Sri Chaitanya IIT Academy.,India.

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A right Choice for the Real Aspirant

ICON Central Office - Madhapur - Hyderabad

|		
SEC: Sr.Super60_STERLING BT	**JEE-MAIN**	**Date: 12-07-2025**
Time: 09:00AM to 12:00PM	**WTM-37**	**Max. Marks: 300**

IMPORTANT INSTRUCTION:

1. Immediately fill in the Admission number on this page of the Test Booklet with **Blue/Black** Ball Point **Pen** only.
2. The candidates should not write their Admission Number anywhere (except in the specified space) on the Test Booklet/ Answer Sheet.
3. The test is of **3 hours** duration.!
4. The Test Booklet consists of **75 Questions.** The maximum marks are **300.**
5. There are **three** parts in the question paper 1,2,3 consisting of **Mathematics, Physics** and **Chemistry** having **25 Questions** in each subject and subject having **two sections.**
   (I) Section –I contains **20 Multiple Choice Questions** with only one correct option.
   Marking scheme: +4 for correct answer, **0** if not attempt and **-1** in all other cases.
   (II) Section-II contains **05 Numerical Value Type Questions.**
   ■ The Answer should be within **0 to 9999.** If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i,e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11).**
   To cancel any attempted question bubble on the question number box.
   For example: To cancel attempted Question 21. Bubble on 21 as shown below
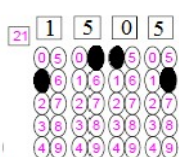
   Question Answered for Marking   Question Cancelled for Marking
   Marking scheme: +4 for correct answer, **0** if **not attempt** and **-1** in all other cases.
6. Use **Blue / Black Point Pen only** for writing particulars / marking responses on the Answer Sheet. **Use of pencil is strictly prohibited.**
7. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electron device etc, except the Identity Card inside the examination hall.
8. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
9. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Hall. **However, the candidate are allowed to take away this Test Booklet with them.**
10. Do not fold of make any stray marks on the Answer Sheet

Name of the Candidate (in Capital): _____

Admission Number:

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

12-07-25_Sr.Super60_STERLING BT_Jee-Main_WTM-37_Test Syllabus

MATHEMATICS : COMPLETE COMBINATIONS

PHYSICS : WAVE OPTICS: Theories on nature of light, Huygen's principle: Wavefronts and rays, Reflection of spherical wavefront at plane surface, Refraction of plane wavefront at plane surfaceYoung's double-slit experiment: Qualitative treatment, Theory of interference fringes: Analytical treatment of Young's double-slit experiment, Displacement of fringes of introducing a thin transparent sheet in the path of one of the interfering beams, Intensity distribution in interference pattern, YDSE with white light, YDSE with source away from line of symmetry, Modified YDSE (Eg: Fresnel mirror experiment, Fresnel biprism, Billetlens, Lloyd's mirror)Interference due to a thin film, Interference due to a thin wedge-shaped film, Newtons ringsDiffractionOptical instruments: Telescope and Microscopes, Magnifying and resolving power (Deleted pertaining to JEE MAINS but still in JEE ADV Syllabus), Polarization, Scattering, Formation of rainbow

CHEMISTRY : Canizzaro reaction, Tollen's Reaction, Perkin Condensation(aromatic aldehyde with acetic anhydride),Robinson's annulation, Oxidation and reduction: Clemmensen's reduction, Wolf-Kishner reduction,Tests for aldehydes and ketones: Fehling's test, Benedict's test, Tollen's test, Schiff's test, Haloform test, Brady's test,, Oxidation by SeO_2, conjugate addition,CARBOXYLIC ACIDS: preparation, properties & Reactions,Physical properties; Preparation: from nitriles, Grignard reagents, hydrolysis of esters and amides;Preparation of benzoic acid from alkylbenzenes; Reactions: reduction, halogenation, formation of esters, acid chlorides and amides.

MATHEMATICS   Max Marks: 100

SECTION-I (SINGLE CORRECT ANSWER TYPE)

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

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

1. A man X has 5 friends 3 of them are ladies and 2 are men. His wife Y also has 5 friends 2 of them are ladies and 3 are men. Assume X & Y have no common friends. Then the total number of ways in which X & Y together can give a party by inviting 2 ladies and 2 men so that 2 friends of each of X and Y are in this party is

   1) 48   2) 49   3) 47   4) 46

2. Match Column – I with Column – II

	Column – I		Column – II
A	Number of diagonals of an octagon is	P	30
B	No. of ways in which 5 different balls can be given to two children so that all balls do not go to the same child is	Q	20
C	The number of triangles formed by the vertices of a decagon such that each triangle and decagon have exactly one side in common is	R	14
D	No. of squares of size 6×6 or More on a chess board is	S	60

   1) $A-Q, B-P, C-S, D-R$ 2) $A-P, B-Q, C-R, D-S$
   3) $A-Q, B-R, C-S, D-P$ 4) $A-S, B-Q, C-R, D-P$

3. The no. of ways of selecting 4-letters from the word DHARMASHALA is

   1) 75   2) 73   3) 74   4) 50

4. A group of students comprises of 9 boys and n girls. If the number of ways in which a team of 3 students can randomly be selected from this group such that there is at least one boy and at least one girl in each team is 198 then n is equal to

   1) 4   2) 3   3) 2   4) 1

5. If α, β, γ are greatest values of $10_{C_p}, 11_{C_q}$ and 12_{C_r} respectively then $\dfrac{\alpha+\beta}{\gamma}$ is

   1) $\dfrac{22}{17}$ 2) $\dfrac{21}{18}$ 3) $\dfrac{17}{22}$ 4) $\dfrac{18}{21}$

6. If $x_1 + x_2 + x_3 + 4x_4 = 30$ then the number of non – negative integral solutions is

   1) 1560   2) 1554   3) 1526   4) 1494

7. No. of ways such that 2n people be divided into n – pairs is equal to

1) $\dfrac{2n!}{(2!)^n}$ 2) $\dfrac{2n!}{2!(n!)}$ 3) $\dfrac{2n!}{(2!)^n \cdot n!}$ 4) None

