

Mock Advanced Test-4 Paper-2

TIME : 3 hrs

M.M. : 240

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-I & II. Section-I contains two types (Type 1 & 2).

7. **Section I** contains two Types of questions. In **TYPE 1**, there are 8 Multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE CHOICE may be correct**. In **TYPE 2**, there are 2 Paragraphs each containing 2 questions. Each question of a particular paragraph has four choices (A), (B), (C) and (D) out of which **ONE OR MORE CHOICE may be correct**.
8. **Section II** contains 8 questions. The answer to each question is a Single Digit Integer, ranging from 0 to 9 (both inclusive).

D. Marking Scheme

9. **Section-I** : For each question of **TYPE-1** and **TYPE-2**, you will be awarded **4 marks** if you darken the bubble corresponding to the correct answer **ONLY** and zero (0) marks if no bubbles are darkened. **In all other cases, minus one (-2) mark will be awarded in these sections.**
10. **Section-II** : For each question, you will be awarded **4 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)

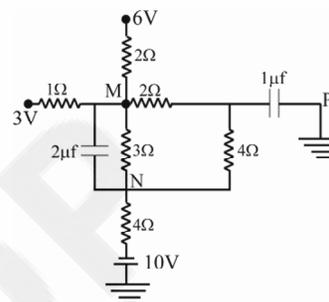
80 MARKS

SECTION-1/TYPE-1

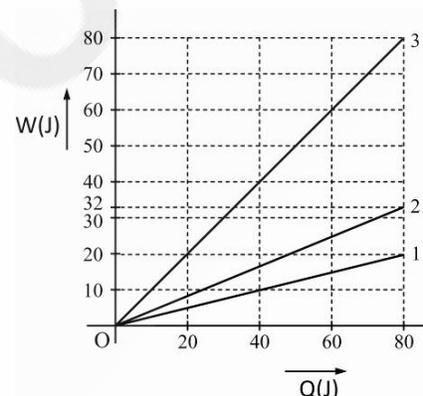
SINGLE CORRECT ANSWER

This section contains 8 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. Figure shows a network of capacitors and resistances in steady state. Potentials of some of the points are given. Then
- (A) potential at $M = 2.6\text{ V}$
 (B) Potential at $N = -1.6\text{ V}$
 (C) Charge across $2\mu\text{f}$ capacitor is $8.4\mu\text{C}$
 (D) Charge across $2\mu\text{f}$ capacitor is $4.2\mu\text{C}$



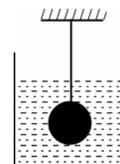
2. In the figure shown, the amount of heat supplied to one mole of an ideal gas is plotted on the horizontal axis and the amount work performed by the gas is drawn on the vertical axis. One of the straight lines in the figure is an isotherm and the other two are isobars of two gases. The initial states of both gases are same. Mark the correct statements.
- (A) Curve 3 corresponds to isothermal process
 (B) Curve 1 corresponds to a polyatomic gas
 (C) Curve 2 corresponds to a monatomic gas
 (D) Process 1 and 2 are isobaric process



3. The ^{238}U nucleus has a binding energy of about 7.6 MeV per nucleon. If the nucleus were to fission into two equal fragments, each would have a kinetic energy of just over 100 MeV . From this, it can be concluded that :
- (A) nuclei near $A = 119$ has mass less than half that of ^{238}U
 (B) nuclei near $A = 119$ have masses greater than half that of ^{238}U
 (C) nuclei near $A = 119$ must be bound by about 6.7 MeV/ nucleon
 (D) nuclei near $A = 119$ must be bound by about 8.5 MeV/ nucleon

