Test Date: 12/08/2020

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CODE

Aakash
Medical | IIT-JEE | Foundations
(Divisions of Aakash Educational Services Limited)

Regd. Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

Time : 3 hrs **MM : 186**

Mock Test_CoE_XII

for JEE (Advanced) - 2020

Test – 5A (Paper – I)_Actual Pattern-2019

Topics covered:

PHYSICS : MOCK TEST on Complete Syllabus

CHEMISTRY : MOCK TEST on Complete Syllabus

MATHEMATICS : MOCK TEST on Complete Syllabus

General Instructions:

1. Read each question carefully.
2. It is mandatory to use blue/black ballpoint pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should completely fill the circle.
4. Rough work must not be done on the answer sheet.
5. Do not use white-fluid or any other rubbing material on answer sheet.
6. Student cannot use log table and calculator or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Before handing over the answer sheet to the invigilator, candidate should check that Roll No., Centre Code and Date of Birth have been filled and marked correctly.
9. Immediately after the prescribed examination time is over, the answer sheet is to be returned to the invigilator.
10. **Pattern of the questions are as under:**
    (i) The question paper consists of three parts **(Physics, Chemistry and Mathematics)**. Each part has three sections.
    (ii) **Section-1:** This section contains **4** Multiple choice questions which have only one correct answer. Each question carries **+3** marks for correct answer and –1 mark for wrong answer.
    (iii) **Section-2:** This section contains **8** Multiple choice questions which have one or more correct answer(s). Each question carries **+4** marks for correct answer and –1 mark for wrong answer. Partial +1 mark is given for darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened.
    (iv) **Section-3:** This section contains **6** questions. The answer to each of the questions is a double-digit integer, ranging from 00 to 99 (both inclusive) without being given any option. Each question carries **+3** marks for correct answer and there is no negative mark for wrong answer.

PART – I : PHYSICS

SECTION - 1

Only One Option Correct Type

This section contains 4 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **Only one is correct**.

1. Consider the following decay reaction

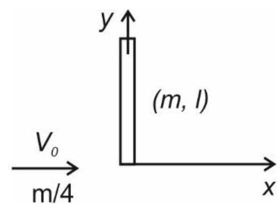
$Al^{25} \rightarrow Mg^{25} + e^{+} + v$

Q-Value of the reaction is $\left[Al^{25} = 24.990432U, Mg^{25} = 24.985833U\right]$

(A) 3.254 MeV (B) 4.276 MeV

(C) 6.184 MeV (D) 5.678 MeV

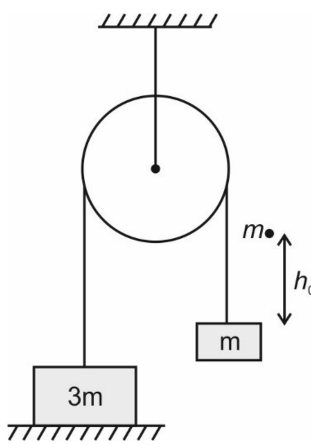
2. A uniform rod of length *l* and mass *m* rest along *y*-axis on smooth horizontal plane. A particle of mass $\frac{m}{4}$ is moving along *x*-axis at speed V_0. At time *t* = 0, particle strikes the rod elastically. Position of center of rod as function of time is



(A) $\left(\frac{V_0}{4}t\,\hat{i} + \frac{l}{2}\hat{j}\right)$ (B) $\left(\frac{V_0}{6}t\,\hat{i} + \frac{l}{2}\hat{j}\right)$

(C) $\left(\frac{V_0}{6}t\,\hat{i} + \frac{l}{4}\hat{j}\right)$ (D) $\left(\frac{V_0}{4}t\,\hat{i} + \frac{l}{4}\hat{j}\right)$

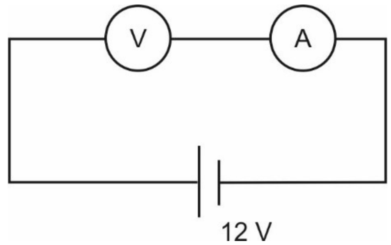
3. In the pulley system as shown in figure, a particle of mass m falls from height h_0 on block of mass *m* and gets sticks to it. Impulse imparted by normal reaction on the block of mass 'm', is



