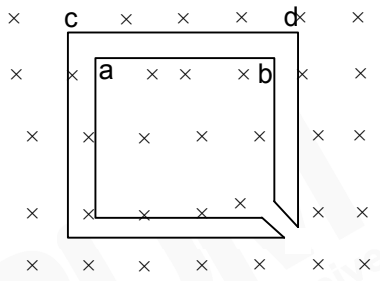
[1] $\frac{LE^2}{2R_1^2}$ [2] $\frac{LE^2}{2R_2^2}$ [3] $\frac{LE^2}{2R_1R_2}$ [4] $\frac{LE^2R_2}{2R_1^3}$

(SPACE FOR ROUGH WORK)

8. A LR circuit is connected to a battery at time t = 0. The energy stored in the inductor reaches half its maximum value at time

[1] $\frac{R}{L}\ln\left[\frac{\sqrt{2}}{\sqrt{2}-1}\right]$ [2] $\frac{L}{R}\ln\left[\frac{\sqrt{2}-1}{\sqrt{2}}\right]$ [3] $\frac{L}{R}\ln\left[\frac{\sqrt{2}}{\sqrt{2}-1}\right]$ [4] $\frac{R}{L}\ln\left[\frac{\sqrt{2}-1}{\sqrt{2}}\right]$

9. The figure shows certain wire segments joined together to form a coplanar loop. The loop is placed in a perpendicular magnetic field in the direction going into the plane of the figure. The magnitude of the field increases with time. I_1 and I_2 are the currents in the segments **ab** and **cd**. Then



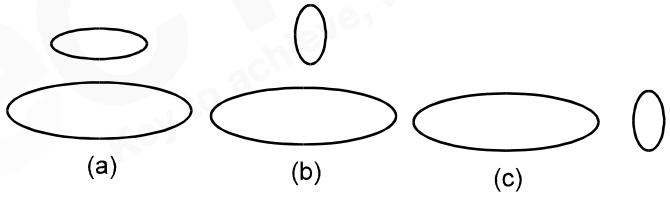
[1] $I_1 > I_2$

[2] $I_1 < I_2$

[3] I_1 is in the direction **ba** and I_2 is in the direction **cd**

[4] I_1 is in the direction **ab** and I_2 is in the direction **dc**

10. Two circular coils can be arranged in any of the three situations shown in the figure. Their mutual inductance will be



[1] Maximum in situation [1]

[2] Maximum in situation [2]

[3] Maximum in situation [3]

[4] the same in all situation

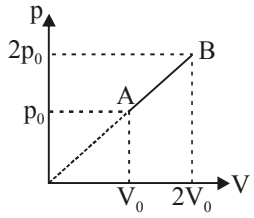
11. How many times will the mean square speed of molecules of an ideal gas change by increasing its volume 2 times ? The gas pressure increases 8 times and the mass remains unchanged.

[1] 2 times [2] 4 times

[3] 16 times [4] Decreases by a factor of 1/4

(SPACE FOR ROUGH WORK)

12. An enclosed one mole of an monoatomic gas is taken through a process A to B as shown in figure. The molar heat capacity of the gas for this process is



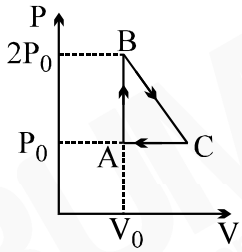
[1] R

[2] 2R

[3] 3R

[4] 4R

13. An ideal gas at pressure, volume and temperature P_0, V_0 and T_0 respectively is heated to point B, allowed to expand to point C, and then returned to the original; point A. Points B and C have the same temperatures. The internal energy decreases by $(3P_0V_0/2)$ in going from point C to A. Heat transfer along the process CA is



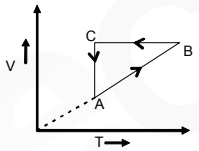
(A) $(+P_0V_0/2)$

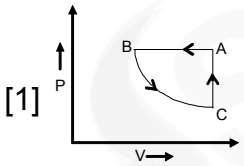
[2] $(-5P_0V_0/2)$

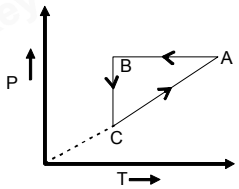
[3] $(-3P_0V_0/2)$

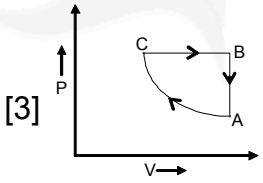
[4] 0

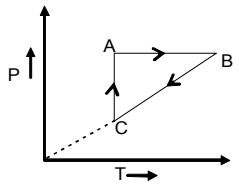
14. A cyclic process of an enclosed gas of constant mass is represented by volume (V) against absolute temperature (T) as shown. If P represents pressure, the graph representing the same process can be