SPACE FOR ROUGH WORK

4. Each of the following system begins moving upwards with a constant acceleration. Select these cases in which quantity will change due to this upward acceleration :
- (A) time period of simple pendulum
 (B) fraction of floating body submerged in a liquid
 (C) time period of a spring block system
 (D) pressure on the base of a container containing liquid
5. The gas equation for n moles of a real gas is: $\left(P + \frac{a}{V^2}\right)(V - b) = nRT$ where P is the pressure, V is the volume, T is the absolute temperature, R is the molar gas constant and a, b are arbitrary constants. Which of the following have the same dimensions as those of PV ?
- (A) nRT (B) a/V (C) Pb (D) ab/V^2
6. An electric dipole is kept in the electric field produced by a point charge.
- (A) dipole can experience zero electrostatic force
 (B) dipole can experience a torque.
 (C) dipole can be rotated in a fixed position without changing the potential energy of the system.
 (D) it is possible to find a path in the field on which work required to move the dipole is zero .
7. A composite rod consists of a steel rod of length 25 cm and area $2A$ and a copper rod of length 50 cm and area A . The composite rod is subjected to an axial load F . If the Young's modulus of steel and copper are in the ratio $2 : 1$.
- (A) the extension in copper and steel parts will be in the ratio $8 : 1$.
 (B) the extension in copper and steel parts will be in the ratio $2 : 1$.
 (C) the stress applied to the copper rod will be more.
 (D) the stress applied to the steel rod will be more.
8. A solid sphere of mass m , suspended through a string in a liquid as shown. The string has some tension. Magnitudes of net force due to liquid on upper hemisphere and that on lower hemisphere are F_A and F_B respectively. Which of the following is(are) true ?
- (A) Density of material of the sphere is greater than density of liquid
 (B) Difference of F_B and F_A is dependent on atmospheric pressure
 (C) $F_B - F_A = mg$ (D) $F_B - F_A < mg$



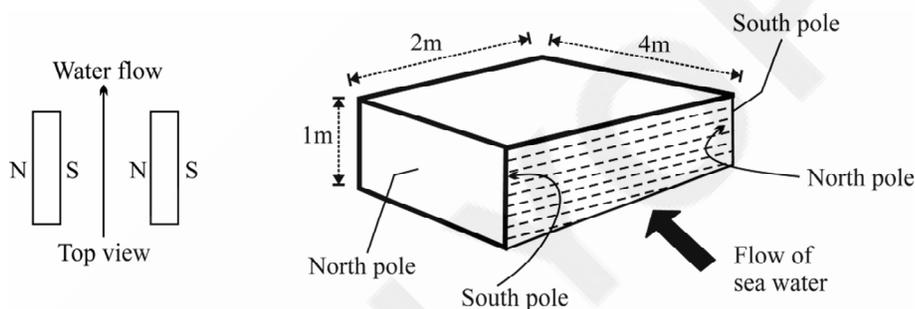
SPACE FOR ROUGH WORK

SECTION-1/TYPE-2
LINK COMPREHENSION TYPE

This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONE OR MORE CHOICES may be correct.

Paragraph for Question 9 - 10

The dead-quiet “caterpillar drive” for submarines in the movie "The Hunt for Red October" is based on a magnetohydrodynamic (*MHD*) drive ; as the submarines moves forward, seawater flows through multiple channels in a structure built around the rear of the hull. Figure shows the essentials of a channel. Magnets, positioned along opposite sides of the channel with opposite poles facing each other, create a magnetic field within the channel. Electrodes (not shown) create an electric field across the channel. The electric field derives a current across the channel and through the water ; the magnetic force on the current propels the water toward the rear of the channel, thus propelling the submarines forward.



9. In figure what should be the direction of electric field ?
 (A) upward (B) downward (C) left ward (D) rightward
10. If the value of magnetic field is 100T and current flowing is 50 A what is the force with which the water is pushed out through this channel?
 (A) 500 N (B) 5000N (C) 10000N (D) 20000N

Paragraph for Question 11 - 12

An equiconvex lens is made of material which has a refractive index of 1.6 for blue light and 1.5 for red light. Its focal length for red light is 0.20 m.

