ODISHA PUBLIC SERVICE COMMISSION

19, DR. P.K. PARIJA ROAD, KATAKA- 753001

NOTICE

No.6036../PSC, Dt.28.10.2026

(DR-IV)(2PH-01-2026/27)

ADVERTISEMENT NO. 14 OF 2026-27

WEBSITE - https://www.opsc.gov.in

I.	**Scientific Officer in Group – B in the State Forensic Science Service Organization under Home Department**
II.	**No. of Vacancies– 89(29-W)**

Online applications are invited from the prospective candidates through Proforma Application to be made available on the website of the Commission **(https://www.opsc.gov.in)**. ***The link for registration and payment of Examination fees shall be available from 06.11.2026 to 26.11.2026 till 5.00 P.M. (Note: 26.11.2026 (5.00 P.M.) is the last date/ closing date for submission of Registered online Application)*** *for* recruitment to **89 (Eighty-nine) posts of Scientific Officer in (Group – B) across 10 (Ten) Divisions of the State Forensic Science Service Organization under Home Department** in the scale of pay of Rs. 44,900/- (Level 10, Cell -1 of Pay Matrix under Rule-3 of the ORSP Rules, 2017), with usual Dearness and other Allowances as may be sanctioned by the Government of Odisha from time to time.

2. VACANCY POSITION:

As per requisition furnished by the Home Department, Government of Odisha, out of a total of **89 (29-w) vacancies in 10(Ten) Divisions**, 45(15-w) vacancies are for UR category, 08(02-w) vacancies are reserved for SEBC category, 18(05-w) vacancies are reserved for SC category and 18(07-w) vacancies are reserved for ST category.

Also, 04 posts are reserved for Person with Disabilities whose permanent disability is 40% or more.

Candidates belonging to the categories of PWD shall be adjusted against the categories to which they belong.

3. AGE:

A candidate must have attained the age of **21(twenty-one)** years and must not be above the age of **42** (**Forty-two**) years on the **1st day of January, 2026** i.e., he/she must have been born **not earlier than 2nd January, 1984 and not later than 1st January, 2005.**

4. EDUCATIONAL QUALIFICATION:

The candidate must have **Post Graduate or Master's Degree** from a recognized University or equivalent in various disciplines as mentioned in Annexure-A of the detailed Advertisement for respective Divisions with **minimum 55% of the aggregate marks.**

(ii) **A candidate shall apply for one division only.**

5. EXAMINATION FEE:

The candidates other than SC, ST, and PwD category shall have to pay the examination fee amounting to **Rupees Seven Hundred (₹700/-) only** through online mode while filling the Online Application Form. The examination fees paid shall be refunded only to those candidates who actually appear in both the papers of Written Examination. Application without payment of examination fees (except SC/ ST/ PwD candidates) will be taken as incomplete and outrightly be rejected.

Refund shall be issued in due course after completion of the Written Examination. Refund will be processed to the original mode of payment used at the time of the transaction by the candidate. (Credit Card, Debit Card, UPI, Net Banking, Wallet etc.)

6. METHOD OF SELECTION:

The selection of candidates for recruitment to the posts of Scientific Officer shall be made on the basis of **Written Examination and Personality Test.**

The details of **Plan/Scheme & Syllabus for the Written Examination (Objective Type)** are available in the **Long Advertisement**.

7. DATE OF WRITTEN EXAMINATION

The Written Examination will be held on ***17.01.2027 (Sunday)***. The detailed Schedule and Centre of Examination will be notified in due course.

The candidates are advised to visit the Website of the Commission at **https://www.opsc.gov.in** for detailed information for applying to the above post.

28/10/26

KATAKA

DATE: 28.10.2026

SECRETARY

ODISHA PUBLIC SERVICE COMMISSION

KATAKA

ODISHA PUBLIC SERVICE COMMISSION

ADVERTISEMENT NO. 14 of 2026-27

Recruitment to the posts of Scientific Officer (Group-B) in the State Forensic Science Service Organization under the Home Department

WEBSITE – www.opsc.gov.in

Online applications are invited from the prospective candidates through the Proforma application to be made available on the website (**https://www.opsc.gov.in**). **The link for registration and payment of examination fee shall be available from 06.11.2026 to 26.11.2026 (5:00 P.M.) (Note: 26.11.2026 (5:00 P.M) is the last date/ closing date for submission of Registered Online Application)** for recruitment to **89 (Eighty-nine)** posts of **Scientific Officer** (Group – B) across 10 (Ten) Divisions in the State Forensic Science Service Organization under Home Department in the Scale of Pay of Rs. 44,900/- in Level 10, Cell -1 of Pay Matrix under Rule-3 of the ORSP Rules, 2017 with usual Dearness and other Allowances as may be sanctioned by the Government of Odisha from time to time. The recruitment will be conducted as per the Odisha Forensic Science Service (Method of Recruitment and Conditions of Service of Group-'A' and Group-'B' Posts) Rules, 2025 and one-time relaxation Notification No. 25739, dtd- 18.07.2026 of Govt. in Home Department.

