From Long Term Classroom Programs and Medium / Short Classroom Program 4 in Top 10, 10 in Top 20, 43 in Top 100, 75 in Top 200, 159 in Top 500 Ranks & 3542 total selections in IIT-JEE 2012

ALL INDIA TEST SERIES

FIITJEE

JEE (Advanced), 2013

CONCEPT RECAPITULATION TEST
(Set – IV)

Paper 2

Time Allotted: 3 Hours **Maximum Marks: 237**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains Three Parts.
3. **Part-I** is Physics, **Part-II** is Chemistry and **Part-III** is Mathematics.
4. Each part is further divided into three sections: **Section-A, Section-B & Section-C**
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with black pen for each character of your Enrolment No. and write your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Three Parts.

(i) **Section-A (01 – 06)** contains 6 multiple choice questions which have only one correct answer. Each question carries **+5 marks** for correct answer and **– 2 marks** for wrong answer.
Section-A (07 – 12) contains 2 paragraphs. Based upon paragraph, 3 multiple choice questions have to be answered. Each question has only one correct answer and carries **+3 marks** for correct answer and **– 1 mark** for wrong answer.

(ii) **Section-B (01 – 02)** contains 2 Matrix Match Type questions containing statements given in 2 columns. Statements in the first column have to be matched with statements in the second column. Each question carries **+8 marks** for all correct answer. For each correct row **+2 marks** will be awarded. There may be one or more than one correct choice. No marks will be given for any wrong match in any question. There is no negative marking.

(iii) **Section-C (01 – 05)** contains 5 Numerical based questions with single digit integer as answer, ranging from 0 to 9 and each question carries **+3 marks** for correct answer. There is no negative marking.

Name of the Candidate	
Enrolment No.	

Useful Data

PHYSICS

Acceleration due to gravity	$g = 10\ m/s^2$
Planck constant	$h = 6.6 \times 10^{-34}$ J-s
Charge of electron	$e = 1.6 \times 10^{-19}$ C
Mass of electron	$m_e = 9.1 \times 10^{-31}$ kg
Permittivity of free space	$\varepsilon_0 = 8.85 \times 10^{-12}\ C^2/N\text{-}m^2$
Density of water	$\rho_{water} = 10^3\ kg/m^3$
Atmospheric pressure	$P_a = 10^5\ N/m^2$
Gas constant	$R = 8.314\ J\ K^{-1}\ mol^{-1}$

CHEMISTRY

Gas Constant	R	=	$8.314\ J\ K^{-1}\ mol^{-1}$
		=	0.0821 Lit atm $K^{-1}\ mol^{-1}$
		=	$1.987 \approx 2$ Cal $K^{-1}\ mol^{-1}$
Avogadro's Number	N_a	=	6.023×10^{23}
Planck's constant	h	=	6.625×10^{-34} J·s
		=	6.625×10^{-27} erg·s
1 Faraday		=	96500 coulomb
1 calorie		=	4.2 joule
1 amu		=	1.66×10^{-27} kg
1 eV		=	1.6×10^{-19} J

Atomic No: H=1, He = 2, Li=3, Be=4, B=5, C=6, N=7, O=8, N=9, Na=11, Mg=12, Si=14, Al=13, P=15, S=16, Cl=17, Ar=18, K =19, Ca=20, Cr=24, Mn=25, Fe=26, Co=27, Ni=28, Cu = 29, Zn=30, As=33, Br=35, Ag=47, Sn=50, I=53, Xe=54, Ba=56, Pb=82, U=92.

Atomic masses: H=1, He=4, Li=7, Be=9, B=11, C=12, N=14, O=16, F=19, Na=23, Mg=24, Al = 27, Si=28, P=31, S=32, Cl=35.5, K=39, Ca=40, Cr=52, Mn=55, Fe=56, Co=59, Ni=58.7, Cu=63.5, Zn=65.4, As=75, Br=80, Ag=108, Sn=118.7, I=127, Xe=131, Ba=137, Pb=207, U=238.