11. What is the ratio of focal length for red light to focal length for blue light?
 (A) 5/6 (B) 15/16 (C) 16/1 (D) 6/5
12. The curvature of one surface of the lens is doubled, and of the other surface is halved. What is the ratio of the new focal length for red light to the old focal length for red light?
 (A) 1/2 (B) 4/5 (C) 2 (D) 5/4

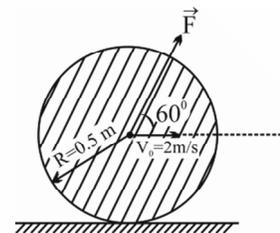
SPACE FOR ROUGH WORK

SECTION - II

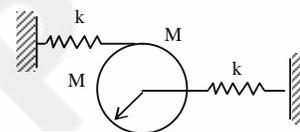
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 8 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 garden roller (like uniform disc) is pulled by a constant force \vec{F} (see figure). It attains a velocity of 2m/s after its centre moves a distance of 6m . The roller is initially at rest. Calculate the value of magnitude of force F (in Newton) if the mass and radius of roller are 400kg and 0.5m respectively and it rolls on ground without slipping. If the force is $F = x.100\text{N}$, write x as your answer.



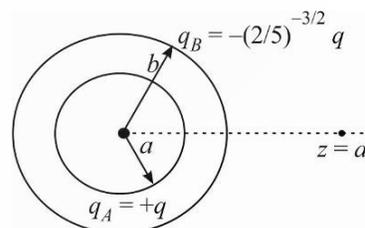
2. A solid uniform cylinder of mass M performs small oscillations due to the action of two springs, each having stiffness k . Find the period of these oscillations in absence of any sliding (springs have their natural length initially). For calculations, take $m=10\text{kg}$, $k = 3\pi^2$.



3. A Bohr hydrogen atom undergoes a transition $n = 5 \rightarrow n = 4$ and emits a photon of frequency ν . Frequency of circular motion of electron in $n = 4$ orbit is ν_4 . Find the ratio $10\nu/\nu_4$, rounded off to the nearest integer.

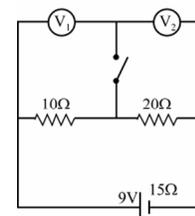
4. Two concentric rings, one of radius ' a ' and the other of radius ' b ', have the charge $+q$, and $-(2/5)^{-3/2}q$, respectively, as shown in the figure.

Find the ratio b/a if a charge particle placed on the axis at $z = a$ is in equilibrium.



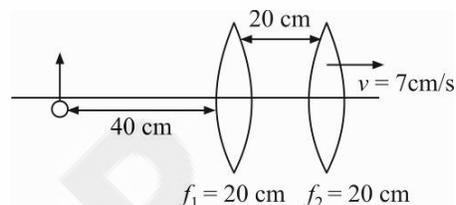
5. In the circuit shown in the figure the electromotive force of the battery is 9V and its internal resistance is 15Ω . The two identical voltmeters can be considered ideal. Let V_1 and V_1' reading of 1st voltmeter when switch is open and closed respectively. Similarly, V_2 and V_2' be the reading of 2nd voltmeter when switch is open and closed

respectively. $\frac{V_2' - V_2}{V_1 - V_1'} =$



SPACE FOR ROUGH WORK

6. A beam of light has intensity of 144 W/m^2 equally distributed among three wavelengths of 410 nm , 496 nm and 620 nm . The beam is incident normally on an area of 0.5 cm^2 of a clean sodium surface, having a work function of 2.3 eV . Assuming that there is no loss of energy by reflection and that each energetically capable photon ejects a photoelectron, find the saturation photocurrent in mA (milli-ampere), rounded off to the nearest integer.
7. Two identical flasks contain same number of hydrogen molecules. They are connected by a pipe with a valve. The *RMS* speed of molecules in the first flask is 400 m/s . The valve is suddenly opened so that the gases mix. There is no heat loss to the surroundings. The *RMS* speed of the molecules now in the mixture is 500 m/s . If the *RMS* speed of molecules in the 2nd flask before mixing was $100\sqrt{17x}$, find the value of x .
8. An object O is located 40 cm from the first of two thin converging lenses (each of focal length 20 cm), as shown in the figure. The speed of the right lens is 7 cm/s rightwards. If the speed of final image is $(7x)/4 \text{ cm/s}$ at the instant shown, find the value of x .