[1] 

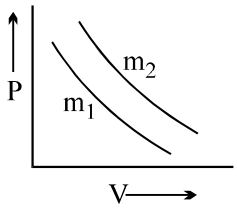
[2] 

[3] 

[4] 

(SPACE FOR ROUGH WORK)

15. Two different isotherms representing the relationship between pressure P and volume V at a same temperature of the same ideal gas are shown for masses m_1 and m_2 of the gas respectively in the figure given, then:



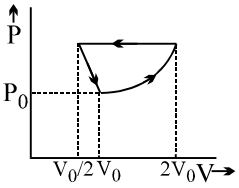
[1] $m_1 > m_2$

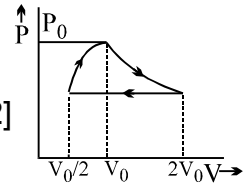
[2] $m_1 = m_2$

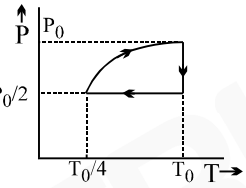
[3] $m_1 < m_2$

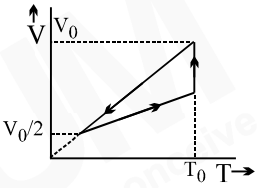
[4] All of the above are possible

16. One mole of an ideal gas at pressure P_0 and temperature T_0 volume V_0 is expanded isothermally to twice its volume and then compressed at constant pressure to $(V_0/2)$ and the gas is brought to original state by a process in which $P \alpha V$ (Pressure is directly proportional to volume). The correct representation of process is

[1] 

[2] 

[3] 

[4] 

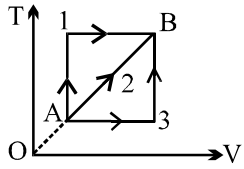
17. Consider a gas confined to a horizontal container by means of a piston of area $40cm^2$. If a horizontal force 20 N is exterted on the piston to keep the gas from expanding, find the gas pressure. Atmospheric pressure is 100 kPa.

[1] 100.5 kPa [2] 105.0 kPa [3] 95.0 kPa [4] 99.5 kPa

18. 1 mole of a monoatomic gas undergoes the process PT = constant. Then the molar heat capacity of the gas during the process will be equal to :

[1] 4R [2] 2.5R [3] 3.5 R [4] 8R/3

19. A given mass of a gas expands from a state A to the state B by three paths 1, 2 and 3 as shown in T-V indicator diagram. If W_1, W_2 and W_3 respectively be the work done by the gas along the three paths, then



[1] $W_1 > W_2 > W_3$

[2] $W_1 < W_2 < W_3$

[3] $W_1 = W_2 = W_3$

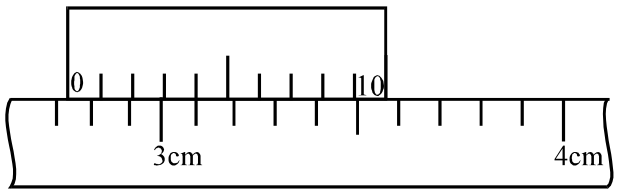
[4] $W_1 < W_2$, $W_1 > W_3$

(SPACE FOR ROUGH WORK)

20. In an H_2 gas process, PV^2 = constant. The ratio of work done by gas to change in its internal energy is

[1] 2/3 [2] 0.4 [3] – 0.4 [4] – 2/3

21. The diagram shows part of the vernier scale on a pair of calipers.



Which reading is correct ?

[1] 2.74 cm [2] 3.10 cm [3] 3.26 cm [4] 3.64 cm

22. A projectile is thrown with velocity U = 20m/s ± 5% at an angle 60°. If the projectile falls back on the ground at the same level then which of following can not be a possible answer for range. Consider g = 10m/s^2.

