[redacted]

unacademy

JEE-MAIN
Batch - Growth (June) | Minor Test – 12

Time: 3:00 | **Test Date: 02nd February 2025** | **Maximum Marks: 300**

Name of the Candidate: ________________________________ Roll No. ______________________

Centre of Examination (in Capitals): ____

Candidate's Signature: ___________________ Invigilator's Signature: _______________________

READ THE INSTRUCTIONS CAREFULLY

1. The candidates should not write their Roll Number anywhere else (except in the specified space) on the Test Booklet/Answer Sheet.

2. This Test Booklet consists of 75 questions.

3. This question paper is divided into three parts **PART A - MATHEMATICS, PART B - PHYSICS** and **PART C - CHEMISTRY** having 25 questions each and every **PART** has two sections.

   (i) **Section-I** contains 20 multiple choice questions with only one correct option. **Marking scheme:** +4 for correct answer, 0 if not attempted and –1 in all other cases.

   (ii) **Section-II** contains 5 questions, is an INTEGERAL VALUE.

   Marking scheme: +4 for correct answer, 0 if not attempted and –1 in all other cases.

4. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electronic device etc., except the Identity Card inside the examination hall/room.

5. Rough work is to be done on the space provided for this purpose in the Test Booklet only.

6. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Room/Hall. However, the candidate is allowed to take away this Test Booklet with them.

7. **For integer-based questions, the answer should be in decimals only not in fraction.**

8. **If learners fill the OMR with incorrect syntax (say 24.5. instead of 24.5), their answer will be marked wrong.**

[redacted]

TEST SYLLABUS

BATCH – Growth (JUNE) | Minor Test - 12

02nd February 2025

Mathematics	:	Ellipse
Physics	:	Fluid Mechanics
Chemistry	:	Isomerism

Useful Data Chemistry:

Gas Constant	R	$= 8.314\,JK^{-1}mol^{-1}$
		$= 0.0821$ Lit atm $K^{-1}mol^{-1}$
		$= 1.987 \approx 2$ Cal $K^{-1}mol^{-1}$
Avogadro's Number	N_a	$= 6.023 \times 10^{23}$
Planck's Constant	h	$= 6.626 \times 10^{-34}$ Js
		$= 6.25 \times 10^{-27}$ erg.s
1 Faraday		$= 96500$ Coulomb
1 calorie		$= 4.2$ Joule
1 amu		$= 1.66 \times 10^{-27}$ kg
1 eV		$= 1.6 \times 10^{-19}$ J

Atomic No:

H = 1, D = 1, Li = 3, Na = 11, K = 19, Rb = 37, Cs = 55, F = 9, Ca = 20, He = 2, O = 8, Au = 79.

Atomic Masses:

He = 4, Mg = 24, C = 12, O = 16, N = 14, P = 31, Br = 80, Cu = 63.5, Fe = 56, Mn = 55, Pb = 207, Au = 197, Ag = 108, F = 19, H = 2, Cl = 35.5, Sn = 118.6

Useful Data Physics:

Acceleration due to gravity $g = 10\ m/s^2$

PART – A: MATHEMATICS

SECTION-I

1. If the distance between the foci of an ellipse is half the length of its latus rectum, then the eccentricity of the ellipse is:

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

Ans. B

Sol. Focus of an ellipse is given as $(\pm \text{ae}, 0)$ Distance between them $= 2\text{ae}$

According to the question, $2\text{ae} = \frac{\text{b}^2}{\text{a}}$

$$\Rightarrow 2\text{a}^2\text{e} = \text{b}^2 = \text{a}^2(1-\text{e}^2)$$
$$\Rightarrow 2\text{e} = 1-\text{e}^2 \Rightarrow (\text{e}+1)^2 = 2 \Rightarrow \text{e} = \sqrt{2}-1$$

2. The equation of the circle drawn with the two foci of $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ as the end-points of a diameter, is

(A) $x^2+y^2=a^2+b^2$ (B) $x^2+y^2=a^2$
(C) $x^2+y^2=2a^2$ (D) $x^2+y^2=a^2-b^2$

Ans. D

Sol. The coordinates of two foci of the given ellipse are $S(ae,0)$ and $S'(-ae,0)$. So, equation of the circle with SS' as diameter is

$$(x-ae)(x+ae)+(y-0)(y-0)=0$$
$$\Rightarrow x^2+y^2=a^2e^2$$
$$\Rightarrow x^2+y^2=a^2-b^2\ [\because b^2=a^2(1-e^2)]$$

3. The number of real tangents that can be drawn to the ellipse $3x^2+5y^2=32$ passing throygh (3,5) is

(A) 0 (B) 1 (C) 2 (D) infinite

Ans. C

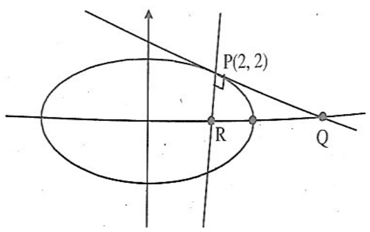
Sol. Since $3(3)^2+5(5)^2-32>0$. So the given point lies outside the ellipse. Hence, two real tangents can be drawn from the point to the ellipse.

4. The tangent and normal to the ellipse $3x^2+5y^2=32$ at the point $P(2,2)$ meet the x-axis at Q and R, respectively. Then the area (in sq. units) of the triangle PQR is :

(A) $\frac{34}{15}$ (B) $\frac{14}{3}$ (C) $\frac{16}{3}$ (D) $\frac{68}{15}$

Ans. D

Sol. $3x^2+5y^2=32 \Rightarrow \frac{3x^2}{32}+\frac{5y^2}{32}=1$



Tangent on the ellipse at P is

$\frac{3(2)x}{32}+\frac{5(2)y}{32}=1 \Rightarrow \frac{3x}{16}+\frac{5y}{16}=1$

$\therefore$ co-ordinates of Q will be $\left(\frac{16}{3},0\right)$

Now, normal at P is $\frac{32}{3(2)}-\frac{32y}{5(2)}=\frac{32}{3}-\frac{32}{5}$

$\therefore$ co-ordinates of R will be $\left(\frac{4}{5},0\right)$

Hence, area of $\triangle$ PQR $=\frac{1}{2}(PQ)(PR)$

$=\frac{1}{2}\sqrt{\frac{136}{9}}\cdot\sqrt{\frac{136}{25}}=\frac{68}{15}$

5. In an ellipse, with centre at the origin, if the difference of the lengths of major axis and minor axis is 10 and one of the foci is at $(0,5\sqrt{3})$, then the length of its latus rectum is:

(A) 10 (B) 5 (C) 8 (D) 6

Ans. B

Sol. Given that focus is $(0,5\sqrt{3}) \Rightarrow |b|>|a|$

Let $b>a>0$ and foci is $(0,\pm be)$

$\because a^2=b^2-b^2e^2 \Rightarrow b^2e^2=b^2-a^2$

$be=\sqrt{b^2-a^2} \Rightarrow b^2-a^2=75$

$\because 2b-2a=10 \Rightarrow b-a=5$

From (i) and (ii), $b+a=15$

On solving (ii) and (iii), we get $\Rightarrow b=10, a=5$

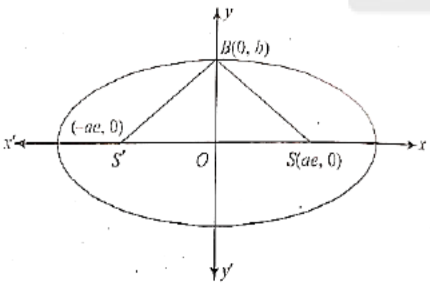
Now, length of latus rectum $=\frac{2a^2}{b}=\frac{50}{10}=5$

6. Let S and S' be the foci of an ellipse and B be any one of the extremities of its minor axis. If $\Delta S'BS$ is a right angled triangle with right angle at B and area $(\Delta S'BS)=8$ sq. units, then the length of a latus rectum of the ellipse is :

(A) 4 (B) $2\sqrt{2}$ (C) $4\sqrt{2}$ (D) 2

Ans. A

Sol. $\triangle S'BS$ is right angled triangle, then (Slope of BS) $\times$ Slope of BS') $=-1$.