SPACE FOR ROUGH WORK

SECTION-1/TYPE-1

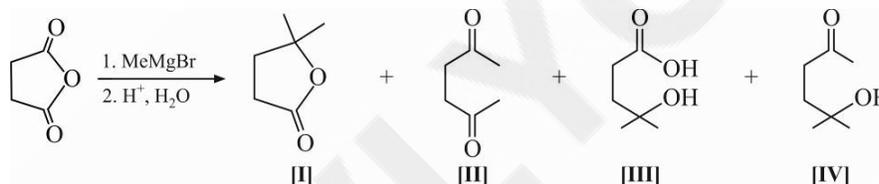
SINGLE CORRECT ANSWER

This section contains 8 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

- When O_2 is reacted with PtF_6 electron transfer occurs from O_2 to PtF_6 . The true statement(s) regarding this process is(are) ?

(A) Occupancy of π_{2p}^* of O_2 is decreased (B) Red coloured compound is formed
 (C) Bond length of O – O bond is decreased (D) Paramagnetic character is decreased
- For each of the properties given below, which of the following properties has the greater value for H_2O than the H_2S ?

(A) Heat of fusion (B) Bond angle
 (C) Acid dissociation constant (D) Reducing nature
- In the following reaction, the possible product(s) that might be formed from the reaction of excess of $MeMgBr$ with the cyclic anhydride are as shown.



Which of the following chemical test or reaction can be used to identify them :

- Compound I and III can be distinguished by $NaHCO_{3(aq)}$
 - Compound III and IV can be distinguished by $I_2 / NaOH$
 - Compound II form aromatic compound on heating with $(NH_4)_2CO_3$
 - Compound III on heating with conc. H_2SO_4 form unsaturated hydrocarbon
- Which of the following statement(s) is(are) correct for compounds of chlorine ?

(A) Atomic chlorine has greater first ionization energy than the molecular chlorine
 (B) Chloride ion has larger radius than atomic Cl
 (C) ClO_2 is paramagnetic
 (D) Oxidation state of chlorine in bleaching powder is +1 as well as -1

SPACE FOR ROUGH WORK

5. In which of the following binary mixture of miscible liquids, the components can be subjected to complete separation through fractional distillation.
- (A) $C_6H_5Cl : C_6H_5Br$ (B) $C_6H_6 : C_7H_8$
(C) $CHCl_3 : CH_3COCH_3$ (D) $C_2H_5OH : C_3H_7OH$
6. Which of the following is(are) correct for SiO_2 ?
- (A) Network silicate (B) Covalent solid
(C) Coordination number of Si is four (D) Molecular solid
7. Elements **X** and **Y** form both oxides and chlorides. Under laboratory conditions, XCl_2 is a cherry red liquid while YCl_2 is a white solid. Which one of the following statements is most likely to describe the oxides of these elements?
- (A) **X** forms a basic oxide **XO** while **Y** forms an acidic oxide **YO**
(B) **X** forms a basic oxide XO_2 while **Y** forms two acidic oxides **YO** and YO_2
(C) **X** forms two acidic oxides XO_2 and XO_3 while **Y** forms a basic oxide **YO**
(D) **X** forms an acidic oxide **XO** while **Y** forms a basic oxide **YO**
8. 5.0 g of basic ore is dissolved in water to form one litre solution. This solution required 15 mL of 1 M HCl solution to reach phenolphthalein end point and further 15 ml of $1M H_2SO_4$ to reach methyl orange end point. Which of the following is present as basic material in the ore?
- (A) Only Na_2CO_3 (B) Only $NaHCO_3$
(C) Na_2CO_3 and NaOH (D) Na_2CO_3 and $NaHCO_3$