[1] 39.0 m [2] 37.5 m [3] 34.6 m [4] 32.0 m

23. The dimensions of $\frac{a}{b}$ in the equation $P = \frac{a - t^2}{bx}$ where P is pressure, x is distance and t is time, are:

[1] $[M^2L\,T^{-3}]$ [2] $[MT^{-2}]$ [3] $[LT^{-3}]$ [4] $[ML^3T^{-1}]$

24. If energy (E), velocity (V) and time (T) are chosen as the fundamental quantities, then the dimensions of surface tension will be. (Surface tension = force / length)

[1] $E\,V^{-2}T^{-1}$ [2] $E\,V^{-1}T^{-2}$ [3] $E^{-2}\,V^{-1}T^{-3}$ [4] $E\,V^{-2}T^{-2}$

25. In a given system of units, 1 unit of mass = 2 kg, 1 unit of length = 5 m and 1 unit of time = 5 sec. Then in this system, 1 N represents :

[1] $\frac{5}{2}$ units of force [2] $\frac{2}{5}$ units of force

[3] 2 units of force [4] $\frac{1}{2}$ units of force

(SPACE FOR ROUGH WORK)

26. A hole diffuses from the P-side to the N-side in a P-N junction. This means that-

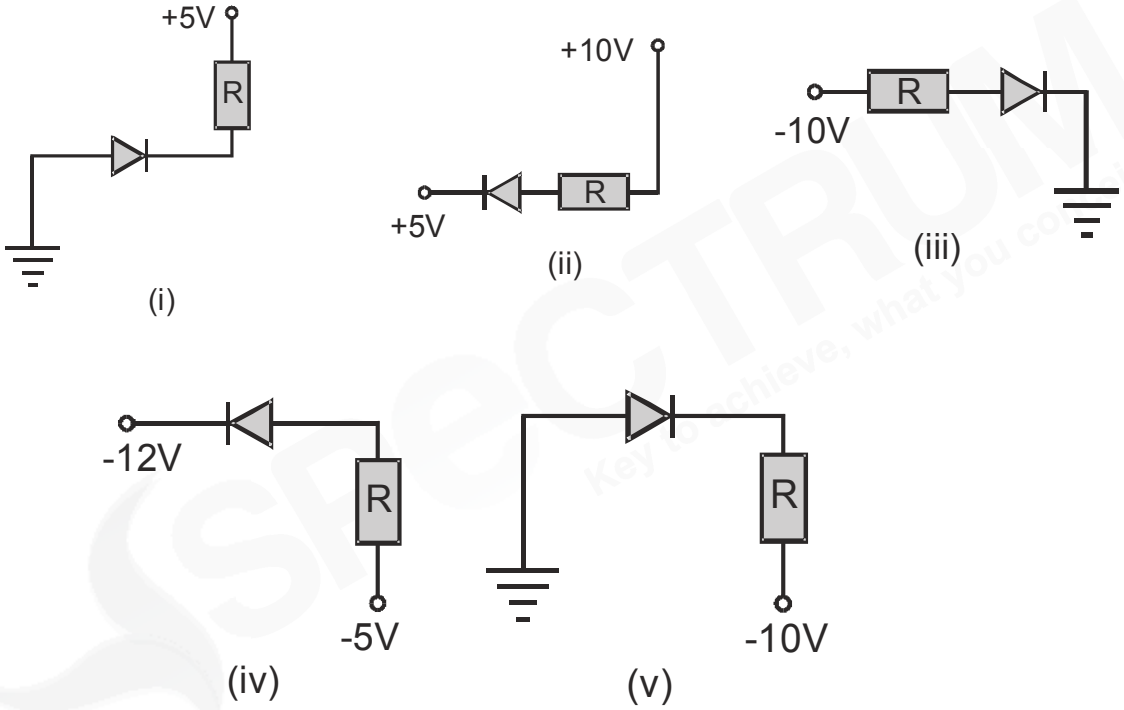
[1] A bond is broken on the N-side and the electron free from the bond jumps to the conduction band

[2] A conduction electron on the P-side jumps to a broken bond to complete it.

[3] A bond is broken on the N-side and the electron free from the bond jumps to a broken bond on the P-side to complete it.

[4] A bond is broken on the P-side and the electron free from the bond jumps to a broken bond on the N-side to complete it.