$\frac{b}{-ae}\times\frac{b}{ae}=-1 \Rightarrow b^2=a^2e^2$

Since, area of $\triangle S'BS=8$

$\Rightarrow \frac{1}{2}\cdot 2ae\cdot b=8 \Rightarrow b^2=8$

[redacted]

From eq ^{n} (i), $a^2e^2 = 8$

Also, $e^2 = 1 - \frac{b^2}{a^2}$

$\Rightarrow a^2e^2 = a^2 - b^2 \Rightarrow 8 = a^2 - 8 \Rightarrow a^2 = 16$

Hence, required length of latus rectum

$$= \frac{2b^2}{a} = \frac{2(8)}{4} = 4 \text{ units}$$

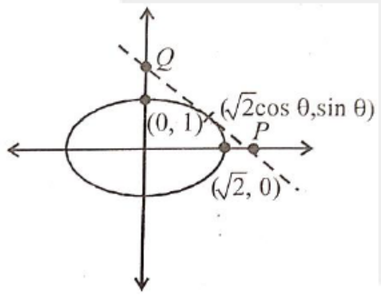
7. If tangents are drawn to the ellipse $x^2 + 2y^2 = 2$ at all points on the ellipse other than its four vertices then the mid points of the tangents intercepted between the coordinate axes lie on the curve:

(A) $\frac{1}{4x^2} + \frac{1}{2y^2} = 1$ (B) $\frac{x^2}{4} + \frac{y^2}{2} = 1$ (C) $\frac{1}{2x^2} + \frac{1}{4y^2} = 1$ (D) $\frac{x^2}{2} + \frac{y^2}{4} = 1$

Ans. C

Sol. Given the equation of ellipse,

$$\frac{x^2}{(\sqrt{2})^2} + y^2 = 1$$



Equation of tangents $\frac{\sqrt{2}\cos\theta x}{2} + y\sin\theta = 1.$

$P\left(\frac{\sqrt{2}}{\cos\theta}, 0\right)$ and $Q\left(0, \frac{1}{\sin\theta}\right)$

Let mid point be $(h, k) \Rightarrow h = \frac{1}{\sqrt{2}\cos\theta}, k = \frac{1}{2\sin\theta}$

As $\cos^2\theta + \sin^2\theta = 1, \therefore \frac{1}{2h^2} + \frac{1}{4k^2} = 1$

Locus is $\frac{1}{2x^2} + \frac{1}{4y^2} = 1$

8. If m is the slope of a common tangent to the curves $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and $x^2 + y^2 = 12$, then $12m^2$ is equal to:

(A) 6 (B) 9 (C) 10 (D) 12

Ans. B

Sol. Given ellipse is $\frac{x^2}{16} + \frac{y^2}{9} = 1$

So equation of tangent to the ellipse is,

$$y = mx \pm \sqrt{a^2m^2 + b^2}$$
$$y = mx \pm \sqrt{16m^2 + 9}$$

Now, given circle is

$x^2 + y^2 = 12$

So equation of tangent to the circle is

$y = mx \pm \sqrt{12}\sqrt{1+m^2}$

For common tangent on equating equations (i) and (ii)

$\Rightarrow 16m^2 + 9 = 12(1+m^2)$

$16m^2 - 12m^2 = 3 \Rightarrow 4m^2 = 3 \Rightarrow 12m^2 = 9$

9. The eccentricity of the curve $2x^2 + y^2 - 8x - 2y + 1 = 0$ is :

(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{2}{3}$ (D) $\frac{3}{4}$

Ans. **(B)**

Sol. The given curve is : $2x^2 + y^2 - 8x - 2y + 1 = 0$

Þ$2(x^2 - 4x + 4 - 4) + (y^2 - 2y + 1) = 0$

Þ$2(x - 2)^2 - 8 + (y - 1)^2 = 0$

Þ $2(x-2)^2 + (y-1)^2 \Rightarrow \frac{(x-2)^2}{4} + \frac{(y-1)^2}{8} = 1$

This is equation of ellipse with centre (2, 1).

Þ$a^2 = 4$, $b^2 = 8$

Eccentricity $e = \sqrt{\frac{b^2 - a^2}{b^2}} = \sqrt{\frac{8-4}{8}} = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$

10. Find the equation of the ellipse whose vertices are (± 13, 0) and foci are (± 5, 0).

(A) $\frac{x^2}{13} + \frac{y^2}{12} = 1$ (B) $\frac{x^2}{169} + \frac{y^2}{144} = 1$ (C) $\frac{x^2}{144} + \frac{y^2}{169} = 1$ (D) $\frac{x^2}{12} + \frac{y^2}{13} = 1$

Ans. **(B)**

Sol. Since the vertices are on x-axis, the equation will be of the form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where a is the semi-major axis.

Given that a = 13, c = ± 5.

Therefore, from the relation $c^2 = a^2 - b^2$, we get

$25 = 169 - b^2$, i.e., b = 12

Hence, the equation of the ellipse is $\frac{x^2}{169} + \frac{y^2}{144} = 1$.

11. The equation of the ellipse whose centre is at the origin and the x-axis, the major axis, which passes through the points (–6, 1) and (4, –4) is

(A) $3x^2 - 4y^2 = 32$ (B) $3x^2 + 4y^2 = 112$

(C) $4x^2 - 3y^2 = 112$ (D) $4x^2 + 3y^2 = 112$

Ans. **B**

Sol. Let $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ be the equation of the ellipse. Then according to the given conditions, we have

$\frac{36}{a^2} + \frac{1}{b^2} = 1$ ...(i)

[redacted]

And $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{16}$ ...(ii)

Solving (i) and (ii), we get

$a^2=\frac{112}{3}$ and $b^2=\frac{112}{4}$.

Hence, required equation of ellipse is $3x^2 + 4y^2 = 112$.

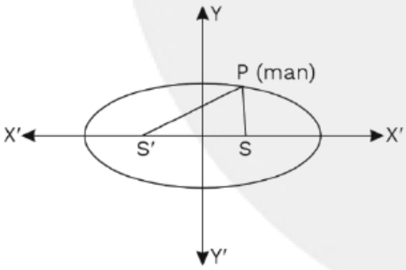
12. A man running a race course notes that sum of its distance from two flag posts from him is always 10m and the distance between the flag posts is 8m. Then, the equation of the posts traced by the man is

(A) $\frac{x^2}{25}+\frac{y^2}{9}=1$ (B) $x^2 + y^2 = 25$ (C) $x^2 + y^2 = 9$ (D) $\frac{x^2}{9}+\frac{y^2}{25}=1$

Ans. A

Sol. Clearly, path traced by the man will be ellipse.

Given, $SP + S'P = 10$ i.e., $2a = 10 \Rightarrow a = 5$



Flag posts

Since, the coordinates of S and S' are (c, 0) and (−c, 0), respectively. Therefore, distance between S and S' is

$2c = 8 \Rightarrow c = 4$

$\because$ $c^2 = a^2 - b^2 \Rightarrow 16 = 25 - b^2 \Rightarrow b^2 = 25 - 16$

$\Rightarrow b^2 = 9 \Rightarrow b = 3$

Hence, equation of path (ellipse) is

$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1 \Rightarrow \frac{x^2}{25}+\frac{y^2}{9}=1$ ($\because$ $a = 5, b = 3$)

13. The curve represented by $x = 2(\cos t + \sin t)$, $y = 5(\cos t - \sin t)$, is

(A) a circle (B) a parabola

(C) an ellipse (D) a hyperbola

Ans. C

Sol. We have,

$x = 2(\cos t + \sin t)$ and $y = 5(\cos t - \sin t)$

$\Rightarrow \left(\frac{x}{2}\right)^2 + \left(\frac{y}{5}\right)^2 = 2 \Rightarrow \frac{x^2}{8} + \frac{y^2}{50} = 1$

Clearly, it represents an ellipse.