(A) $\frac{2m}{5}\sqrt{gh_0}$ (B) $\frac{2m}{5}\sqrt{2gh_0}$

(C) $\frac{4m}{5}\sqrt{2gh_0}$ (D) $\frac{3m}{5}\sqrt{2gh_0}$

4. In the circuit shown A and V stands for ammeter and voltmeter respectively. After connecting a certain resistance in parallel with voltmeter, reading of voltmeter decreases by factor of two and reading of ammeter increases by factor of two. Final reading of voltmeter is



(A) 4 V
(B) 6 V
(C) 8 V
(D) 10 V

SECTION - 2

One or More Options Correct Type

This section contains 8 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **one or more is/are correct**.

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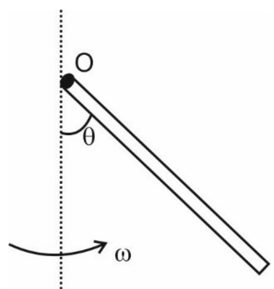
5. A rigid rod of length l rotates about vertical axis passing through smooth hinge at point 'O' as shown. If the angle of inclination of rod with vertical is 60°, then



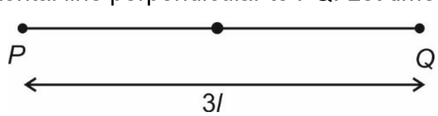
(A) Angular velocity of rod is $\sqrt{\dfrac{3g}{2l}}$

(B) Angular velocity of rod is $\sqrt{\dfrac{3g}{l}}$

(C) Hinge reaction in horizontal direction is $\dfrac{3\sqrt{3}\ Mg}{4}$

(D) Hinge reaction in horizontal direction is $\dfrac{3\ Mg}{2}$

6. A string of natural length $2l$ and modulus of elasticity k is stretched between two fixed point P and Q on smooth table. Distance between P, Q is $3l$. A point mass m is attached to the mid-point on the string and makes small oscillates in horizontal line perpendicular to PQ. Let time period be T, then

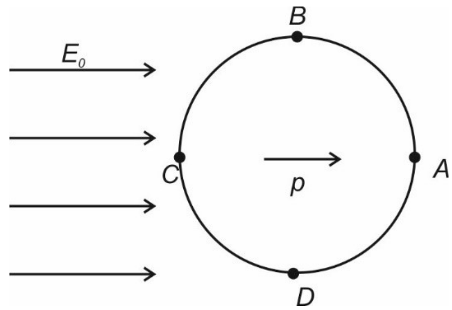


(A) T is independent length 'l'
(B) T is dependent on l
(C) Particle executes SHM
(D) Particle does not execute SHM but executes periodic motion

7. A hot body placed in surrounding of temperature 20°C obeys newton's laws of cooling, $\frac{dT}{dt} = -k(T - T_0)$. Its temperature at t = 0 is 40°C. The specific heat capacity is S and mass of body is m. If maximum heat, the body can loose is Q and time taken to loose 50% of this maximum heat is T_0, then

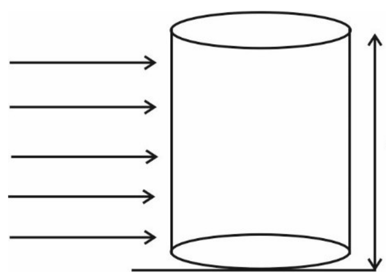
(A) $Q = 10$ m s
(B) $Q = 20$ m s
(C) $T_0 = \ln 2/k$
(D) $T_0 = 2 \ln 2/k$

8. A point electric dipole with dipole moment $\vec{p}$ is placed in the uniform electric field, $\vec{E}_0$. One of the equipotential surface enclosing the dipole forms a sphere as shown



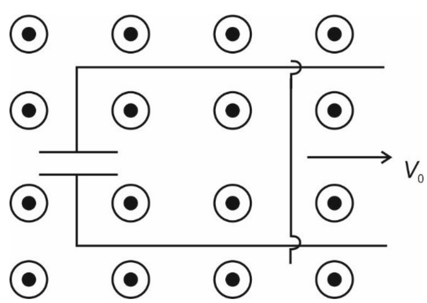
(A) Radius of sphere, is $\left[\frac{p}{2\pi \in_0 E_0}\right]^{1/3}$
(B) Radius of sphere, is $\left[\frac{p}{4\pi \in_0 E_0}\right]^{1/3}$
(C) Field at point A is $3E_0$
(D) Field at point B is zero