2. VACANCY POSITION:

As per requisition filed by the Home Department, Government of Odisha, the category wise vacancy position along with reservation thereof is given below:

Sl. No.	Name of the Division	Total Vacancies	Category-wise vacancy position			
			UR	SC	ST	SEBC
1	Physics	07(02-w)	04 (01-w)	01	02 (01-w)	00
2	Ballistics	06(02-w)	03 (01-w)	00	02 (01-w)	01
3	Chemistry	10(03-w)	04 (01-w)	03(01-w)	03 (01-w)	00
4	Toxicology	13(05-w)	08 (03-w)	03 (01-w)	02 (01-w)	00
5	Biology	14(05-w)	06 (02-w)	04 (01-w)	02 (01-w)	02 (01-w)
6	Serology	04(01-w)	03 (01-w)	01	00	00
7	DNA	12(04-w)	06 (02-w)	02 (01-w)	03 (01-w)	01
8	Forensic Psychology	06(01-w)	03 (01-w)	01	01	01
9	Cyber Forensic	11(05-w)	05 (02-w)	02 (01-w)	02 (01-w)	02 (01-w)
10	Document	06(01-w)	03 (01-w)	01	01	01
Grand Total		**89(29-w)**	**45(15-w)**	**18(05-w)**	**18(07-w)**	**08(02-w)**

NOTE 1:- A candidate can apply for one Division only.

The Transgender candidates can apply for the said post.

Out of the total **89** number of vacancies mentioned above, **04** posts are reserved for **Persons with Disabilities** (**whose Permanent Disability is 40% or more**). The details of Physical Requirement and Functional Classification are given below: -

Sl. No.	Name of Post/ Division	No. of vacancies reserved for PwD category	Physical Requirement	Suitable Categories of Benchmark Disabilities (Functional Classification)
1	Toxicology	01	S, ST, BN, MF, RW, SE, W	a) **Cat -II**- D (Deaf), HH (Hard of Hearing) b) **Cat-III** - OA (One Arm), BA (Both Arm), OL (One Leg), CP (Cerebral Palsy), Dw (Dwarfism), AAV (Acid Attack Victims) c) **Cat-IV (d)**- SLD (Specific learning Disability), MI (Mental-illness) d) **Cat-IV (e)**- MD (Multiple Disability) involving (a) to (c) above.
2	Biology	01	S, ST, BN, MF, RW, SE, W	a) **Cat-II** - D(Deaf), HH (Hard of Hearing) b) **Cat-III** - OA (One Arm), BA (Both Arm), OL (One Leg), CP (Cerebral Palsy), LC (Leprosy Cured), Dw (Dwarfism), AAV (Acid Attack Victims) c) **Cat-IV (d)** - SLD (Specific Learning Disability), MI (Mental-illness) d) **Cat-IV (e)** - MD (Multiple Disability) involving (a) to (c) above
3	Forensic Psychology	01	S, ST, BN, MF, RW, SE, W	a) **Cat- I** - LV (Low vision) b) **Cat- II** - D(Deaf), HH (Hard of Hearing) c) **Cat-III** - OL (One Leg), OAL (One Arm and One Leg), CP (Cerebral Palsy), LC (Leprosy Cured), Dw (Dwarfism), AAV (Acid Attack Victims) d) **Cat-IV (d) -** ASD(M) Autism Spectrum Disorder (M-Mild), SLD(Specific Learning Disability), MI(Mental-illness) e) **Cat-IV (e) -** MD (Multiple Disability) involving (a) to (d) above
4	Document	01	S, ST, BN, MF, RW, SE, W	a) **Cat -II** - D(Deaf), HH (Hard of Hearing) b) **Cat-III** - OL (One Leg), OAL (One Arm & One Leg), CP (Cerebral Palsy), LC (Leprosy Cured), Dw (Dwarfism), AAV (Acid Attack Victims) c) **Cat-IV (d)** - ASD(M) Autism Spectrum Disorder (M-Mild), SLD (Specific Learning Disability), MI (Mental-illness) d) **Cat-IV (e)** - MD (Multiple Disability) involving (a) to (c) above

(S- Sitting, ST- Standing, W- Walking, BN- Bending, MF- Manipulation with Fingers, RW-Reading & Writing, SE- Seeing).