8. A test has 4 parts the first 3 parts carry 10 – marks each and the 4th part carries 20 – marks. Assuming that marks are not given in fraction then the number of ways in which a candidate get 30 marks out of 50 is

1) 111   2) 11   3) 1111   4) 11111

9. Consider 4 boxes where each box contains 3 red balls & 2 blue balls. Assume that all 20 balls are distinct. In how many different ways can 10 balls be chosen from these 4 boxes so that from each box at least one red ball and one blue ball are chosen is

1) 85536   2) 12096   3) 56816   4) 21816

10. How many 3×3 matrices M with entries from $\{0,1,2\}$ are there for which the sum of the diagonal entries of $M^T M$ is 5 is

1) 126   2) 198   3) 162   4) 135

11. At an election a voter may vote for any number of candidates not greater than the number to be elected. There are ten candidates and 4 are to be elected. If a voter votes for at least one candidate. Then the number of ways in which he can vote is

1) 6210   2) 385   3) 1110   4) 5040

12. Number of ways of selecting 4 – shoes. Out of 6 – pairs of shoes, having exactly one pair is

1) 120   2) 360   3) 60   4) 240

13. The number of ways two distinct natural numbers can be selected which are less than or equal to 100 and differ by at most 10 is

1) $100_{C_2} - 90_{C_2}$ 2) 100_{C_2} 3) 90_{C_2} 4) $100_{C_2} + 90_{C_2}$

14. Statement–I: The no. of ways of dividing 15 different objects into 3 equal groups is $\dfrac{15!}{(5!)^3}$

Statement – II : The no. of ways in which 52 cards can be distributed among 4 persons

equally is $\dfrac{52!}{(13!)^4.4!}$

Which one of the above statement is/are correct?

1) Only I   2) Only II   3) Both I & II   4) Neither I nor II

15. In an examination of 9 papers a candidate has to pass in more papers than the number of

papers in which he fails in order to be successful. The number of ways in which he can be

unsuccessful is

1) 250   2) 255   3) 256   4)254

16. A scientific committee is to be formed from 5 Indians and 7 foreigners. Which includes at
least one Indian and double the number of foreigners as Indians. Then the no. of ways the
committee can be formed is

1) 525   2) 575   3) 580   4) 350

17. Consider three boxes each containing 5 balls labelled 1,2,3,4,5. Suppose one ball is

randomly drawn from each of the boxes, denote by P_i. The label of the ball drawn from

the ith box (i = 1,2,3). Then the no. of ways in which the ball can be chosen such that

$P_1 < P_2 < P_3$ is

1) 5   2) 3   3) 10   4) 15

18. There are 7 points $a_1, a_2, a_3, ...a_7$ on the side AB. Excluding A & B of a triangle ABC,

similarly 4 points a_8, a_9, a_{10}, a_{11} on side BC and 3 points a_{12}, a_{13}, a_{14} on side CA of triangle.

Then the no. of triangles that can be formed using the points $a_1, a_2, a_3, ...a_{14}$ as vertices is

1) 250   2) 324   3) 450   4) 580

19. Let the set $S = \{3, 3^2, 3^3......3^{18}\}$ be partitioned into 3 sets A,B,C with equal number of

elements such that $A \cup B \cup C = S$ and $A \cap B = B \cap C = C \cap A = \phi$. The maximum number of

such possible partitions of S is equal to

1) $\dfrac{18!}{6!}$ 2) $\dfrac{18!}{(6!)^2}$ 3) $\dfrac{18!}{3!(6!)^3}$ 4) $\dfrac{18!}{(6!)^3}$

20. A natural number has prime factorization given by $n = 2^x 3^y 5^z$. Where y & z are

such that $y + z = 25$ and $y^{-1} + z^{-1} = \dfrac{1}{4}$, $y > z$. Then the number of odd divisors

of n including 1 is _____

1) 120   2) 126   3) 105   4) 125

SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i,e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.

21. The number of ways in which 15 identical mangoes can be distributed among 3 children. Such that each child gets at least 2 mangoes is

22. The number of positive integral solution of the equation $xyz = 432$ is

23. If $x, y \in (0, 30)$ such that $\left[\dfrac{x}{3}\right] + \left[\dfrac{3x}{2}\right] + \left[\dfrac{y}{2}\right] + \left[\dfrac{3y}{4}\right] = \dfrac{11}{6}x + \dfrac{5}{4}y$ (where $[x]$ denotes

greatest integer $\leq x$) then the number of possible ordered pairs (x, y) is

24. The number of natural numbers less than 10^8 with sum of the digits equal to 7 is 14_{C_r}. Then r is equal to

25. The number of onto functions which are non decreasing from $A = \{1, 2, 3, 4, 5\}$ to

$B = \{7, 8, 9\}$ is equal to

PHYSICS   **Max Marks: 100**

SECTION-I (SINGLE CORRECT ANSWER TYPE)

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

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

26. What is the minimum slit separation d for interference in YDSE to produce at least one maximum other than the central maximum?

    1) $d \geq 5\lambda$ 2) $d \geq 3\lambda$ 3) $d \geq \lambda$ 4) $d \geq \lambda/3$

27. In a Young's double slit experiment a monochromatic light whose wavelength is λ strikes on the slits, separated by distance d, as shown in the figure. Refractive index of the medium between slits and screen varies with time t as $n = n_0 + kt$. Here n_0 and k are positive constants.
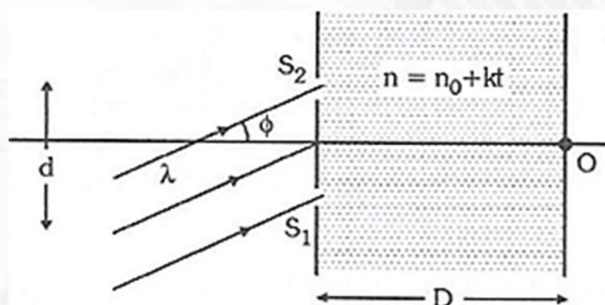
    If a glass plane of small thickness P is placed in front of one of the slit S_1. How should its refractive index vary with time so that central maxima is formed at O at all times.

