VMC Vidyamandir Classes SINCE 1986
IIT JEE | MEDICAL | FOUNDATION

CODE A

JEE Advanced-1 | Paper-2 | JEE 2024

Maximum Marks: 180

Timing: 2:00 PM to 5:00 PM **Duration : 3.0 Hours**

General Instructions

1. The question paper consists of 3 Subject (Subject I: **Physics**, Subject II: **Chemistry**, Subject III: **Mathematics**). Each Part has **three** sections (Section 1, Section 2 & Section 3).

2. **Section 1** contains **4 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.

   Section 2 contains **6 Multiple Correct Answers Type Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE CHOICE** is correct.

   Section 3 contains **8 Single Digit Integer Type Questions** ranging from **0 to 9**, Both Inclusive. For each question, enter the correct numerical value of the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.

3. For answering a question, an ANSWER SHEET (OMR SHEET) is provided separately. Please fill your **Test Code, Roll No.** and **Group** properly in the space given in the ANSWER SHEET.

Name of the Candidate (In CAPITALS) : _____

Roll Number : _____

OMR Bar Code Number : _____

Candidate's Signature : _____ **Invigilator's Signature** _____

Syllabus

Physics : Kinematics of a Particle, Relative Velocity, Motion in 2 Dimensions, Dynamics of a particle, Energy and Momentum

Chemistry : Stoichiometry I & II, Atomic Structure, Periodic Properties, Chemical Bonding, States of Matter, Thermochemistry, Thermodynamics, Chemical Equilibrium.

Mathematics : Quadratic Equations, Trigonometry, Sequence and Series, Function, Inverse Trigonometry Function, DC – 1

MARKING SCHEME

SECTION – 1 | (Maximum Marks: 12)

- This section contains **FOUR (04)** Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If only (all) the correct option(s) is(are) chosen

Zero Mark: 0 if none of the options is chosen (i.e. the question is unanswered)

Negative Marks: –1 In all other cases.

SECTION – 2 | (Maximum Marks: 24)

- This section consists of **Six (06)** Questions. Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is(are) chosen

Partial Marks: +3 If all the four options are correct but ONLY three options are chosen

Partial Marks: +2 If three or more options are correct but ONLY two options are chosen and both of which are correct

Partial Marks: +1 If two or more options are correct but ONLY one option is chosen, and it is a correct option

Zero Mark: 0 if none of the options is chosen (i.e. the question is unanswered)

Negative Marks: –2 In all other cases.

SECTION – 3 | (Maximum Marks: 24)

- **Section 3** contains **8 Single Digit Integer Type Questions** ranging from **0 to 9**, Both Inclusive. For each question, enter the correct numerical value of the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 **ONLY** the correct integer is entered.

Zero Mark: 0 If the questions is unanswered.

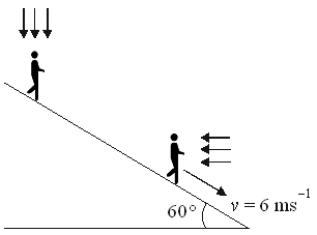
Negative Marks: –1 In all other cases.

SUBJECT I : PHYSICS 60 MARKS

SECTION - 1
SINGLE CHOICE CORRECT TYPE

Section 1 contains **4 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.

1. A man standing on an inclined plane observes that rain is falling vertically. When he starts moving down the inclined plane with velocity $v = 6$ m/s, he observes that rain is hitting him horizontally. The angle of inclination of the inclined plane is 60°. The actual speed of rain is:



(A) $2\sqrt{3}$ ms^{-1} **(B)** $3\sqrt{3}$ ms^{-1}

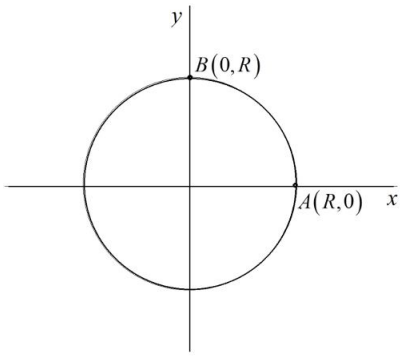
(C) 3 ms^{-1} **(D)** 6 ms^{-1}

2. From the top of a building of height h, a stone A is thrown vertically upwards with velocity v_0. At the same instant, another stone B is thrown vertically downwards with velocity v_0 from the same point. The stone A reaches its highest point at the same instant the stone B reaches the ground. The velocity v_0 is equal to:

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

SPACE FOR ROUGH WORK

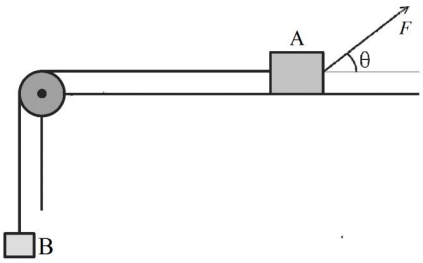
3. Two particles, A and B, are initially at rest at the points $(R, 0)$ and $(0, R)$. Starting at $t = 0$, the particles move anti-clockwise along the circular path of radius R centred at the origin shown in the figure, with constant speed v and $\frac{3v}{2}$. The time instant when the particles meet for the first time is:



(A) $t = \frac{\pi R}{v}$ **(B)** $t = \frac{3\pi R}{2v}$

(C) $t = \frac{2\pi R}{v}$ **(D)** $t = \frac{3\pi R}{v}$

4. Two blocks A and B of masses 6 kg and 1 kg respectively are arranged as shown with a massless string and ideal pulley. The block A rests on a rough horizontal table with coefficient of friction 0.1. A force of magnitude F is applied on A in a direction making an angle $\theta = \sin^{-1}(0.6)$ with the horizontal as shown. The range of values of F for which the blocks remain in equilibrium is: $(g = 10\ \text{m/s}^2)$



(A) $3.92\ N \le F \le 21.18\ N$ **(B)** $5.41\ N \le F \le 21.18\ N$

(C) $3.92\ N \le F \le 18.61\ N$ **(D)** $5.41\ N \le F \le 18.61\ N$

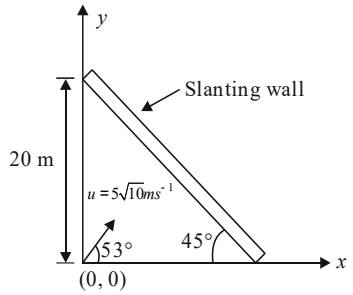
SPACE FOR ROUGH WORK

SECTION 2

MULTIPLE CORRECT ANSWERS TYPE

This Section contains **6 Multiple Correct Answers Type Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE CHOICE** is correct.

5. A projectile is fired at a speed of $5\sqrt{10}$ ms^{-1} at an angle of 53° with horizontal towards a fixed, slanting wall. Let the point of projection be the origin of coordinates and let the X and Y axes be along the ground and perpendicular to the ground as shown. Which of the following options is/are correct? $(g = 10\ \text{m/s}^2)$



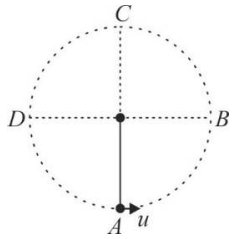
(A) Coordinates of the point where projectile hits the wall are (8, 12)

(B) Coordinates of the point where projectile hits the wall are (12, 8)

(C) Velocity of the projectile when it hits the wall is $(3\sqrt{10}\hat{i} + 1.6\hat{j})$ m/s

(D) Velocity of the projectile when it hits the wall is $3\sqrt{10}\hat{i}$ m/s

6. A small bob of mass m is suspended from a light string of length ℓ whose upper end is tied to a peg. The bob is given a horizontal velocity u at the bottommost point A such that it completes the vertical circle $ABCD$, and tension in the string at the topmost point C is mg. Which of these options are correct?