Persons with Temporary Disability will not be eligible for reservation for PwD category.

Candidates belonging to the category of Persons with Disabilities shall be adjusted against the categories to which they belong.

NOTE 2 : -

a) **SEBC candidates**

The candidates applying against SEBC Category (Non-Creamy Layer) must submit Caste Certificate issued by the Competent Authority not more than 03 years before the first date of submission of Online Application Form. Candidates furnishing SEBC certificate which is issued more than 03 years prior to the start date (06.11.2026) of submission of Online Application, shall not be considered under SEBC category. **The SEBC Certificate must be issued on or after 07.11.2023.**

b) **PwD candidates**

PwD candidates must upload their Permanent Disability Certificate. Certificate showing Temporary Disability will not be accepted.

c) Experience has shown that, some candidates obtain SC/ST/SEBC certificate etc. immediately ahead of the date of Application and upload the same along with Online Application, only to secure admission to the examination, which sometimes get cancelled subsequently on the grounds of inadmissibility etc. If any such cancellation
of any uploaded certificate is detected at any stage of the recruitment examination or even subsequently, the candidature of such candidates will be cancelled, or recommendation be withdrawn as the case may be if the candidate has availed the benefits of Reservation.

d) In case of non-availability of eligible/ suitable women candidate(s) belonging to the respective category, the unfilled vacancies of that category shall be filled up by eligible/ suitable male candidate(s) of the same category.

e) Exchange of reservation between Scheduled Caste and Scheduled Tribe will not be considered in the event of non-availability of eligible and suitable S.C. / S.T. candidates.

f) The number of vacancies to be filled up on the basis of this recruitment is subject to change by the Government without Notice, depending upon the exigencies of public service at the discretion of the State Government.

3. AGE:

A candidate must have attained the age of **21(twenty-one)** years and must not be above the age of **42** (**Forty-two**) years on the **1st day of January, 2026** i.e., he/she must have been born **not earlier than 2nd January, 1984 and not later than 1st January, 2005.**

Provided that the upper age limit prescribed above shall be relaxed by **five (05) years** for candidates belonging to the categories of Socially & Educationally Backward Classes (S.E.B.C.), Scheduled Castes (S.C.), Scheduled Tribes (S.T.), Women & Ex-Servicemen and by **10 (Ten) years** for Persons with Disabilities whose **permanent disability is forty percent (40%) or more.**

Persons with Disabilities belonging to SEBC/ SC/ ST categories are eligible for cumulative age relaxation benefit upto fifteen (15) years.

(SAVE AS PROVIDED ABOVE, THE AGE LIMITS PRESCRIBED CAN IN NO CASE BE RELAXED)

Date of birth entered in the High School Certificate or equivalent certificate issued by the concerned Board/Council will only be accepted by the Commission.

4. EDUCATIONAL QUALIFICATION:

(i) The candidate must have **Post Graduate or Master's Degree** from a recognised University or equivalent as mentioned in **Annexure-A** for respective Divisions with **minimum 55% of the aggregate marks**.

(ii) **A candidate shall apply for one division only**.

5. KNOWLEDGE IN ODIA:

A candidate must be able to speak, read and write Odia and must have –

a) passed M.E. School or higher examination with Odia as a language subject; or

b) passed Matriculation or equivalent examination with Odia as a medium of examination in non-language subject; or

c) passed in Odia as a language subject in the final examination of Class VII from a school or educational institution recognized by the Government of Odisha or the Central Government; or

d) passed a test in Odia in Middle English School standard conducted by the School & Mass Education Department of the Government of Odisha / Board of Secondary Education, Odisha.

Explanation: if a candidate has not passed Odia as a subject in the High School Certificate Examination or not passed Matriculation or equivalent Examination with Odia as medium of examination in non-language subject; then the candidate may provide any of the following documents:

i. The Certificate issued by the Headmaster of the concerned High School recognized by the Board of Secondary Education, Odisha in compliance with the provision mentioned at sub-para(a) above,

OR

ii. Certificate by the Principal of the recognized School showing that he/she had taken Odia as a subject in Class-VII or Standard VII or above and has passed the said examination in compliance with the provision mentioned at sub-para (c) above,

OR

iii. Odia Test Pass Certificate from the School and Mass Education Department/ Board of Secondary Education, Odisha in support of passing Odia Language Test equivalent to M.E. School Standard in compliance with the provision mentioned at sub-para(d) above. The certificate must be issued before the last date of application form.