    1) $n_0 + kt + \dfrac{P\sin\phi}{d}$ 2) $n_0 - kt + \dfrac{d\sin\phi}{P}$ 3) $n_0 - kt + \dfrac{P\sin\phi}{d}$ 4) $n_0 + kt + \dfrac{d\sin\phi}{P}$

28. A thin slice is cut out of a glass cylinder along a plane parallel to its axis. The slice is placed on a flat glass plate as shown. The observed interference fringes from this combination shall be
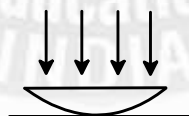
    1) Straight   2) Circular   3) Equally spaced

    4) Having fringe spacing which increases as we go outwards.

29. Plane parallel wave fronts encounter the interface between one medium and another, as shown below. The wave speed is different in the two media.
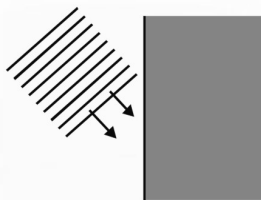
What will happen to the distance between wavefronts and the direction of travel of the wavefronts, as the waves enter the second medium?

1) The distance between wavefronts remains unchanged but the direction of wavefront changes.

2) The distance between wavefronts and the direction of wavefront both remain unchanged.

3) The distance between wavefronts and the direction of wavefront both changed.

4) The distance between wavefronts changes but the direction of wavefront remains unchanged.

30. A light source, which emits two wavelengths $\lambda_1 = 400 \text{nm}$ and $\lambda_2 = 600 \text{nm}$, is used in a Young's double-slit experiment. If recorded fringe widths for λ_1 and λ_2 and β_1 and β_2 and the number of fringes for them within a distance y on one side of the central maximum are m_1 and m_2, respectively, then choose incorrect option from given below options;

1) $\beta_2 > \beta_1$ 2) $m_1 > m_2$

3) From the central maximum, 3rd maximum of λ_2 overlaps with 5th minimum of λ_1

4) The angular separation of fringes of λ_1 is greater than λ_2

31. A source of light of wavelength 5000 Å is placed in situation as shown in figure. Considering interference of direct and reflected rays, Comments about the position of the region where the fringes will be visible and total the number of fringes are given as the options. Choose the correct options.
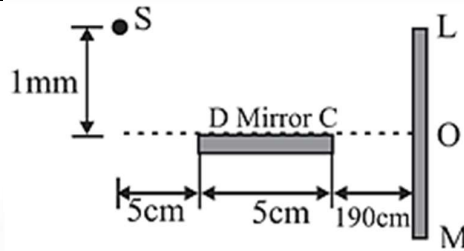
1) The width of the region on the screen where interference pattern is visible is 2 cm.

2) The width of the region on the screen where interference pattern is visible is nearly 10 cm.

3) Total number of fringes which are visible on the screen are nearly 10

4) Total number of fringes which are visible on the screen are nearly 50

32. A cylindrical shell of radius 1 m has two slits S_1 and S_2 separated by a distance 1 mm.

light having a wavelength $\lambda = 4000 \overset{\circ}{A}$ is incident on the double slit and produces a fringe pattern within the shell. Assume that the intensity does not vary substantially as one move from O to P. Also assume coherence length of the light coming from the two slits is sufficiently large for fringes to appear upto point P on the shell

O is central point
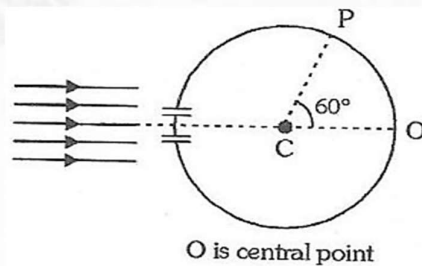
Total number of fringes from O to P is

1) 1252   2) 1249   3) 1251   4) 1250

33. A person A can clearly see objects between 25 cm and 200 cm. Which of the following may represent the range of clear vision for a person B having muscles stronger than A, but all other parameters of eye identical to that of A?

1) 25 cm to 200 cm   2) 18 cm to 200 cm

3) 25 cm to 300 cm   4) 18 cm to 300 cm

34. Assertion: No interference pattern is detected when two coherent sources are infinitely close to each other.
Reason: The fringe width is inversely proportional to the distance between the two slits.
1) Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
2) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion
3) Assertion is true, but Reason is false
4) Reason is true, but Assertion is false

35. In the figure shown, if a parallel beam of white light is incident on the plane of the slits, then the distance of the nearest white spot on the screen from O is (assume $d \ll D, \lambda \ll d$)
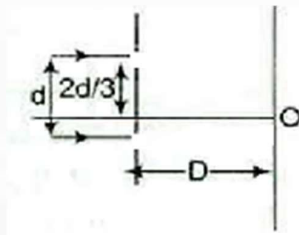
1) $\dfrac{d}{4}$ 2) $\dfrac{d}{2}$ 3) $\dfrac{d}{3}$ 4) $\dfrac{d}{6}$

36. In Young's double slit experiment, how many maxima's can be obtained on a screen (including the central maximum) on both sides of the central fringe if $\lambda = 2000\overset{0}{A}$ and $d = 7000\overset{0}{A}$?
1)12 2) 7 3) 18 4) 4

37. A perfectly flat piece of glass (n = 1.50) is placed over a perfectly flat piece of black plastic (n = 1.20) as shown in figure, they touch at A. Light of wavelength 600 nm is incident normally from above. Then,
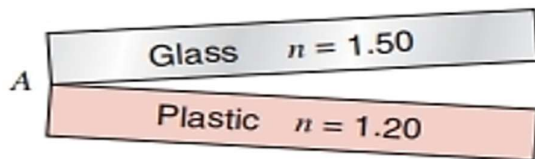
1) At A bright fringe is formed 2) fringes are circular