9. A parallel beam of light of intensity I is incident on a cylinder of height h and radius R placed on surface as shown in figure. If surface is reflecting then force exerted by beam is F_1, and force exerted by beam is F_2 if surface is absorbing



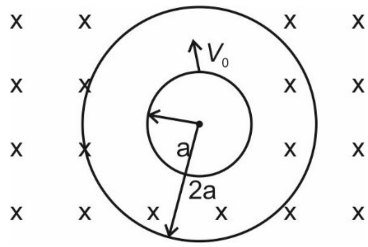
(A) $F_1 = \frac{8IRh}{3C}$
(B) $F_1 = \frac{9IhR}{4C}$
(C) $F_2 = \frac{2IRh}{C}$
(D) $F_2 = \frac{3IRh}{C}$

10. Two infinitely long conducting parallel rails are connected through a capacitor C as shown in figure. A conductor of mass m length l is given speed V_0 toward right



(A) Finally current in circuit is zero
(B) Finally current in circuit is non zero
(C) Terminal velocity of conductor is zero
(D) Terminal velocity of conductor is non zero

11. In an annular region of inner radius 'a' and outer radius 2*a*, *a* charge particle (q, m) is given radially outward velocity V_0 in magnetic field region given by $B = B_0\left(1 - \frac{kr}{2a}\right)$, where k is constant and r is radial distance. If charge particle exits the annular region with radially outward velocity only, then



(A) $k = \frac{1}{2}$ (B) $k = 1$

(C) flux through annular region is non zero (D) flux through annular region is zero

12. A fluid with viscosity η fills the space between two long co-axial cylinder of radius R and $2R$. The inner cylinder is stationary while the outer one is rotated with constant angular velocity ω_0. If the angular velocity of the rotating fluid at radius $\frac{3R}{2}$ is ω_1 and torque of the friction force acting on unit length of outer cylinder is τ, then

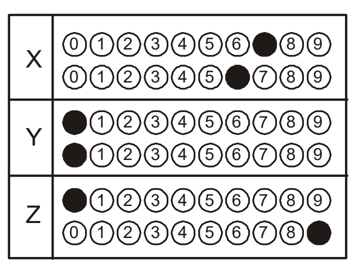
(A) $\tau = \frac{16}{3}\pi\eta\omega_0 R^2$ (B) $\tau = 4\pi\eta\omega_0 R^2$

(C) $\omega = \frac{20}{27}\omega_0$ (D) $\omega_1 = \frac{2}{3}\omega_0$

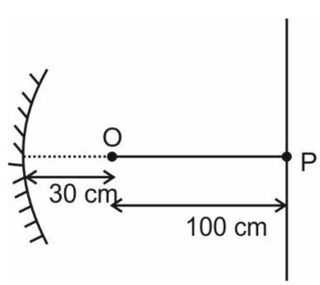
SECTION - 3

Integer Value Correct Type

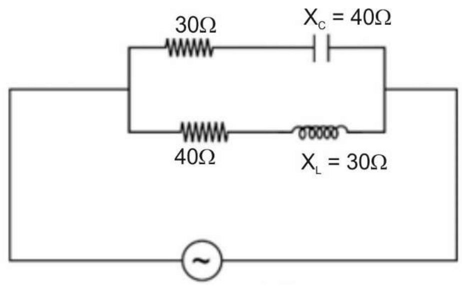
This section contains 6 questions. The answer to each of the questions is a **double-digit integer,** ranging from 00 to 99. The answer will have to be appropriately bubbled in the OMR as per the instructions. **Examples-** If the correct answer to question numbers X, Y and Z (say) are 76, 0 and 9 respectively, then mark 76, 00 and 09 in OMR respectively.