NOTE:

a. Any kind of manipulation/forgery/tampering of the Odia Pass Certificates as mentioned *supra* by the candidate will be treated as criminal offence and legal action will be taken beside rejection of the candidature and debarment from further OPSC recruitment as per procedure.

b. **The Commission reserves the right to test the ability of the candidate to read, write and speak Odia during the Interview process.**

6. EXAMINATION FEE, MODE OF PAYMENT & REFUND:

The candidates other than SC, ST and PWD category shall have to pay the examination fee amounting to **Rs. 700/- (Rupees Seven Hundred) only** through online mode while filling the Online Application Form. The examination fees paid shall be **refunded only to those candidates who actually appear in both the Paper-I & Paper-II of the Written Examination. Applications without payment of examination fees (except SC/ ST/ PWD candidates) will be taken as incomplete and outrightly be rejected.**

Refund shall be issued in due course after completion of the Written Examination. Refunds will be processed to the original mode of payment used at the time of the transaction by the candidate. (Credit Card, Debit Card, UPI, Net Banking, Wallet etc.).

However, the candidates shall have to furnish their bank account details i.e. Account Number, IFSC Code, Name of the Account Holder and Name of the Bank branch in the required field in the Online Application Form which will be required in case of failure of refund of money through the original mode of payment owing to technical glitches or other issues, if any. The Bank Account must remain valid/active. The onus of furnishing the correct bank account details lies with the candidates and the Commission (OPSC) shall not entertain any correspondence from any candidate in this regard.

7. METHOD OF SELECTION:

The selection of candidates for recruitment to the posts of Scientific Officer shall be made on the basis of **Written Examination (400 marks) and Personality Test (50 marks).**

A. WRITTEN EXAMINATION:

a) The **total marks** for the Written Examination shall be **400.**

b) There shall be two papers i.e., **Paper-I** & **Paper-II**, which shall be **Objective Type-Multiple Choice Questions (MCQ Pattern).**

c) **Paper-I**

A) General English: **50 questions**, each carrying one (01) mark.

B) General Awareness, General Aptitude & Reasoning: **50 questions**, each carrying one (01) mark.

d) The **total marks** in **Paper-I** shall be **100** and the **duration** of examination shall be **90 minutes (one and half hour).**

e) **Paper-II (for each Division)** shall consist of **150 questions**, each carrying two (02) marks.

f) The **total marks** of **Paper-II** shall be **300** and the duration of examination shall be **150 minutes (two and half hours).**

g) **The standard of questions in Paper-II shall be of Master's Degree Level.**

h) There shall be **Negative Marking** for each wrong answer/response by the candidates with a **deduction of 25%** of the marks allotted to each question in both Paper-I & Paper-II.

i) The Plan/Scheme of Written Examination and syllabus are provided at **Annexure-B** of this advertisement.

B. PERSONALITY TEST/VIVA VOCE:

a) The **Personality Test / Viva Voce** shall carry **50 (Fifty)** marks.

b) Shortlisting of candidates for Personality /Viva Voce:

i. The Commission shall fix up minimum qualifying marks for each Paper-I and Paper-II for different categories of candidates.

ii. Then the Commission shall shortlist the candidates who secure the minimum qualifying marks as per para (i) *supra* for the Personality Test/Viva Voce in the order of merit as per marks secured by them in the Written Examination (400 marks) in a ratio of twice the number of vacancy in each category.

C. PREPARATION OF MERIT LIST:

The Commission shall prepare Division-wise merit list of candidates in order of merit based on the aggregate marks secured in the Competitive Examination (Written Examination and Personality Test /Viva Voce), subject to reservation against different social categories.

In case of candidates securing same marks in Competitive Examination in aggregate (Written Examination and Personality Test /Viva Voce), the following principles shall be adopted:-

(a) Candidate securing higher marks in Paper-II of the Written Test shall be ranked higher.

(b) In case of further tie, the merit shall be arranged in order of date of birth (i.e. the older in age shall be ranked higher).

Note: - Details relating to this recruitment like Qualifying Marks, mark secured by Last Selected Candidate (LSC mark), individual marks, etc. shall only be declared in the Website of the Commission after publication of the Final Result and Select List.

8. DATE OF WRITTEN EXAMINATION:

The Written Examination will be held on **17.01.2027 (Sunday)**. The detailed Schedule and Centre of Examination will be notified in due course.

N.B.: After completion of the Written Examination, the Provisional Answer Key of the Papers shall be uploaded in the Website immediately after examination inviting suggestions/objections, if any, from the candidates through the applicable online mode. Those candidates who do not challenge the Provisional Answer Key through the applicable online mode within the specific date shall forfeit their right to agitate the matter subsequently in any forum or in any other manner.