14. The foci of the conic $25x^2 + 16y^2 - 150x = 175$ are:

(A) $(0, \pm 3)$ (B) $(0, \pm 2)$ (C) $(3, \pm 3)$ (D) $(0, \pm 1)$

Ans. **C**

Sol. The given conic can be re-written as

$$25(x^2 - 6x + 9) + 16y^2 = 400$$

$$\Rightarrow \frac{(x-3)^2}{4^2} + \frac{(y-0)^2}{5^2} = 1$$

Shifting the origin at $(3, 0)$ without rotating the coordinate axes, we have

$x = X + 3, y = Y + 0$

The equation of the ellipse with reference to new axes is

$\frac{X^2}{4^2} + \frac{Y^2}{5^2} = 1$

Comparing this equation with the standard equation

$\frac{X^2}{a^2} + \frac{Y^2}{b^2} = 1$, we get $a = 4, b = 5$

Let e be the eccentricity of the given conic. Then,

$e = \sqrt{1 - \frac{a^2}{b^2}} = \sqrt{1 - \frac{16}{25}} = \frac{3}{5}$

The coordinates of foci with respect to new origin are

$(X = 0, Y = \pm be) = (X = 0, Y = \pm 3)$

Substituting these in (i), we obtain $(3, \pm 3)$ as the coordinates of foci.

15. The equation of the ellipse, with axes parallel to the coordinate axes, whose eccentricity is $\frac{1}{3}$ and foci are at $(2, -2)$ and $(2, 4)$, is

(A) $\frac{(x-1)^2}{8} + \frac{(y-2)^2}{9} = 9$ (B) $\frac{(x-2)^2}{8} + \frac{(y-1)^2}{9} = 9$

(C) $\frac{(x-1)^2}{9} + \frac{(y-2)^2}{8} = 9$ (D) $\frac{(x-2)^2}{9} + \frac{(y-1)^2}{8} = 9$

Ans. **B**

Sol. The centre of the ellipse is at the mid-point of its foci. So, coordinates of centre are $(2,1)$.

Clearly, two foci lie on the line $x = 2$. So, major axis is parallel to y-axis.

The distance between two foci is 6 .

$$\therefore\ 2be = 6 \Rightarrow \frac{2b}{3} = 6 \Rightarrow b = 9 \left[\because e = \frac{1}{3} \text{ (given)}\right]$$

Now, $a^2 = b^2(1 - e^2) \Rightarrow a^2 = 81\left(1 - \frac{1}{9}\right) = 72$

Hence, the equation of the ellipse is $\frac{(x-2)^2}{72} + \frac{(y-1)^2}{81} = 1$

16. If α and β are eccentric angles of the ends of a focal chord of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then $\tan\frac{\alpha}{2}\tan\frac{\beta}{2}$ is equal to.

(A) $\frac{1-e}{1+e}$ (B) $\frac{e-1}{e+1}$ (C) $\frac{e+1}{e-1}$ (D) none of these

Ans. **B**

Sol. The coordinates of the end points of the focal chord are $(a\cos\alpha, b\sin\alpha)$ and $(a\cos\beta, b\sin\beta)$.

Therefore, the equation of the focal chord is

[redacted]

$\frac{x}{a}\cos\left(\frac{\alpha+\beta}{2}\right)+\frac{y}{b}\sin\left(\frac{\alpha+\beta}{2}\right)=\cos\left(\frac{\alpha-\beta}{2}\right)$

This passes through $(ae, 0)$.

$\therefore \quad \frac{ae}{a}\cos\left(\frac{\alpha+\beta}{2}\right)=\cos\left(\frac{\alpha-\beta}{2}\right)$

$\Rightarrow \quad \frac{\cos\left(\frac{\alpha+\beta}{2}\right)}{\cos\left(\frac{\alpha-\beta}{2}\right)}=\frac{1}{e}$

$\Rightarrow \quad \frac{\cos\left(\frac{\alpha+\beta}{2}\right)-\cos\left(\frac{\alpha-\beta}{2}\right)}{\cos\left(\frac{\alpha+\beta}{2}\right)+\cos\left(\frac{\alpha-\beta}{2}\right)}=\frac{1-e}{1+e}$

$\Rightarrow \quad -\frac{2\sin\frac{\alpha}{2}\sin\frac{\beta}{2}}{2\cos\frac{\alpha}{2}\cos\frac{\beta}{2}}=\frac{1-e}{1+e}$

$\Rightarrow \quad -\tan\frac{\alpha}{2}\tan\frac{\beta}{2}=\frac{1-e}{1+e} \Rightarrow \tan\frac{\alpha}{2}\tan\frac{\beta}{2}=\frac{e-1}{e+1}$

17. If the line $lx+my+n=0$ to touches the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, then

(A) $a^2l^2+b^2m^2=n^2$ (B) $a^2m^2+b^2l^2=n^2$

(C) $a^2n^2+b^2m^2=l^2$ (D) none of these

Ans. **A**

Sol. The equation of the line is.

$lx+my+n=0 \Rightarrow y=\left(-\frac{l}{m}\right)x+\left(-\frac{n}{m}\right)$

We know that the line $y=mx+c$ touches the ellipse

$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ if, $c^2=a^2m^2+b^2$

So, line (i) will touch the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, if

$\left(-\frac{n}{m}\right)^2=a^2\left(-\frac{l}{m}\right)^2+b^2 \Rightarrow n^2=a^2l^2+b^2m^2$

18. The locus of mid-points of a focal chord of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

(A) $\frac{x^2}{a^2}+\frac{y^2}{b^2}=\frac{ex}{a}$ (B) $\frac{x^2}{a^2}-\frac{y^2}{b^2}=\frac{ex}{a}$

(C) $x^2+y^2=a^2+b^2$ (D) none of these

Ans. **A**

Sol. Let $P(h,k)$ be the mid-point of a focal chord of the ellipse. Then, its equation is

$\frac{hx}{a^2}+\frac{ky}{b^2}=\frac{h^2}{a^2}+\frac{k^2}{b^2}$

It passes through $(ae, 0)$.

$\therefore \quad \frac{h}{a}e=\frac{h^2}{a^2}+\frac{k^2}{b^2}$

Hence, the locus of (h,k) is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=\frac{xe}{a}$

19. The equation of the ellipse with its centre at $(1,2)$, one focus at $(6,2)$ and passing through $(4,6)$ is.

(A) $\frac{(x-1)^2}{45}+\frac{(y-2)^2}{20}=1$ (B) $\frac{(x-1)^2}{20}+\frac{(y-2)^2}{45}=1$

(C) $\frac{(x+1)^2}{45}+\frac{(y+2)^2}{20}=1$ (D) None of these

Ans. A

Sol. Let the equation of the ellipse be.

$$\frac{(x-1)^2}{a^2}+\frac{(y-2)^2}{b^2}=1$$

It passes through $(4,6)$.

$$\therefore \frac{9}{a^2}+\frac{16}{b^2}=1$$

Let e be the eccentricity of the ellipse. Then,

$ae =$ Distance between $(1,2)$ and $(6,2)$

$\Rightarrow \quad ae = 5$

$\Rightarrow \quad a^2e^2 = 25 \Rightarrow a^2 - b^2 = 25 \Rightarrow a^2 = 25 + b^2$

Solving (ii) and (iii), we get $a^2 = 45$, and $b^2 = 20$

Hence, the equation of the ellipse is $\frac{(x-1)^2}{45}+\frac{(y-2)^2}{20}=1$.