27. In the given fig. which of the diodes are foward biased



[1] (i), (ii), (iii)

[3] (i), (iii), (iv)

[3] (ii), (iv), (v)

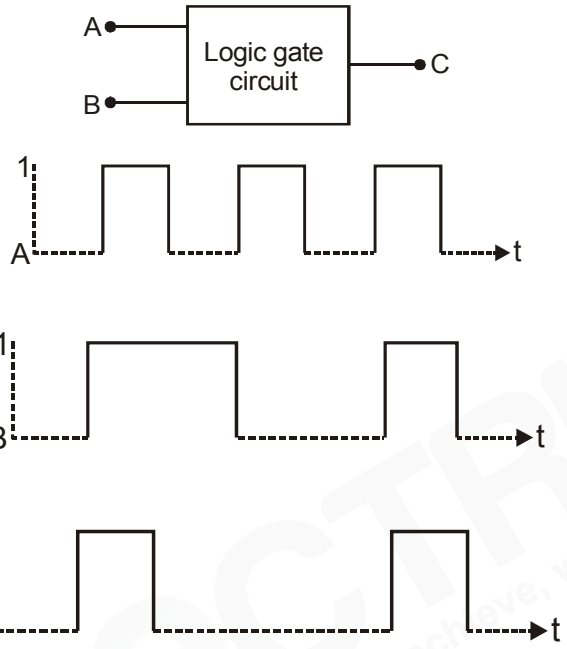
[4] (ii), (iii), (iv)

(SPACE FOR ROUGH WORK)

28. For transistor relation in current amplification factors is

[1] $\alpha = \frac{\beta}{1-\beta}$ [2] $\beta = \frac{\alpha}{1-\alpha}$ [3] $\alpha = \frac{1+\beta}{\beta}$ [4] $\beta = \frac{\alpha}{1+\alpha}$

29. The following figure shows a logic gate circuit with two inputs A and B and the output C. The voltage waveforms of A, B and C are as shown below



The logic circuit gate is

[1] OR gate [2] AND gate [3] NAND gate [4] NOR gate

30. A transistor is operated in common emitter configuration at constant collectorvoltage V_C = 1.5 V such that a change in the base current from 100 μA to 150μA produces a change in the collector current from 5 mA to 10 mA. The current gain [2] is

[1] 50 [2] 67 [3] 75 [4] 100

(SPACE FOR ROUGH WORK)

31. Chile saltpetre is
[1] $NaNO_3$ [2] Na_2SO_4 [3] KNO_3 [4] Na_2SO_3

32. Conductivity (unit Siemen's) is directly proportional to area of the vessel and the concentration of the solution in it and is inversely proportional to the length of the vessel then the unit of the constant of proportionality is
[1] $Sm\ mol^{-1}$ [2] $Sm^2\ mol^{-1}$ [3] $S^{-2}m^2\ mol$ [4] $S^2m^2\ mol^{-2}$

33. Na_2CO_3 can be manufactured by Solvey's process but K_2CO_3 cannot be prepared because
[1] K_2CO_3 is more soluble [2] K_2CO_3 is less soluble
[3] $KHCO_3$ is more soluble than $NaHCO_3$ [4] $KHCO_3$ is less soluble than $NaHCO_3$

34. The solubility of the alkali metal carbonates
[1] Increases at first and then decreases [2] Does not show regular variation
[3] Increases as we go down the group [4] Decreases as we go down the group

35. In the manufacture of iron lime stone added to the blast furnace, the calcium ion ends in the form of
[1] Slag [2] Gangue [3] Calcium metal [4] $CaCO_3$

36. If hydrogen electrode dipped in 2 solution of $pH = 3$ and $pH = 6$ and salt bridge is connected the e.m.f. of resulting cell is
[1] 0.177 *V* [2] 0.3 *V* [3] 0.052 *V* [4] 0.104 *V*

37. Which of the following metals cannot be extracted by carbon reduction process
[1] Pb [2] Al [3] Hg [4] Zn

38. 50 *ml* of 1 *M* oxalic acid (molar mass = 126) is shaken with 0.5 *gm* of wood charcoal. The final concentration of the solution after adsorption is 0.5 *M.* Amount of oxalic acid absorbed per *gm* of charcoal is
[1] 3.45 *gm* [2] 3.15 *gm* [3] 6.30 *gm* [4] None

