Vidyamandir Classes
Gurukul for IITJEE Preparation

Mock Advanced Test-3 Paper-1

TIME : 3 hrs	M.M. : 210

Read the following Instructions very carefully before you proceed.

A. General

1. This booklet is your Question Paper. Do not break the seals of this booklet before being instructed to do so by the invigilators.

2. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers, and electronic gadgets are NOT allowed inside the examination hall.

3. **Using a black ball point pen, darken the bubbles on the upper original sheet.** Apply sufficient pressure so that the impression is created on the bottom sheet.

4. DO NOT TAMPER WITH/MUTILATE THE OMR OR THE BOOKLET.

5. Read carefully the Instructions printed at the beginning of each section.

B. Filling the Right Part of the OMR

6. 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.

C. Question Paper Format :

The question paper consists of **3 Subjects** (Physics, Chemistry and Mathematics). Each subject consists of two sections i.e., Section 1 & 2.

9. **Section I** contains 10 Multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** choices may be correct.

10. **Section II** contains 10 questions. The answer to each question is a Single Digit Integer, ranging from 0 to 9 (both inclusive).

D. Marking Scheme :

11. **Section-I** : For each question, you will be awarded **4 marks** If you darken ALL the bubble(s) corresponding to the correct answer(s) ONLY and zero marks If no bubbles are darkened. In all other cases, **minus one (–1) mark will be awarded in this section.**

14. **Section-II** : For each question, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer ONLY and zero marks If no bubbles are darkened. **No negative marks will be awarded for incorrect answers in this section.**

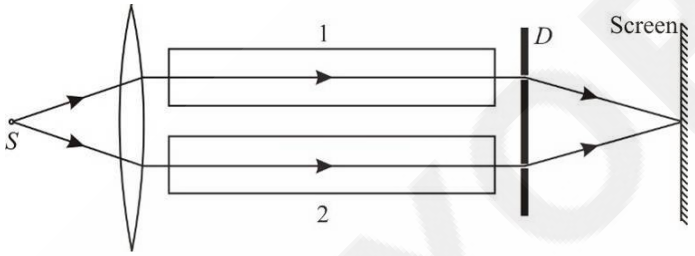
PART - I (PHYSICS)	70 MARKS

SECTION - I

MULTIPLE CORRECT ANSWERS

This section contains 10 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct:

1. Interference is obtained on a screen using a setup as shown in figure. *S* is a narrow slit illuminated by monochromatic light of wavelength λ, and 1 & 2 are identical tubes of length *l* filled with air. The diaphragm *D* has two slits as shown. If tube 1 is now filled with ammonia gas (Refractive index μ), then :



(A) Interference pattern will shift upwards

(B) Interference pattern will shift downwards

(C) Interference pattern will shift by $\frac{\omega}{\lambda}\mu l$, where ω is width of fringes obtained on screen

(D) Interference pattern will shift by $\frac{\omega}{\lambda}(\mu-1)\, l$, where ω is width of fringes obtained on screen

2. A parallel plate capacitor is connected to a cell. Its positive plate *A* and its negative plate *B* have charges $+Q$ and $-Q$ respectively. A third plate *C*, identical to *A* and *B*, with charge $+Q$, is now introduced midway between *A* and *B*, parallel to them. Which of the following are correct?

(A) The charge on the inner face of *B* is now $-\frac{3Q}{2}$

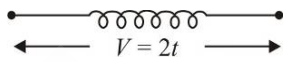
(B) There is no change in the potential difference between *A* and *B*

(C) The potential difference between *A* and *C* is one-third of the potential difference between *B* and *C*

(D) The charge on the inner face of *A* is now $Q/2$

SPACE FOR ROUGH WORK

3. A time varying voltage $V = 2t$ (Volt) is applied across an ideal inductor of inductance $L = 2H$ as shown in figure. Then : (Assume current to be zero at $t = 0$)



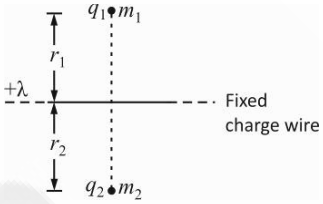
(A) Current versus time graph is a parabola

(B) Energy stored in magnetic field at $t = 2s$ is 4 J

(C) Potential energy at time t = 1 s in magnetic field is increasing at a rate of 1 J/s

(D) Energy stored in magnetic field is zero all the time

4. For the arrangement shown in the figure, the two point charges are in equilibrium. The infinite wire is fixed in the horizontal plane and the two point charges are placed one above and the other below the wire.