20. The eccentricity of a ellipse with centre at the origin and axes along the coordinate axes, is $1/2$. If one of the directrices is $x = 4$, then the equation of the ellipse is

(A) $4x^2 + 3y^2 = 1$

(B) $3x^2 + 4y^2 = 12$

(C) $4x^2 + 3y^2 = 12$

(D) $3x^2 + 4y^2 = 1$

Ans. B

Sol. Let the equation of the ellipse be $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.

We have,

$e=\frac{1}{2}$ and $\frac{a}{e}=4$ $\qquad \left[\because x=\frac{a}{e} \text{ is a directrix}\right]$

$\Rightarrow a = 2$

$\Rightarrow b^2 = 2^2\left(1-\frac{1}{4}\right)$ $\qquad [\because b^2 = a^2(1-e^2)]$

$\Rightarrow b^2 = 3$

Hence, the equation of the ellipse is $\frac{x^2}{4}+\frac{y^2}{3}=1$ or, $3x^2+4y^2=12$.

SECTION-II

21. If the length of the latus rectum of the ellipse $x^2 + 4y^2 + 2x\ 8y - \lambda = 0$ is 4, and l is the length of its major axis, then $\lambda + l$ is equal to.

Ans. 75

Sol. We have

$$x^2+4y^2+2x+8y-\lambda=0$$

$$\Rightarrow \frac{(x+1)^2}{\lambda+5}+\frac{(y+1)^2}{\frac{\lambda+5}{4}}=1 \because \frac{2\,b^2}{a}=4$$

$$2\frac{(\lambda+5)}{4}=4(\sqrt{\lambda+5})$$

on solving $\Rightarrow \lambda = 59$

$\lambda \neq -5$

$\ell = 2a = 2\sqrt{\lambda+5} = 2\sqrt{64} = 16 \Rightarrow \lambda + \ell = 59 + 16 = 75$

22. The area of the quadrilateral formed by the tangents at the end-points of latusrecta to the ellipse $\frac{x^2}{9}+\frac{y^2}{5}=1$, is

Ans. **27**

Sol. We have, $\frac{x^2}{9}+\frac{y^2}{5}=1$

Let e be the eccentricity of this ellipse. Then,

$e^2=1-\frac{5}{9}\Rightarrow e=\frac{2}{3}$

The coordinates of the end-points of latusrecta are

$L(2,5/3), M(-2,5/3), M'(-2,-5/3)$ and $L'(2,-5/3)$

The equations of tangents at these points are

$$\begin{aligned} 2x+3y-9 &= 0 \ldots..\text{(i)} \\ -2x+3y-9 &= 0 \ \ldots..\text{(ii)} \\ 2x+3y+9 &= 0 \ \ldots..\text{(iii)} \\ -2x+3y+9 &= 0 \ldots..\text{(iv)} \end{aligned}$$

Clearly, these tangents form a parallelogram whose area is given by.

$$\mathrm{A}=\left|\frac{\{9-(-9)\times\{9-(-9)\}}{\begin{vmatrix}2 & 3\\ -2 & 3\end{vmatrix}}\right|=\frac{18\times 18}{12}\text{sq.units}$$

$\Rightarrow A=27$ sq. units.

23. If the eccentricities of the two ellipse $\frac{x^2}{169}+\frac{y^2}{25}=1$ and $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ are equal, then the value of $\frac{5a}{b}$, is.

Ans. **13**

Sol. We have,

$$\sqrt{1-\frac{25}{169}}=\sqrt{1-\frac{b^2}{a^2}}$$

$$\Rightarrow \frac{144}{169}=1-\frac{b^2}{a^2}\Rightarrow\frac{b^2}{a^2}=\frac{25}{169}\Rightarrow\frac{b}{a}=\frac{5}{13}\Rightarrow\frac{a}{b}=\frac{13}{5}$$

24. If the distance between the foci of an ellipse is 6 and the distance between its directrices is 12, then square of length of its latus rectum is:

Ans. **18**

Sol.

$2ae=6$ and $\frac{2a}{e}=12$

$\Rightarrow ae=3$

and $\frac{a}{e}=6\Rightarrow e=\frac{a}{6}$

$\Rightarrow a^2=18$

$\Rightarrow b^2=a^2-a^2e^2=18-9=9$

$\therefore$ Latus rectum $=\frac{2b^2}{a}=\frac{2\times 9}{3\sqrt{2}}=3\sqrt{2}$

25. If the co-ordinates of two points A and B are $(\sqrt{7}, 0)$ and $(-\sqrt{7}, 0)$ respectively and P is any point on the conic, $9x^2 + 16y^2 = 144$, then PA + PB is equal to:

Ans. 8

Sol. Ellipse: $\frac{x^2}{16} + \frac{y^2}{9} = 1, a = 4, b = 3, c = \sqrt{16 - 9} = \sqrt{7}$

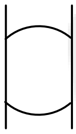
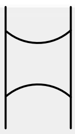
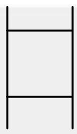
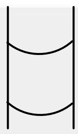
$\therefore (\pm\sqrt{7}, 0)$ are the foci of given ellipse.

So for any point P on it; $PA + PB = 2a \Rightarrow PA + PB = 2(4) = 8$.

PART – B: PHYSICS

SECTION-I

26. A vertical glass capillary tube open at both ends contains some water. Which of following shapes may be taken by the water?

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

Ans. D

Sol. The two free liquid surfaces must provide a net upward force due to surface tension to balance the weight of the liquid column.

27. A raft of wood (density 600 kg/m³) of mass 120 kg floats in water. How much weight can be put on the raft to make it just sink?

(A) 120 kg (B) 200 kg (C) 40 kg (D) 80 kg

Ans. D

Sol. Volume of raft = $V = \frac{\text{mass}}{\text{density}} = \frac{120}{600} = \frac{1}{5}\text{m}^3$

Mass of $\frac{1}{5}m^3$ water = $\frac{1}{5} \times 1000 = 200$ kg

Extra weight which can be put on the raft = 200 – 120 = 80 kg

28. When a capillary tube is dipped in a liquid, the capillary rise is h_1, when the inner surface is coated with wax, the capillary rise is h_2, then

(A) $h_1 = h_2$ (B) $h_1 < h_2$ (C) $h_1 > h_2$ (D) none of these

Ans. C

Sol. When wax is coated, angle of contact increases, so liquid level drops, i.e.,

$h_2 < h_1$

29. A beaker is filled with a liquid of density *d* up to a height *h*. If the beaker is at rest, then the mean pressure on any of the wall is

(A) zero (B) *hdg* (C) $\frac{h}{2}dg$ (D) 2 *hdg*

Ans. C

Sol. Mean pressure = $\frac{h}{2}dg$

30. An open vessel containing water is given a constant acceleration a in the horizontal direction. Then the free surface of water gets sloped with the horizontal at an angle θ given by

(A) $\theta = \tan^{-1}\left(\frac{a}{g}\right)$ (B) $\theta = \tan^{-1}\left(\frac{g}{a}\right)$ (C) $\theta = \sin^{-1}\left(\frac{a}{g}\right)$ (D) $\theta = \cos^{-1}\left(\frac{g}{a}\right)$

Ans. A

Sol. $\tan\theta = \frac{ma}{mg} = \frac{a}{g}$

$\theta = \tan^{-1}\left(\frac{a}{g}\right)$

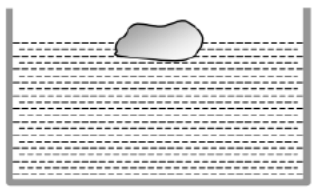
31. A beaker containing a liquid of density ρ moves up with an acceleration a. The pressure due to the liquid at a depth h below the free surface of the liquid is