Physics PART – I

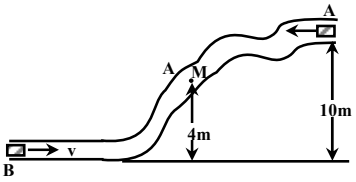
SECTION – A

Single Correct Choice Type

This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

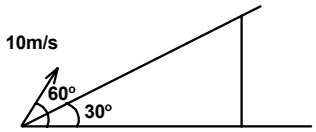
1. In a room where temperature is 30°C, a body cools from 61°C to 59°C in 4 minutes. The time taken by the body to cool from 51°C to 49°C will be
   (A) 4 minute (B) 6 minute
   (C) 5 minute (D) 8 minute

2. Two bodies A and B of each of mass 100 gm are allowed to move along a frictionless typical path as shown below. In order to have the same kinetic energy for both the bodies at M, the initial velocity that should be given to B, if A starts from rest is



   (A) 10m/s (B) $\sqrt{2}$ m/s
   (C) 11 m/s (D) $10\sqrt{2}$ m/s

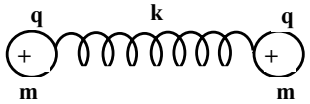
3. A particle is thrown at time t = 0 with a velocity of 10 m/s at an angle of 60° with the horizontal from a point on an incline plane, making an angle of 30° with the horizontal. The time when the velocity of the projectile becomes parallel to the incline is



   (A) $\frac{2}{\sqrt{3}}$ sec (B) $\frac{1}{\sqrt{3}}$ sec
   (C) $\sqrt{3}$ sec (D) $\frac{1}{2\sqrt{3}}$ sec

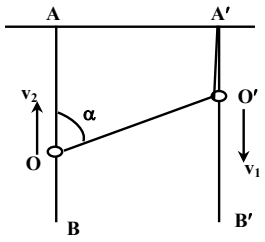
Rough work

4. The ratio of the time periods of small oscillation of the insulated spring and mass system before and after charging the masses is



(A) ≥ 1 (B) >1
(C) ≤ 1 (D) $=1$

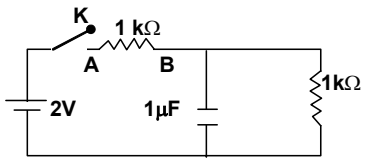
5. Two small rings O and O′ are put on two vertical stationary rods AB and A′B′, respectively. One end of an inextensible thread is tied at point A′. The thread passes through ring O′ and its other end is tied to ring O. Assuming that ring O′ moves downwards at a constant velocity v_1, determine the velocity v_2 of the ring O, when $\angle AOO' = \alpha$.



(A) $v_1\left[\frac{2\sin^2\alpha/2}{\cos\alpha}\right]$ (B) $v_1\left[\frac{2\cos^2\alpha/2}{\sin\alpha}\right]$

(C) $v_1\left[\frac{3\cos^2\alpha/2}{\sin\alpha}\right]$ (D) None of these

6. When the key k is pressed at time t = 0, which of the following statements about the current I, in the resistor AB of the given circuit is true.



(A) 2 mA at all time
(B) oscillates between 1 mA and 2 mA
(C) 1 mA at all time
(D) At t = 0, I = 2 mA and with time it finally reduces to 1 mA

Rough work

Comprehension Type

This section contains 2 groups of questions. Each group has **3 multiple choice question** based on a paragraph. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE is correct**.

Paragraph for Question Nos. 7 to 9

The Betatron was the first important machine for producing high energy electrons. The action of the betatron depends on the same fundamental principle as that of the transformer in which an alternating current applied to a primary coil induces an alternating current usually with higher or lower voltage in the secondary coil. In the betatron secondary coil is replaced by a doughnut shaped vacuum chamber. Electron produced in the doughnut from a hot filament, are given a preliminary acceleration by the application of an electric field having potential difference of 20 kV to 70 kV, when an alternating magnetic field is applied parallel to the axis of the tube, two effects are produced (1) an electromotive force is produced in the electron orbit by the changing magnetic flux that gives an additional energy to the electrons (2) a radial force is produced by the action of magnetic field whose direction is perpendicular to the electron velocity which keeps the electron moving in a circular path. Conditions are arranged such that the increasing magnetic field keeps the electron in a circular orbit of constant radius. The mathematical relation between the betatron parameters and electron parameters to ensure the above condition is called BETATRON condition.
If the orbit radius of the circular path traced by the electron is R, magnetic field is B, speed of the electron is v, mass of the electron is m, charge on the electron is e and ϕ is the flux within the orbit of radius R. Then answer the following questions based on the above comprehension.