SPACE FOR ROUGH WORK

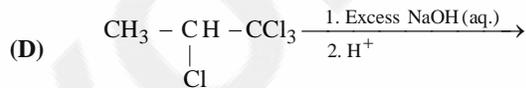
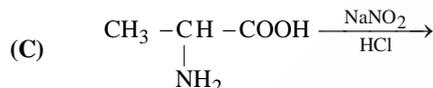
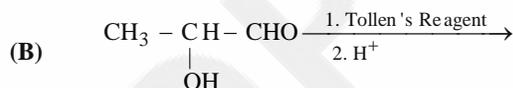
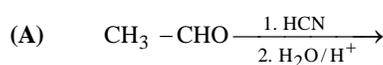
SECTION-1/TYPE-2
LINK COMPREHENSION TYPE

This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONE OR MORE CHOICES may be correct.

Paragraph for Questions 9 - 10

Lactic acid is produced industrially through the bacterial conversion of sucrose. In this process (+)-2-hydroxypropanoic acid is formed, which is used in the food sector and also as a starting material for a number of chemical products. A fine-chemical produced on heating from (+)-lactic acid is called as cyclic di-lactide (M). This di-lactide is polymerized to a poly-lactide (N), which among other things is being used in surgery as a "biodegrading" thread in the suturing of surgical wounds.

9. Which of the following chemical conversion can be used to produce lactic acid ?



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

- (A) Dilactide exist in three stereo isomeric forms
- (B) Polylactide can exist in three stereoisomeric forms
- (C) One form of dilactide is optically inactive
- (D) PHBV is biodegradable polymer

SPACE FOR ROUGH WORK

Paragraph for Questions 11 - 12

Chromium metal reacts with acid to produce Cr^{3+} ions and hydrogen gas. When a sample of chromium metal is reacted with excess acid, 94.7 mL of gas is collected over water at 745 mm Hg and 25°C . Assume ideal gas behaviour. [The vapour pressure of water at 25°C is 24 mm Hg, atomic mass of Cr = 52 ; atomic number of Cr = 24, $R = 0.0821 \text{ L atm mol}^{-1} \text{ K}^{-1}$]

11. Identify the correct statement(s) ?
- (A) 0.129 g of chromium metal is reacted
 - (B) 63.1 ml of H_2 would be released if Cr^{2+} (rather than Cr^{3+}) ions were formed in the reaction
 - (C) The ratio of the average molecular velocity of hydrogen to the average molecular velocity of water vapour at the same temperature is 3 : 1 [Assuming ideal behaviour]
 - (D) $\text{Cr}_{(\text{aq})}^{2+}$ is strong reducing agent
12. Which of the following statement(s) is(are) true regarding chromium ?
- (A) Valence shell electronic configuration of chromium is $[\text{Ar}]3d^5 4s^1$
 - (B) Maximum oxidation state of chromium is +6
 - (C) The chromates and dichromates are interconvertible in aqueous solution depending upon pH of the solution
 - (D) The colouration of gam stone Ruby is due to d-d transition in Cr^{3+} present in ruby

SPACE FOR ROUGH WORK

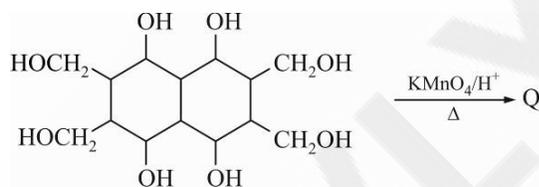
SECTION - II

SINGLE INTEGER VALUE CORRECT TYPE

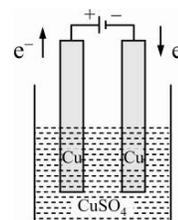
This section contains 8 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

