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# JEE ADVANCED



## Sri Chaitanya IIT Academy., India.

★ A.P ★ T.S ★ KARNATAKA ★ TAMILNADU ★ MAHARASTRA ★ DELHI ★ RANCHI

A right Choice for the Real Aspirant

ICON Central Office, Madhapur – Hyderabad

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**JEE-ADV\_2023-P1**

**Date: 13-07-2025**

Time: 09.00Am to 12.00Noon

**WTA-37**

**Max. Marks :180**

### MATHEMATICS

: COMPLETE COMBINATIONS

### CHEMISTRY

: Cannizzaro 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  $\text{SeO}_2$ , 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.

### 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 surface, Young'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, Billet lens, Lloyd's mirror) Interference due to a thin film, Interference due to a thin wedge-shaped film, Newton's rings, Diffraction, Optical instruments: Telescope and Microscopes, Magnifying and resolving power (Deleted pertaining to JEE MAINS but still in JEE ADV Syllabus), Polarization, Scattering, Formation of rainbow

Name of the Student: \_\_\_\_\_

H.T. NO:

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## JEE-ADVANCE-2023-P1-Model

Time:3Hr's

### IMPORTANT INSTRUCTIONS

Max Marks: 180

### MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 3)	Questions with Multiple Correct Choice with partial mark	+4	-2	3	12
Sec – II(Q.N : 4 – 7)	Questions with Single Correct Choice!	+3	-1	4	12
Sec – III(Q.N : 8 – 13)	Questions with Integer Answer Type	+4	0	6	24
Sec – IV(Q.N : 14 – 17)	Matching Type	+3	-1	4	12
<b>Total</b>				<b>17</b>	<b>60</b>

### PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 18 – 20)	Questions with Multiple Correct Choice with partial mark	+4	-2	3	12
Sec – II(Q.N : 21 – 24)	Questions with Single Correct Choice	+3	-1	4	12
Sec – III(Q.N : 25 – 30)	Questions with Integer Answer Type	+4	0	6	24
Sec – IV(Q.N : 31 – 34)	Matching Type	+3	-1	4	12
<b>Total</b>				<b>17</b>	<b>60</b>

### CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 35 – 37)	Questions with Multiple Correct Choice with partial mark	+4	-2	3	12
Sec – II(Q.N : 38 – 41)	Questions with Single Correct Choice	+3	-1	4	12
Sec – III(Q.N : 42 – 47)	Questions with Integer Answer Type	+4	0	6	24
Sec – IV(Q.N : 48 – 51)	Matching Type	+3	-1	4	12
<b>Total</b>				<b>17</b>	<b>60</b>

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**MATHEMATICS****Max Marks: 60**

**SECTION – I**  
**(ONE OR MORE CORRECT ANSWER TYPE)**

This section contains **THERE (03)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

**Full Marks** : +4 **ONLY** if (all) the correct option(s) is(are) chosen;

**Partial Marks** : +3 If all the four options are correct but **ONLY** three options are chosen;

**Partial Marks** : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct ;

**Partial Marks** : +1 If two or more options are correct but **ONLY** two options are chosen, and it is a correct option ;

**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered);

**Negative Marks** : -2 In all other cases.

For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then choosing **ONLY** (A), (B) and (D) will get +4 marks; choosing **ONLY** (A) and (B) will get +2 marks; choosing **ONLY** (A) and (D) will get +2 marks; choosing **ONLY** (B) and (D) will get +2 marks; choosing **ONLY** (A) will get +1 mark; choosing **ONLY** (B) will get +1 mark; choosing **ONLY** (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -2 marks.

- ${}^nC_r$  is equal to  
 A) Number of possible subsets of  $r$  members from set of  $n$  distinct members  
 B) Number of possible binary messages of length  $n$  with exactly  $r$  1's  
 C) Number of non-decreasing 2D paths from  $(0, 0)$  to  $(r, n)$   
 D) Number of ways of selecting  $r$  things out of  $n$  when a particular thing is always included plus the number of ways of selecting  $r$  things out of  $n$ . when particular thing is always excluded
- $M$  points on one straight line are joined to  $n$ -points on other straight line. The number of Points of intersection of line segments thus formed not lying on give two lines) is  
 A)  ${}^mC_2 \cdot {}^nC_2$       B)  $\frac{mn(m-1)(n-1)}{4}$       C)  $\frac{{}^mC_2 \cdot {}^nC_2}{2}$       D)  ${}^mC_2 + {}^nC_2$
- The number of ways to select 2 ordered numbers from  $\{0, 1, 2, 3, 4\}$  such that sum of Squares of selected numbers is divisible by 5 are ( repetition of digits is allowed)  
 A)  ${}^9C_1$       B)  ${}^9C_8$       C) 9      D) 7

**SECTION – II**  
**(SINGLE CORRECT ANSWER TYPE)**

This section contains **FOUR (04)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:

**Full Marks** : +3 If **ONLY** the correct option is chosen;

**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered);

**Negative Marks** : -1 In all other cases

- The number of different seven digits numbers that can be written using only three digits 1, 2, and 3 under condition that digit 2 occurs exactly twice in each number is  
 A) 672      B) 640      C) 512      D) None

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**THE PERFECT HAT-TRICK WITH ALL- INDIA RANK 1**  
**IN JEE MAIN 2023 JEE ADVANCED 2023 AND NEET 2023**

**JEE MAIN 2023**  
SINGARAJU VENKAT KOUNDINYA  
AIR 1  
300 MARKS



**JEE Advanced 2023**  
RAVILAKSHMI CHIDVILAS REDDY  
AIR 1  
341 MARKS



**NEET 2023**  
BORJA VARUN CHAKRAVARTHI  
AIR 1  
720 MARKS





5. How many of the 900 three digit numbers have at least one even digit?  
A) 775                      B) 875                      C) 450                      D) 750
6. A student has to answer 10 out of 13 questions in an examination. The number of ways in which he can answer if he must answer atleast 3 of first five questions is  
A) 276                      B) 267                      C) 80                      D) 1200
7. 5 Indian and 5 american couples meet at party and shake hands. If no wife shakes Hands with her own husband and no indian wife shakes hands with a male, then the Number of hand shakes that takes place in party is  
A) 95                      B)130                      C) 135                      D) 150

**SECTION-III****(NON-NEGATIVE INTEGER.)**This section contains **SIX (06)** questions.

- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme  
Full Marks : +4 If ONLY the correct integer is entered; Zero Marks : 0 In all other cases.

8. The number of six digit numbers that can be formed from digits 1,2,3,4,5,6 and 7 so that digits do not repeat and terminal digits even is \_\_\_\_\_
9. The total number of ways in which 5 balls of different colours can be distributed among 3 persons so that each person gets at least one ball is
10. Let  $S = \{1,2,3,4\}$ . The total number of unordered pairs of dis joint subsets of S is equal to
11. A debate club consists of 6 girls and 4 boys A team of 4 members is said to be selected from this club including the selection of captain for team(captain should be selected from this 4 members) . If item has to include at most one boy then number of ways of selecting the team is
12. A bag contains 2 apples, 3 oranges, 4 bananas the number of ways in which 3 fruits Can be selected. If at least one banana is always in combination (Assume fruits of same Species to be alike)
13. Team A consist of 7 boys and n girls and team B has 4 boys and 6 girls if a total of 52 single matches can be arranged between these two teams when a boy play against a boy and a girl plays against a girl; then n is equal to

### SECTION – IV (MATCHING TYPE)

This section contains **FOUR (04)** Matching List Sets.

- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists : **List-I** and **List-II**.
- **List-I** has **Four** entries (I), (II), (III) and (IV) and **List-II** has **Five** entries (P), (Q), (R), (S) and (T).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme :  
**Full Marks:** +3 **ONLY** if the option corresponding to the correct combination is chosen;  
**Zero Marks:** 0 If none of the options is chosen (i.e. the question is unanswered);  
**Negative Marks:** -1 In all other cases.

14. Match the following

	Column-I		Column-II
i)	The number of ways in which 35 mangoes can be distributed among 3 boys so that each can have any number of mangoes	P)	666
ii)	The number of triangles whose vertices are at vertices of decagon with one side common with decagon	Q)	60
iii)	A box contains 2 white and 3 black of 4 red balls. In how many ways can three Balls be drawn from box if atleast one black ball is to be include in draw	R)	64
iv)	A child attempts to open a five disc lock. He takes 5 seconds to dial a particular number on disc. If he does so for 5 hours, every day then number of days he would take to open lock	S)	28

A) i-P, ii-Q, iii-S, iv-R

B) i-P, ii-R, iii-S, iv-Q

C) i-P, ii-Q, iii-R, iv-S

D) i-Q, ii-P, iii-R, iv-S

15. Match the following

	Column-I		Column-II
i)	The number of straight lines that can be drawn out of 12 points of which 8 are collinear is	P)	7
ii)	In a cricket championship there are 21 matches. If each team plays one match with every other team the number of team is	Q)	39
iii)	In an examination a student is required to pass all five different subjects. The number of ways he can fail is	R)	31
iv)	The number of ways in which 448 mobile phones can be shared equally among students	S)	14

A) i-P ,ii-Q ,iii-S ,iv-R

B) i-P ,ii-R ,iii-S ,iv-Q

C) i-P ,ii-Q ,iii-R ,iv-S

D) i-Q ,ii-P ,iii-R ,iv-S

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16. Match the following

	Column-I		Column-II
i)	${}^{n+4}C_{n+1} - {}^{n+3}C_n = 15(n+2)$ . then n equals	P)	6
ii)	$2^n C_3 = 11 \cdot {}^n C_3$ then n equals	Q)	27
iii)	If $r \in N$ , $r > 10$ . Such that $6 \cdot {}^{35}C_r = (K^2 - 3) \cdot {}^{36}C_{r+1}$ where K is an integer then r is	R)	35
iv)	The number of ways of choosing 10 objects out of 31 of which 10 are identical	S)	20