(A) $h\rho g$ (B) $h\rho(g+a)$ (C) $h\rho(g-a)$ (D) $2h\rho g\left(\frac{g-a}{g+a}\right)$

Ans. B

Sol. $g_{eff} = g + a$

32. A body floats in a liquid contained in a beaker. The whole system as shown falls freely under gravity. The upthrust on the body due to the liquid is



(A) Zero

(B) Equal to the weight of the liquid displaced

(C) Equal to the weight of the body in air

(D) Equal to the weight of the immersed position of the body

Ans. A

Sol. Upthrust $= V\rho_{\text{liquid}}(g-a)$

where, a = downward acceleration, V = volume of liquid displaced But for free fall $a = g$

$\therefore$ Upthrust $= 0$

33. The ratio of excess pressure in two soap bubbles is 3 : 1. The ratio of their volumes will be

(A) $\frac{1}{3}$ (B) $\frac{1}{9}$ (C) $\frac{27}{1}$ (D) $\frac{1}{27}$

Ans. D

Sol. The excess pressure inside a soap bubble,

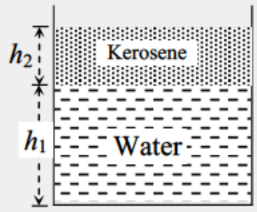
$\Delta p = \frac{4T}{r}$

i.e., $\Delta p \propto \frac{1}{r}$

$\frac{\Delta p_1}{\Delta p_2} = \frac{r_2}{r_1} = \frac{3}{1}$

Hence, $\frac{V_1}{V_2} = \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{1}{3}\right)^3 = \frac{1}{27}$.

34. A wide vessel which is filled with water of density ρ_1 and kerosene of density ρ_2. The thickness of water layer is h_1 and that of kerosene layer is h_2. The gauge pressure at the bottom of the vessel will be



(A) $h_1\rho_1 g$ (B) $h_2\rho_2 g$ (C) $h_1\rho_1 g + h_2\rho_2 g$ (D) $h_1\rho_2 g + h_2\rho_1 g$

Ans. C

Sol.

35. Work done in splitting a drop of water of 1 mm radius into 64 droplets is (Surface tension of water is 72×10^{-3} J/m²)

(A) 2.0×10^{-6} J (B) 2.7×10^{-6} J (C) 4×10^{-6} J (D) 5.4×10^{-6} J

Ans. B

Sol. $\Delta A = 4\pi r^2 (n^{1/3} - 1)$

$\Delta W = S\Delta A$

$= 72 \times 10^{-3} \times 4\pi \times (10^{-3})^2 (64^{1/3} - 1)$

$= 2.7 \times 10^{-6}$ J

36. Two water pipes of diameters 2 cm and 4 cm are connected with the main supply line. The velocity of flow of water in the pipe of 2 cm diameter is

(A) 4 times that in the other pipe (B) $\frac{1}{4}$ times that in the other pipe

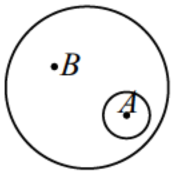
(C) 2 times that in the other pipe (D) $\frac{1}{2}$ times that in the other pipe

Ans. A

Sol. AV = Constant $\Rightarrow \frac{V_1}{V_2} = \frac{A_2}{A_1} = \frac{d_2^2}{d_1^2}$

$$\frac{V_1}{V_2} = \frac{4^2}{2^2} = 4$$

37. There is an air bubble of radius R inside a drop of water of radius $3R$. Find the ratio of gauge pressure at point B to that at point A.

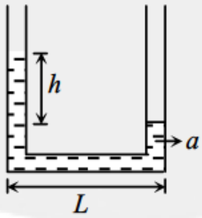


(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) 1

Ans. B

Sol. $P_B - P_0 = \frac{2T}{3R}$, $P_A = P_B + \frac{2T}{R}$, $P_A - P_0 = \frac{2T}{3R} + \frac{2T}{R} = 2T\left[\frac{4}{3R}\right]$, $\frac{P_B - P_0}{P_A - P_0} = \frac{1}{4}$

38. At rest, a liquid stands at the same level in the tubes. As the system is given an acceleration a towards the right, a height difference h occurs as shown in the figure. The value of h is:



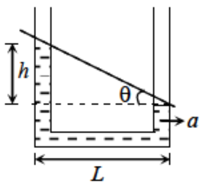
(A) $\frac{aL}{2g}$ (B) $\frac{gL}{2a}$ (C) $\frac{gL}{a}$ (D) $\frac{aL}{g}$

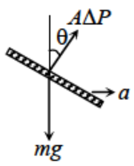
Ans. **D**

Sol. Newton's equations are :

$A\Delta P \sin\theta = ma$ ...(i)

And $A\Delta P \cos\theta = mg$ ...(ii)





By (i) and (ii)

$$\tan\theta = \frac{a}{g} = \frac{h}{L}$$

or $h = \frac{aL}{g}$

39. A large open tank has two holes in the wall. One is a square hole of side L at a depth y from the top and the other is a circular hole of radius R at a depth $4y$ from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both the holes are the same. Then, R is equal to

(A) $\frac{L}{\sqrt{2\pi}}$ (B) $2\pi L$ (C) L (D) $\frac{L}{2\pi}$

Ans. A

Sol. By principle if continuity: $A_1 v_1 = A_2 V_2$

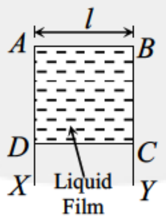
As per quesiton: $A_1 = L^2$; $v_1 = \sqrt{2gy}$ and

$A_2 = \pi R^2, v_2 = \sqrt{2\ g4y}$

So,

$$L^2\sqrt{2gy} = \pi R^2\sqrt{2g4y}$$
$$\Rightarrow L^2 = 2\pi R^2$$
$$\Rightarrow R = \frac{L}{\sqrt{2\pi}}$$

40. A liquid film is formed over a frame $ABCD$ as shown in figure. Wire CD (massless) can slide without friction. The mass to be hung from CD to keep it in equilibrium is (Surface tension of liquid is T)



(A) $\frac{T}{g}$ (B) $\frac{2Tl}{g}$ (C) $\frac{g}{2Tl}$ (D) $T \times l$

Ans. B

Sol. $Mg = 2Tl \therefore \quad M = \frac{2Tl}{g}$

41. If two soap bubbles of different radii are in communication with each other

(A) air flows from larger bubble into the smaller one until the two bubbles are of equal size.

(B) the size of the bubbles remains the same

(C) air flows from the smaller bubble into the larger one and larger bubble grows at the expense of the smaller one

(D) the air flows from the larger bubble into the smaller bubble until the radius of the smaller one becomes equal to that of the larger one, and of the larger one equal to that of the smaller one.

Ans. C

Sol. As pressure inside the smaller bubble is greater than that inside a larger bubble ($\because$ excess pressure inside a bubble is inversely proportional to its radius), hence air flows from the smaller bubble into the larger bubble and larger bubble grows at the expense of smaller one.