Considering the gravitational effect of the earth, the nature of q_1 and q_2 can be :

(A) $q_1 \to +ve,\ q_2 \to +ve$ **(B)** $q_1 \to +ve,\ q_2 \to -ve$

(C) $q_1 \to -ve,\ q_2 \to -ve$ **(D)** $q_1 \to -ve,\ q_2 \to +ve$

5. A student performs an experiment for determination of $g\left(=\frac{4\pi^2\ell}{T^2}\right)$, using a second's pendulum with $\ell \approx 1m$ and he commits an error of $\Delta\ell$. For T he takes the time of n oscillations with the stop watch of least count ΔT and he commits a human error of 0.1sec. For which of the following data, the measurement of g will be most accurate?

	$\Delta\ell$	ΔT	n	Amplitude of oscillation
(A)	5mm	0.2sec	10	5mm
(B)	5mm	0.2sec	20	5mm
(C)	5mm	0.1sec	20	1mm
(D)	1mm	0.1sec	50	1mm

6. Following are equations of four waves (x, y, z are Cartesian coordinates)

I. $y_1 = a\sin\omega\left(t - \frac{x}{v}\right)$ **II.** $y_2 = a\cos\omega\left(t + \frac{x}{v}\right)$

III. $z_1 = a\sin\omega\left(t - \frac{x}{v}\right)$ **IV.** $z_2 = a\cos\omega\left(t + \frac{x}{v}\right)$

Which of the following statements are correct?

(A) On superposition of waves I and III, a travelling wave having amplitude $a\sqrt{2}$ will be formed

(B) Superposition of waves II and III is not possible

(C) On superposition of waves I and II, a stationary wave having amplitude $a\sqrt{2}$ will be formed

(D) On superposition of III and IV, a transverse stationary wave will be formed

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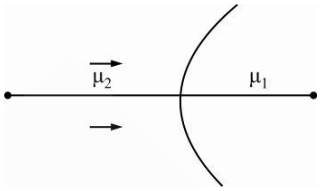
7. Two refraction media are separated by a spherical interface as shown in the figure.



(A) If $\mu_2 > \mu_1$, then there cannot be a real image of real object

(B) If $\mu_2 > \mu_1$, then there cannot be a real image of virtual object

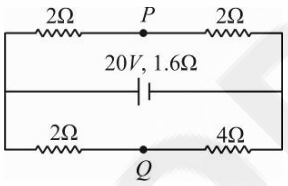
(C) If $\mu_1 > \mu_2$, then there cannot be a virtual image of virtual object

(D) If $\mu_1 > \mu_2$, then there cannot be a real image of real object

8. A vessel is partially filled with liquid. When the vessel is cooled to a lower temperature, the space in the vessel unoccupied by the liquid remains constant. Then the volume of the liquid (V_L) volume of the vessel (V_V), the coefficient of cubical expansion of the material of the vessel (γ_V) and of the liquid (γ_L) are related as :

(A) $\gamma_L > \gamma_V$ **(B)** $\gamma_L < \gamma_V$ **(C)** $\frac{\gamma_V}{\gamma_L} = \frac{V_V}{V_L}$ **(D)** $\frac{\gamma_V}{\gamma_L} = \frac{V_L}{V_V}$

9. In the given circuit figure.



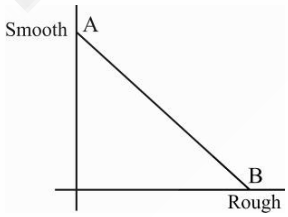
(A) The current through the battery is 5*A*

(B) *P* and *Q* are at the same potential

(C) *P* is 2*V* higher than *Q*

(D) *Q* is 2*V* higher than *P*

10. A ladder *AB* is standing against a wall as shown in the figure. A boy starts from *B* and moves towards *A*. If ladder is at equilibrium at every instant, Then :