A) i-Q ,ii-P ,iii-R ,iv-S

B) i-Q ,ii-P ,iii-S ,iv-R

C) i-Q ,ii-S ,iii-P ,iv-R

D) i-Q ,ii-S ,iii-R ,iv-P

17. In a hand poker, 5 cards are dealt from a regular pack of 52 cards

	Column-I		Column-II
i)	Number of ways. These are 4 kings	P)	624
ii)	Number of ways these are 2 clubs & 3 hearts	Q)	24
iii)	Number of ways these 4 of same kind	R)	22308
iv)	Number of ways these are 3 ace & 2 kings	S)	48

A) i-S ,ii-R ,iii-P ,iv-Q

B) i- S,ii-R ,iii-Q ,iv-P

C) i-S ,ii-Q ,iii-P ,iv-R

D) i-P ,ii-Q ,iii-R ,iv-S

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Space for rough work

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## PHYSICS

Max Marks: 60

### SECTION – I

#### (ONE OR MORE CORRECT ANSWER TYPE)

This section contains **THERE (03)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
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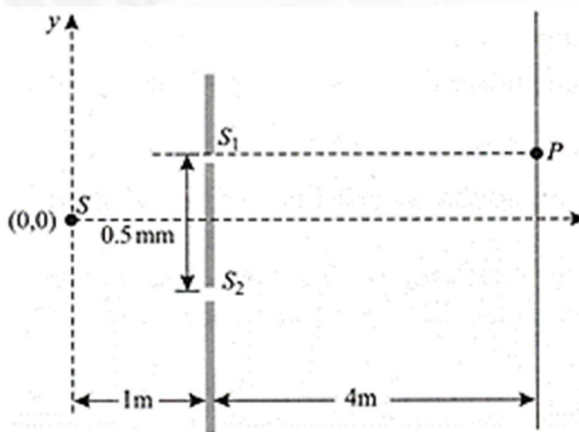
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For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then choosing **ONLY** (A), (B) and (D) will get +4 marks; choosing **ONLY** (A) and (B) will get +2 marks; choosing **ONLY** (A) and (D) will get +2 marks; choosing **ONLY** (B) and (D) will get +2 marks; choosing **ONLY** (A) will get +1 mark; choosing **ONLY** (B) will get +1 mark; choosing **ONLY** (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -2 marks.

18. If one of the slits of a standard young's double-slit experiment is covered by a thin parallel sided glass slab so that it transmits only one-half the light intensity of the other, then
- The fringe pattern will get shifted towards the covered slit
  - The fringe pattern will get shifted away from the covered slit
  - The bright fringes will become less bright and the dark ones will become more bright
  - The fringe width will remain unchanged
19. Figure shows a Young's double slit experiment setup. The source S of wavelength 4000 Å oscillates along y-axis according to the equation  $y = \sin \pi t$  where y measured in millimeters and t is in seconds. The distance between two slits  $S_1$  and  $S_2$  is 0.5 mm



- The position of the central maxima as a function of time is  $8 \sin \pi t$
- The position of the central maxima as a function of time is  $4 \sin \pi t$
- The instant at which maximum intensity occurs at P for first time is  $\frac{1}{\pi} \sin^{-1} \left( \frac{54}{80} \right)$
- The instant at which maximum intensity occurs at P for first time is  $\frac{1}{\pi} \sin^{-1} \left( \frac{27}{80} \right)$

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20. Choose the correct option(s)
- A) Waves from two coherent sources may be in same phase always at some points
- B) Waves from two incoherent sources have fixed phase different at a point always
- C) Initial phase difference between the waves emitted by two coherent sources may vary with time
- D) Waves from two coherent sources may be in opposite phase always at some points

**SECTION – II**  
**(SINGLE CORRECT ANSWER TYPE)**

This section contains **FOUR (04)** questions.

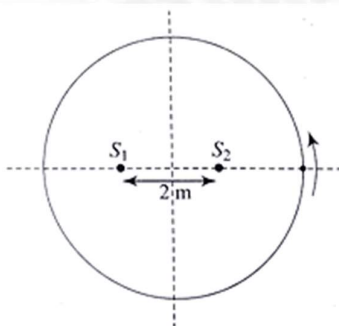
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 If **ONLY** the correct option is chosen;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases

21. Two point sources separated by 2.0 m are radiating in phase with  $\lambda = 0.50\text{ m}$ . A detector moves in a circular path around the two sources in a plane containing them. How many maxima are detected?