- Complex octacarbonyldicobalt (0) exist in two isomeric forms. Find the number of bridging CO groups in major isomer.
- A metal complex of coordination number six having three different types of ligands a, b and c of composition $Ma_2b_2c_2$ can exist in several geometrical isomeric forms. The total number of such isomers is _____.
- Eight moles of $SOCl_2$ are completely reacted with white phosphorus. The number of moles of sulphur containing products formed is _____.
- A salt containing chromium, chlorine and water has formula $CrCl_n(H_2O)_m$. A sample of the salt is electrolyzed for 1310 s using a current of 1.24 A and deposits 0.292 g metallic Cr. What is the value of n in the salt?
- A closed vessel with rigid walls contains 1 mol of ${}^{226}_{88}Ra$ and 1 mol of air at 298 K. Considering complete decay of ${}^{226}_{88}Ra$ to ${}^{222}_{86}Rn$, the ratio of the final pressure to the initial pressure of the system at 298 K is _____.

- The number of carboxylic group(s) in Q is _____.



- An ammonia-ammonium chloride buffer has a pH value of 9 with $[NH_3] = [NH_4Cl] = 0.25 M$. What will be the new pH if 500 ml 0.1 M NaCl is added to 200 ml buffer solution ($K_b = 1 \times 10^{-5}$) ?
- In electrolytic refining of impure copper as shown in figure the electrolytic cell contains 1 L of an aqueous 1 M copper (II) sulphate solution. If 0.4 mole of electrons passes through the cell, the concentration of copper ions in mol/lit after passage of the charge will be _____. [Assume no change in volume of electrolyte solution]



SPACE FOR ROUGH WORK

SECTION-1/TYPE-1

SINGLE CORRECT ANSWER

This section contains 8 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. If $f(x) = |2x^2 - 4x - 7|$ and $g(x)$ is defined for $\alpha \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right)$ as $g(\alpha) = \left[1 + \frac{1}{2} \left(\frac{\cos \alpha}{\cos \frac{\alpha}{2} - \sin \frac{\alpha}{2}} \right)^2 \right]$ where $[\cdot]$

denotes greatest integer function then the set of value(s) of x for which $f(x) < g(\alpha), \forall \alpha \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right)$ is :

- (A) $(1 - \sqrt{5}, -1) \cup (3, 1 + \sqrt{5})$ (B) $(-2, -1) \cup (2, 3)$
 (C) $(1, 1 + \sqrt{5})$ (D) $(-2, 1 + \sqrt{5})$

2. For $x \in (0, 2)$ consider the function $f(x) = \int_0^2 e^{|x-t|} dt$

- (A) $f(x)$ decreases for $x \in (0, 1)$ (B) $f(x)$ has maximum value $(2e - 2)$
 (C) $f(x)$ decreases for $x \in (1, 2)$ (D) $f(x)$ has minimum value $(2e - 2)$

3. Let $I = \int_0^2 g(x) dx$ and $g(x) = e^{x^2} + [x^2]$ [here $[\cdot]$ is G.I.F.]. Then :

- (A) $I > 2$ (B) $g(x)$ has range $[1, e^4 + 4]$ for $x \in [0, 2]$
 (C) $I < 2e^4 + 6$ (D) $g(x)$ is discontinuous at 4 points in $[0, 2]$

4. For a given function $f(x) = x^3 - 3x^2 + x + 2$ roots are shifted by ' λ ' to eliminate x^2 term and α, β, γ are the roots of new function then value of expression

$$\left(\frac{\alpha^3}{(\alpha - \beta)(\alpha - \gamma)(\alpha - \lambda)} + \frac{\beta^3}{(\beta - \gamma)(\beta - \alpha)(\beta - \lambda)} + \frac{\gamma^3}{(\gamma - \alpha)(\gamma - \beta)(\gamma - \lambda)} + \frac{\lambda^3}{(\lambda - \alpha)(\lambda - \beta)(\lambda - \gamma)} \right)$$