(A) Normal reaction at *A* will increase

(B) Normal reaction at *A* will decrease

(C) Normal reaction at *B* will remain unchanged

(D) Force of friction at *B* will increase

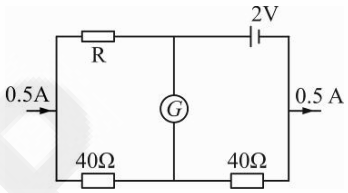
SPACE FOR ROUGH WORK

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

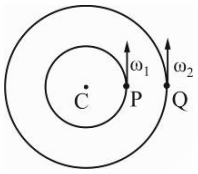
This section contains 10 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. A fighter jet is flying horizontally with a speed of 250 m/s at an altitude of *h*. A tank is moving at a speed of 50 m/s on ground. The jet fires a bomb with a speed of 1000 m/s (with respect to itself) at an angle of 37° below horizontal such that the bomb hits the tank. If the distance between tank and a point on ground directly below jet, at the instant when bomb is fired, is 1000 m. Then value of *h* in metres is 2420/*x*. Value of *x* is _____.
(Bomb undergoes free fall after leaving jet).

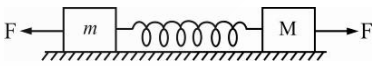
2. In the circuit shown in the figure, the internal resistance of the cell is negligible. A current of 0.5 A enters the circuits as show in the figure. For value of $R = 40/x\ \Omega$, no current flows through the galvanometer. What is *x*?



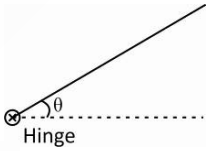
3. Two particles rotating in two circles with angular velocity 50π and 56π rad/s in their corresponding circles, starting from initial position as shown in the figure. In next one second of their motion how many times line joining of ball will pass through centre.



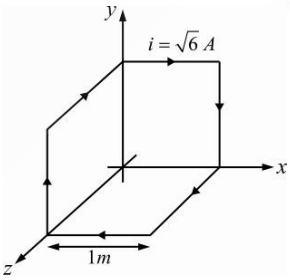
4. In the situation shown in figure all contact surfaces are smooth. The force constant of the spring is *K*. Two forces *F* are applied as shown. The maximum elongation produced in the spring is how many times of *F*/*K* (initially the spring is relaxed)?



5. An uniform rod is left to fall from an angle $\theta = \sin^{-1}\left(\frac{3}{4}\right)$ in the figure, α is the angle made by hinge force with vertical when rod becomes horizontal. Find $2\tan\alpha$.

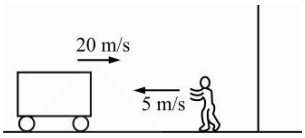


6. A current carrying coil exists in 3d space along edges of a cube as shown in figure. If a magnetic field $\vec{B} = (\hat{i} + 2\hat{j} + 3\hat{k})T$ exists in the region. Then the magnitude of torque acting on the coil is _____.



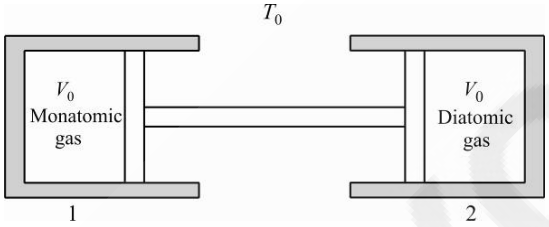
SPACE FOR ROUGH WORK

7. A noising car is approaching towards the wall with 20m/s and a man in between the car and wall is running towards car with 5m/s, find the number of beats heard by man. If speed of sound in still air is 340m/s and frequency emitted by car is 160Hz.



8. Two particles P and Q move with constant velocities $v_1 = 2\ ms^{-1}$ and $v_2 = 4\ ms^{-1}$ along two mutually perpendicular straight lines towards the intersection point O. At moment t = 0, the particles were located at distances $\ell_1 = 12\ m$ and $\ell_2 = 19\ m$ from O, respectively. Find the time when they are nearest.

9. The two conducting cylinder-piston systems shown below are linked. Cylinder 1 is filled with a certain molar quantity of a monatomic ideal gas and cylinder 2 is filled with an equal molar quantity of a diatomic ideal gas. The entire apparatus is situated inside an oven whose temperature is T_0 = 27°C. The cylinder volumes have the same initial value V_0 = 100 cc. When the oven temperature is slowly raised to T_b = 127°C. What is the volume change ΔV (in cc) of cylinder 1?



10. A wire of length $l = 6 \pm 0.06$ cm and radius $r = 0.5 \pm 0.005$ cm has mass $m = 0.3 \pm 0.003$ g. Maximum percent age error in density is _____.