- A) 16                      B) 20                      C) 24                      D) 32
22. Young's double slit experiment is carried out by using green, red and blue light, one color at a time. The fringe widths recorded are  $\beta_G, \beta_R$  and, respectively. Then,
- A)  $\beta_G > \beta_B > \beta_R$     B)  $\beta_B > \beta_G > \beta_R$     C)  $\beta_R > \beta_B > \beta_G$     D)  $\beta_R > \beta_G > \beta_B$
23. In YDSE of equal width slits. let  $\beta$  be the fringe width and  $I_0$  be the maximum intensity. At a distance  $x$  from the central bright fringe, the intensity will be
- A)  $I_0 \cos\left(\frac{x}{\beta}\right)$     B)  $I_0 \cos^2\left(\frac{2\pi x}{\beta}\right)$     C)  $I_0 \cos^2\left(\frac{\pi x}{\beta}\right)$     D)  $\frac{I_0}{4} \cos^2\left(\frac{\pi x}{\beta}\right)$
24. In young's double-slit experiment using a monochromatic light of wavelength  $\lambda$ , the path difference (in terms of an integer  $n$ ) corresponding to any point having half the peak intensity is
- A)  $(2n+1)\frac{\lambda}{2}$     B)  $(2n+1)\frac{\lambda}{4}$     C)  $(2n+1)\frac{\lambda}{8}$     D)  $(2n+1)\frac{\lambda}{16}$





## SECTION-III

(NON-NEGATIVE INTEGER.)

This section contains **SIX (06)** questions.

- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme  
Full Marks : +4 If ONLY the correct integer is entered; Zero Marks : 0 In all other cases..

25. Bichromatic light is used in YDSE having wavelengths  $\lambda_1 = 400\text{ nm}$  and  $\lambda_2 = 700\text{ nm}$ .  
Find minimum order of  $\lambda_1$  which overlaps with  $\lambda_2$
26. In young's double slit experiment, when the slit plane is illuminated with light of wavelength  $\lambda_1$ , it was observed that point P is closest point from central maximum O, where intensity was 25% the intensity at O. When the light of wavelength  $\lambda_2$  is used, point P happens to be nearest point from O where intensity is 75% of that at O. Find the ratio  $\frac{\lambda_2}{\lambda_1}$ .
27. In a Biprism experiment with sodium light, bands of width 0.0195 cm are observed at 100 cm from slit. On introducing a convex lens 30 cm away from the slit between biprism and screen, two images of the slit are seen 0.7 cm apart at 100 cm distance from the slit. Calculate the wavelength of sodium light (in Å).
28. A thin paper of thickness 0.02 mm having a refractive index 1.45 is pasted across one of the slits in a YDSE. The paper transmits  $\frac{4}{9}$  of the light energy falling on it. How many fringes will cross through the centre if an identical paper piece is pasted on the other slit also? The wavelength of the light used is 600 nm
29. Two coherent monochromatic light sources are located at two vertices of an equilateral triangle. If the intensity due to each of the source independently is  $1\text{ Wm}^2$  at the third vertex. The resultant intensity due to both the source at the third vertex is (in  $\text{Wm}^2$ )
30. In YDSE fringes are obtained using light of wavelength  $4800\text{ Å}$ . One slit is covered with a thin glass film of refractive index 1.4 and another slit is covered by a film of same thickness but refractive index 1.7. By doing so the central fringe is shifted to fifth bright fringe in the original pattern. The thickness of glass film is  $x \times 10^{-3}\text{ mm}$ , what is the value of x?

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Space for rough work

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## SECTION – IV (MATCHING TYPE)

This section contains **FOUR (04)** Matching List Sets.

- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists : **List-I** and **List-II**.
- **List-I** has **Four** entries (I), (II), (III) and (IV) and **List-II** has **Five** entries (P), (Q), (R), (S) and (T).
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- Answer to each question will be evaluated according to the following marking scheme :  
*Full Marks*: +3 **ONLY** if the option corresponding to the correct combination is chosen;  
*Zero Marks*: 0 If none of the options is chosen (i.e. the question is unanswered);  
*Negative Marks*: -1 In all other cases.