3) fringe width is uniform

4) fringe width is non uniform and depends on angle between two plates

38. Three Experiments involving a thin film (in air) are shown. If t denotes the film thickness and A denotes the wavelength of the light in the film, which experiments will produce constructive interference as seen by the observer? The incident light is nearly normal to the surface.
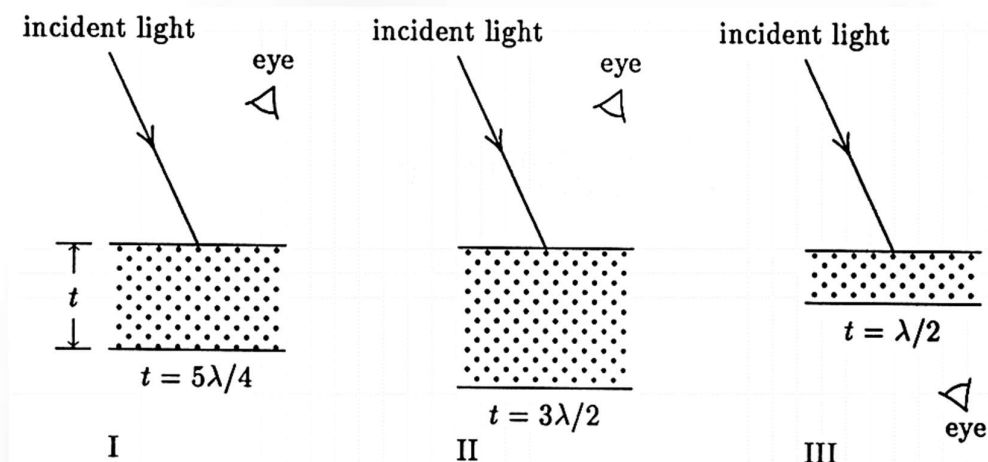
     1) I only   2) II only   3) III only   4) I and III only

39. The rainbow seen after a rain shower is caused by:

     1) Diffraction   2) Interference   3) Refraction   4) Polarization

40. At the second minimum adjacent to the central maximum of a single-slit diffraction pattern the Huygens wavelet from the top of the slit is 180° out of phase with the wavelet from:

     1) A point one-fourth of the slit width from the top
     2) The midpoint of the slit
     3) A point one-fourth of the slit width from the bottom of the slit
     4) The bottom of the slit

41. In a single-slit diffraction pattern, the central maximum is about twice as wide as the other maxima. This is because:

     1) Half the light is diffracted up and half is diffracted down

     2) The small angle approximation applies only near the central maximum

     3) The screen is flat instead of spherical

     4) None of the above

42. The objective and the eyepiece of a microscope have focal lengths of 4 mm and 25 mm, respectively. The objective produces a real image 30 times the size of the object. The final image is viewed at infinity. The near point of the microscope user is at 25 cm. The overall magnification of the microscope is:

1) 250   2) 350   3) 300   4) 450

43. The objective lens of an astronomical telescope has a focal length of 60 cm and the eyepiece has a focal length of 2 cm. How far apart should the lenses be placed in order to form a final image at infinity?

1) 62 cm   2) 44 cm   3) 76 cm   4) 60 cm

44. Fringes are produced by a Fresnel's biprism at 1.0 m from the slit. A lens is placed between the biprism and the screen gives two images of the slit in two positions. In such cases, the two images of the slit are 5 mm and 2.25 nm apart. If the wavelength of light used is 589.6 mm, calculate the distance between the interference bands.

1) 0.18 mm   2) 1.8 mm   3) 2.6 mm   4) 0.26 mm

45. Consider a light beam incident from air to a glass slab at Brewster's angle as shown in figure. A polaroid is placed in the path of the emergent ray at point P and rotated about an axis passing through the centre and perpendicular to the plane of the polaroid.
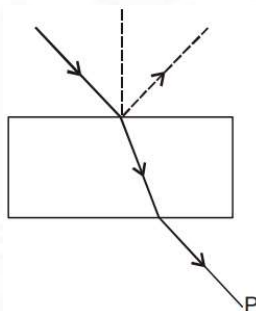
1) For a particular orientation, there shall be darkness as observed through the polaroid
2) The intensity of light as seen through the polaroid shall be independent of the rotation
3) The intensity of light as seen through the polaroid shall go through a minimum but not zero for two orientations of the polaroid
4) The intensity of light as seen through the polaroid shall go through a minimum for four orientations of the polaroid

SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i,e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

46. Monochromatic light from a distant source is incident on a slit 0.750 mm wide. On a screen 2.00 m away, the distance from the central maximum of the diffraction pattern to the first minimum is measured to be 1.35 mm. The wavelength of the light is (in nm).

47. Determine the optical path difference Δ_{12} (in m) between two waves starting from S and reaching in a given spatial point P if the trajectories of propagation of these waves consist of straight line segments of geometric lengths L_1, L_2, and L_3 (passed through media with refractive indices n_1, n_2, and n_3 respectively) for the first wave, and L_4 and L_5 (passed through media with refractive indices n_4 and n_5) for the second wave.

(consider $n_1=1.2, n_2=1.4, n_3=1.6, n_4=1.5$ and $n_5=1.3$ and

$L_1=3m, L_2=4m, L_3=2m, L_4=6m$ and $L_5=5m$)