[redacted]

42. A ball of mass m and radius r is released in viscous liquid. The value of its terminal velocity is proportional to

(A) $1/r$ only (B) m/r (C) $(m/r)^{1/2}$ (D) m only

Ans. B

Sol.
$$v_T = \frac{2}{9}\frac{r^2(\rho-\sigma)}{\eta}g = \frac{2}{9}\frac{(r^3\rho)\left(1-\frac{\sigma}{\rho}\right)g}{r\eta}$$

$\therefore \quad v_T \propto \left(\frac{m}{r}\right) \qquad (\because m \propto r^3\rho)$

43. Two soap bubbles with radii r_1 and r_2 ($r_1 > r_2$) come in contact. Their common surface has a radius of curvature

(A) $\frac{r_1+r_2}{2}$ (B) $\frac{r_1r_2}{r_1-r_2}$ (C) $\frac{r_1r_2}{r_1+r_2}$ (D) $\sqrt{r_1r_2}$

Ans. B

Sol. P_0 = atmospheric pressure

$$p_1 - p_0 = \frac{4S}{r_1} \text{ and } p_2 - p_0 = \frac{4S}{r_2}$$

i.e. $$p_2 - p_1 = \frac{4S}{r} = \frac{4S}{r_2} - \frac{4S}{r_1}$$

or, $$r = \frac{r_1r_2}{r_1-r_2}$$

44. A liquid drop at temperature T, isolated from its surroundings, breaks into a number of droplets. The temperature of the droplets will be

(A) equal to T

(B) greater than T

(C) less than T

(D) either (A), (B) or (C) depending on the surface tension of the liquid

Ans. C

Sol. The total surface area of droplets is greater than that of the single drop.

45. An incompressible liquid is continuously flowing through a cylindrical pipe whose radius is $2R$ at point A. The radius at point B, in the direction of flow, is R. If the velocity of liquid at point A is v then its velocity at point B will be

(A) v (B) $4v$ (C) $2v$ (D) $v/2$

Ans. B

Sol. By equation of continuity $a_1v_1 = a_2v_2 \Rightarrow \pi r_1^2 v_1 = \pi r_2^2 v_2$

$$\therefore \quad v_2 = v_1 \times \left(\frac{r_1}{r_2}\right)^2 = v \times \left(\frac{2R}{R}\right)^2 = 4\ v$$

SECTION-II

46. A mercury drop of radius 1 cm is sprayed into 10^6 droplets of equal size. The energy expended (if surface tension of mercury is 35×10^{-3} N/m) is given as $\Delta U = \frac{4.35}{10^N}$ J Find N. (change in surface tension is neglected)

Ans. 3

Sol.

$$\frac{4}{3}\pi R^3 = 10^6\left(\frac{4}{3}\pi r^3\right)$$
$$\Rightarrow r = (10^{-2})R = 10^{-2}\ \text{cm}$$
$$A_i = 4\pi R^2$$
$$A_f = (10^6)(4\pi r^2)$$
$$\Delta A = A_f - A_i$$
$$\therefore\ \Delta U = (T)(\Delta A)$$
$$= 4.35 \times 10^{-3}\ \text{J}$$

47. Two separate air bubbles (radii 0.002 m and 0.004 m) formed of the same liquid (surface tension 0.07 N/m) come together to form a double bubble. The radius R (in meter) of curvature of the internal film surface common to both the bubbles is $R = \frac{N}{1000}$. Find N.

Ans. 4

Sol. Let R be the radius of curvature of common surface when bubbles A and B of radii R_A and R_B coalesce. The excess pressure.

in A and B are

$$p_A = \frac{4\ T}{R_A} \text{ and } p_B = \frac{4\ T}{R_B}$$

If R is radius of common interface, then we must have

$$P_A - p_B = \frac{4T}{R}$$
$$\text{Or } \frac{4T}{R_A} - \frac{4T}{R_B} = \frac{4T}{R}$$

This gives $R = \frac{R_A R_B}{R_B - R_A} = \frac{0.002 \times 0.004}{0.004 - 0.002} = 0.004\ \text{m}$

48. A glass rod of diameter d_1 = 1.5 mm is inserted symmetrically into a glass capillary of inside diameter d_2 = 2 mm. Then the whole arrangement is vertically oriented and brought in contact with the surface of water. To what height (in mm) will the water rise in the capillary? (Density of water = 1 gm/cc, surface tension = 0.07 N/m, angle of contact = 0^0, g = 10 m/s^2)

Ans. 56

Sol. Net force upward = weight of liquid in capillary.

$$\left[\frac{2\pi d_2}{2}T+\frac{2\pi d_1}{2}T\right]=\pi\left(\frac{d_2^2}{4}-\frac{d_1^2}{4}\right)\rho gh$$

$h=$ 56 mm

49. Two solids A and B float in water. It is observed that A floats with half its volume immersed and B floats with 2/3 of its volume immersed. The ratio of densities of A and B is given as $\frac{\rho_A}{\rho_B}=\frac{N}{4}$ then find N.

Ans. 3

Sol. If two different bodies A and B are floating in the same liquid then $\frac{\rho_A}{\rho_B}=\frac{(f_{in})_A}{(f_{in})_B}=\frac{1/2}{2/3}=\frac{3}{4}$

50. If pressure at half the depth of a lake is equal to $\frac{2}{3}$ pressure at the bottom of the lake then what is the depth of the lake in meter (if atmospheric pressure = $10^5\frac{\mathrm{N}}{\mathrm{m}^2}$, density of water $=10^3\frac{\mathrm{Kg}}{\mathrm{m}^3}$ and $\mathrm{g}=10\frac{\mathrm{m}}{\mathrm{s}^2}$).

Ans. 20

Pressure at bottom of the lake $=P_0+h\rho g$

Pressure at half the depth of a lake $=P_0+\frac{h}{2}\rho g$

According to given condition

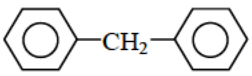
$$P_0+\frac{1}{2}h\rho g=\frac{2}{3}(P_0+h\rho g)\Rightarrow\frac{1}{3}P_0=\frac{1}{6}h\rho g$$

$$\Rightarrow h=\frac{2P_0}{\rho g}=\frac{2\times10^5}{10^3\times10}=20\text{ m.}$$

PART – C: CHEMISTRY

SECTION-I

51. The molecular formula of diphenylmethane,



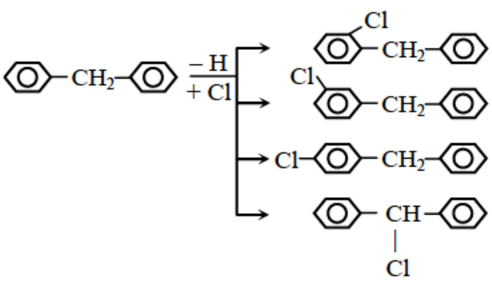
, is $C_{13}H_{12}$;

How many structural isomers are possible when one of the hydrogen is replaced by a chlorine atom ?

(A) 6 (B) 4 (C) 8 (D) 7

Ans. B

Sol.



52. Tautomerism will be explained by:

[redacted]

unacademy

(A) $(CH_3)_2NH$ (B) $(CH_3)_3CNO$ (C) R_3CNO_2 (D) RCH_2NO_2

Ans. D

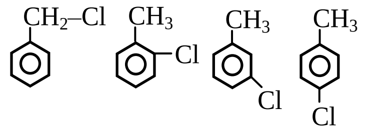
Sol. Due to presence of α – H atom R – CH_2 – NO_2 show tautomerism

53. C_7H_7Cl shows how many aromatic isomers ?

(A) 4 (B) 5 (C) 3 (D) 2

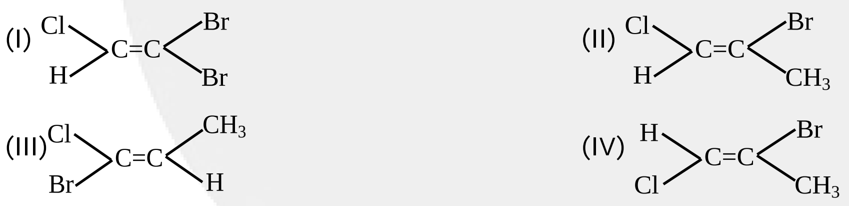
Ans. B

Sol. C_7H_7Cl have four aromatic isomers



o –. m – p – Isomer.