31. Figure shows a set up to perform young's double slit experiment. A monochromatic source of light is placed at S,  $S_1$  and  $S_2$  and act as coherent sources and interference pattern is obtained on the screen



	Column-I		Column-II
i)	A thin transparent plate is placed in front of $S_1$	a)	Interference fringes disappear
ii)	$S_1$ is closed	b)	There is a uniform illumination on a large Part of the screen
iii)	A thin transparent plate is placed in front of $S_2$	c)	The zero order fringe will not form at O
iv)	S is removed and two different sources emitting light of same wavelength are placed at $S_1$ and $S_2$	d)	Central Maxima is formed below O

A) i-a,b; ii-c,d; iii-b,c ; iv-b,d

B) i-a; ii-c; iii-d; iv -b

C) i-c; ii-a,b; iii-c,d; iv-a,b

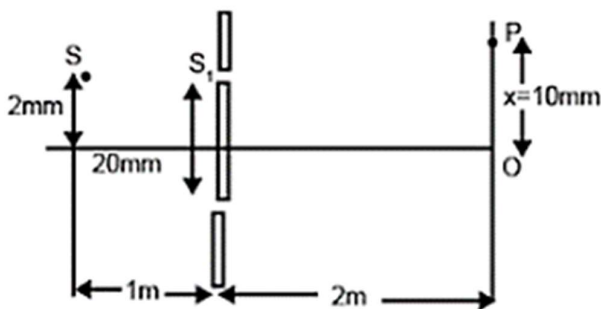
D) i-b,c; ii-a,b; iii-c; iv-a

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32. In young's double-slit experiment, the point source S is placed slightly off the central axis as shown in figure. If  $\lambda = 500 \text{ nm}$ , then match the following



	Column-I		Column-II
i)	Nature and order of interference at point P, $OP=10 \text{ mm}$	a)	Bright fringe of order 80
ii)	Nature and order of interference at point O	b)	Bright fringe of order 262
iii)	If a transparent paper (refractive index $\mu = 1.45$ ) of thickness $t=0.02 \text{ mm}$ is pasted on $S_1$ , i.e., one of the slits, the nature and order of the interference at P	c)	Bright fringe of order 62
iv)	After inserting the transparent paper in front of slit $S_1$ , the nature and order of interference at O	d)	Bright fringe of order 280

A) i-d; ii-a.iii-b; iv-c

B) i-c; ii-a; iii-c; iv-b

C) i-d; ii-c-iii-a; iv-b

D) i-a; ii-b; iii-c, iv-d

33.

	Column-I		Column-II
A)	If Young's double slit experiment is performed in water instead of air then the fringe pattern will	p)	Equal
B)	If the distance between slits in YDSE is reduced, the fringe width will	q)	Decrease
C)	If blue light is used instead of red light in YDSE, the fringe width will	r)	Increase
D)	For best contrast between maxima and minima in the interference pattern of Young's double slit experiment the intensity of light emerging out if the two slits should be	s)	Shrink

A) A-s; B-r; C-q; D-p

B) A-r; B-s; C-q; D-p

C) A-s; B-r; C-p; D-q

D) A-r; B-s; C-p; D-q

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Space for rough work

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34.

	Column-I		Column-II
A)	The fringe width for red colour as compared to that for violet colour is approximately	p)	Half
B)	In a Young's double slit experiment, the distance between the slits is halved and the distance between slit and screen is doubled then the fringe width will become	q)	Double
C)	If the distance of a surface from light source is doubled then the power received will become	r)	Quarter times
D)	Light from lamp is falling normally on a small surface. If the surface is tilted to $60^\circ$ from this position, then the power received by the surface will become	s)	Four times

A) A-q; B-s; C-p; D-q

B) A-s; B-p; C-q; D-r

C) A-q; B-s; C-r; D-p

D) A-p; B-q; C-r; D-s

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Space for rough work

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## CHEMISTRY

Max Marks: 60

### SECTION – I

#### (ONE OR MORE CORRECT ANSWER TYPE)

This section contains **THERE (03)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

**Full Marks** : +4 **ONLY** if (all) the correct option(s) is(are) chosen;

**Partial Marks** : +3 If all the four options are correct but **ONLY** three options are chosen;

**Partial Marks** : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct ;

**Partial Marks** : +1 If two or more options are correct but **ONLY** two options are chosen, and it is a correct option ;

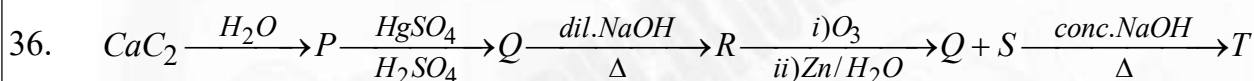
**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered);

**Negative Marks** : -2 In all other cases.

For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then choosing **ONLY** (A), (B) and (D) will get +4 marks; choosing **ONLY** (A) and (B) will get +2 marks; choosing **ONLY** (A) and (D) will get +2 marks; choosing **ONLY** (B) and (D) will get +2 marks; choosing **ONLY** (A) will get +1 mark; choosing **ONLY** (B) will get +1 mark; choosing **ONLY** (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -2 marks.