SPACE FOR ROUGH WORK

39. In order to refine "blister copper" it is melted in a furnace and is stirred with green logs of wood. The purpose is

[1] To expel the dissolved gases in blister copper

[2] To bring the impurities to surface and oxidize them

[3] To increase the carbon content of copper

[4]To reduce the metallic oxide impurities with hydrocarbon gases liberated from the wood

40. On electrolysing a solution of dilute H_2SO_4 between platinum electrodes, the gas evolved at the anode is

[1] SO_2 [2] IF_5 [3] O_2 [4] H_2

41. On dissolving moderate amount of sodium metal in liquid NH_3 at low temperature, which one of the following does not occur

[1] Blue coloured solution is obtained

[2] Na^+ ions are formed in the solution

[3] Liquid NH_3 becomes good conductor of electricity

[4]Liquid ammonia remains diamagnetic

42. When 9.65 coulombs of electricity is passed through a solution of silver nitrate (atomic weight of $Ag = 107.87$ taking as 108) the amount of silver deposited is

[1]10.8 *mg* [2] 5.4 *mg* [3] 16.2 *mg* [4] 21.2 *mg*

43. Specific conductance (conductivity) of 0.1 *M* nitric acid is 6.3×10^{-2} ohm^{-1}cm^{-1}. The molar conductance of solution is

[1] 630 ohm^{-1}cm^{2}mole^{-1} [2] 315 ohm^{-1}cm^{2}mole^{-1}

[3] 100 ohm^{-1}cm^{2}mole^{-1} [4] 6300 ohm^{-1}cm^{2}mole^{-1}

44. Phenol $\xrightarrow[\text{Distillation}]{\text{Zn}} A \xrightarrow[\text{Conc. } HNO_3]{\text{Conc. } H_2SO_4} B \xrightarrow[\text{NaOH}]{\text{Zn}} C$ In the above reaction A, B and C are the following compounds

[1] $C_6H_6, C_6H_5NO_2$ and aniline

[2] C_6H_6, dinitrobenzene and metanitroaniline

[3] Toluene, metanitrobenzene and metatoluedine

SPACE FOR ROUGH WORK

[4] $C_6H_6, C_6H_5NO_2$ and hydrazobenzene

45. When lead storage battery is charged
[1] PbO_2 is dissolved
[2] H_2SO_4 is regenerated
[3] $PbSO_4$ is deposited on lead electrode
[4] Lead is deposited on lead electrode

46. A solution containing one mole per litre of each $Cu(NO_3)_2$, $AgNO_3$, $Hg_2(NO_3)_2$ and $Mg(NO_3)_2$, is being electrolysed by using inert electrodes. The values of standard electrode potentials in volts (reduction potentials) are
$Ag/Ag^+ = +0.80$, $2Hg/Hg_2^{2+} = +0.79$, $Cu/Cu^{2+} = +0.34$, $Mg/Mg^{2+} = -2.37$ with increasing voltage, the sequence of deposition of metals on the cathode will be
[1] Ag, Hg, Cu, Mg [2] Mg, Cu, Hg, Ag [3] Ag, Hg, Cu [4] Cu, Hg, Ag

47. For the adsorption of a gas on a solid, the plot of log (x/m) versus log P is linear with slope equal to
[1] k [2] log k [3] n [4] $1/n$

48. $\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{dil. } H_2SO_4} \underset{\text{Fructose}}{C_6H_{12}O_6}(aq) + \underset{\text{Glucose}}{C_6H_{12}O_6}(aq)$
In this reaction, dilute H_2SO_4 is called
[1] Homogeneous catalysis [2] Homogeneous catalyst
[3] Heterogeneous catalysis [4] Heterogeneous catalyst

49. Electrode potential of Zn^{2+}/Zn is $-0.76\,V$ and that of Cu^{2+}/Cu is $+0.34\,V$. The *EMF* of the cell constructed between these two electrodes is
[1] 1.10 *V* [2] 0.42 *V* [3] – 1.1 *V* [4] – 0.42 *V*

50. The purification of the colloidal particles from crystalloid dimensions through semipermeable membrane is known as
[1] Coagulation [2] Dialysis [3] Ultrafiltration [4] Peptisation

SPACE FOR ROUGH WORK

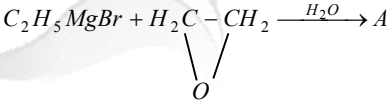
51. Primary and secondary alcohols on action of reduced copper give
[1]Aldehydes and ketones respectively
[2] Ketones and aldehydes respectively
[3] Only aldehydes
[4] Only ketones