9. PLACE OF EXAMINATION:

The Written Examination for the posts of **Scientific Officer** will be held at **Kataka/Bhubaneswar**.

10. OTHER ELIGIBILITY CONDITIONS:

(i) The candidate must be a citizen of India;

(ii) A candidate if married must not have more than one spouse living:

Provided that the State Government may, if satisfied that such marriage is permissible under the personal law applicable to such person or there are other grounds for doing so, exempt any person from the operation of this rule.

(iii) A candidate must be of good mental condition and sound health and free from physical defect that is likely to interfere with the discharge of duties in the service and the candidate, who after such medical examination is not found to satisfy these requirements, shall not be appointed to the service.

(iv) A candidate must be of good moral and character. He/she should not have been convicted of any criminal offense.

(v) Government servants, whether temporary or permanent, are eligible to apply provided that they possess the requisite qualification and are within the prescribed age-limit as provided under Para-3 & 4 of the Advertisement. They must inform their respective Head of Offices in writing regarding submission of their applications for this recruitment and furnish **"No Objection Certificate"** during document verification. **So the candidates must obtain NOC well in advance;**

(vi) If a candidate has at any time, been debarred for a certain period/chance(s) by the Odisha Public Service Commission or other State Public Service Commission or U.P.S.C. from appearing at any examination/ viva voce test, he/she will not be eligible for such recruitment for that specified period/chance(s).

(vii) A candidate who claims change in his/her name after having passed the High School Certificate Examination or equivalent examination, is required to furnish copy of publication of the changed name in local leading daily newspaper as well as copy of notification in the Gazette in support of his/her change of name.

(viii) **Only those candidates, who possess the requisite qualifications, are within the prescribed age limit & fulfil other eligibility conditions strictly etc. by the closing date of submission of registered online application form, will be considered eligible**;

(ix) Every candidate selected for appointment shall be examined by the Medical Board. A candidate, who does not satisfy the requirement after medical examination, shall not be appointed to the service.

11. IMPORTANT POINTS:

a) The provisions of the Odisha Conduct of Examination Act, 1988 (Odisha Act-2 of 1988) and Odisha Public Examinations (Prevention of Unfair Means) Act, 2024 are applicable to the examination conducted by the Odisha Public Service Commission. Any violation of the above Acts and violation of **"Instructions to candidates"** (as provided in the advertisement, application form, Brochure, Admission Certificate & Answer Script etc.) will be seriously viewed and disciplinary action will be taken against the concerned candidates as deemed proper.

b) A candidate found guilty of seeking support for his/her candidature by offering illegal gratification or applying pressure on any person connected with the conduct of the recruitment process or found indulging in any type of malpractice in course of the selection or otherwise, shall, in addition to rendering himself/herself liable to criminal prosecution, be disqualified not only for the recruitment for which he/she is a candidate, but also may be debarred, either permanently or for a specified period, from any recruitment or selection to be conducted by the Commission;

c) **Online applications submitted to OPSC, if found to be incomplete in any respect, are liable for rejection without entertaining any correspondence with the applicants on that score;**

d) **Admission to Written Examination / Document Verification will be provisional. If on verification at any stage before or after the Written Examination/ Document Verification Publication, it is found that a candidate does not fulfil all the eligibility conditions, his/her candidature will be liable for rejection. Decision of the Commission with regard to eligibility or otherwise of a candidate shall be final;**

e) This advertisement should not be construed as binding on the Appointing Authority to make an appointment.

f) **Reservation and Relaxation etc. meant for S.C. / S.T. by Birth and SEBC are admissible to the Scheduled Castes / Scheduled Tribes and Socially & Educationally Backward Classes of Odisha only;**

g) Community (caste status) once mentioned by the candidates under the appropriate box of the online application form, will be treated as final and the same not be changed subsequently under any circumstances.

h) **Any misrepresentation or suppression of information by the candidate in the online application form will result in cancellation of his/her candidature or penalty, as decided by the Commission shall be imposed on the candidate;**

i) Mere empanelment in the select list shall not confer any right for appointment unless the Appointing Authority is satisfied after making such enquiry as may be deemed necessary that the candidate is suitable in all respects for appointment to the Service.

j) No request for withdrawal of candidature and change of category will be entertained under any circumstances.

k) All persons appointed under the Government of Odisha on or after 1st January, 2005, shall not be eligible for pension as defined under Sub-rule (1) of Rule-3 of the Odisha Civil Service (Pension) Rules, 1992; but shall be covered by the defined Contributory Pension Scheme in accordance with the Odisha Civil Services (Pension) Amendment Rules, 2005;

l) **Submission of NPS application is mandatory for all recommended candidates at the time of joining in Government services.**

m) Candidates are requested to bring the copies of certificates and other requisite documents as stated under Para-12 of this Advertisement at the time of Document Verification.