48. Determine separation (in mm) nearly between the ninth and tenth dark Newton rings if the separation between the second and the third dark rings is 2 mm, and the rings are observed in reflected light in an air wedge between the convex surface of a lens L and the plane surface of a glass plate P.
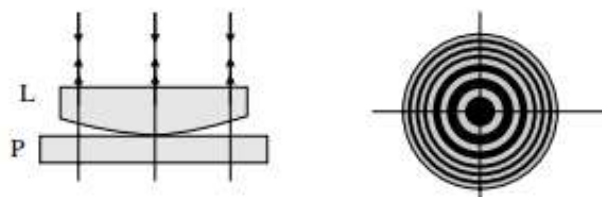
49.   In the figure shown S is a monochromatic point source emitting light of wavelength=500nm. A thin lens of circular shape and focal length 0.10 m is cut into two identical halves L_1 and L_2 by a plane passing through a diameter. The two halves are placed symmetrically about the central axis SO with a gap of 0.5 mm. The distance along the axis from S to L_1 and L_2 is 0.15 m, while that from $L_1 \& L_2$ to O is 1.30 m. The screen at O is normal to SO. If the third intensity maximum occurs at the point A on the screen, find the distance OA (in mm).
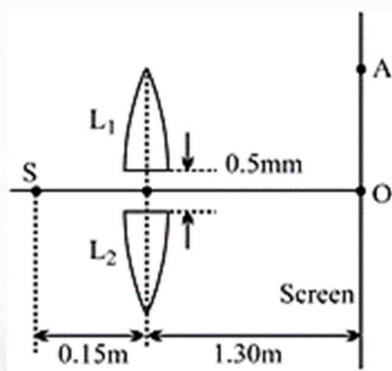
50.   Find the maximum magnifying power of a compound microscope having a 25-dioptre lens as the objective, a 5-dioptre lens as the eyepiece and the separation 30 cm between the two lenses. The least distance for clear vision is 25 cm.

CHEMISTRY   Max Marks: 100

SECTION-I (SINGLE CORRECT ANSWER TYPE)

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

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

51. Phenyl acetaldehyde $\xrightarrow{SeO_2}$ 'X' $\xrightarrow{50\% \, KOH_{aq}}$ 'Y', 'X' and 'Y' respectively is

    1) $ph - \overset{\overset{O}{\|}}{C} - CHO$ and $phCH(OH) - COOK$ 2) $phCH_2CH_2OH$ and $phCH(OH) - COOK$

    3) $phCOCHO$ and $phCH(OH)CHO$ 4) $phCH(OH) - COOK$ and $ph\,COCHO$

52. Assertion (A): Aliphatic aldehydes can be easily identified by using fehling's reagent.

    Reason (R): 'H' atom attached to carbonyl group of aliphatic aldehydes $(-CHO)$

    give reducing character

    1) Both (A) & (R) are correct, and (R) is the correct explanation of (A).
    2) Both (A) & (R) are correct, and (R) is not the correct explanation of (A).
    3) (A) is correct but (R) is incorrect.
    4) (A) is incorrect but (R) is correct.

53.
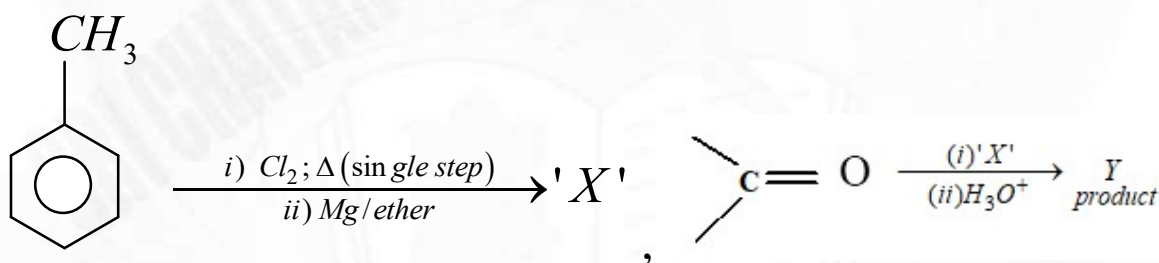
    The correct statemet(s) about product 'Y' is/are

    a) 'Y' is benzyl dimethyl carbinol
    b) 'Y' gives turbidity immediately with lucas reagent
    c) 'Y' is 2^0 alcohol
    d) 'Y' on oxidation with 'PCC' gives an aldehyde.

    Choose the correct option from the following

    1) 'b' and 'c'   2) only 'a'   3) only 'd'   4) 'a' and 'b'

54.   Match Column – I with Column – II
       Column – I   Column – II
       (Name of the Reagent)
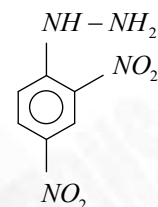
       A) Fehling's reagent   P) Aq or alcoholic solution of NO_2
       B) Tollen's reagent   Q) Rosaniline hydro chloride dissolved in H_2O
       C) Brady's reagent   R) Ammoniacal silver nitrate solution
       D) Schiff's reagent   S) Aq. Alkaline copper sulphate + Rochelle's salt
       1) $A - S, B - R, C - P, D - Q$ 2) $A - R, B - S, C - P, D - Q$
       3) $A - S, B - R, C - Q, D - P$ 4) $A - Q, B - P, C - S, D - R$

55.   In the following sequence of reactions

$$\text{Ar} \xrightarrow[\text{anh. } AlCl_3]{CH_3COCl} X \xrightarrow[\text{conc. } HCl]{Zn-Hg} Y \xrightarrow[\Delta]{K_2Cr_2O_7/H^+} Z$$
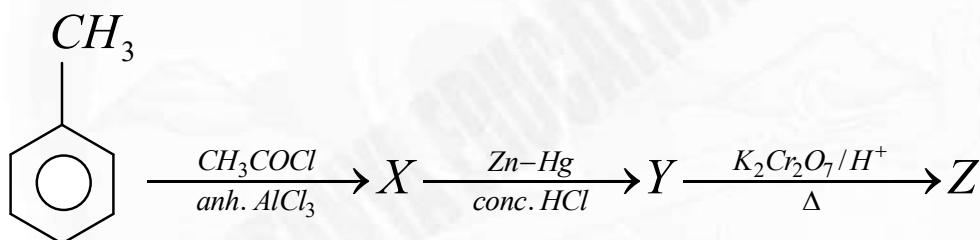
       A) 'X' gives iodoform test
       B) $X \to Y$, reaction is an example of clemmensen's reduction
       C) 'Z' on dehydration gives an anhydride
       D) 'Y' decolourises bradys reagent
       Which of the above statements is correct
       1) A,B,C   2) A & B   3) Only A   4) A & D