(A) $u = \sqrt{5g\ell}$

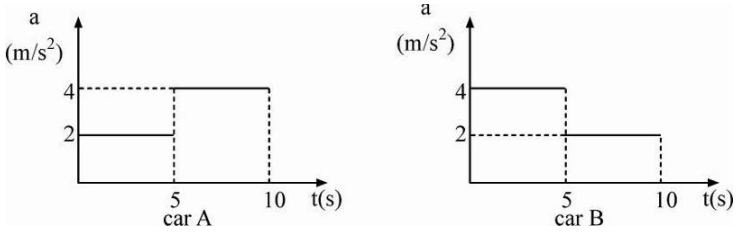
(B) $u = \sqrt{6g\ell}$

(C) Tension in the string when the bob passes through point B is 4 mg

(D) As the bob moves from A to C, tension in the string decreases continuously

SPACE FOR ROUGH WORK

7. Two cars *A* and *B* start from rest and move together for the same time interval. Their acceleration-time graphs are as shown. Choose the correct statement(s).



(A) Both the cars attain the same velocity after 10*s*

(B) The velocity of car *B* is more than that of car *A* after 10*s*

(C) The distance covered by car *B* is more than that of car *A* after 10*s*

(D) Both the cars travel the same distance after 10*s*

8. Two friends *A* and *B* are standing at a distance *x* apart in an open field and wind is blowing at a constant velocity *u* from *A* to *B*. A beats a drum and *B* hears its sound t_1 time after he sees the event. *A* and *B* interchange their positions and *A* beats the drum again. This time *B* hears the drum t_2 time after he sees the event. Neglect the time light takes in travelling between the friends. Wind is continuously blowing in the same direction. Choose the correct options.

(A) Velocity of sound in still air, $v = x\left(\frac{1}{t_1}+\frac{1}{t_2}\right)$

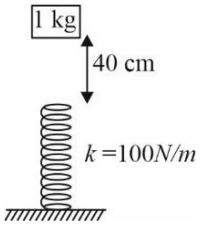
(B) Velocity of wind, $u = \frac{x}{2}\left(\frac{1}{t_1}-\frac{1}{t_2}\right)$

(C) Velocity of sound in still air, $v = \frac{x}{2}\left(\frac{1}{t_1}+\frac{1}{t_2}\right)$

(D) Velocity of wind, $u = x\left(\frac{1}{t_1}-\frac{1}{t_2}\right)$

SPACE FOR ROUGH WORK

9. A long spring of spring constant $100\,N/m$ is kept vertical with its lower end attached to the ground and the upper end free. A block of mass 1 kg is released above the spring so that it strikes the top of the spring after falling through a distance of 40 cm as shown. As the block compresses the spring, assume that the spring remains always vertical. Choose the correct options. (Take $g = 10\ \text{m/s}^2$).



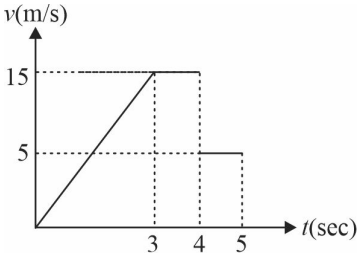
(A) Velocity of the block is maximum just before striking the spring

(B) Velocity of the block is maximum when the compression in spring is 10 cm

(C) Maximum compression of the spring is 10 cm

(D) Maximum compression of the spring is 40 cm

10. The figure shows the velocity as a function of time for an object of mass 10 kg being pushed along a frictionless horizontal surface by external horizontal force. At $t = 3s,$ the force stops pushing and the object moves freely. It then collides head on and sticks to another object of mass 25 kg.