52. The correct name of $[Pt(NH_3)_4Cl_2][PtCl_4]$ is
[1]Tetraammine dichloro platinum (iv) tetrachloro platinate (ii)
[2] Dichloro tetra ammine platinium (iv) tetrachloro platinate (ii)
[3] Tetrachloro platinum (ii) tetraammine platinate (iv)
[4] Tetrachloro platinum (ii) dichloro tetraammine platinate (iv)

53. Amongst $Ni(CO)_4$, $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$
[1] $Ni(CO)_4$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic
[2] $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic
[3]$Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic
[4] $Ni(CO)_4$ is diamagnetic and $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic

54. Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is
[1] Tetrahedral [2]Square planar
[3] Triangular bipyramid [4] Octahedral

55. In the following reaction '*A*' is



[1] $C_2H_5CH_2CHO$ [2] $C_2H_5CH_2CH_2OH$ [3] $C_2H_5CH_2OH$ [4] C_2H_5CHO

56. Types of isomerism shown by
$[Cr(NH_3)_5NO_2]Cl_2$ is
[1] Optical [2] Only Ionisation[3] Geometrical[4] Linkage and ionisation

SPACE FOR ROUGH WORK

57. Phenol is treated with bromine water and shaken well. The white precipitate formed during the process is
[1] *m*-bromophenol
[2] 2, 4-dibromophenol
[3] 2, 4, 6-tribromophenol
[4] A mixture of *o*- and *p*-bromophenols

58. In presence of *NaOH*, phenol react with $CHCl_3$ to form *o*-hydroxy benzaldehyde. This reaction is called
[1] Riemer-Tiemann's reaction [2] Sandmeyer's reaction
[3] Hoffmann's degradation reaction [4] Gattermann's aldehyde synthesis

59. $A \xrightarrow[\text{dil. } H_2SO_4]{K_2Cr_2O_7} B \xrightarrow[H_2O]{CH_3MgI} CH_3-\underset{\displaystyle OH}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_3$. The reactant *A* is

[1] $CH_3CHOHCH_3$ [2] CH_3COCH_3 [3] C_2H_5OH [4] CH_3COOH

60. The reaction, water gas $(CO+H_2)+H_2$ $673K, 300$ atmosphere in presence of the catalyst Cr_2O_3 / ZnO is used for the manufacture of
[1] *HCHO* [2] *HCOOH* [3] CH_3OH [4] CH_3COOH

SPACE FOR ROUGH WORK

61. The upper $\left(\frac{3}{4}\right)$th portion of a vertical pole subtends an angle $\tan^{-1}\left(\frac{3}{5}\right)$ at a point in the horizontal plane through its foot and at a distance 40 m from the foot. A possible height of the verticle pole is

[1] 20 m [2] 40 m [3] 60 m [4] 80 m

62. If a, b, c are in H.P. and a > c > 0, then $\frac{1}{b-c}-\frac{1}{a-b}$

[1] is positive [2] is zero [3] is negative [4] has no fixed sign.

63. The coordinates of the point on the parabola $y = x^2 + 7x + 2$, which is nearest to the straight line $y = 3x - 3$ are

[1] (-2, -8) [2] (1, 10) [3] (2, 20) [4] (-1, -4)

64. If z_1 and z_2 are two complex numbers such that $|z_1 - z_2| = ||z_1| - |z_2||$, then $\arg z_1 - \arg z_2$ is equal to

[1] $-\pi$ [2] $-\pi/2$ [3] $\pi/2$ [4] 0

65. From a moving point P on $x^2 + y^2 = 4$ tangent PA and PB are drawn to $x^2 + y^2 = a^2$ then the locus of the circumcentre of triangle PAB is ($|a| < 2$)

[1] $x^2 + y^2 = a^2 + 4$ [2] $x^2 + y^2 = 4 - a^2$ [3] $x^2 + y^2 = 1$ [4] none of these

66. Let a, b and c be positive real numbers such that a + b + c = 6. Then range of ab^2c^3 is

[1] $(0, \infty)$ [2] (0, 1) [3] (0, 108] [4] (6, 108]