SPACE FOR ROUGH WORK

PART - II (CHEMISTRY)	70 MARKS

SECTION - I

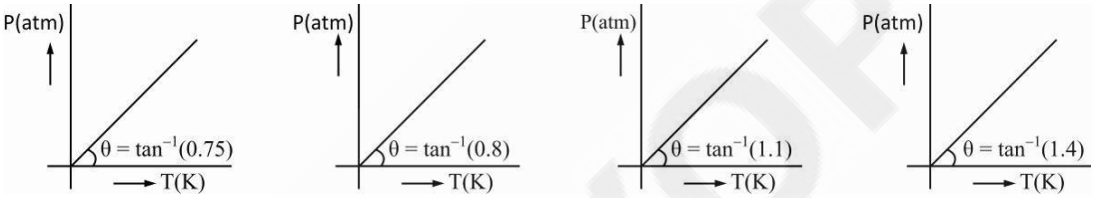
MULTIPLE CORRECT ANSWERS

This section contains 10 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct:

1. Gas A (1 mol) dissociates in a closed rigid container of volume 0.16 litre as per following reaction.

$$2A(g) \longrightarrow 3B(g) + 2C(g)$$

If degree of dissociation of A is 0.4 and remains constant in entire range of temperature, then the INCORRECT P vs T graph(s) is(are) _____. [Given: R = 0.08 lit-atm/mol/K]



(A) **(B)** **(C)** **(D)**

2. Relative lowering of vapour pressure is a colligative property because:

(A) It depends on the concentration of a non-electrolyte solute in solution and does not depend on the nature of the solute molecules.

(B) It depends on number of particles of electrolyte solute in solution and does not depend on the nature of the solute particles

(C) It depends on the concentration of a non-electrolyte solute in solution as well as on the nature of the solute molecules

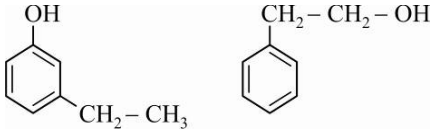
(D) It depends on the concentration of an electrolyte or non-electrolyte solute in solution as well as on the nature of solute molecules

3. The ore/s which can be ''dressed'' using magnetic separation method is(are):

(A) Calamine **(B)** Siderite **(C)** Sphalerite **(D)** Iron pyrite

SPACE FOR ROUGH WORK

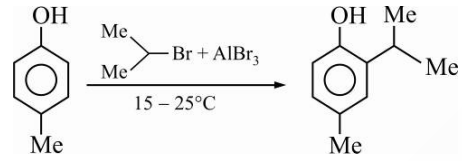
4. Relation between the following isomers are :

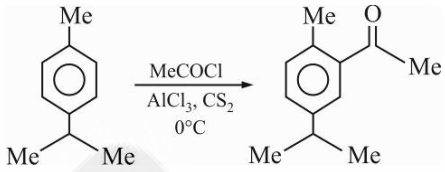


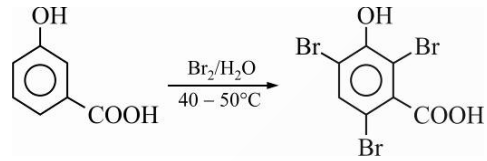
(A) Positional isomers **(B)** Functional isomers

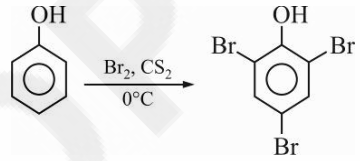
(C) Chain isomers **(D)** Metamers

5. In which of the following reaction(s) is the correct major product formed?

(A) 

(B) 

(C) 

(D) 

6. Which of the following statements is(are) correct ?

(A) O_2 is paramagnetic, O_2^- is also paramagnetic

(B) N_2 is paramagnetic, N_2^{2+} is also paramagnetic

(C) B_2 is paramagnetic, C_2 is diamagnetic

(D) Different observation is found in their bond length when $N_2 \longrightarrow N_2^+$ and $O_2 \longrightarrow O_2^+$

7. $Na_2[B_4O_5(OH)_4]\cdot 8H_2O$ is called borax. Select correct statement(s) for borax.