35. A new C-C bond formation is possible in

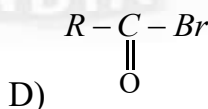
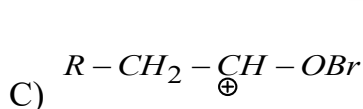
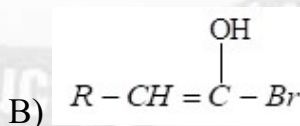
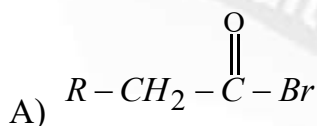
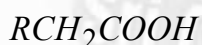
- A) Aldol condensation                      B) Friedel-Crafts alkylation  
C) Clemmensen reduction                  D) Reimer-Tiemann reaction



(S can give glycol on reduction)

Correct statement(s) for the above reaction

- A) (S) to (T) is intramolecular Cannizzaro's reaction  
B) (Q) can show Cannizzaro's reaction  
C) (P) on reaction with red hot iron tube forms aromatic compound  
D) (Q) cannot show tautomerism
37. The structure of the intermediate formed in the HVZ reaction of Bromine with



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Space for rough work

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MARKS



## SECTION – II

### (SINGLE CORRECT ANSWER TYPE)

This section contains **FOUR (04)** questions.

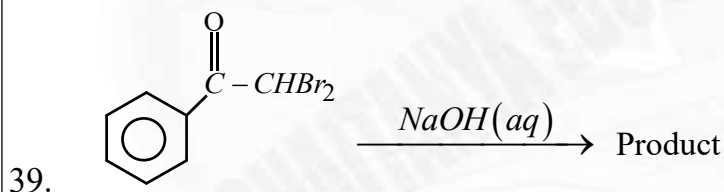
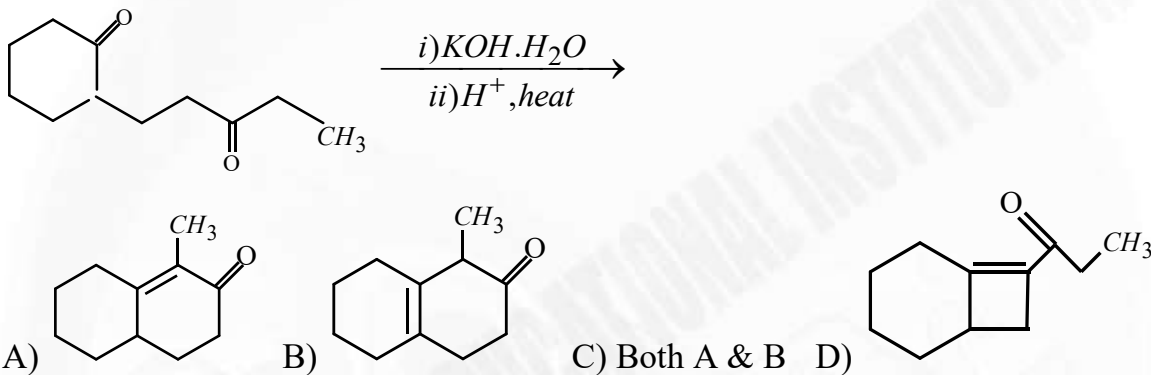
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 If **ONLY** the correct option is chosen;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

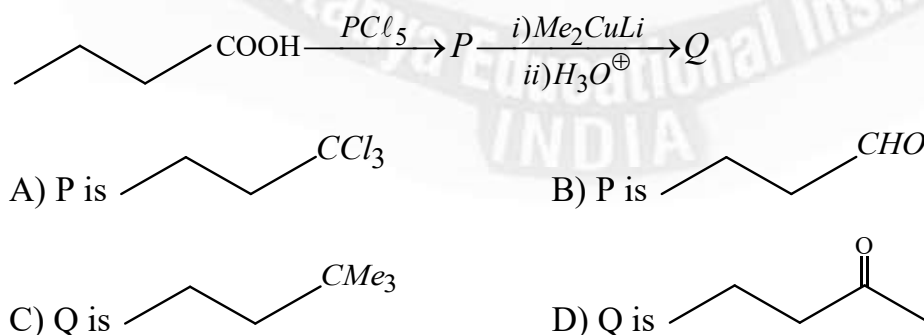
Negative Marks : -1 In all other cases

38. The major product of the following reaction is



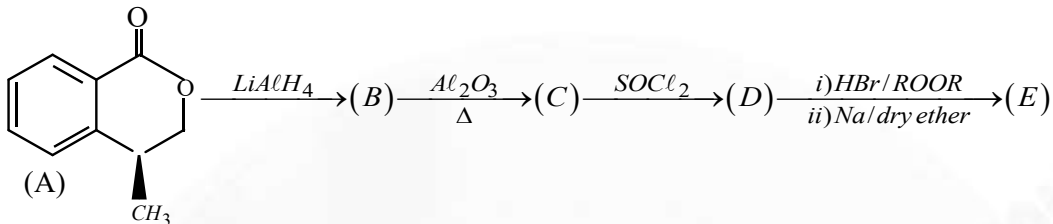
- A)  $\text{Br}_2\text{CH}-\text{C}(=\text{O})-\text{O}^-$ 
 B)  $\text{Ph}-\text{CH}(\text{OH})-\text{C}(=\text{O})-\text{O}^-$
- C)  $\text{Ph}-\text{C}(=\text{O})-\text{C}(=\text{O})-\text{H}$ 
 D)  $\text{Ph}-\text{C}(=\text{O})-\text{O}^- + \text{CH}_2\text{Br}_2$

40. Select the correct option(s) for given reaction





41. With reference to the scheme given below, which of the following statement(s) is/are not true about compounds (A) to (E)?