12. CERTIFICATES/DOCUMENTS TO BE UPLOADED:

The candidates are required to upload the following documents with the online application form:-

(i) H.S.C. or equivalent certificate in support of declaration of age issued by the concerned Board/Council;

(ii) Intermediate/+2 Examination Certificate issued by the concerned Board/ Council;

(iii) Bachelor's Degree Certificate issued by the recognized University;

(iv) Master's Degree Certificate in concerned Division or other Master's Degree Certificate as mentioned at Annexure-A of the Advertisement.

(v) Mark-lists in support of all the aforesaid Examination (H.S.C. to Master's Degree) passed including fail marks, if any, issued by the concerned Board / Council /University

NOTE 1:

(a) Candidates who have not been awarded percentage of marks, but only "GRADE MARKS", should, along with their applications, produce the conversion certificate from the concerned University indicating the actual equivalent percentage of marks and the conversion formula failing which, their applications are liable to be rejected.

(b) The candidates have to upload their relevant documents as required by the system while filling up online application form, failing which their candidature shall be rejected.

(c) All the aforesaid documents are required to be merged into a single PDF file within a size of Maximum 10 MB and uploaded at the time of submission of online application form.

(vi) Caste Certificate by birth in support of claim as S.E.B.Cs./ S.Cs./ S.Ts. wherever applicable **(Please see Note-2 of Para-2 & Note-2 of Para-12);**

(vii) Required Odia Test Pass Certificate / Certificate issued by School Principal in case passed in Odia Language in Class-VII or Middle English School Standard / Certificate issued by Board of Secondary Education, Odisha; **(Please see Para-5)**

(viii) Permanent Disability Certificate (indicating percentage disability i.e., 40% or more) issued by the concerned Medical Board wherever applicable;

(ix) Ex-Servicemen claiming age relaxation are required to submit/ upload Release Certificate issued as per Orissa Ex-Servicemen (Recruitment to State Civil Services and Posts) Rules, 1985 vide GA Department. Notification No. 22586/Gen, dt. 16.10.1985;

(x) If a candidate claims to possess qualification, equivalent to the prescribed qualification, the rule/authority (with number and date) under which it is so treated, must be furnished.

(xi) No Objection Certificate issued by the Competent Authority in case of a Government servant.

(xii) Any proof of photo Identity. Preferred ID is Aadhar Card.

(xiii) **The Third Gender/Transgender candidates are required to submit/ upload their Identity Certificate/Card issued by the Competent Authority as well as requisite document in support of change of their name on getting the Third Gender/Transgender status.**

***NOTE 2*:**

(i) **Candidates claiming to be belonging to S.C. /S.T. categories of Odisha by birth & S.E.B.C. are required to submit copy of the relevant Caste Certificate issued by the competent authority in the prescribed form.**

(ii) **As per the prevailing norms, the SEBC Certificate issued by Competent Authority for claiming reservation under SEBC (Non-Creamy Layer) is valid for 03 (three) years only. Hence, the SEBC Certificate must be issued on or after 07.11.2023. The SEBC certificate issued before 07.11.2023 will not be treated as valid and the candidate will forfeit his/her claim for reservation under SEBC category**

(iii) **Women candidates belonging to S.C. / S.T. categories by birth and S.E.B.C are required to submit Caste Certificates showing "daughter of .....". Caste Certificates by virtue of marriage (i.e. showing "wife of .....") are not acceptable and liable for rejection.**

(iv) **OBC certificate will not be accepted in lieu of SEBC certificate.**

(v) **Community (Caste status) once mentioned by the candidates in the online application form shall not be changed under any circumstances.**

The Competent Authorities are as prescribed by the Government of Odisha under relevant Reservation Rules.

NOTE 3:

Master's Degree Certificate, Odia Test Pass Certificate, Permanent Disability Certificate of Person with Disabilities (indicating % of permanent disability) and Release Certificate of Ex-Servicemen [issued as per Orissa Ex-Servicemen (Recruitment to State Civil Services and Posts) Rules, 1985 vide GA Department. Notification No. 22586/Gen, dt. 16.10.1985] must have been issued by the Competent Authority on or before the date of submission of the registered online application form by the candidate. Such certificates issued after the last date of application shall not be accepted.