56.   Statement – I : But – 3 – en – 2 – one, undergoes addition at carbonyl carbon with $LiAlH_4$,
       but not conjugate addition at (olefinic) position
       Statement – II : But – 3 – en – 2 – one, undergoes conjugate addition at (olefinic) position,
       with dimethyl lithium cuprate – I, but not addition at carbonyl carbon. As the
       reagent is a source of weak nucleophile
       1) Statement – I is true, Statement – II is true; Statement – II is correct explanation for
       Statement – I
       2) Statement - I is true, Statement - II is true; Statement - II is not correct explanation for
       Statement – I
       3) Statement – I is true, Statement – II is false
       4) Statement – I is false, Statement – II is true

57.   The volume of carbon monoxide liberated at STP when 230 gms of formic acid is treated

with excess of dehydrating agent conc. H_2SO_4 , is

1) 230 liters   2) 1120 liters   3) 112 liters   4) 4 moles

58.   How many of the following statement(s) is/are correct

A) Acetaldehyde but not acetone gives silver mirror test
B) During iodoform test, for methanal white precipitate is formed
C) Acetone with Fehling's reagent gives red precipitate of Cu_2O
D) Acetaldehyde with Schiff's reagent gives pink colour.
1) B and C   2) A and B   3) C and D   4) A and D

59. $$\;\!>\!\!=\!0 \xrightarrow[(step-1)]{HCN} P \xrightarrow[(step-2)]{H_2O/H^+} Q \xrightarrow[(step-3)]{Conc.H_2SO_4} R \xrightarrow[(step-4)]{i)B_2H_6 \ , \ ii) \ H_2O_2/OH^-} S$$
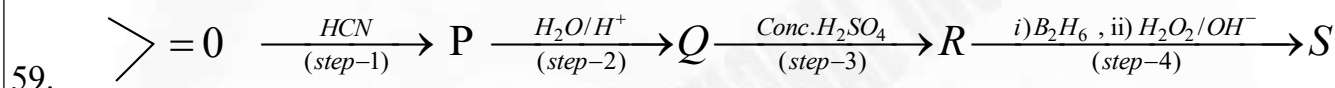
Which one of the following statement(s) is/are correct

1) Step – 4 is an example of Markowni koff's addition.
2) Step – 1 is an example of electrophilic addition.
3) Product 's' is a β - hydroxy acid
4) 'R' is a saturated carboxylic acid

60.   Which one of the following reactions the product formed is correct with respect to the reactants and the name of the, reaction.

1)

2)

3)

4)
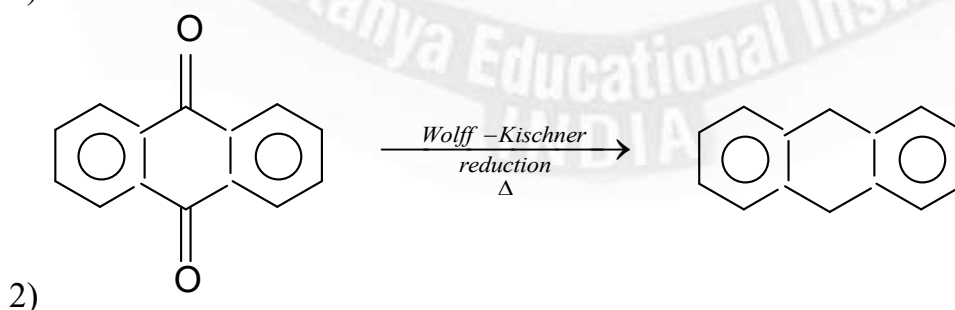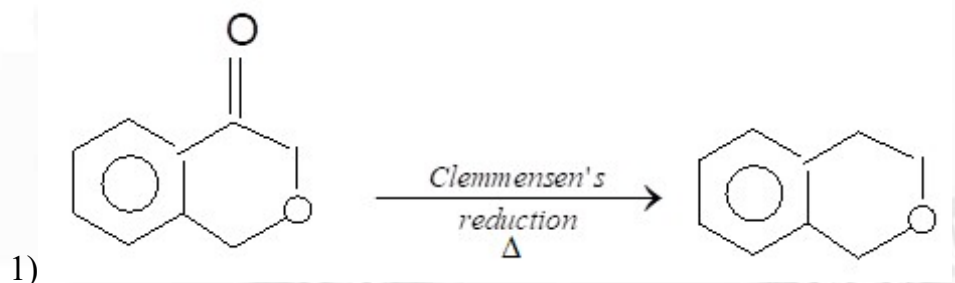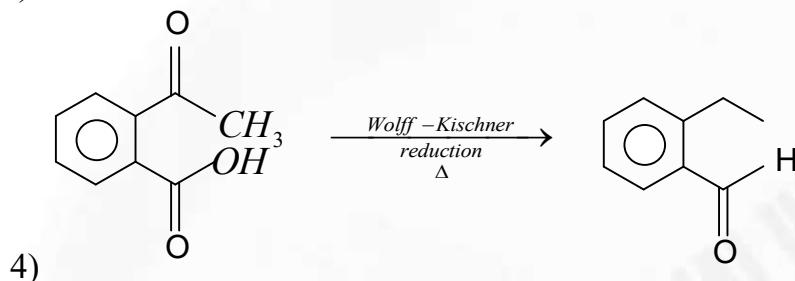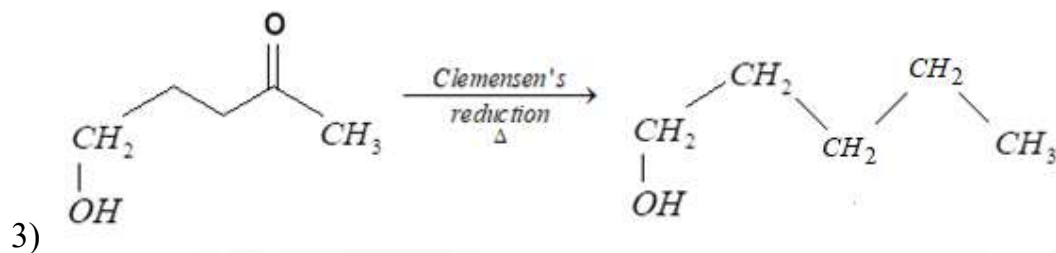
61. **Assertion – (A) :** Isopropyl benzene an oxidation with alkaline $KMnO_4$, followed by acid hydrolysis gives benzoic acid, but not t–butyl benzene.