- (A) equals to 1 (B) lies in $(-2, 1)$
 (C) lies in $(-1, 2)$ (D) equals to $\frac{4}{9}$

SPACE FOR ROUGH WORK

5. If $f(\alpha) = \cot^9 \alpha \left\{ \sum_{r=1}^{20} (r + \tan \alpha)^n \right\} - 2n \tan \alpha$, then value of $\lim_{\alpha \rightarrow \frac{\pi-}{2}} f(\alpha)$, for $n = 10$ is less than :
- (A) 2101 (B) 2099 (C) 2100 (D) 2102
6. An ellipse is sliding between the coordinate axes, if center, of the locus of its center is (a, b) and d is the distance of point P on this locus which is farthest from (a, b) and d is $\frac{1}{\sqrt{3}}$ times length of major axis of ellipse
- (A) $(a+d) \times b = 0$ (B) $(a+b) \times d = 0$ (C) eccentricity of ellipse is $\sqrt{\frac{2}{3}}$
 (D) product of ordinates of foci, for the given length of major axis of ellipse as '6', is 3
7. Let S_1 be the curve $y = \sin \pi x$ and S_2 be the curve $\frac{x^2}{1} - \frac{y^2}{b^2} = 1$.
 For $x, y \geq 0$, if tangent at vertex L_1 of S_2 is rotated to touch S_1 say this tangent is L_2 and rotated to pass through the corresponding end point of latusrectum of S_2 , say this line as L_3 ; It is given that latusrectum subtends 90° at the center of hyperbola; which of the following is(are) correct
- (A) Angle between L_1 and L_2 is $\cot^{-1}(\pi)$ (B) Angle between L_1 and L_3 is $\cot^{-1}\left(\frac{1}{\pi}\right)$
 (C) L_1 is the bisector of L_2 and L_3 (D) $2b^2 = (1 + \sqrt{5})$
8. If $I_1 = \int_0^{\pi/2} \frac{\sin^3 x - \cos^3 x}{1 + (\tan x)^{1/3} + (\cot x)^{1/3}} dx$, $I_2 = \int_0^1 \ln\left(\frac{1}{x} - 1\right) dx$, $I_3 = \int_{-10}^{10} \frac{\tan x \cdot \ln(1 + |x|)}{\sin(x^3) \cdot \cot(x|x|)} dx$
 and $I_4 = \int_0^1 \frac{dx}{\sqrt{4-x^2-x^3}}$
 Then :
- (A) $I_4 < I_3 = I_2$ (B) $I_4 > I_3 = I_2$ (C) $I_4 > I_2 = I_1$ (D) $I_1 = I_3 < I_4$

SPACE FOR ROUGH WORK

SECTION-1/TYPE-2
LINK COMPREHENSION TYPE

This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONE OR MORE CHOICES may be correct.

Paragraph for Questions 9 - 10

$F(x)$ and $g(x)$ be two twice differentiable functions such that, $F'(x).g'(x) < 0, \forall x \in (0, \infty)$

and $f(x) = F(x) \times g(1/x), \{f(x) > 0, \forall x \in (0, \infty)\}$

9. If $F(x) > 0$, then :
- | | |
|--|--|
| (A) $f(x)$ increases if $g(x)$ decreases | (B) $f(x)$ decreases if $g(x)$ decreases |
| (C) $f(x)$ increases if $F(x)$ decreases | (D) $f(x)$ increases if $F(x)$ increases |
10. If $F(1) = -2016, g'(x) + 2015 < 0, \forall x \in \left(\frac{1}{2}, \infty\right)$. Then :
- | | |
|---|--|
| (A) $F(x) = 0$ has exactly one solution in $(1, \infty)$ | (B) $F(x) = 0$ has at most one solution in $(1, \infty)$ |
| (C) $F(x) = 0$ has exactly one solution in $\left(\frac{1}{2}, \infty\right)$ | (D) $F(x)$ is monotonically increasing |