(A) On heating, glassy solid is obtained containing $NaBO_2$ and B_2O_3

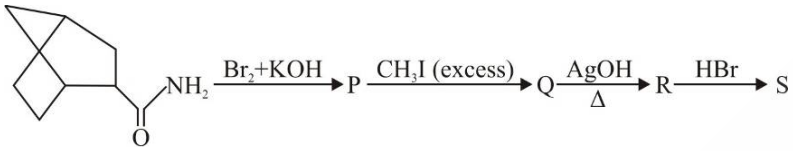
(B) All boron atoms use sp^3 orbitals for bonding

(C) Its aquous solution is alkaline in nature

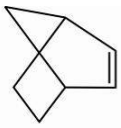
(D) Its aquous solution produce boric acid when treated with conc. H_2SO_4

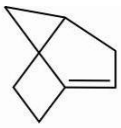
SPACE FOR ROUGH WORK

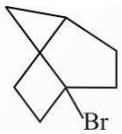
8. Consider the following sequence of reactions :



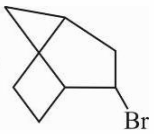
Identify products R and S :

R is  **(A)**

R is  **(B)**

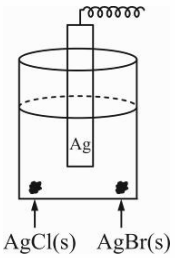
S is 

(C)

S is 

(D)

9. Which of the following statement(s) is(are) true for the given half cell having a solution saturated in AgCl and AgBr. [Given K_{sp} of $AgCl(s) = 10^{-10}$, K_{sp} of $AgBr(s) = 3\times10^{-10}$, $E^{\circ}_{Ag^+/Ag} = 0.8V$, $\frac{2.303RT}{F} = 0.06$, $\log 2 = 0.3$]



(A) $E_{cell} = 0.518V$

(B) $[Ag^+] = 2\times10^{-5}M$

(C) $[Cl^-] = \frac{1}{2}\times10^{-5}M$

(D) $[Br^-] = \frac{3}{2}\times10^{-5}M$

10. A mixture of AO and A_2O_3 take 0.015 moles of $K_2Cr_2O_7$ to oxidize the mixture completely to form AO_4^- and Cr^{3+}. If 0.02 moles of AO_4^- is formed then :

(A) Mole fraction of AO in mixture is 2/3

(B) Mole fraction of A_2O_3 in mixture is 2/3

(C) Number of moles of A_2O_3 in mixture is 0.005 moles

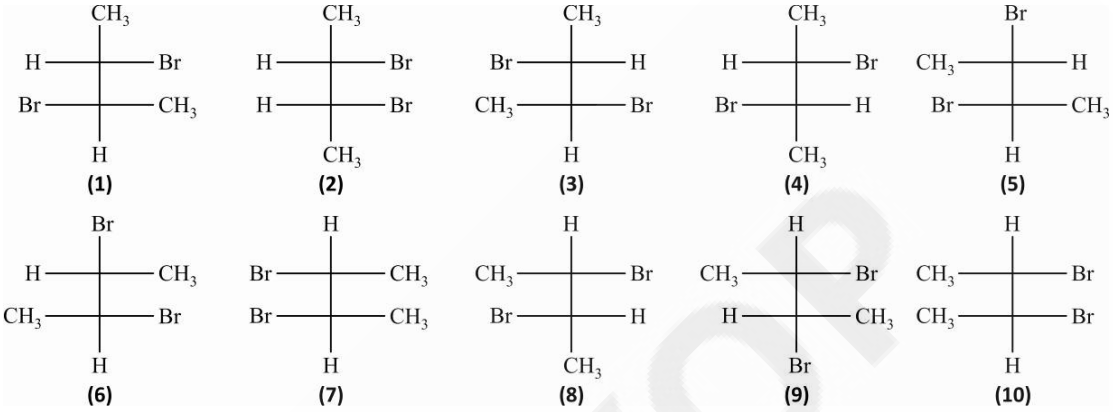
(D) Meq of AO_4^- = meq of AO + meq of A_2O_3

SPACE FOR ROUGH WORK

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 10 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. Maximum number of identical compound among the following isomers are _____.