(A) External force acting on the system is 50 N from $t = 0$ to $t = 3$ sec

(B) Speed of the 2nd particle just before the collision is 1 m/s

(C) Before collision both bodies are moving in the same direction

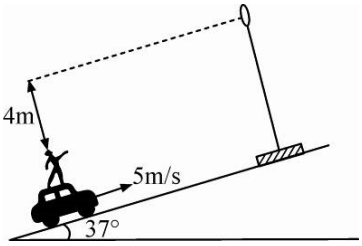
(D) Before collision, bodies are moving in opposite direction

SPACE FOR ROUGH WORK

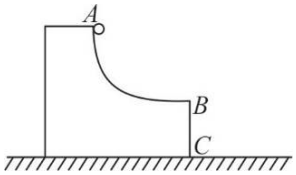
SECTION 3
SINGLE DIGIT INTEGER TYPE

This section contains **8 Single Digit Integer Type Questions** ranging from **0 to 9**, Both Inclusive. For each question, enter the correct numerical value of the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.

1. A man is travelling on a feat car which is moving up an inclined plane at a speed of $5m/s$ as shown. He throws a ball towards a stationary hoop located perpendicular to the incline in such a way that the ball moves parallel to the slope of incline while going through the centre of hoop which is $4m$ high from the man's hand. What is the time (in seconds) taken by the ball to reach the centre of hoop? $(g = 10\ \text{m/s}^2)$

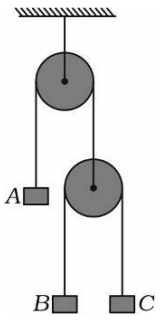


2. A particle is released from the top of a fixed track AB which is a quarter circle of radius 4m. It slides down its smooth surface, leaves the track at B and then lands on the ground. If the height BC is 4m, find the distance (in m) of the point of landing of the particle from C.



3. A particle of mass 1 kg is moving in one dimension under the action of a force that delivers a constant power 4W to the particle. If initial speed of the particle is zero, find its speed (in m/s) after 8 seconds.

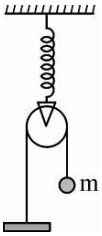
4. Three blocks A, B and C are arranged as shown with ideal pulleys and strings. The masses of the blocks B and C are 3 kg and 2 kg. For the block B to accelerate upwards, the mass of block A must be greater than _____kg.



SPACE FOR ROUGH WORK

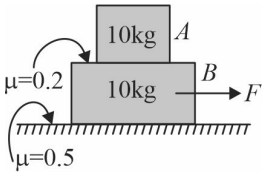
5. Starting from rest at $t = 0$, a car accelerates at $6\ \text{m/s}^2$ for 5 seconds, and then decelerates at $2\ \text{m/s}^2$ until it comes to rest at $t = T$. If the distance travelled by the car between $t = 0$ and $t = T_0$ is equal to the distance travelled by it between $t = T_0$ and $t = T$, the value of T_0 (to the nearest integer in seconds) is _____.

6. A body of mass m hangs by an inextensible string that passes over a smooth massless pulley that is fitted with a light spring of stiffness k as shown in figure. If the body is released from rest and the spring is initially relaxed, the maximum elongation of the spring is $\frac{nmg}{k}$. Find n.



7. Two skaters A and B, both of mass 70 kg, are approaching each other over a frictionless fixed surface, each with a speed of 1 m/s with respect to the surface. A carries a bowling ball of mass of 10 kg. Both skaters can throw the ball at 5 m/s relative to themselves. To avoid collision they start throwing the ball back and forth when they are 10 m apart. How many minimum number of throws are required?

8. Two blocks A and B are as shown in figure. The minimum horizontal force F applied on block 'B' for which slipping begins between 'B' and ground is $20n$. The value of n is _____.



SPACE FOR ROUGH WORK

SUBJECT II : CHEMISTRY 60 MARKS

SECTION - 1
SINGLE CHOICE CORRECT TYPE

Section 1 contains **4 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.