Reason – (R) : At least, one hydrogen atom is to be present on the carbon of the alkyl group that is directly attached to benzene ring can only give benzoic acid on oxidation with $KMnO_4 / OH^-$ followed by acid hydrolysis.

1) Both (A) & (R) are correct, and (R) is the correct explanation of (A).
2) Both (A) & (R) are correct, and (R) is not the correct explanation of (A).
3) (A) is correct but (R) is incorrect.
4) (A) is incorrect but (R) is correct.

62. $CHCl_3 \xrightarrow[\;(excess)\;]{KOH_{aq}} P$ (Final product)
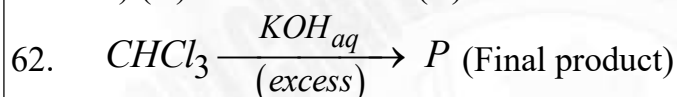
Which one of the following statement(s) is/are correct.

1) $HCOOH$ 2) $HCOOK$ 3) $HCHO$ 4) $CH_2(OH)_2$

63. **Assertion – (A) :** HCOOH is the only acid that gives both silver mirror and Fehling's test, is formic acid

Reason – (R) : Hydrogen directly attached to carboxylic carbon of formic acid gives Reducing character to formic acid, hence HCOOH behaves like CH_2O

1) Both (A) & (R) are correct, and (R) is the correct explanation of (A).
2) Both (A) & (R) are correct, and (R) is not the correct explanation of (A).
3) (A) is correct but (R) is incorrect.
4) (A) is incorrect but (R) is correct.

64. Hydrolysis of an ester gives a carboxylic acid and the conc. aq solution of potassium salt of the acid. The ester is (on Kolbe's electrolysis gives ethane)

   1) Methyl ethanoate   2) Ethyl isobutyrate

   3) Ethyl propanoate   4) Methyl methanoate

65.

$$\text{(A)} \xrightarrow{C_2H_5MgBr} C_2H_6 \uparrow + (B) \xrightarrow[ii) H_2O/H^+]{i) O=C=O} (C)$$

(A)
(1 mole)   I   II
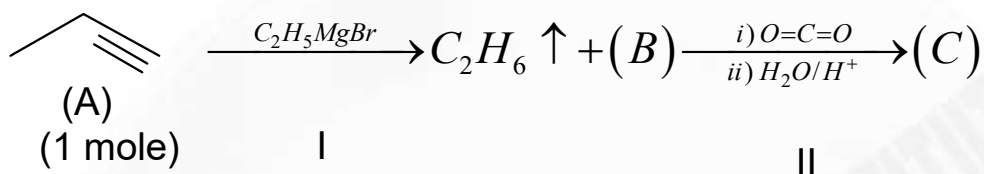
If both reactions I and II take place (100%) completely, the weight of the product 'C' formed is

   1) 42 gms   2) 48 gms   3) 84 gms   4) 126 gms

66. The increasing order of ease of alkaline hydrolysis for the following esters is
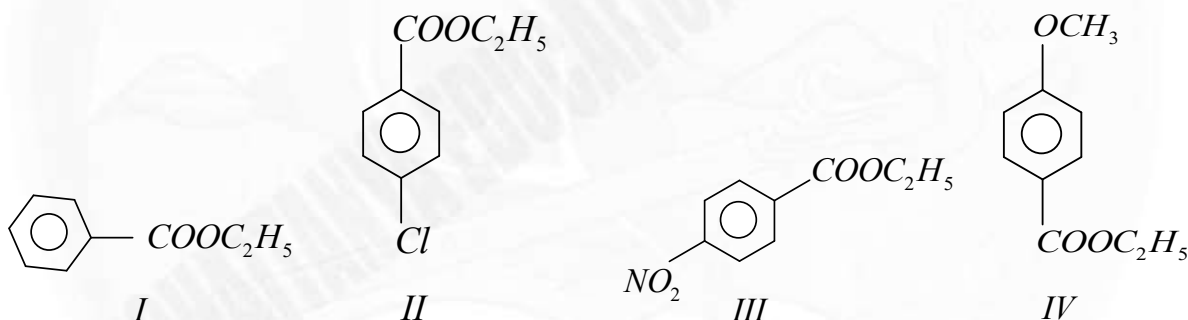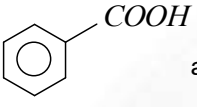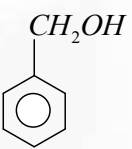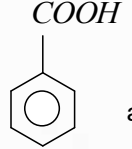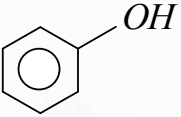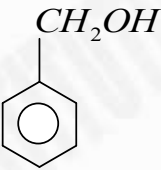
   1) I < II < III < IV   2) III < II < I < IV   3) IV < I < II < III   4) IV < II < I < III

67. Which of the following aldehydic group containing compounds, (1 equivalent) do not form Grignard product with one equivalent of Grignard reagent are
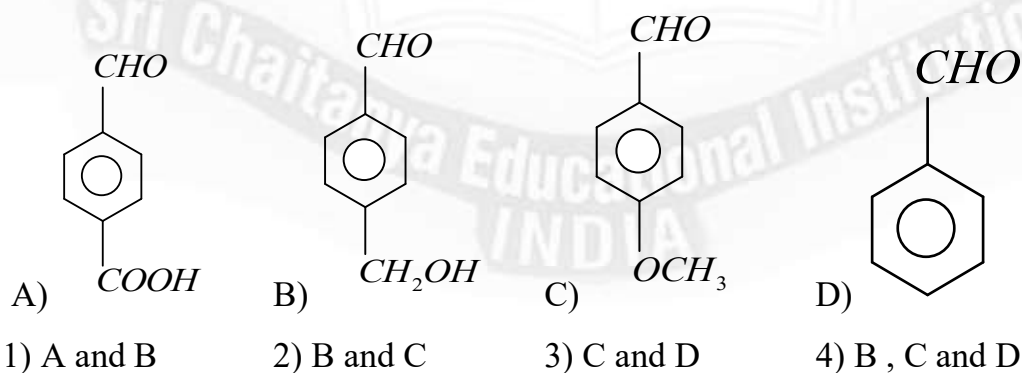
   1) A and B   2) B and C   3) C and D   4) B , C and D