13. GROUNDS OF REJECTION OF APPLICATION:

Applications of candidates will be rejected by the Commission on any of the following grounds: -

(a) In-complete online application form including non-uploading of required documents in the online application form.

(b) Non-submission of hard copy of online application form at the time of verification of original documents.

(c) Declaration not signed (full signature) by the candidate in the hard copy of online application form.

(d) Not passing Odia Test (M.E. standard)/ not furnishing Odia Test pass evidence by the date for submission of online application form as required under Para -5 of the Advertisement.

(e) Not coming within the age limit as mentioned in Para-3 of the advertisement (Age relaxation shall not be allowed to P.W.D. candidates with less than 40% permanent disability).

(f) Not having prescribed requisite qualification by the date of submission of online application form as provided under Para-4 of the advertisement.

(g) Non-payment of examination fee, (wherever applicable), as provided under Para - 6 of Advertisement.

(h) Not furnishing copies of certificates/documents as provided under Para-12 of the Advertisement.

(i) Submission/ uploading of wrong information / false information/ forged or fake or manipulated certificates/ testimonials with respect to qualification/ Age/ Category status (SEBC/ SC/ ST/ PWD/ Ex-Servicemen/Women)/ OT pass evidence etc.

(j) Suppression of facts / information about eligibility, if any.

(k) Any such certificates as provided under Para-12 of the Advertisement issued after the last date for submission of Online Application Form will not be entertained to consider eligibility.

(l) Application received through any other mode (except the Online mode of the OPSC website).

NB: Application /candidature of a candidate shall be rejected at any stage of recruitment process, whenever discrepancy is noticed/ detected.

14. HOW TO APPLY:

a) Candidates must carefully go through the details of this Advertisement available in the Website of OPSC before filling up online application form.

b) Candidates must apply online through the concerned Website of the OPSC ***http://opsc.gov.in.*** Applications received through **any other mode** would not be accepted and summarily rejected.

c) **Before filling up the online application form, the candidates must go through detailed instructions available at OPSC portal.**

d) The online application form is automated and system driven & will guide the candidate seamlessly in filling the application. The requisite options shall be enabled and information shall be asked as per data furnished by the candidate. Before filling up the information, ensure that accurate information is fed. The candidate must also verify the submitted copy of online application after its submission. If the candidate further wants to modify any information, she/he has to cancel the application and apply again within the last date of submission of application.

e) Candidates are requested to upload the scanned image of latest passport size photograph along with scanned image of his/her full signature and scanned image of Left-hand Thumb Impression (LTI) in the online application form. Uploaded photograph, Specimen (full) signature and LTI must be clearly identifiable / visible; otherwise, the application of the candidate is liable to be rejected by the Commission and no representation from the candidate will be entertained.

f) Candidates should keep at least four copies of latest passport size photograph which is uploaded to the online application form for future use.

g) *On successful submission of the online Registration, a unique "**Permanent Public Service Account Number (PPSAN)**" will be assigned to the applicant. Candidates are required to take a printout of the finally submitted online Registration/Re-registration and finally submitted Online Application forms and put his/her signature under the declaration for submission to OPSC along with copies of requisite certificate & documents as and when asked.*

h) **The candidates are advised to submit the Online Application Form well in advance without waiting for the closing date to avoid the last hour rush.**

i) Certificate of Admission to the written examination to the eligible candidates will be uploaded in the Website of the OPSC prior to the date of written examination, which will be published in the Website of the Commission and Newspapers. The candidates are required to download their Admission Certificate from the Website of the Commission and produce the same at the Examination centre for admission to the written examination. No separate correspondence will be made on this score.

j) "NOTICE" to candidates for document verification shall be uploaded in the website of OPSC prior to the date of Document Verification.

k) **Any complaint** on the conduct of examination must be sent to the Grievance Wing of the Commission by e-mail (opsc@od.gov.in) within **07(Seven) days of completion of the examination.**

l) **Experience has shown that the candidates do submit online application form with omission/error/without uploading documents and subsequently send e-mail/letter to the Commission for rectification. The Commission is under no obligation to entertain such request/representation.**

15. FACILITATION COUNTER:

To resolve any technical problem faced during online Registration and in filling up of Application forms, candidate may contact OPSC Technical Support ***over Telephone No. 0671-2304707*** *between 10.30 A.M. to 1.30 P.M. & 2.00 P.M. to 5.30 P.M. on any Odisha Government working days.*

In case of any guidance/information on this advertisement & recruitment, candidates may go through the **FAQ** available in the website of the Commission or contact the O.P.S.C. Facilitation Counter over **Telephone No. 0671-2304141/ 2305611 & Extn. - 205** on any working day between **10.30 A.M. to 01.30 P.M. & 02.00 P.M. to 5.30 P.M**.