67. If normal drawn at any point 'P' of parabola $y^2 = 4x$, meets the curve again at 'Q', then least distance of Q from origin is equal to;

[1] $6\sqrt{3}$ units [2] $4\sqrt{6}$ units [3] $9\sqrt{6}$ units [4] none of these

68. A circle C_2 passes through the centre of the circle C_1; $x^2 + y^2 = 2$ and gets bisected at its point of intersection with C_1. The radius of C_2 is equal to

[1] 1 units [2] 2 units [3] $\sqrt{2}$ [4] none of these

69. For a complex number z, $|z-1| + |z+1| = 2$. Then z lies on a

[1] parabola [2] line segment [3] circle [4] none of these

SPACE FOR ROUGH WORK

70. A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite bank of the river is 60º and when he retires 40 m away from the tree the angle of elevation becomes 30º. The breadth of the river is

[1] 60m [2] 30 m [3] 40 m [4] 20 m

71. The value of $\frac{1}{6.10}+\frac{1}{10.14}+\frac{1}{14.18}+....\infty$ equals to

[1] $\frac{1}{(24)^2}$ [2] $\frac{1}{6}$ [3] $\frac{1}{24}$ [4] $\frac{1}{(24)^3}$

72. Two circles of radii 'a' and 'b' touching each other externally, are inscribed in the area bounded by y = $\sqrt{1-x^2}$ and the x–axis. If b = $\frac{1}{2}$, then a is equal to

[1] $\frac{1}{4}$ [2] $\frac{1}{8}$ [3] $\frac{1}{2}$ [4] $\frac{1}{\sqrt{2}}$

73. If one end of the diameter of a circle is (3, 4) which touches the x-axis then the locus of other end of the diameter of the circle is

[1] parabola [2] hyperbola [3] ellipse [4] none of thee

74. Let r^{th} term of a series be given by $T_r = \frac{r}{1-3r^2+r^4}$. Then $\lim_{n\to\infty}\sum_{r=1}^{n} T_r$ is

[1] 3/2 [2] ½ [3] –1/2 [4] –3/2

75. The line x + y = 5 intersects the circle $x^2+y^2-6x-8y+21=0$ at points A and B, then the locus of the point C such that AC is perpendicular to BC is

[1] $x^2+y^2-6x-4y+11=0$ [2] $x^2+y^2-4x-6y+11=0$

[3] $x^2+y^2+6x+4y+11=0$ [4] none of these

76. Consider a square OABC in the argand plane, where 'O' is origin and A ≡ A(z_0). Then the equation of the circle that can be inscribed in this square is; (vertices of square are given in anticlockwise order)

[1] $|z - z_0(1+ i)| = |z_0|$ [2] $2\left|z-\frac{z_0(1+i)}{2}\right| = |z_0|$

[3] $\left|z-\frac{z_0(1+i)}{2}\right| = |z_0|$ [4] none of these .

SPACE FOR ROUGH WORK

77. A tower stands at the centre of a circular park. A and B are two points on the boundary of the park such that AB(=a) subtends an angle of 60° at the foot of the tower, and the angle of elevation of the top of the tower from A or B is 30º The height of the tower is

[1] $\frac{2a}{\sqrt{3}}$ [2] $2a\sqrt{3}$ [3] $\frac{a}{\sqrt{3}}$ [4] $\sqrt{3}$

78. The centre of the circle obtained by reflecting the circle $x^2 + y^2 = m^2 + m + 1$ in the line $y = mx + m$, is

[1] $\left(-\frac{2m^2}{1+m^2}, -\frac{2m}{1+m^2}\right)$ [2] $\left(-\frac{2m^2}{1+m^2}, \frac{2m}{1+m^2}\right)$

[3] $\left(\frac{2m}{1+m^2}, \frac{2m^2}{1+m^2}\right)$ [4] $\left(\frac{2m}{1+m^2}, -\frac{2m^2}{1+m^2}\right)$

79. The value of the expression $2\left(1+\frac{1}{\omega}\right)\left(1+\frac{1}{\omega^2}\right)+3\left(2+\frac{1}{\omega}\right)\left(2+\frac{1}{\omega^2}\right)+4\left(3+\frac{1}{\omega}\right)\left(3+\frac{1}{\omega^2}\right)+ \ldots +$ $(n+1)\left(n+\frac{1}{\omega}\right)\left(n+\frac{1}{\omega^2}\right)$, where ω is an imaginary cube root of unity, is