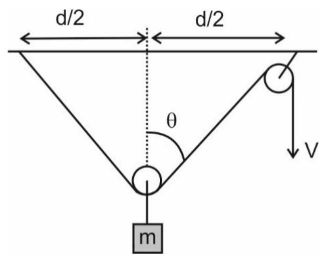
13. Intensity at a point P on the screen due to point source O is I_0. A concave mirror of focal length 30 cm is placed behind as shown. New intensity at point 'P' is $\frac{109}{n}I_0$, Value of n is ___



14. For the circuit shown in figure power factor of the circuit is $\frac{7}{\sqrt{2n}}$. Value of n is ____

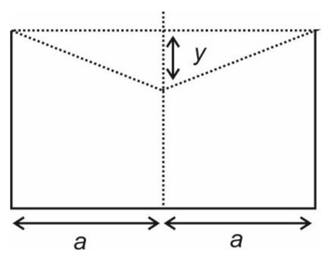


15. In the figure shown string is pulled with constant speed V. Acceleration of mass m as a function of θ is given by $\frac{V^2}{2d}(\tan\theta)^n$. Value of n is



16. A detector receives waves from three sources of frequency 98 Hz, 100 Hz and 102 Hz. Amplitude of each wave is A. If the detector remains active for amplitude greater than 2A, then time during which it remains idle in 60 S is n S. Value of n is ___

17. A uniform wire having mass per unit length λ is placed over a liquid surface. The wire causes the liquid to depress by y (<< a) as shown in figure. Surface tension of liquid is $\frac{\lambda a g}{n y}$. Value of n is___



18. Two identical galvanometer each of coil resistance 100Ω and full scale deflection current 10 mA are to be connected with two identical resistor of 100Ω. They are connected, in order to convert into a voltmeter of maximum possible voltage range. Maximum possible voltage range obtained is $\frac{n}{5}V$. Value of n is

PART – II: CHEMISTRY

SECTION - 1

Only One Option Correct Type

This section contains **4** Multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **Only one is correct**.

19. Which of the following metal ions gives a black ppt in presence of H_2S (in NH_4OH), forms a precipitate with NaOH which dissolves in excess of the regent and does not form a complex with excess of KCN?

(A) Zn^{2+} (B) Pb^{2+}

(C) Cu^{2+} (D) Ag^{+}

20. 0.05 moles of a complex compound $MCl_3.6H_2O$ was passed through a cation exchange resin and the solution coming out was neutralised completely with 250 ml of 0.4 N $Ca(OH)_2$. How many chloride ions are present inside the co-ordination sphere?

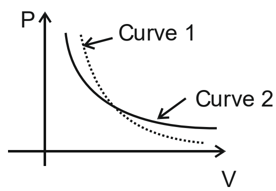
(A) 0

(B) 1

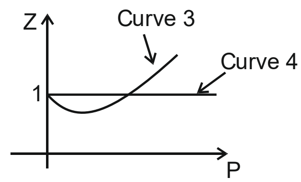
(C) 2

(D) 3

21. Consider the P vs V and Z vs P plots of a real gas at constant temperature as shown below



Plot (1)


Plot (2)

Which of the following are representation of real gas?

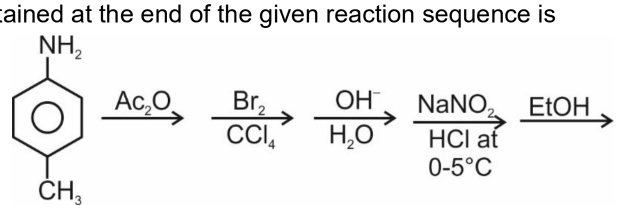
(A) Curve 1 and Curve 3

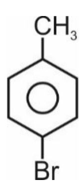
(B) Curve 2 and Curve 3

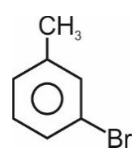
(C) Curve 1 and Curve 4

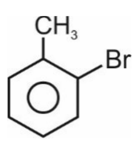
(D) Curve 2 and Curve 4

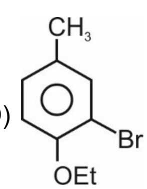
22. The major product obtained at the end of the given reaction sequence is



(A) 

(B) 

(C) 

(D) 

SECTION - 2

One or More Options Correct Type

This section contains **8** multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **one or more is/are correct**.