7. What is the tangential force acting on the electron?

(A) evB (B) $\frac{e}{\pi R}\frac{d\phi}{dt}$

(C) $\frac{e}{2\pi R}\frac{d\phi}{dt}$ (D) $\frac{ev^2}{R}$

8. What is the value of $\frac{d(m|\vec{v}|)}{dt}$?

(A) $eR\frac{dB}{dt}$ (B) BeV

(C) $\frac{e}{2\pi R}\frac{d\phi}{dt}$ (D) $\frac{ev^2}{R}$

9. What is the BETATRON condition?

(A) BeV = $\frac{e}{\pi R}\frac{d\phi}{dt}$ (B) $\frac{d\phi}{dt} = 2\frac{d}{dt}(\pi R^2 B)$

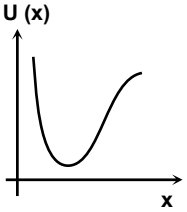
(C) $\frac{d\phi}{dt} = \frac{d}{dt}(\pi R^2 B)$ (D) Data insufficient to determine.

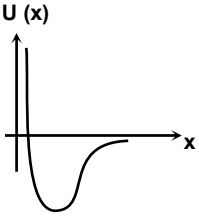
Rough work

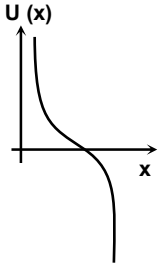
Paragraph for Question Nos. 10 to 12

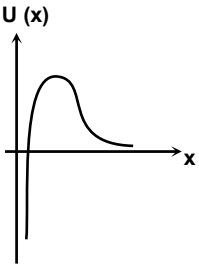
The potential energy function for the force between two in a diatomic molecule can approximately be expressed as $U(x) = \frac{a}{x^{12}} - \frac{b}{x^6}$, where a and b are positive constants, and x is the distance between the atoms. Answer the following question by selecting most appropriate alternative.

10. The graph between potential energy vs x will be

(A) 

(B) 

(C) 

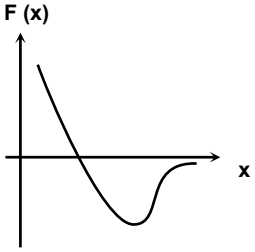
(D) 

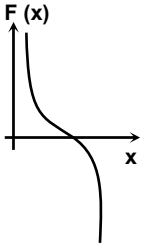
11. The dissociation energy of the molecule is (initially molecule is at rest at equilibrium)

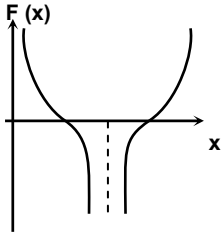
(A) $-\frac{b^2}{4a}$ (B) $-\frac{b^2}{2a}$

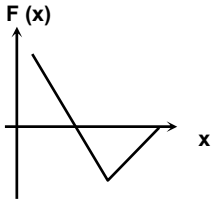
(C) $+\frac{b^2}{4a}$ (D) $+\frac{b^2}{2a}$

12. The graph between force between the atoms [F(x)] vs x will be

(A) 

(B) 

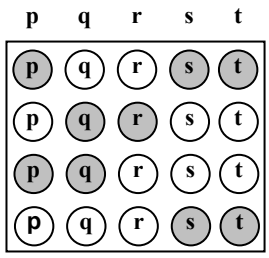
(C) 

(D) 

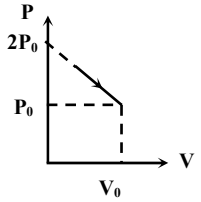
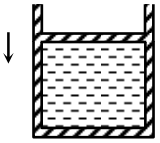
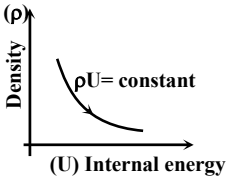
Rough work