1. 1 L of an organic compound containing carbon, hydrogen and oxygen requires 2.5 L of oxygen to burn completely at STP and gives two litres each of CO_2 and H_2O vapour. The empirical formula of the compound is likely to be:

(A) C_2H_4O **(B)** CH_2O **(C)** C_2H_2O **(D)** C_4H_2O

2. The F – N – F bond angle in NF_3 is 102°30', whereas H – N – H bond angle in NH_3 is 107°48'. This difference in bond angle can be explained based on:

(A) VSEPR theory that the repulsion between bond pairs is less in NF_3 than in NH_3

(B) VSEPR theory that the repulsion between bond pairs is more in NF_3 than in NH_3

(C) Molecular orbital theory that predicts low bond order for NF_3 molecule

(D) The fact that the first ionization energy of fluorine is higher than that of hydrogen

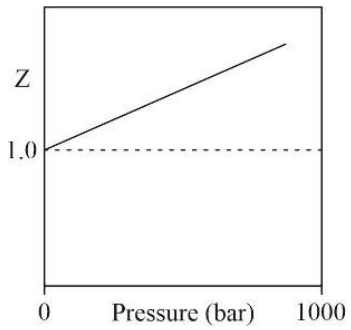
3. A photon of wavelength 300 nm is absorbed by a gas and then re-emitted as two photons, one with wavelength of 760 nm. The wavelength (in nm) of the second photon is approximately:

(A) 496 **(B)** 300 **(C)** 760 **(D)** 530

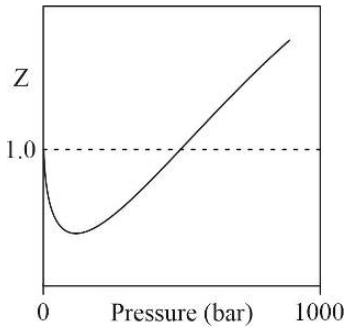
SPACE FOR ROUGH WORK

4. The Boyle temperature (T_B) is defined as the temperature at which the properties of a real gas coincide with those of an ideal gas in the low pressure limit. The graph that shows the pressure dependence of the compression factor (Z) for a real gas at T_B is:

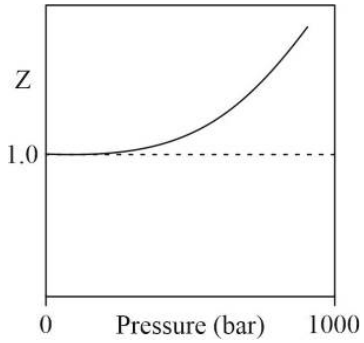
(A)



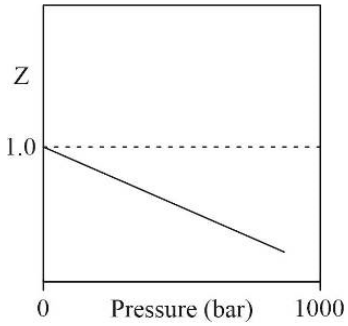
(B)



(C)



(D)



SPACE FOR ROUGH WORK

SECTION 2

MULTIPLE CORRECT ANSWERS TYPE

This Section contains **6 Multiple Correct Answers Type Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE CHOICE** is correct.

5. Among the following pair of diatomic molecules, choose the one where the bonding $\sigma(2p)$ orbitals is higher in energy than the $\pi(2p)$ orbitals.

(A) O_2 and F_2 **(B)** N_2 and B_2 **(C)** C_2 and HF **(D)** C_2 and B_2

6. SbF_5 reacts with XeF_4 and XeF_6 to form ionic compounds $[XeF_3]^+[SbF_6]^-$ and $[XeF_5]^+[SbF_6]^-$ respectively then molecular shape of $[SbF_6]^-$ and $[XeF_3]^+$ ion respectively are incorrectly given in which options ?