23. Which of the following statement(s) is/are correct?

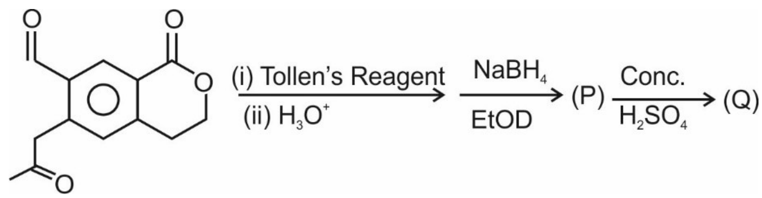
(A) CrO is basic and CrO_3 is acidic

(B) Aqua regia oxidised Au to +3 oxidation state

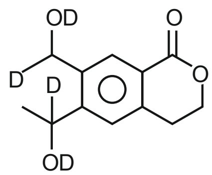
(C) Both Mn^{3+} and Cr^{2+} have same $3d^4$ configuration but Mn^{3+} functions as oxidising agent and Cr^{2+} functions as reducing agent

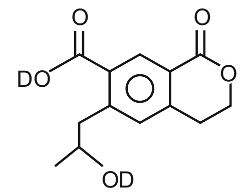
(D) Oxygen and fluorine stabilise the higher oxidation states of metals to a greater extent than other non metals when bonded to the same metal

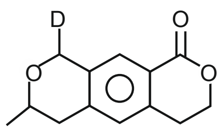
24. Consider the reaction sequence given below

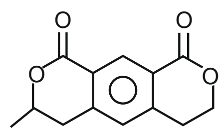


Select the correct statement(s)

(A) P is 

(B) P is 

(C) Q is 

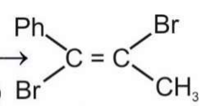
(D) 

25. Which of the following correctly represent the major product or property of major product(s)?

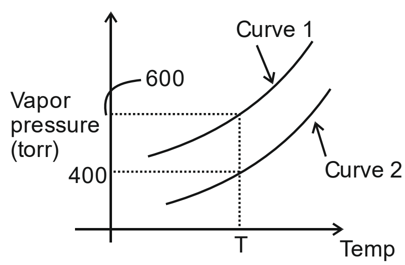
(A) $Ph-C\equiv C-CH_3 \xrightarrow[H_2O]{Br_2} Ph-\overset{O}{\overset{||}{C}}-C(Br)_2-CH_3$

(B) $Ph-C\equiv C-CH_3 \xrightarrow[\text{liq } NH_3]{Na} \xrightarrow[CCl_4]{Br_2}$ Meso Compound

(C) $Ph-C\equiv C-CH_3 \xrightarrow[\text{Lindlar's Catalyst}]{H_2} \xrightarrow[\text{Reagent}]{\text{Baeyer's}}$ Racemic Mixture

(D) $Ph-C\equiv C-CH_3 \xrightarrow[CCl_4\ (1\text{ eq})]{Br_2}$ 
(Trans)

26. The Vapour pressure diagram of Benzene and Toluene is given below (not necessarily in order)



The Vapour pressure above a solution of Benzene and toluene is 550 torr at T K. Select the correct statement(s)

(A) Curve 1 is for Toluene Curve 2 is for Benzene

(B) Curve 1 is for Benzene, Curve 2 is for Toluene

(C) Composition in Vapour phase of Benzene and Toluene are respectively $\frac{2}{11}$ and $\frac{9}{11}$

(D) Composition in Vapour phase of Benzene and Toluene are respectively $\frac{9}{11}$ and $\frac{2}{11}$

27. The conductivity of 10^{-3} M Na_2SO_4 solution is 2.6×10^{-2} Sm^{-1} and it changes to 7×10^{-2} S m^{-1} when the solution is saturated with $CaSO_4$. The molar conductivity of Na^+ and Ca^{2+} at infinite dilution are 50 and 120 S cm^2 mol^{-1} and assuming the actual molar conductivity to be equal to limiting molar conductivity, select the correct statement(s)

(A) Limiting molar conductivity of Na_2SO_4 is 260 S cm^2 mol^{-1}

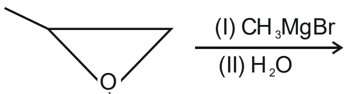
(B) Limiting molar conductivity of SO_4^{2-} is 160 S cm^2 mol^{-1}

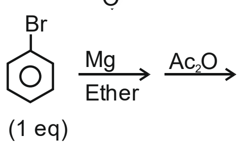
(C) Limiting molar conductivity of $CaSO_4$ is 240 S cm^2 mol^{-1}