SECTION - B
Matrix – Match Type

*This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p, q, r, s and t. Any given statement in **Column I** can have correct matching with **ONE OR MORE** statement(s) in **Column II.** The appropriate bubbles corresponding to the answers to these questions have to be darkened as illustrated in the following example:*
If the correct matches are A – p, s and t; B – q and r; C – p and q; and D – s and t; then the correct darkening of bubbles will look like the following:

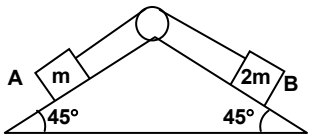


1. Match the following.

Column-I		Column-II	
(A)	A monatomic gas expands according to the process $P/T^{5/2}$ = constant.	(p)	Temperature of the gas increases.
(B)		(q)	Temperature of the gas decreases.
(C)	 Piston and all walls are thermally insulated and the piston is slowly moving downward.	(r)	No heat exchange with the gas.
(D)		(s)	Heat is absorbed by the gas
		(t)	none of these

Rough work

2. Two blocks A and B of mass m and 2m are placed on a fixed triangular wedge are placed on a fixed triangular wedge by massless inextensible string as shown. The pulley is massless and frictionless. The coefficient of friction between block A and the wedge is 2/3 and that between B and the wedge is 1/3. (Take m = 1 kg, g = 10 m/s^2)



	Column – I		Column – II
(A)	Friction force between block A and wedge	(p)	$\frac{5}{\sqrt{2}}$ units
(B)	Friction fore between block B and wedge	(q)	$\frac{10}{3\sqrt{2}}$ units
(C)	Tension in the string	(r)	$\frac{10\sqrt{2}}{3}$ units
(D)	Maximum friction force between Block B and wedge.	(s)	$30\sqrt{2}$ units
		(t)	$\frac{20\sqrt{2}}{3}$ units

Rough work

SECTION –C
Integer Answer Type

This section contains **5 questions.** The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).

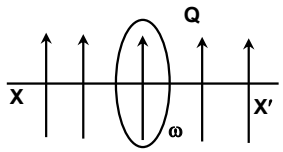
1. The ratio of de-Broglie wavelength of a α particle to that of a proton being subjected to the same magnetic field so that the radii of their path are equal to each other assuming the field induction vector $\vec{B}$ is perpendicular to the velocity vectors of the α-particle and the proton is K/2. Find the value of K.

2. Three infinitely long thin wires each carrying current I in the same direction are in x-y plane of a gravity free space. The central wire is along the y-axis while the other two are along x = $\pm$ d. If the central wire is slightly displaced along z axis and released, show that it will execute S.H.M. The linear mass density of the wire is λ. If the time period of this small oscillation is $\frac{k\pi d}{I}\sqrt{\frac{\pi\lambda}{\mu_0}}$, then find the value of k.

3. Find the quantum number n corresponding to nth excited state of He^+ ion if on transition to the ground state the ion emits two photons in succession with wavelengths 108.5 nm and 30.4 nm. The ionizaton energy of the hydrogen atom is 13.6 eV.

4. The coefficient of mutual inductance of the two coils is 0.5 H. If the current is increased from 2 to 3 A in 0.01 sec. in one of them, then the induced e.m.f. in the second coil is 25K Volt. Find the value of K.

5. A disc of mass m has a charge Q distributed on its surface. It is rotating about an XX′ with a angular velocity ω. Find the force acting on the disc.



Rough work

Chemistry

PART – II

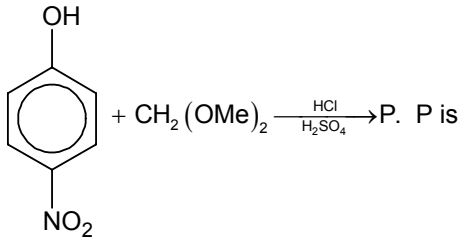
SECTION – A

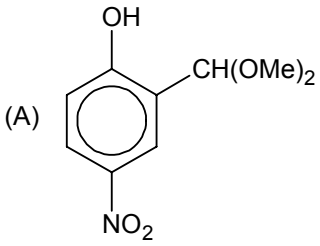
Straight Objective Type

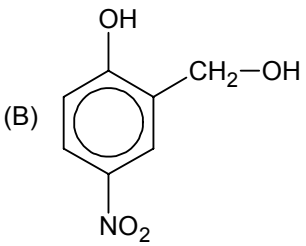
This section contains 6 multiple choice questions numbered 1 to 6. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