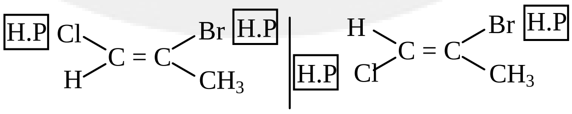
54. Which is a pair of geometrical isomers ?



(A) I & II (B) I & III (C) II & IV (D) III & IV

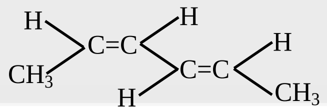
Ans. C

Sol.



Z - form E - form

55. The correct name of the structure :

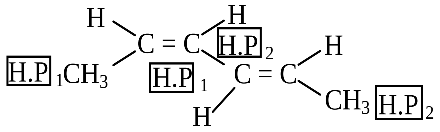


(A) (E), (E)-2,4-hexadiene (B) (Z), (Z)-2,4-hexadiene

(C) (E), (Z)-3,5-hexadiene (D) (Z), (E)-2,4-hexadiene

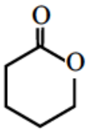
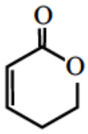
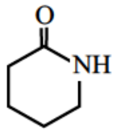
Ans. D

Sol.



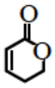
Z,E - Hexa – 2, 4 – diene

56. Which of the following compounds can not show tautomerism ?

(A) HO–CH=CH_2 (B)  (C)  (D) 

Ans. **C**

Sol.

 Compound does not show tautomerism due to absence of $\alpha - H$ H atom,

57. Which one of the following pairs are called position isomers

(A) $CH_2(OH)CH_2COOH$ & CH_3–CH(OH)COOH

(B) C_2H_5OH & CH_3OH

(C) $(C_2H_5)_2CO$ & $CH_3COCH_2CH_2CH_3$

(D) All are

Ans. **A**

Sol.

$\overset{3}{CH_2}(OH) - \overset{2}{CH_2} - \overset{1}{COOH}$

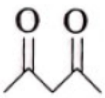
3-Hydroxy propanoic acid

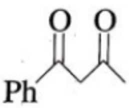
$CH_3 - CH(OH) - COOH$

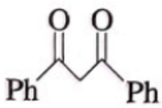
2- Hydroxy propanoic acid

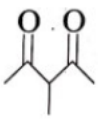
Position of substituent (– OH) is differ = P.I.

58. Which of the following compound has highest enol content?

(A) 

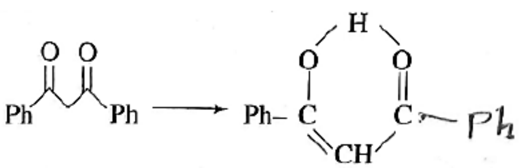
(B) 

(C) 

(D) 

Ans. **C**

Sol.

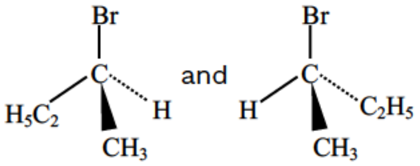


Keto enol

→ Stabilised by intramolecular H-bond

→ Phenyl group, further stabilised via Resonance

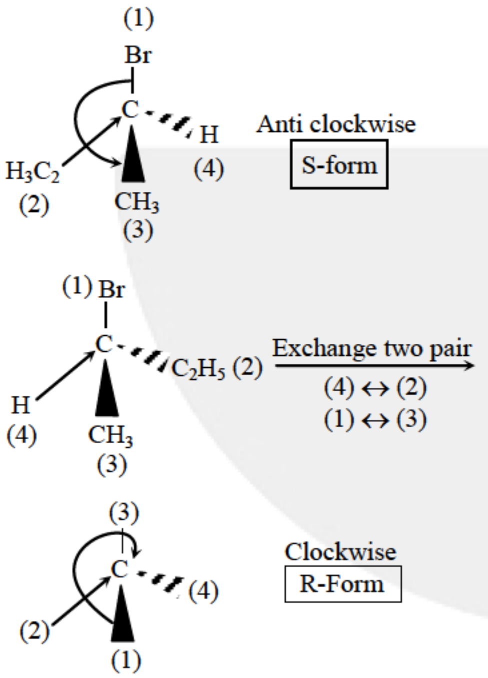
59. The given pair is



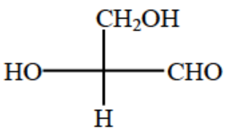
(A) enatiomers
(B) Identical
(C) constitutional isomers
(D) diastereomers

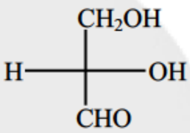
Ans. A

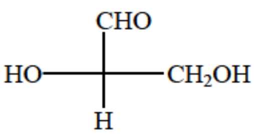
Sol.

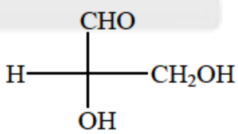


60. Which of the following Fischer's projection formula is identical to D-glyceraldehyde ?

(A) 

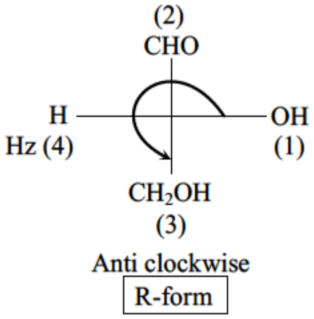
(B) 

(C) 

(D) 

Ans. C

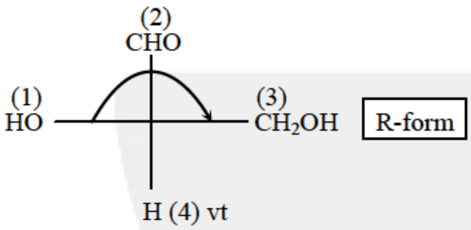
[redacted]



Sol.

D-glyceroldehyde show R-configuration.

Compound [C] has R-configuration



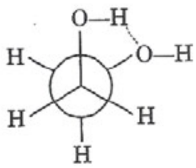
61. Most stable form of ethylene glycol is :

(A) anti (B) gauche

(C) fully eclipsed (D) partially eclipsed

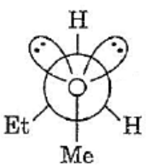
Ans. **B**

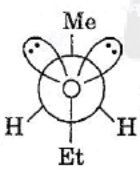
Sol.



Reason 1 : intramolecular H-bond

Reason 2 : no torsional strain

62. 

and 

are :

(A) chain isomers (B) metamers

(C) positional isomers (D) conformers

Ans. **B**

Sol. Structures of given compound are

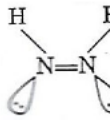
$Me - O - CH_2 - Et$ and $Et - O - CH_2Me$ so metamers.

63. Minimum C atoms required for a compound to show geometrical isomerims:

[redacted]

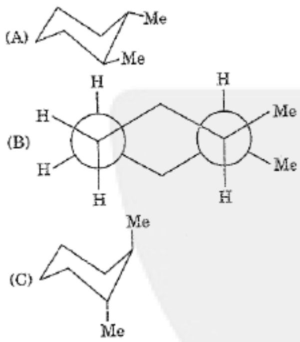
(A) 2 (B) 3 (C) 4 (D) none of these

Ans. D

Sol.  can show GI

So no carbon required.

64. The correct stability order of the following species is.



(A) C < A < B (B) C = B < A (C) C < A = B (D) A = B = C

Ans. C

Sol. (a) Trans 1,2-dimethyl cyclohexane equatorial-equatorial position

(b) Trans 1,2-dimethyl cyclohexane equatorial-equatorial position

(c) Trans 1,2-dimethyl cyclohexane axial-axial position

65. Which of the following statement is not correct?

(A) Cyclobutane is a planar compound

(B) Trans cyclohexadecene is relatively more stable than its cis form

(C) Cis form of 1, 3, 5-trimethylcyclohexane is relatively more stable than its trans form

(D) Cis 1,2-dichloroethene is relatively more stable than its trans form

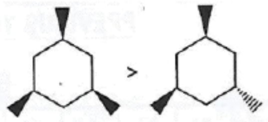
Ans. A

Sol. (A) Cyclobutane exist in non-planar puckered form.