(D) Conductivity due to $CaSO_4$ is 4.4×10^{-4} S cm^{-1}

28. Product of which of the following reactions can give positive iodoform test?

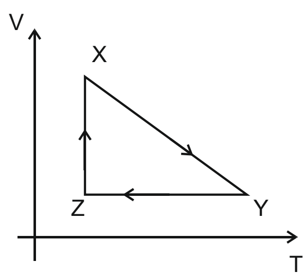
(A) $CH_3 - CH = CH_2 \xrightarrow[NaBH_4]{Hg(OAc)_2, THF}$

(B) 

(C) 

(D) $PhCHO \xrightarrow[EtOH]{CN^-}$

29. Consider the V-T diagram given below



Which of the given statements are correct?

(A) $W_{x \to y}$ is positive

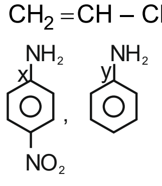
(B) $\Delta S_{y \to z}$ is positive

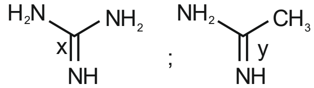
(C) $\Delta H_{x \to y}$ is negative

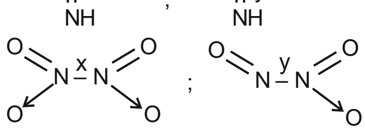
(D) Heat is released in $z \to x$

30. Consider the structures given below and select those in which the indicated bond length x is greater than y.

(A) $CH_2 \overset{x}{=} CH - CH = CH_2$, $CH_2 \overset{y}{=} CH_2$

(B) 

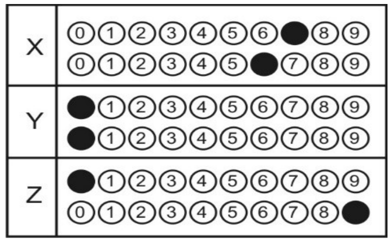
(C) 

(D) 

SECTION - 3

Integer Value Correct Type

This section contains **6** questions. The answer to each of the questions is a **double-digit integer,** ranging from 00 to 99. The answer will have to be appropriately bubbled in the OMR as per the instructions given. **Examples-** If the correct answer to question numbers X, Y and Z (say) are 76, 0 and 9 respectively, then mark 76, 00 and 09 in OMR respectively



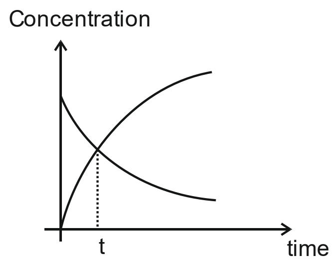
31. Consider the equilibrium

$$NH_2COONH_4(s) \rightleftharpoons N_2(g) + 3H_2(g) + CO(g) + \frac{1}{2}O_2(g)$$

The value of K_p (in suitable atm units) is 3^x2^y and the total pressure at equilibrium is 11 atm. What is the value of (x + 2y)?

32. The stereoisomers of 3,4-Dimethylcyclopentane-1,1-dicarboxylic acid are subjected to heating and undergo decarboxylation. How many cyclic compounds (including stereo isomers) are formed?

33. For the first order dissociation reaction $An \longrightarrow nA$ the following plot of concentration was obtained



If 't' corresponds to the time in which $\left(\frac{1}{7}\right)^{th}$ of the reactant has dissociated, the value of n is

34. Consider the following ores or minerals or compounds

(i) Magnesite	(ii) Kaolinite
(iii) Wolframite	(iv) Malachite
(v) Cryolite	(vi) Epsom
(vii) Dolomite	(viii) Chromite

The number of species containing more than one type of metal is x. The number of oxygen containing compounds are y. The number of magnesium containing compounds is z. The value of (x + y + z) is

35. Aq solution of $Na_2S_2O_3$ upon reaction with Cl_2 and I_2 separately form sulphur containing compounds X and Y. The average oxidation state of sulphur in X and Y are respectively x and y. The value of (x + 2y) is equal to

36. Total number of geometrical isomers for the complex $[Pt(Cl)(Br)(PPh_3)(NH_3)]$ is

PART – III : MATHEMATICS

SECTION - 1

Only One Option Correct Type

This section contains 4 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **Only one is correct**.