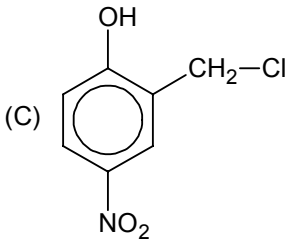
1. What volume of HCl of density 1.18 g/cc and containing 35% by weight HCl, must be allowed to react with Zn in order to liberate 4.68 gm of hydrogen?
   (A) 230 cc (B) 410 cc
   (C) 604 cc (D) 713 cc

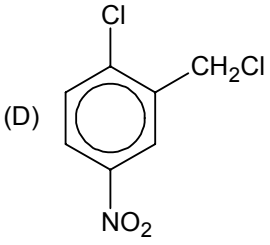
2. Ice crystallizes in a hexagonal lattice. At the low temperature at which the structure was determined, the lattice constants are a = 4.53 $\overset{\circ}{A}$, c = 7.41 $\overset{\circ}{A}$. How many H_2O molecules are present in a unit cell? (d_{ice} at 0^oC = 0.92 gm/cc, area of rhombus base = $a^2 \sin 60^o$)
   (A) 4 (B) 6
   (C) 8 (D) 12

3.  P. P is

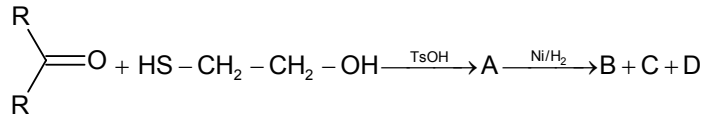
(A) 

(B) 

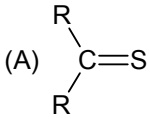
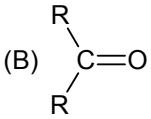
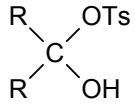
(C) 

(D) 

Rough Work

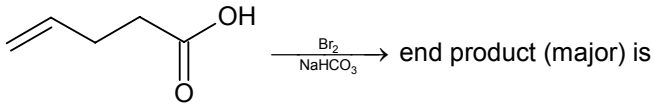
4. 

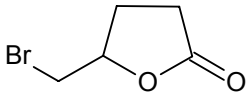
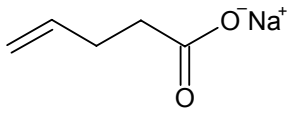
C on oxidative ozonolysis {(i) O_3, (ii) H_2O} gives a product which can give Ag mirror with Tollen's reagent. B is

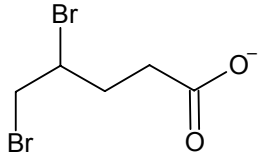
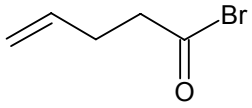
(A)  (B)  (C) $H_2C{=}CH_2$ (D) 

5. In borax bead test of Cu^{2+}, which non metal changes the blue colour of copper compound (when it is heated in flame) to colourless?

(A) N (B) S
(C) C (D) Cl

6. 

(A)  (B) 

(C)  (D) 

Rough Work

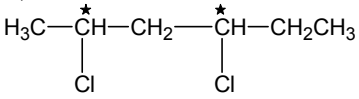
Paragraph Type

This section contains 2 groups of questions. Each group has 3 multiple choice question based on a paragraph. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

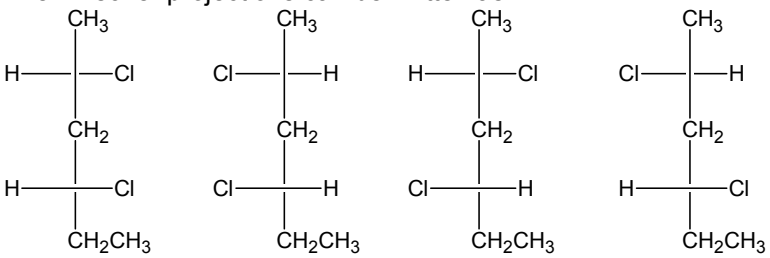
Paragraph for Question Nos. 7 to 9

Read the paragraph and answer the questions given below:

2, 4 – dichlorohexane has two chiral centres indicated by (*).