(A) Square pyramidal, T-shape **(B)** T-shape, Square pyramidal

(C) Octahedral, T-shape **(D)** See-saw, octahedral

7. Two identical containers, each of volume V_0 are joined by a small pipe of negligible volume. The containers contain identical gases at temperature T_0 and pressure P_0. One container is heated to temperature $3T_0$ while maintaining the other at the same temperature T_0. The common pressure of the gas is P and n is the number of moles of gas in container at temperature $3T_0$ then:

(A) $P = \frac{4P_0}{3}$ **(B)** $n = \frac{2P_0V_0}{3RT_0}$ **(C)** $n = \frac{P_0V_0}{2RT_0}$ **(D)** $P = \frac{3}{2}P_0$

SPACE FOR ROUGH WORK

8. For the reaction, $2NO(g)+O_2(g) \longrightarrow 2NO_2(g)$; $\Delta H = -35\,kcal$ at 300 K. If 6 moles of NO reacts with 3 moles of O_2 at constant pressure of 1 atm and temperature 300K to form NO_2 then the correct statement is/are: [Given R = 2 cal $mol^{-1}\,K^{-1}$]

(A) The amount of heat released by reaction is 35 kcal

(B) The internal energy of system decreased by 103.2 kcal

(C) The magnitude of work done by system is 1.8 kcal

(D) The amount of heat released by reaction is 105 kcal

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

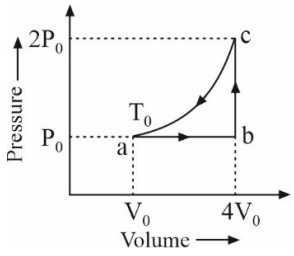
(A) The second ionization enthalpy of O is greater than that of F

(B) The third ionization enthalpy of P is greater than that of Al

(C) The first ionization enthalpy of Al is slightly greater than that of Ga

(D) The second ionization enthalpy of Cu is greater than that of Zn

10. One mole of an ideal monoatomic gas is caused to go through the cycle shown in the figure. The correct option(s) is/are:



(A) Change in internal energy from the path a to b is $8RT_0$

(B) Change in internal energy from path a to c is $\frac{21}{2}RT_0$

(C) Work done by the gas from path a to b is $4RT_0$

(D) Change in enthalpy from path a to b is $\frac{15}{2}RT_0$

SPACE FOR ROUGH WORK

SECTION 3
SINGLE DIGIT INTEGER TYPE

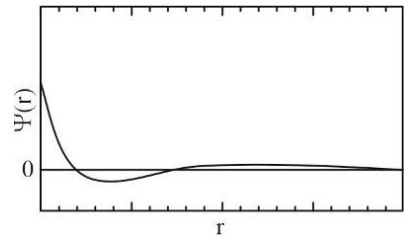
This section contains **8 Single Digit Integer Type Questions** ranging from **0 to 9**, Both Inclusive. For each question, enter the correct numerical value of the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.

1. The valve on a cylinder containing initially 1 litre of an ideal gas at 7 atm and 25°C is opened to the atmosphere (temperature is 25°C). Assuming that the process is isothermal, how much magnitude of work (in atm-Litre) is done on the atmosphere by the action of expansion?

2. How many electrons in a ground-state As atom in the gas phase have quantum numbers $n = 3$ and $l = 1$? [Given: Atomic Number of As = 33]

3. The formation of tetramminecopper(II) ion, $Cu(NH_3)_4^{2+}$, is a reversible reaction having formation constant $K_f = 1.1\times10^{13}$. The minimum concentration of free ammonia in solution required to ensure that at least 99% of the dissolved copper(II) ion is found in the form of its ammonia complex is 1.73×10^{-p} M. What is value of p? [Given : $\sqrt{3} = 1.732$]

4. An orbital has the radial wavefunction shown below. What is the value of the principal quantum number of the orbital?



SPACE FOR ROUGH WORK

5. 0.0005 moles of metal bromide were dissolved in water and 60.0ml of 0.025M silver nitrate solution was required for complete precipitation of silver bromide. The oxidation state of the metal ion in the metal bromide is _____.

6. In an acidic solution I^- changes to I_2. How many grams of I_2 is produced if, in the same process, 1.5×10^{22} electrons are used to reduce H_3AsO_4 to H_3AsO_3?

[Given : $N_A = 6\times10^{23}$, atomic mass of I = 127 g/mol]

Report your answer after rounding off to the nearest integer.