2. Total number of nitrate salts which neither produce ppt. with excess NaOH nor with excess NH_4OH is(are)_____.

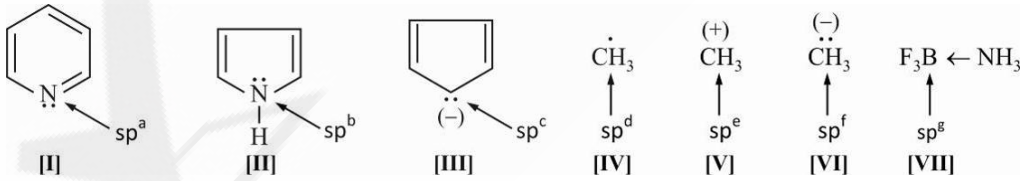
$Cu(NO_3)_2$ $Hg(NO_3)_2$ $Zn(NO_3)_2$ $AgNO_3$

$Pb(NO_3)_2$ $Al(NO_3)_3$ $Cr(NO_3)_3$ $Fe(NO_3)_3$

3. Find the number of molecules or ions in which d-orbital(s) is(are) not used in hybridization.

PCl_4^+, XeO_3F_2, ICl_2^+, SF_2, SiF_4, $[Pt(NH_3)_4]^{2+}$, $[Cu(NH_3)_4]^{2+}$, $[ZnCl_4]^{2-}$, $[Ni(CO)_4]$

4. The hybridization of atoms in compounds/Intermediates are sp^a, sp^b, sp^c, sp^d, sp^e, sp^f, sp^g respectively, then the value of $\frac{a+b+c+d+e+f+g}{2}$ is _____.



SPACE FOR ROUGH WORK

5. How many of the following reactions (partially balanced or balanced) are redox reactions?

(i) $Mg + N_2 \rightarrow Mg_3N_2$

(ii) $K_4[Fe(CN)_6] + H_2SO_4 + H_2O \rightarrow K_2SO_4 + CO + FeSO_4 + (NH_4)_2SO_4$

(iii) $I_2 + 3Cl_2 \rightarrow ICl_3$ **(iv)** $CuSO_4 + NH_3 \rightarrow [Cu(NH_3)_4]SO_4$

(v) $NaIO_3 + NaHSO_3 \rightarrow NaHSO_4 + Na_2SO_4 + I_2 + H_2O$

(vi) $FeCl_3 + K_4[Fe(CN)_6] \rightarrow KCl + Fe_4[(Fe(CN)_6]_3$

(vii) $AgCl + Na_2S_2O_3 \rightarrow Na_3[Ag(S_2O_3)_2] + NaCl$

(viii) $NaBiO_3 + MnSO_4 + HNO_3 \rightarrow HMnO_4 + Bi(NO_3)_3 + NaNO_3 + Na_2SO_4 + H_2O$

(ix) $2BaO + O_2 \rightarrow 2BaO_2$

6. x moles of H_3PO_4 were added to 500gm of a solvent. The resulting solution was found to have a density of 1.196 gm/ml. 25ml of the sample was taken out and diluted to 100ml. 20ml of this new solution required 15ml of 1M $Ca(OH)_2$ for complete neutralization. The value of 3x is _____. [Atomic mass H = 1, O = 16, P = 31]

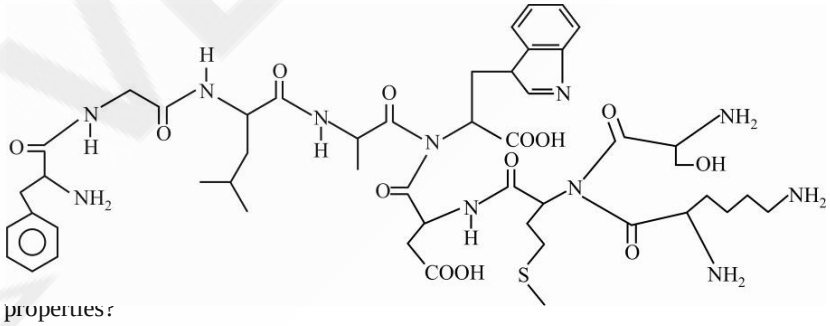
7. Consider a hypothetical scenario in which a charged particle of one negative electronic charge (i.e. carrying charge equal to electron) and mass same as proton is revolving around a proton.

How many of the following quantities of hypothetical charged particle will change with respect to electron in hydrogen atom. (Assuming Bohr's model is applicable)

Speed	Radius	Potential Energy	Total Energy
Kinetic Energy	Angular momentum	Rydberg's constant	

8. HgI_2 is added gradually in 0.001 M KI solution. Initially freezing point of the solution increases then after some time it becomes constant. When freezing point becomes constant, till that instant number of moles of HgI_2 added is $x \times 10^{-3}$ moles. Value of X is_____. (Given volume of solution is 2L)

9. The total number of naturally occurring *acidic* amino acid(s) obtained by complete acidic hydrolysis of the peptide shown below is(are) _____.