37. $I = \int_0^1 \frac{\sin x}{\sqrt{x}} dx$ and $J = \int_0^1 \frac{\cos x}{\sqrt{x}}$, then

(A) $I > \frac{2}{3}$ and $J > 2$
(B) $I < \frac{2}{3}$ and $J > 2$
(C) $I < \frac{2}{3}$ and $J < 2$
(D) $I > \frac{2}{3}$ and $J < 2$

38. A curve is represented by the equations, $x = \sec^2 t$ and $y = \cot t$ where t is a parameter. If the tangents at the point P on the curve where $t = \frac{\pi}{4}$ meets the curve again at the point Q then $|PQ|$ is equal to

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

39. If α, β, γ are roots of $x^3 - x^2 + 4 = 0$, then the equation whose roots are $\alpha + \beta^2 + \gamma^2$, $\beta + \gamma^2 + \alpha^2$, $\gamma + \alpha^2 + \beta^2$ is

(A) $x^3 + 3x^2 - x + 19 = 0$
(B) $x^3 - 3x^2 + x + 19 = 0$
(C) $x^3 - 3x^2 - x + 19 = 0$
(D) $x^3 - 3x^2 - x - 19 = 0$

40. If $x, y \in R - \{0\}$ and $xy(x^2 - y^2) = x^2 + y^2$, then minimum value of $x^2 + y^2$ is

(A) 1
(B) 2
(C) 4
(D) 8

SECTION - 2

One or More Options Correct Type

This section contains 8 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **one or more is/are correct**.

41. Let $f_n(x) = \sum_{r=1}^{n} \frac{\sin^2 x}{\cos^2\left(\frac{x}{2}\right) - \cos^2\left(\frac{2r+1}{2}\right)x}, g_n(x) = \prod_{r=1}^{n} f_r(x)$. If $I_n = \int_0^{\pi} \frac{f_n(x)}{g_n(x)} dx$, , then $\sum_{K=1}^{100} I_K = m\pi \ (m \in N)$.

Which of the following are factors of m?

(A) 5
(B) 25
(C) 2
(D) 10

42. If (1 + 3 + 5 + …+ p) + (1 + 3 + 5 + …. + q) = (1 + 3 + 5 + …+ r) where each set of parenthesis contain the sum of consecutive odd integers and $p > 6$ then

(A) The smallest possible value of $p + q + r = 21$
(B) The maximum value of $p + q + r = 21$
(C) $p + q + r$ can attain the value 45
(D) $p + q + r$ is an odd prime integer

43. Consider the function $f(x) = \begin{cases} \{x\} + 2 & x \in [-4, -3) \cup (3, 4] \\ 1 + \operatorname{sgn}(x) & x \in [-3, -2) \cup (2, 3] \\ [\![x]\!] & x \in [-2, -1) \cup (1, 2] \\ |x| & x \in [-1, 1] \end{cases}$ in the interval [–4, 4]. Where [.] and {.} denotes the greatest integer function and fractional part function. Then

(A) $f(x)$ is discontinuous at 5 points in [–4, 4]
(B) $f(x)$ is nondifferentiable at 7 points in (–4, 4)
(C) The range of $f(x)$ is [0, 3)
(D) $f(x)$ is non differentiable at 6 points in (–4, 4)

44. If [.] denotes the greatest integer function, then which of the following limit(s) exist(s)?

(A) $\lim_{x \to 0} \left[\frac{1}{\sqrt{2}} \sqrt{1 + \cos\left(\sqrt{2 + 2\cos(2[x])}\right)} \right]$
(B) $\lim_{x \to 0} \left[\frac{1}{\sqrt{2}} \sqrt{1 + \cos\left(\sqrt{2 - 2\cos(2[x])}\right)} \right]$

(C) $\lim_{x\to 0}\left[\frac{1}{\sqrt{2}}\sqrt{1-\cos\left(\sqrt{2+2\cos(2[x])}\right)}\right]$

(D) $\lim_{x\to 0}\left[\frac{1}{\sqrt{2}}\sqrt{1-\cos\left(\sqrt{2-2\cos(2[x])}\right)}\right]$

45. Consider two curves

C_1: $y^2 = 4(x - \lambda)$ & C_2: $x^2 = 4(y - \lambda)$

Where λ is a parameter then which of the following is/are true?