Their Fischer projections can be written as:



(I) (II) (III) (IV)

Based on these structures, answer the questions at the end.

7. Pair of enantiomers are:
   (A) I and III; II and IV (B) I and II; III and IV
   (C) I and IV; II and III (D) none of these

8. Pair of stereoisomers that are diastereomers are:
   (A) I and II ; III and IV (B) I and III ; II and IV
   (C) I and III ; I and IV ; II and II ; II an IV (D) I and IV ; II and III

9. Pair of erythro enantiomers is
   (A) I and II (B) III and IV
   (C) I and III (D) II and IV

Rough Work

Paragraph for Question Nos. 10 to 12

Xe forms three binary fluorides XeF_2, XeF_4 and XeF_6. All are colourless crystalline solid sublimating at 295 K. They are powerful fluorinating agents and are readily hydrolyzed by water.

10. Which fluoride is isostructural with ICl_2^-

(A) XeF_4 (B) XeF_6

(C) XeF_2 (D) XeF_8^{2-}

11. XeO_3 is a colourless explosive solid acid, prepare by hydrolysis of

(A) XeF_2 (B) XeF_4

(C) XeF_6 (D) Both B and C

12. XeF_4 exists whereas $XeCl_4$ is not stable because

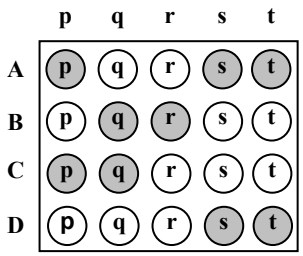
(A) electron affinity of Cl is greater than F
(B) oxidation potential of F is greater than Cl
(C) the size of F is smaller than Cl
(D) None of these

Rough Work

SECTION-B
(Matrix Type)

This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p, q, r, s and t. Any given statement in **Column I** can have correct matching with **ONE OR MORE** statement(s) in **Column II.** The appropriate bubbles corresponding to the answers to these questions have to be darkened as illustrated in the following example:

If the correct matches are A – p, s and t; B – q and r; C – p and q; and D – s and t; then the correct darkening of bubbles will look like the following:



1. Match the reactions in Column – I with their characteristics in Column – II:

Column – I	Column – II
(A) By product of the serpek process	(p) Weak lewis acid with hexagonal structure
(B) SF_6	(q) Synthetic detergent
(C) Borazole	(r) Insulating medium for high voltage transformers
(D) $P_3O_{10}^5$ contributes to excessive fertilization and rampant growth of algae	(s) NH_3
	(t) Octahedral

2. Match the following:

Column - I	Column-II (value of 'x' in balanced equation)
(A) $Cr_2O_7^{2-} + I^- + xH^+ \rightarrow I_2 + Cr^{3+} + H_2O$	(p) 8
(B) $P_4 + x\,OH^- \rightarrow PH_3 + H_2PO_2^-$	(q) 3
(C) $MnO_4^- + Fe^{2+} + xH^+ \rightarrow Mn^{2+} + Fe^{3+} + H_2O$	(r) 6
(D) $Cl_2 + x\,OH^- \rightarrow Cl^- + ClO_3^- + H_2O$	(s) 14

Rough Work

SECTION – C

Integer Answer Type

This section contains **5 questions.** The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).

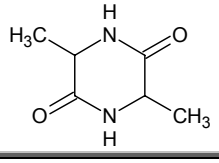
1. How many times volume of 1 mole of an ideal gas will increase, when the pressure decreased by 2 times and absolute temperature increased by 4 times.

2. What is total number of lone pair of electrons in XeF_4.

3. Find pH of 0.01 M CH_3COOH solution having Van't Hoff factor of 1.01.

4. An aqueous solution containing 288 g of a nonvolatile compound having molecular formula $C_xH_{2x}O_x$ in 5 mole of water boils at 374.24 K at 1 atm. If K_b of $H_2O = 0.512$ $Kmol^{-1}$ kg. If x = 11a, find a.