68.
$$HCHO + phCHO \xrightarrow[\;ii)\, H_2O\,/\,H^+\;]{i)\,50\%\,KOH_{aq}}$$
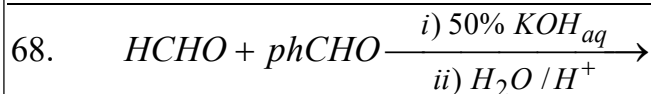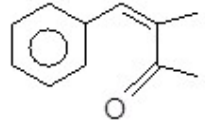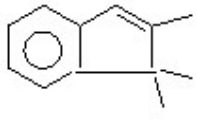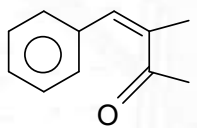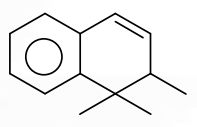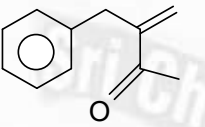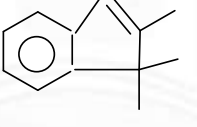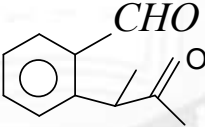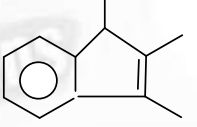
Major products of the above reaction are

1) COOH and CH₂OH benzyl alcohol

2) COOH and CH_3OH

3) $HCOOH$ and OH (phenol)

4) $HCOOH$ and CH₂OH benzyl alcohol

69. Consider the following reaction sequence.
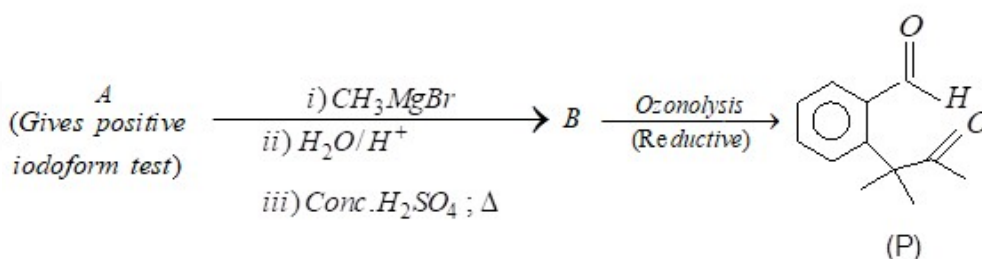
A and B in the above sequence of reactions respectively is

70.

$$\text{(PhCHO)} + (CH_3CO)_2 O \xrightarrow[170-180^0 C]{CH_3COONa} \quad \text{Ph}-CH=CH-COOH + CH_3COOH$$

The reaction is

1) Tollen's reaction   2) Perkin condensation

3) Robin Son's annulation   4) Benedict's reaction

SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i,e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

71. Acetic acid reacts with PCl_5 completely to give major product 'X' and $POCl_3$ and HCl as the other products. What number of $sp^3 - sp^2$ sigma bonds is present in 'X'

72.

$$\xrightarrow[\substack{ii)\, Conc.\, H_2SO_4 \\ \Delta}]{i)\, LiAlH_4} 'X'$$
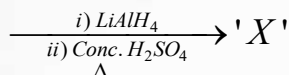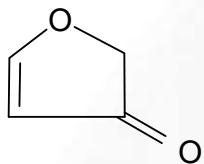
(major product)

The number of delocalized 'π' electrons in 'X' is

73. $\beta -$ Keto acids and also dicarboxylic acids, where the two $-COOH$ groups are present on same carbon atom, on heating lose CO_2. 1 mole of the following compound 'X' gives 'Y' moles of CO_2.

(X)
(1 mole)
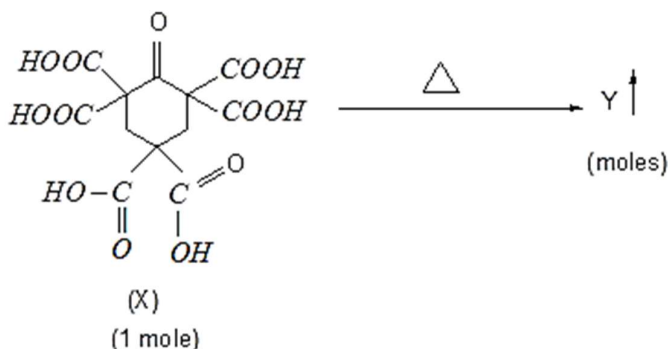
Then '2Y' is _____

74. How many of the following are reduced with $LiAlH_4$ in ether followed by acid hydrolysis to give saturated alcohol .

$CH_3CH = CHCOOC_2H_5$; $CH_3 - CH = CHCOOH$

$C_6H_5 - CH = CH - CHO$; $CH_3COCH_2COOC_2H_5$, $CH_3CH = CH - CHO$

75.

$$CH_3CHO \xrightarrow[Ca(OH)_{2aq}]{CH_2O\,;\,Excess} 'X' \xrightarrow[Conc.\,NaOH_{aq}]{CH_2O\,;\,Excess} 'Y'$$
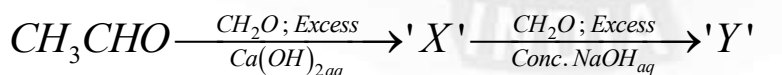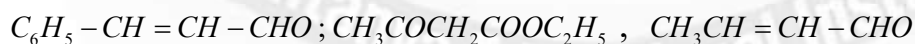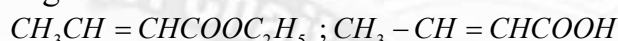
1 mole   dil. solution   1 mole   1 mole

What is the sum of moles of hydroxyl methyl groups in X and Y.