10. How many of these are intensive properties?

Volume	Internal energy	Temperature	Specific heat capacity
Heat capacity	Pressure	Density	Molar heat capacity
Molar enthalpy	Standard electrode potential		

SPACE FOR ROUGH WORK

PART - III (MATHEMATICS)	70 MARKS

SECTION - I

MULTIPLE CORRECT ANSWERS

This section contains 10 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct:

1. Given that f is a real valued non-constant (in any non-zero length interval) and differentiable function such that $f(x).f'(x) \le 0$, for all real x, then it follows that:

(A) $(f(x))^2$ is increasing function **(B)** $(f(x))^2$ is decreasing function

(C) $f(x)$ has no critical point **(D)** $f(x) = 0$ does not have any real root

2. Let $[A_k]_{n\times n}$ be a square matrix of order $n \times n$, such that $a_{ij} = 0 \ \forall \ i \ne j$, $a_{ii} = \frac{1}{k+i}$ and $[B_k]_{n\times n}$ is its inverse matrix then :

(A) $\lim\limits_{m\to\infty} \dfrac{\sum\limits_{n=1}^{m} \text{trace}[B_k]_{n\times n}}{m^3} = \dfrac{1}{6}$ **(B)** $\sum\limits_{n=1}^{10} \text{trace}[B_2]_{n\times n} = 320$

(C) $\lim\limits_{m\to\infty} \dfrac{\sum\limits_{n=1}^{m} \text{trace}[B_k]_{n\times n}}{m^3} = \dfrac{1}{3}$ **(D)** $\sum\limits_{n=1}^{10} \text{trace}[B_2]_{n\times n} = 330$

3. If $\lim\limits_{x\to a} f(x) = \lim\limits_{x\to a} [f(x)]$ ([.] denotes the greatest integer function) and $f(x)$ is non-constant in the neighbourhood of 'a' and is continuous function, then :

(A) $\lim\limits_{x\to a} f(x)$ is an integer **(B)** $\lim\limits_{x\to a} f(x)$ is non-integer

(C) $f(x)$ has local maximum at $x = a$ **(D)** $f(x)$ has local minimum at $x = a$

4. If the equation $px^2 + y^2 + qz^2 + 2yz + zx + 3xy = 0$ represents a pair of perpendicular planes, then $p - q =$

(A) 5 **(B)** –5 **(C)** $\frac{5}{2}$ **(D)** $-\frac{5}{2}$

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5. Let $A=[a_{ij}]_{n\times n}$ be a matrix such that $a_{ij}=i.2^{-j}$ then find the value of $\lim\limits_{n\to\infty}\left(\text{trace } A^n\right)^{1/n}$ (where $n\in N$).

(A) $A^n=\left(\sum\limits_{i=1}^{n} i\,2^{-i}\right)^{n-1}A$ **(B)** $A^n=\left(\sum\limits_{i=1}^{n} i\,2^{-i}\right)^{n}A$

(C) $\lim\limits_{n\to\infty}\left(\text{trace } A^n\right)^{1/n}=2$ **(D)** $\lim\limits_{n\to\infty}\left(\text{trace } A^n\right)^{1/n}=3$

6. Let $\hat{\alpha}$, $\hat{\beta}$ and $\hat{\gamma}$ be the unit vectors such that $\hat{\alpha}$ and $\hat{\beta}$ are mutually perpendicular and $\hat{\gamma}$ is equally inclined to $\hat{\alpha}$ and $\hat{\beta}$ at an angle θ. If $\hat{\gamma}=x\hat{\alpha}+y\hat{\beta}+z\left(\hat{\alpha}\times\hat{\beta}\right)$, then :