Paragraph for Questions 11 - 12

Hundred bags are given such that they form a row of bags, first ninety bags contain n_1 -white and n_1 -black balls and rest bags contain n_1 -white ball and n_2 black balls ($n_1 \neq n_2$). If a ball is drawn from bag-1 randomly and placed into bag-2 and then a ball is drawn from bag-2 and placed into bag-3, and so on then answer the following questions

11. The probability of getting a white ball from 90th bag is :
- | | |
|--------------------------|----------------------------|
| (A) $2/3$ | (B) $1/2$ |
| (C) Independent of n_1 | (D) Dependent on ' n_1 ' |
12. The probability of getting a black ball from 91st bag is :
- | | |
|--|----------------------------|
| (A) Depends on n_2 | (B) $1/4$ |
| (C) Independent of ' n_1 and n_2 ' | (D) Dependent on ' n_1 ' |

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SECTION - II

SINGLE INTEGER VALUE CORRECT TYPE

This section contains 8 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. Coefficient of x^4 in the expansion $\{(1+x)(1+x^2)(1+x^4)(1+x^8)\dots\dots(1+x^{64})\} \cdot f(x)$ where $x \in R - \{1\}$ and $f(x) = (1-x)^{-3}(1-x^2)(1-x^3)$, is $7n$ then $n =$ _____.
2. Suppose that foci of the ellipse $\frac{x^2}{64} + \frac{y^2}{48} = 1$ is $F_1 : (f_1, 0)$ and $F_2 : (f_2, 0)$ where $f_1 > 0$ and $f_2 < 0$; consider a point Q on +ve minor axis of ellipse which has distance from center of ellipse $\frac{\sqrt{3}}{2}$ times the distance of vertex on minor axis from centre. If a parabola touches axes of ellipse at F_1 and Q, has latus rectum of parabola $\frac{1}{13\sqrt{3}}[286 + a]$ then $a =$ _____.
3. Let m and n be two positive integers greater than '1'. If $\lim_{\alpha \rightarrow 0} \left(\frac{\ln(\tan(\alpha^n) + 1)}{\cos(\alpha^m) - 1} \right) = -2$. Then the value of $\frac{m+n}{m} =$ _____.
4. For given $f(x) = 9x + 3 \tan^{-1} x$, $\int_{-2}^2 \left(\frac{1 - e^{f(x)}}{1 + e^{f(x)}} \right) \left(\frac{12 + 9x^2}{1 + x^2} \right) dx$, equals to _____.

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5. $f(x), g(x)$ be the twice differentiable function such that $f(1) = 0 = g(1)$ and $f'(1) = 2$,
 Consider $F(x) = \int_x^{x^2} f(x) dx$ and $G(x) = \int_1^{x^3} g(x) dx$, $\lim_{x \rightarrow 1} \left(\frac{F(x)}{G(x)} \right) = \frac{1}{3}$ then $g'(1) =$ _____.
6. If m is the real number such that vector $(1, 2, m)$ can be written as a linear combination of $(0, 1, 1)$ and $(1, 1, 2)$ and ' n ' represents the number of real solutions to equation $x^{12} = 2^x$. If $(m\hat{i} + n\hat{j}) \cdot (n\hat{i} + m\hat{j})$ is λ then $\lceil \sqrt{\lambda} \rceil$ (here $\lceil \cdot \rceil$ is G.I.F.) is _____.
7. The number of elements the set $\{Z \in \mathbb{C} : Z^{60} = -1, Z^k \neq -1 \text{ for } 0 < k < 60\}$ contain is λ , number of factors of λ is _____.
8. If $S_n = \frac{5}{1.2} \cdot \frac{1}{3} + \frac{7}{2.3} \cdot \frac{1}{3^2} + \frac{9}{3.4} \cdot \frac{1}{3^3} + \dots$ upto n terms and $S_n - S_{n-4} = \frac{188}{3^6 \times 7}$; then n equals to _____.

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