5. The number of stereoisomers formed by the given molecule is



Rough Work

Mathematics PART – III

SECTION – A

Single Correct Choice Type

This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

1. The area of the region in the xy-plane defined by the inequalities $x - 2y^2 \geq 0$, $1 - x - |y| \geq 0$ is

   (A) $\frac{1}{2}$ (B) $\frac{1}{3}$

   (C) $\frac{1}{4}$ (D) $\frac{7}{12}$

2. The vectors $a\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + b\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + c\hat{k}$ are coplanar where a,b,c are real and distinct from 1. Then $\frac{1+a}{1-a} + \frac{1+b}{1-b} + \frac{1+c}{1-c}$ is equal to

   (A) –1 (B) 1

   (C) –2 (D) 2

3. An electric component manufactured by a company is tested for its defectiveness by a sophisticated device. Let 'A' denote the event "the device is defective'' and 'B' the event "the testing device reveals the component to be defective''. Suppose $P(A) = \alpha$ and $P(B/A) = P(\bar{B}/\bar{A}) = 1 - \alpha$. Where $0 < \alpha < 1$. If it is given that the testing device revels it to be defective, then the probability that the component is not defective is

   (A) $\frac{1}{4}$ (B) $\frac{3}{4}$

   (C) 0.7 (D) 0.5

4. The equation whose solution is self orthogonal is (where 'p' = $\frac{dy}{dx}$)

   (A) $p - \frac{1}{p} = p^2$ (B) $(px + y)(x + py) - \lambda p = 0$

   (C) $(px - y)(x + py) - \lambda p = 0$ (D) $(px + y)(x - py) - \lambda p = 0$

Rough work

5. Two straight lines 3x + 4y = 5 and 4x – 3y = 15 intersect at point A. Points B and C are chosen on these two lines such that AB = AC then the equation of the line BC passing through (1, 2) with negative slope is
(A) x + 7y – 15 = 0 (B) 7x + y – 9 = 0
(C) 3x + y – 5 = 0 (D) x + 5y – 11 = 0

6. The value of $\frac{1}{81^n} - \frac{10}{81^n}.{}^{2n}C_1 + \frac{10^2}{81^n}.{}^{2n}C_2 - \frac{10^3}{81^n}.{}^{2n}C_3 + ... + \frac{(10)^{2n}}{81^n}$ is
(A) 2 (B) 1
(C) 0 (D) $\frac{1}{2}$

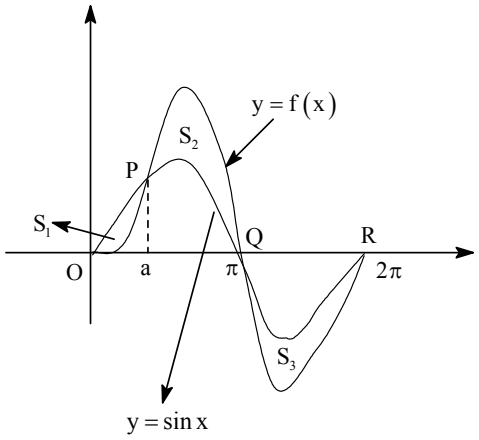
Comprehension Type

This section contains **2 paragraphs**. Based upon paragraphs **3 multiple choice questions** have to be answered. Each of these questions has four choices (A), (B), (C) and (D) out of **which ONLY ONE** is correct.

Paragraph for Question Nos. 7 to 9

Read the following write up carefully and answer the following questions:

In the adjacent figure, the graphs of $y = f(x)$ and y = sin x are given. The graphs of two equations intersect at $P(a, f(a)), Q(\pi, 0)$ and $R(2\pi, 0)$.



Let S_1, S_2 and S_3 represent areas bounded by the curves $y = f(x)$ and y = sin x between x = 0 and x = a; between x = a and $x = \pi$ and between $x = \pi$ and $x = 2\pi$ respectively.

It is given that $S = 1 - \sin t + (t - 1)\cos t \ \forall \ t \le a$ represents the area bounded between $y = f(x)$ and $y = \sin x$.