(A) $z^2=1-2x^2$ **(B)** $z^2=1-2y^2$ **(C)** $z^2=1-x^2-y^2$ **(D)** $x^2=y^2$

7. If the equation $x^5-10a^3x^2+b^4x+c^5=0$ $(a, b, c\in R, a\neq 0)$ has three equal real roots, then :

(A) $2b^2-10\,a^3b^2+c^5=0$ **(B)** $6a^5+c^5=0$

(C) $2c^5-10\,a^3b^2+b^4c^5=0$ **(D)** $b^4=15\,a^4$

8. Which one the following function(s) is(are) continuous $\forall\, x\in R$?

(A) $\sqrt{2\sin x}+3$ **(B)** $\dfrac{e^x+1}{e^x+3}$

(C) $\left(\dfrac{2^{2x}+1}{2^{3x}+5}\right)^{5/7}$ **(D)** $\sqrt{sgn\,x+1}$ (where *sgn x* is signum function of *x*)

9. The function $f(x)=\cos^{-1}\left(\dfrac{2[|\sin x|+|\cos x|]}{\sin^2 x+2\sin x+\frac{11}{4}}\right)$ is defined if x belongs to (where [.] represents greatest integer function)

(A) $\left[0,\dfrac{7\pi}{6}\right]$ **(B)** $\left[0,\dfrac{\pi}{6}\right]$ **(C)** $\left[\dfrac{11\pi}{6},2\pi\right]$ **(D)** $[\pi,2\pi]$

10. Let P be any point on the curve $S=0$ such that tangents from P to $x^2+y^2-2x-4y-4=0$ make 60° with each other and from point Q perpendicular tangents are drawn to S, then

(A) locus of P is circle of radius 5 **(B)** locus of P is a circle of radius 6

(C) locus of Q is a circle of radius $3\sqrt{2}$ **(D)** locus of Q is a circle of radius $6\sqrt{2}$

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SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 10 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. If the sides of a triangle are determined by throwing a dice thrice then the maximum number of different obtuse isosceles triangles that can be formed is _____.

2. Suppose $f(x)$ and $g(x)$ are differentiable functions such that $x.g(f(x)).f'(g(x)).g'(x) = f(g(x)).g'(f(x)).f'(x)$ for all real x and $\int_0^a f(g(x))dx = \frac{1-e^{-2a}}{2}$ for all real a. Given that $g(f(0)) = 1$. If the value of $g(f(4)) = e^{-k^2}$, (where $k \in N$) then k is equal to _____.

3. If the number of integral solutions of the equation $x_1 x_2 x_3 x_4 = 210$ is 2.4^p then p is _____.

4. If $\vec{A}$, $\vec{B}$, $\vec{C}$ are vectors such that $|\vec{B}| = |\vec{C}|$, then find $((\vec{A}+\vec{B})\times(\vec{A}+\vec{C}))\times(\vec{B}\times\vec{C}).(\vec{B}+\vec{C})$.

5. Let $f(x)$, $x \geq 0$ be a non-negative continuous function. If $f'(x)\cos x \leq f(x).\sin x$, $\forall\ x \geq 0$, then find $f\left(\frac{5\pi}{3}\right)$.

6. If $\int_0^x f(x)\sin t\,dt$ = constant, $0 < x < 2\pi$ and $f(\pi) = 2$ then find the value of $f(\pi/2)$.

7. If a, b, c are in H.P. and $\left(\frac{a+b}{2a-b}\right)+\left(\frac{c+b}{2c-b}\right) \leq \sqrt{\lambda\sqrt{\lambda\sqrt{\lambda.....\infty}}}$, then find the least value of λ. (where a, b, c are positive).

8. If $f: [-1, 1] \to R$ be a continuous function satisfying $f(2x^2 - 1) = (x^3 + x) f(x)$, then $\lim_{x\to 0} \frac{f(\cos x)}{\sin x}$ is _____.

9. The number of solutions of the equation $e^{-\sqrt{|\ln\{x\}|}} - \{x\}^{1/\sqrt{|\ln\{x\}|}} = [\text{sgn}(x)]$ (where [.] is greatest integer function and {.} is fractional part function) is(are)_____

10. The area of the region bounded by curves.

I. $|z - z_1| = |z - z_3|$ **II.** $|\text{Re}(z) - \text{Re}(z_1)| = |\text{Re}(z) - \text{Re}(z_3)|$

III. $|z - z_2| - |z - z_1| = |z_1 - z_2|$

(Where $z_1 = 1+i$, $z_2 = 2+i$, $z_3 = -3+3i$) is $\frac{p}{q}$, (p, q are co-prime) then find $p+q$.

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End of Mock JEE Advanced-3/PAPER-1