- A) Compound (B) releases a gas on treatment with sodium metal  
 B) Compound (C) gives a resolvable mixture on reaction with  $Hg(OAc)_2$  followed by reduction with  $NaBH_4$   
 C) Compound (D) does not exhibit geometrical isomerism  
 D) Compound (E) is chiral

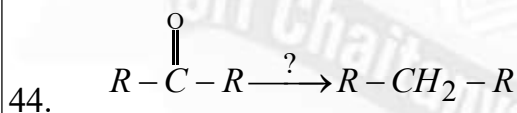
### SECTION-III

(NON-NEGATIVE INTEGER.)

This section contains **SIX (06)** questions.

- The answer to each question is a **NON-NEGATIVE INTEGER**.
  - For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
  - Answer to each question will be evaluated according to the following marking scheme
- Full Marks : +4 If ONLY the correct integer is entered; Zero Marks : 0 In all other cases.

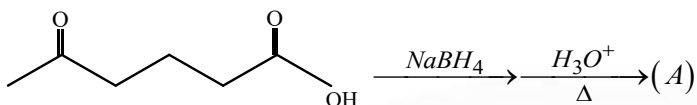
42.  $X(C_9H_{12}O_4) \xrightarrow[\text{ii) } H^+]{\text{i) } I_2/OH^-} \text{Yellow solid} + (y) \xrightarrow{Na \text{ metal}} 2H_2 \uparrow + \text{sodium salt of tetracarboxylic acid. Find the number of moles of yellow solid formed?}$
43. Acetaldehyde will react positive in how many of the following tests:  
 i) Lucas test      ii) Victor mayor test      iii) Iodoform test  
 iv) Sodium bisulfite test      v) Litmus test      vi) Sodium metal test  
 vii) Tollen's test      viii) Fehling's solution test      ix) 2, 4-DNP test



Identify the number of reagents that can be used for above conversion

- a)  $Zn-Hg/HCl$     b)  $LiAlH_4$     c)  $N_2H_4/OH^-$   
 d)  $\begin{array}{c} CH_2-SH \\ | \\ CH_2-SH \end{array}, H_2/Ni$     e)  $CrO_3$     f)  $KMnO_4/OH^\ominus$

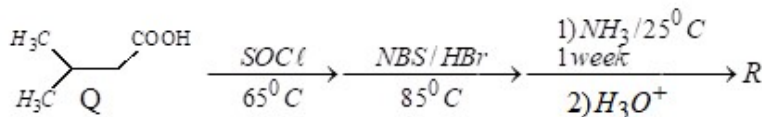
45. In the final product of the given reaction, find  $x + y$



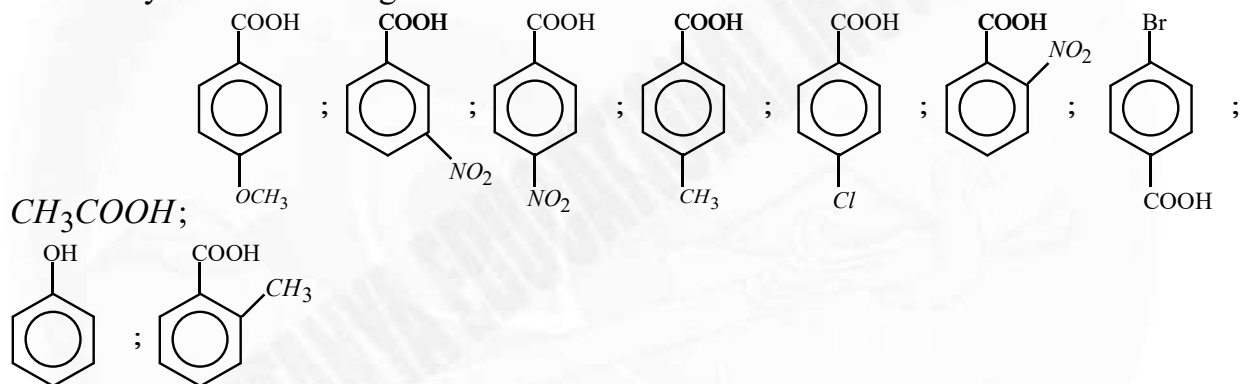
$x$  = Number of oxygen atoms

$y$  = Number of  $sp^2$  carbons

46. Find the mass (in g) of Q required to produce 5.85 g of R (rounding to nearest integer)



47. How many of the following acids are more acidic than benzoic acid



### SECTION – IV (MATCHING TYPE)

This section contains **FOUR (04)** Matching List Sets.