7. The value of a is
(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$
(C) 1 (D) $\frac{\sqrt{3}}{2}$

Rough work

8. The value of $S_2 - S_1$ is

(A) π (B) $\pi - 1 + \sin 1$

(C) $1 - \sin 1$ (D) $\pi - 2$

9. The area S_3 is equal to

(A) $3\pi - 2$ (B) $2(\pi - 1)$

(C) $\pi - 2$ (D) $4 - \pi$

Paragraph for Question Nos. 10 to 12

Read the following write up carefully and answer the following questions:

Let $f(x)$ be a real valued function not identically zero, such that $f(x + y^n) = f(x) + (f(y))^n \ \forall \ x, y \in R$ where $n \in N (n \neq 1)$ and $f'(0) \geq 0$

10. The value of $f'(0)$ is

(A) 1 (B) 1 + n

(C) n (D) 2

11. The value of $f(5)$ is

(A) 2 (B) 3

(C) 5n (D) 5

12. $\int_0^1 f(x)\,dx$ is equal to

(A) $\frac{1}{2n}$ (B) 2n

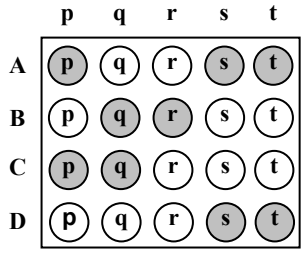
(C) $\frac{1}{2}$ (D) 2

Rough work

SECTION – B

Matrix – Match Type

This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p, q, r, s and t. Any given statement in **Column I** can have correct matching with **ONE OR MORE** statement(s) in **Column II.** The appropriate bubbles corresponding to the answers to these questions have to be darkened as illustrated in the following example:
If the correct matches are A – p, s and t; B – q and r; C – p and q; and D – s and t; then the correct darkening of bubbles will look like the following:



1. Match the following column–I with column–II.

	Column–I		Column–II
(A)	Area bounded by $y = x^2 + 2$ and $y = 2\|x\| - \cos \pi x$ is equal to A, then 3A equals	(p)	4
(B)	The value of $2\cot(\cot^{-1}3 + \cot^{-1}7 + \cot^{-1}13 + \cot^{-1}21)$	(q)	$\frac{8}{3}$
(C)	Tangent and normal at the ends A and C of focal chord AC of parabola $y^2 = 4x$ intersect at B and D, then minimum area of ABCD is	(r)	3
(D)	Number of integral values of ordered pair (α, β) for which the area common to $x^2 + y^2 - 2\alpha^2 x - 2\beta^2 y + c = 0$ and its image in $x + y = 1$ is maximum is	(s)	8
		(t)	2

2. For the function $f(x) = ax^2 - b|x|$. Match the following column–I with column–II.

	Column–I		Column–II
(A)	f(x) has local max. at x = 0	(p)	When a > 0, b > 0
(B)	f(x) has local min at x = 0	(q)	When a > 0, b < 0
(C)	f(x) has local extremum at $x = \frac{b}{2a}$	(r)	When a < 0, b < 0
(D)	f(x) is not diff. at x = 0	(s)	When a < 0, b > 0
		(t)	can not say

Rough work

SECTION – C

Integer Answer Type

This section contains **5 questions.** The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).

1. If a and b are selected at random from the range of y (a, b are distinct positive integers). Then the probability of selecting distinct ordered pairs (a, b) of prime numbers from the range of y, where $y = \frac{147}{x + \frac{1}{x} + 5} \quad \forall\ x > 0$, is $\frac{K}{15}$. Find K _____.

2. $\int_{-1}^{1} x^8 \{x\}\, dx$ is equal to ({x} denotes the fractional part of x) is a then 9a is _____.

3. The line $\frac{x-2}{3} = \frac{y-1}{2} = \frac{z-1}{-1}$ intersects the curve $x^2 - y^2 = a^2; z = 0$ then |a| is equal to _____.

4. The lines $(m-2)x + (2m-5)y = 0$; $(m-1)x + (m^2-7)y - 5 = 0$ and $x + y - 1 = 0$ are parallel, for m is equal to _____.

5. Let $f(x)$ be a real valued function such that $f(0) = \frac{1}{2}$ and $f(x+y) = f(x)f(a-y) + f(y)f(a-x)$ $\forall\ x, y \in R$ then for some real 'a', [f(2)] is equal to _____ (where [.] denotes the greatest integer function).

Rough work