7. Metallic copper reacts with conc. nitric acid and produces $Cu(NO_3)_2$, NO_2 and H_2O. The variables given below as a, b, c, d and e represent the stoichiometric coefficients.

$$aCu(s) + bHNO_3(aq) \longrightarrow cCu(NO_3)_2(aq) + dNO_2(g) + eH_2O(\ell)$$

Find $\frac{a+b+c+d+e}{5}$.

8. An element 'X' has its electronic configuration of K-shell is $(n-5)s^2$ and it has total number of electrons in its outermost, penultimate and antepenultimate shell are 2, 8, 28 respectively then find out total number of unpaired electrons in element 'X' in their ground state.

SPACE FOR ROUGH WORK

SUBJECT III : MATHEMATICS 60 MARKS

SECTION - 1
SINGLE CHOICE CORRECT TYPE

Section 1 contains **4 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.

1. The domain of $f(x)=\sqrt[4]{x\left(2.3^{x}-\frac{4x^{2}+x+2}{x^{2}+x+1}\right)}$ is :

(A) $(-\infty, 0)\cup[101, \infty)$ **(B)** $(-\infty, 0)\cup[103, \infty)$

(C) $(-\infty, 0)\cup[93\ln 3, \infty)$ **(D)** $(-\infty,\infty)$

2. For an increasing geometric sequence $a_1, a_2, a_3, ..., a_n ....$ if $a_6 = 4a_4$ & $a_9 - a_7 = 192$ and $\sum_{i=4}^{n} a_i = 1016,$ then n is:

(A) 8 **(B)** 9 **(C)** 10 **(D)** 11

3. If a function $f:[-2, \infty)\to R$ is such that $f(x)=x^2+4x-\left|x^2-4\right|$, then range of $f(x)$ is:

(A) $(-\infty,\infty)$ **(B)** $[-6, 12]$ **(C)** $[-6, \infty)$ **(D)** $[-6, 4]$

4. Let $f(x)=ax^4+bx^2+3x+7$ and $f(-4)=2286$ and $f(4)=N$. The number of ways in which N can be resolved as a product of two divisors which are relatively prime:

(A) 15 **(B)** 16 **(C)** 17 **(D)** None of these

SPACE FOR ROUGH WORK

SECTION 2

MULTIPLE CORRECT ANSWERS TYPE

This Section contains **6 Multiple Correct Answers Type Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE CHOICE** is correct.

5. If $\sin(\sin x + \cos x) = \cos(\cos x - \sin x)$, then the value of $\sin x$ can be:

(A) $\frac{\pi}{4}$ **(B)** $\frac{\sqrt{16-\pi^2}}{4}$ **(C)** $\frac{\pi}{8}$ **(D)** $-\frac{\pi}{4}$

6. $f(x)$ is defined as follows:

$$f(x)=\begin{cases}(\sin x+\cos x)^{\cos ecx}, & -\frac{\pi}{2}<x<0\\ a, & x=0\\ \dfrac{e^{\frac{1}{x}}+e^{\frac{2}{x}}+e^{\frac{3}{|x|}}}{ae^{\frac{2}{x}}+be^{\frac{3}{|x|}}}, & 0<x<\frac{\pi}{2}\end{cases}$$

If $f(x)$ is continuous at $x=0$, choose the correct options.

(A) The function cannot be continuous at $x=0$ as LHL $\neq$ RHL

(B) The value of *a* is greater than 2

(C) The value of *b* is greater than 2

(D) The product *ab* is less than 2

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7. Consider $f(x)=\dfrac{\cos^{-1}\left(\cos\left(\sin x\right)\right)-\left|x-\pi\right|}{\sin^3 x}$, then :

(A) $\lim\limits_{x\to 0} f(x)$ does not exist **(B)** $f(x)$ has removable discontinuity at $x=\pi$

(C) Jump of discontinuity at $x=\pi$ is $\dfrac{1}{3}$ **(D)** $f(x)$ is discontinuous at all $x = n\pi,\ n\in I$