- Each set has **ONE** Multiple Choice Question.
  - Each set has **TWO** lists : **List-I** and **List-II**.
  - List-I** has **Four** entries (I), (II), (III) and (IV) and **List-II** has **Five** entries (P), (Q), (R), (S) and (T).
  - FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
  - Answer to each question will be evaluated according to the following marking scheme :
- Full Marks: +3 **ONLY** if the option corresponding to the correct combination is chosen;  
 Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered);  
 Negative Marks: -1 In all other cases..

48.

	Column-I (Reaction)		Column-II (Product)
A)	Beckman rearrangement	P)	$\alpha, \beta$ – unsaturated carbonyl compound
B)	Perkin's condensation	Q)	N-Alkylamide
C)	Aldol condensation	R)	$\alpha, \beta$ – unsaturated acid
D)	Cannizarro's reaction	S)	Self oxidation and reduction

A) A-Q, B-R, C-P, D-S

B) A-R, B-Q, C-P, D-S

C) A-Q, B-R, C-S, D-P

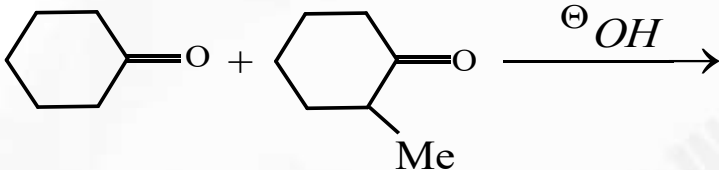
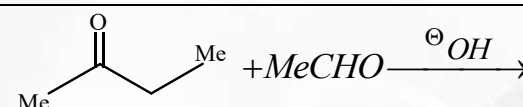
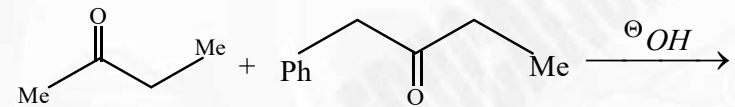
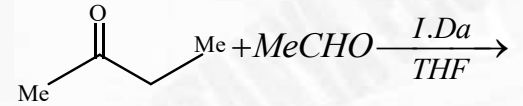
D) A-S, B-R, C-P, D-Q

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49.

	Column-I (Reaction)		Column-II (Only Number of crossed aldol products including minor)
A)	$MeCHO + MeCH_2CHO \xrightarrow{^{\ominus}OH}$	P)	3
B)		Q)	2
C)		R)	4
D)		S)	1
E)			

A) A-Q, B-P, C-P, D-R, E-P

B) A-P, B-Q, C-P, D-S, E-R

C) A-Q, B-P, C-R, D-S, E-R

D) A-R, B-S, C-P, D-Q, E-R

50.

	Column-I (Reagents reacting with $PhCH_2COOH$ )		Column-II (product formed)
A)	$CH_3MgBr$	p)	$PhCH_2COCl$
B)	$PCl_5$	q)	$PhCH_2COOCH_3$
C)	$NH_3$ , followed by heating	r)	$CH_4$
D)	$CH_3OH$ in the presence of $conc.H_2SO_4$	s)	$PhCH_2CONH_2$

A) A-r, B-p, C-s, D-q

B) A-p, B-r, C-q, D-s

C) A-p, B-q, C-r, D-s

D) A-p, B-r, C-s, D-q

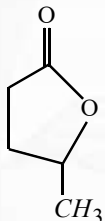
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51.

	Column-I		Column-II
A)	$C_6H_5 - \overset{\overset{O}{\parallel}}{C} - OC_2H_5 + H_3C - \overset{\overset{O}{\parallel}}{C} - O - C_2H_5 \rightarrow$ $C_6H_5 - \overset{\overset{O}{\parallel}}{C} - CH_2 - \overset{\overset{O}{\parallel}}{C} - OC_2H_5 + C_2H_5OH$	p)	Anhydrous $ZnCl_2$
B)	$H_3C - \overset{\overset{O}{\parallel}}{C} - OH + Cl_2 \rightarrow ClCH_2 - \overset{\overset{O}{\parallel}}{C} - OH$	q)	$C_2H_5O^-$
C)	$C_6H_6 + (H_3C - C = O)_2O \rightarrow C_6H_5 - \overset{\overset{O}{\parallel}}{C} - CH_3$	r)	Red P
D)	 $\rightarrow CH_3CH(OH)CH_2CH_2CH_2OH$	s)	$LiAlH_4$

A) A-p, B-q, C-r, D-s

B) A-q, B-r, C-p, D-s

C) A-s, B-q, C-r, D-p

D) A-r, B-q, C-p, D-s



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