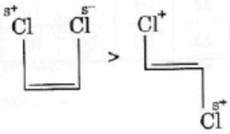
(B) In cycloalkene after 12 member trans is more stable than cis.

[redacted]

(C) All three are on equatorial position



$\Rightarrow$ 2 equatorial + 1 axial

(d)  due to resonance

66. Order of stability of enol content:

(a) $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$ (b) $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$

(c) $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-O-Et$

(A) a > b > c

(B) b > a > c

(C) b > c > a

(D) a > b > c

Ans. **C**

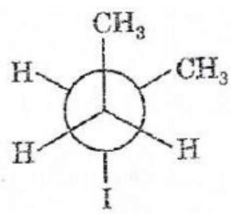
$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$ (a) (Monocarbonyl)

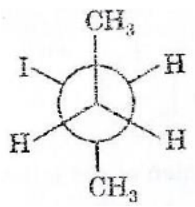
$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$ (b) (β–dicarbonyl)

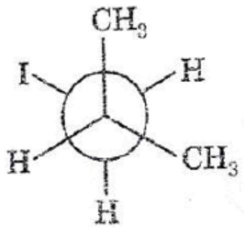
$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-O-Et$ (c) (β–ketoester)

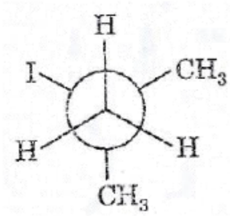
Sol. $\because$ (b > c > a) (refer key concept)

67. Which of the Newman projections shown below represents the most stable conformation about the $C_1 - C_2$ bond of 1-iodo-2-methyl propane?

(A) 

(B) 

(C) 

(D) 

Ans. C

Sol. Staggered configuration. Minimising the steric crowding.

68. The correct order of the substituent in each of the following set in order of priority according to CIP rule

(A) -Cl > -OH > -SH > H

(B) $-CH_2 - Br > -CH_2-Cl > -CH_2-OH > -CH_3$

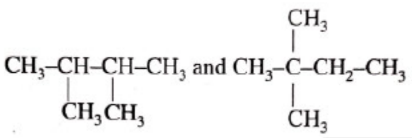
(C) -CH = O > -OH > $-CH_3$ > -H

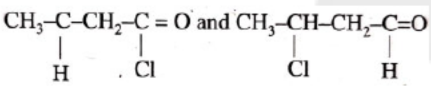
(D) $-OCH_3 > -N(CH_3)_2 > -CH_3 > -CD_3$

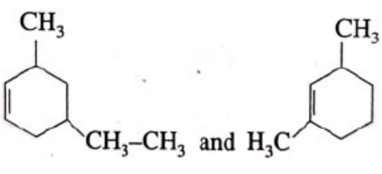
Ans. B

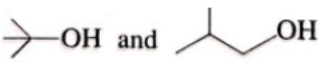
Sol. Use sequence rule or CIP rule

69. Which are not position isomers?

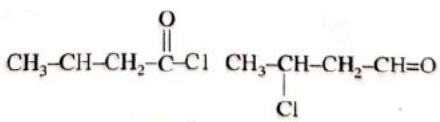
(A) 

(B) 

(C) 

(D) 

Ans. B

Sol. 

Functional group isomer

70. Which of the following will have zero dipole moment?

(A) cis-1, 2-Dichloroethene

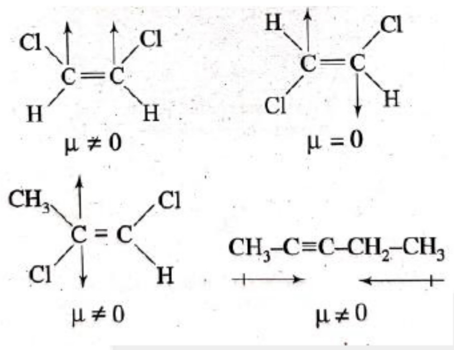
(B) trans-1, 2-Dichloroethene

(C) trans-1, 2-Dichloropropene

(D) 2-Pentyne

Ans. **B**

Sol.

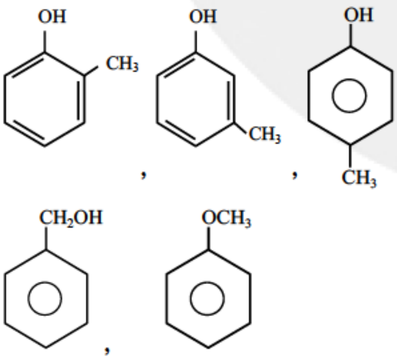


SECTION-II

71. C_7H_8O shows how many Isomers

Ans. **5**

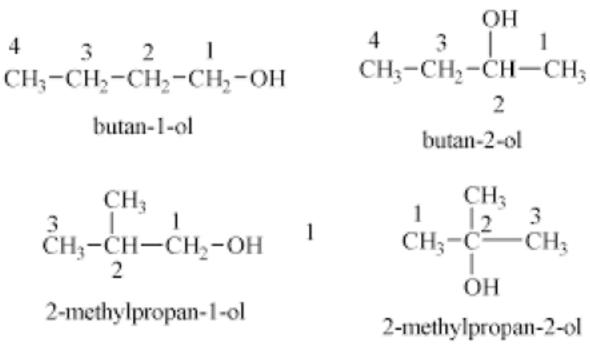
Sol.



72. How many alcohols of the molecular formula $C_4H_{10}O$ are possible

Ans. **4**

Sol. The four alcohol isomers **of $C_4H_{10}O$** are



73. $C_6H_4Cl_2$ is converted into $C_6H_3Cl_3$

(a) o–isomer will give x types of $C_6H_3Cl_3$

(b) m–isomer will give y types of $C_6H_3Cl_3$

(c) p–isomer will give z types of $C_6H_3Cl_3$.

What is the value of x + y + z =?

Ans. 6

Sol. x = 2, y = 3, z = 1

- o-isomer:

When a chlorine atom is added to the o-dichlorobenzene, it can occupy either of the two adjacent positions, leading to two possible isomers of trichlorobenzene.

- m-isomer:

Similarly, adding a chlorine atom to m-dichlorobenzene can also occur at three different positions, resulting in three possible isomers.

- p-isomer:

However, when considering p-dichlorobenzene, there is only one position available for the additional chlorine atom, hence only one isomer of trichlorobenzene can be formed.

74. Number of structural isomers of given compounds is :

C_5H_{10}

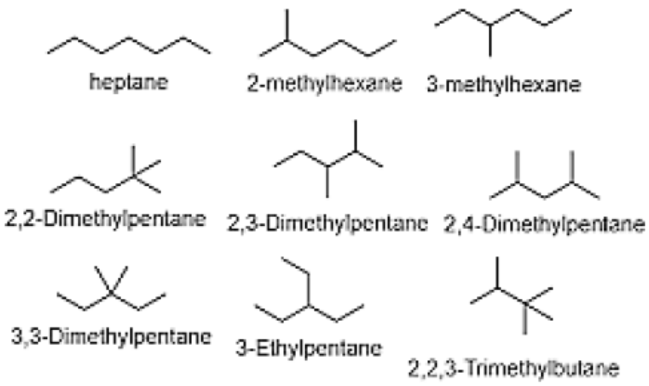
Ans. 9

Sol. Five alkenes and 4 cycloalkenes

75. How many isomers of the molecular formula C_7H_{16} are possible

Ans. 9

Sol. The chemical formula C_7H_{16} has nine isomers:



[redacted]

[redacted]

[redacted]

Unacademy Centres across India