8. Let $f\left(x\right)=\cos^{-1}\left(\cos 2x\right)$ and $g\left(x\right)=\left|\cos x\right|$ then:

(A) number of solution of $f\left(x\right)=g\left(x\right)$ in $\left[0,2\pi\right]$ is 4

(B) $\max\left\{f\left(x\right),g\left(x\right)\right\}$ is a periodic function

(C) $\max\left\{f\left(x\right),g\left(x\right)\right\}$ is a non differentiable function for some x,

(D) $\min\left\{f\left(x\right),g\left(x\right)\right\}$ is an even function

9. Let $f\left(x^2+y\right)=\left(f\left(x\right)\right)^2+f\left(y\right)$ for $x,y\in R$, then :

(A) $f\left(x\right)$ is odd

(B) $f\left(x\right)$ is even $\Rightarrow$ $f\left(x\right)=0\forall x\in R$

(C) $f\left(x\right)$ is continuous at $x=0$ $\Rightarrow$ it is continuous everywhere

(D) $f\left(x\right)$ is differentiable at $x=0\Rightarrow f\left(x\right)=x\,f'\left(0\right),\ \forall x\in R$

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

(A) $(-3, 1)$ **(B)** $(-\infty,-3]$ **(C)** $[1,\infty)$ **(D)** $[-3,\infty)$

SPACE FOR ROUGH WORK

SECTION 3
SINGLE DIGIT INTEGER TYPE

This section contains **8 Single Digit Integer Type Questions** ranging from **0 to 9**, Both Inclusive. For each question, enter the correct numerical value of the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.

1. If 8 harmonic means are inserted between two numbers a and b $(a < b)$ such that arithmetic mean of a and b is $\frac{5}{4}$ times equal to geometric mean of a and b, then $\left(\frac{H_8 - a}{b - H_8}\right)$ is equal to ____.

2. Find the largest integer value of x satisfying the inequality $\log_{0.09}(x^2 + 2x) \geq \log_{0.3}\sqrt{x+2}$.

3. Let $P(x) = (m^2 + 4m + 5)x^2 - 4x + 7, \quad m \in R$. If $3 \leq x \leq 5$ then find the minimum of minimum value of $P(x)$.

4. If $f(x)$ is twice differentiable and $f''(0) = p$, then $\lim\limits_{x \to 0} \frac{2f(x) - 3f(2x) + f(4x)}{x^2}$ is kp. The value of k is _____.

SPACE FOR ROUGH WORK

5. The value of $(b+c)$ for which the identity $f(x+1)-f(x)=8x+3$ is satisfied, where $f(x)=bx^2+cx+d$, are:

6. Let $f(x)=(x-1)^2\sin\dfrac{1}{x-1}-|x|,\ x\neq 1$

$=-1,\ x=1$

be a real-valued function. The number of integral points where $f(x)$ is not differentiable is _____.

7. If α, β and γ are three distinct real values such that $\dfrac{\sin\alpha+\sin\beta+\sin\gamma}{\sin(\alpha+\beta+\gamma)}=\dfrac{\cos\alpha+\cos\beta+\cos\gamma}{\cos(\alpha+\beta+\gamma)}=2$ and $\cos(\alpha+\beta)+\cos(\beta+\gamma)+\cos(\gamma+\alpha)=a$, then find the value of $\lim\limits_{x\to a}\dfrac{\sqrt{x^2-a^2}}{\sqrt{x-a}+(\sqrt{x}-\sqrt{a})}$.

8. Find the sum of an infinite geometric series whose first term is $\lim\limits_{x\to 0}\sum\limits_{k=1}^{2013}\dfrac{\left\{\dfrac{x}{\tan x}+2k\right\}}{2013}$ and whose common ratio is the value of $\lim\limits_{x\to 0}\dfrac{e^{\tan^3 x}-e^{x^3}}{2\ln(1+x^3\sin^2 x)}$.

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End of JEE Advanced-1_Paper -2| XII PASS [JEE 2024]