(A) There is a single value of 'λ' for which these two curves have exactly one point of intersection & co-ordinates of that point of intersection is (2, 2)

(B) If $\lambda = -2$, then area bounded by these two curves & coordinate axes in the first quadrant is $\frac{8}{3}\left(4+3\sqrt{3}-2\sqrt{2}\right)$ units^2

(C) The minimum area of circle which touches both these parabola is $\frac{\pi}{2}$ units^2, if $\lambda = 2$

(D) If $\lambda = -4$, then there are only two points common to C_1 & C_2

46. Let A and B any two independent events if α and β are any two positive real numbers such that $\alpha\sqrt{P\left(\frac{A}{B}\right)}+\beta\sqrt{\left(\frac{\overline{A}}{B}\right)}=\frac{2}{3}$, then $9(\alpha^2 + \beta^2)$ can take the values(s)

(A) 5

(B) 3

(C) 6

(D) 4

47. Consider a function $f(x)=\left|\sin^2(\pi\{x\})-2\cos(\pi\{x\})+1\right|$ where $x \in (0, 3)$ and {.} represents the fractional part function.

A solution of the equation $f(x) = 2$ can lie in the interval

(A) $\left(\frac{1}{3},\frac{2}{3}\right)$

(B) $\left[1,\frac{3}{2}\right]$

(C) $\left(\frac{3}{2},2\right)$

(D) $\left(\frac{9}{4},\frac{11}{4}\right)$

48. Which of the following curve(s) is/are orthogonal

(A) $\frac{x^2}{21}+\frac{y^2}{17}=1, \frac{x^2}{3}-\frac{y^2}{1}=1$

(B) $\frac{x^2}{47}+\frac{y^2}{4}=1, \frac{x^2}{21}-\frac{y^2}{23}=1$

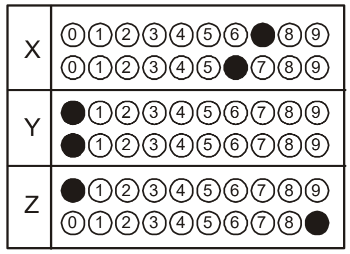
(C) $\frac{x^2}{49}+\frac{y^2}{4}=1, \frac{x^2}{23}-\frac{y^2}{22}=1$

(D) $\frac{x^2}{21}+\frac{y^2}{9}=1, \frac{x^2}{42}-\frac{y^2}{30}=1$

SECTION - 3

Integer Value Correct Type

This section contains 6 questions. The answer to each of the questions is a **double-digit integer,** ranging from 00 to 99. The answer will have to be appropriately bubbled in the OMR as per the instructions. **Examples-** If the correct answer to question numbers X, Y and Z (say) are 76, 0 and 9 respectively, then mark 76, 00 and 09 in OMR respectively.



49. If $\lim\limits_{n\to\infty}\left[\dfrac{{}^{3n}C_n}{{}^{2n}C_n}\right]^{\frac{1}{n}} = \dfrac{a}{b}$, where a, b are relatively prime positive integers then (a + b) equals

50. If $z_1, z_2 \in R$, $z_1\left(z_1^2 - 3z_2^2\right) = 2$ and $z_2\left(3z_1^2 - z_2^2\right) = 11$, then the value of $z_1^2 + z_2^2$ is

51. If the length of the three altitudes of a triangle are 2, 2 and 3 and r, Δ be the inradius and area of the triangle respectively, then $\left(r + \dfrac{\Delta}{\sqrt{2}}\right)$ is….

52. If the range of the function $f:\{1,2,3,4,5\} \to \{1,2,3,4,5\}$ assumes exactly 3 distinct values then if number of such functions are N then $\dfrac{N}{30}$ is

53. If $f_1(x) = \dfrac{x}{2} + 10, \forall x \in [2,20]$ and define $f_n(x) = f_1(f_{n-1}(x)) \forall x \in [2,20]; n \ge 2$ and $\lim\limits_{n\to\infty} f_n(x) = g(x)$ and if $\displaystyle\int_{\frac{g(x)}{2}}^{g(x)-2} \frac{dx}{1+x^a} < \frac{1}{2}$ then least positive integral value of a equals

54. Let $x \in R^+$ and maximum of $\dfrac{x^2 + 2 - \sqrt{x^4 + 4}}{x}$ is $\dfrac{K}{\sqrt{2}+1}$, then K = …..

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