[1] $\frac{n\left(n^2+2\right)}{3}$ [2] $\frac{n\left(n^2-2\right)}{3}$

[3] $\frac{n^2(n+1)^2+4n}{4}$ [4] none of these

80. If at x = 1, y = 2x is tangent to the parabola $y = ax^2 + bx + c$, then respective values of a, b, c are

[1] $\frac{1}{2}, 1, \frac{1}{2}$ [2] $1, \frac{1}{2}, \frac{1}{2}$ [3] $\frac{1}{2}, \frac{1}{2}, 1$ [4] None of these

81. The point of intersection of the tangents of the circle $x^2 + y^2 = 10$, drawn at end points of the chord x + y = 2 is

[1] (-5, -5) [2] (-5, -4) [3] (-4, -5) [4] none of these

82. If normals are drawn form a point P (h, k) to the parabola $y^2 = 4ax$ then the sum of the intercepts which the normals cut off from the axis of the parabola is

[1] (h +a) [2] 3(h+a) [3] 2(h+a) [4] None of these

SPACE FOR ROUGH WORK

83. If z is a complex number such that $-\frac{\pi}{2} \le \arg z \le \frac{\pi}{2}$, then which of the following inequality is true

[1] $|z - \bar{z}| \le |z|(\arg z - \arg \bar{z})$ [2] $|z - \bar{z}| \ge |z|(\arg z - \arg \bar{z})$
[3] $|z - \bar{z}| < (\arg z - \arg \bar{z})$ [4] none of these

84. If a, b, c are in A.P a, x, b are in G.P and b, y, c are in G.P., then x^2, b^2, y^2 are in
[1] A.P. [2] G.P.
[3] H.P. [4] None of these

85. Let P be any moving point on the circle $x^2 + y^2 - 2x = 1$. AB be the chord of contact of this point w.r.t the circle $x^2 + y^2 - 2x = 0$. The locus of the circumcentre of the triangle CAB, (C being centre of the circles) is
[1] $2x^2 + 2y^2 - 4x + 1 = 0$ [2] $x^2 + y^2 - 4x + 2 = 0$
[3] $x^2 + y^2 - 4x + 1 = 0$ [4] $2x^2 + 2y^2 - 4x + 3 = 0$

86. The parametric coordinates of any point on the parabola $y^2 = x$ can be
[1] $(\sin^2\theta, \sin\theta)$ [2] $(\cos^2\theta, \cos\theta)$ [3] $(\sec^2\theta, \sec\theta)$ [4] none of these

87. If z_1 and z_2 are two complex numbers such that $|z_1| = |z_2| + |z_1 - z_2|$, then
[1] $\text{Im}\left(\frac{z_1}{z_2}\right) = 0$ [2] $\text{Re}\left(\frac{z_1}{z_2}\right) = 0$ [3] $\text{Re}\left(\frac{z_1}{z_2}\right) = \text{Im}\left(\frac{z_1}{z_2}\right)$ [4] none of these.

88. If length of a focal chord of parabola $y^2 = 4x$ is $\frac{25}{4}$ and has the positive slope, then the slope will be
[1] $\sqrt{3}$ [2] $\frac{1}{\sqrt{3}}$ [3] $\frac{4}{3}$ [4] 1

89. The equations of the common tangents of the circle $x^2 + y^2 - 2x - 6y + 9 = 0$ and $x^2 + y^2 + 6x - 2y + 1 = 0$ are
[1] x = 0, y = 4 [2] y = 0, x = 4 [3] y = 4, x = 4 [4] None of these

90. AB is a vertical pole with B at the ground level and A at the top. A man finds the angle of elevation of the point A from a certain point C on the ground is 60º. He moves away from the pole along the line BC to a point D such that CD = 7 m. From D the angle of elevation of the point A is 45º. Then the height of the pole is
[1] $\frac{7\sqrt{3}}{2}\left(\frac{1}{\sqrt{3}-1}\right)$ m [2] $\frac{7\sqrt{3}}{2}(\sqrt{3}+1)$ m [3] $\frac{7\sqrt{3}}{2}(\sqrt{3}-1)$ m [4] $\frac{7\sqrt{3}}{2}\left(\frac{1}{\sqrt{3}+1}\right)$ m

SPACE FOR ROUGH WORK