The candidates are required to visit the website of the Commission at ***https://www.opsc.gov.in*** for detailed information about important notices, rejection of applications, the date & time of Written Examination/Document Verification and also keep track of publication of various notices to the effect in the leading local daily newspapers for information.

16. GENERAL:

Candidates submitting forged/manipulated documents will be debarred from appearing examination conducted by Odisha Public Service Commission for a specific period to be decided by the Commission. Candidates adopting unfair means will be permanently debarred.

CLOSING DATES

1. THE LINK FOR REGISTRATION AND PAYMENT OF EXAMINATION FEES SHALL BE AVAILABLE IN THE WEBSITE FROM **06.11.2026 TO 26.11.2026 (5.00 P.M.) (NOTE:- 26.11.2026 (5.00 P.M.)** IS THE LAST DATE FOR SUBMISSION OF ONLINE APPLICATION FORM).
2. ONLY ONLINE APPLICATIONS RECEIVED WITHIN THE DEADLINE I.E., **26.11.2026 (5.00 P.M.)** SHALL BE ACCEPTED.

NB: - THE ONLINE APPLICATION FORMS IF FOUND DEFECTIVE IN ANY RESPECT ARE LIABLE TO BE SUMMARILY REJECTED.

PLACE: KATAKA

DATE : 28.10.2026

SECRETARY

ODISHA PUBLIC SERVICE COMMISSION

KATAKA

Annexure-A

Educational Qualifications

Sl. No	Name of the Division	Required Educational Qualifications
1.	**Physics**	(i) Master's Degree in Physics or Applied Physics or Electronics with Physics as one of the subjects during all three years at Bachelor of Science level from a recognized university, or (ii) Integrated M.Sc. in Physics from a recognized university, or (iii) Master's Degree in Forensic Science with Forensic Physics or Ballistics as one of the subjects and Physics or Forensic Science as one of the subjects during all three years at Bachelor of Science level from a recognized university, or (iv) Integrated M.Sc. in Forensic Science with Forensic Physics or Ballistics as one of the subjects from a recognized university.
2.	**Ballistics**	(i) Master's Degree in Physics or Applied Physics or Mathematics or Applied Mathematics with Physics or Mathematics as one of the subjects during all three years at Bachelor of Science level from a recognized university, or (ii) Integrated M.Sc. in Physics or Mathematics from a recognized university, or (iii) Master's Degree in Forensic Science with Forensic Physics or Ballistics as a subjects and Physics or Mathematics or Forensic Science as one of the subjects during all three years at Bachelor of Science level from a recognized university, or (iv) Integrated M.Sc. in Forensic Science with Forensic Physics or Ballistics as one of the subjects from a recognized university.
3.	**Chemistry**	(i) Master's Degree in Chemistry or Analytical Chemistry or Applied Chemistry or Bio-chemistry or Pharmaceutical Chemistry or Pharmaceutical Quality Assurance, or (ii) Integrated M.Sc. in Chemistry from a recognized university, or (iii) Master's Degree in Forensic Science with Forensic Chemistry or Toxicology as one of the subjects and Chemistry as one of the subjects during all three years at Bachelor of Science level or Bachelor of Science in Forensic Science from a recognized university, or (iv) Integrated M.Sc. in Forensic Science with Forensic Chemistry or Toxicology as one of the subjects from a recognized university.

Sl. No.	Name of the Division	Required Educational Qualifications
4.	**Toxicology**	(i) Master's Degree in Chemistry or Analytical Chemistry or Applied Chemistry from a recognized university, or (ii) Integrated M.Sc. in Chemistry from a recognized university, or (iii) Master's Degree in Forensic Science with Forensic Chemistry or Toxicology as one of the subjects and Chemistry as one of the subjects during all three years at Bachelor of Science level or Bachelor of Science in Forensic Science from a recognized university, or (iv) Integrated M.Sc. in Forensic Science with Forensic Chemistry or Toxicology as one of the subjects from a recognized university.
5.	**Biology**	(i) Master's Degree in Zoology or Microbiology or Life Science or Genetics or Biotechnology or Biochemistry or Molecular Biology from a recognized university. or (ii) Integrated M.Sc. in Biology from a recognized university, or (iii) Master's Degree in Forensic Science with Forensic Biology or Serology or DNA as one of the subjects and Botany or Zoology as one of the subjects during all three years at Bachelor of Science level or Bachelor of Science in Forensic Science from a recognized university, or (iv) Integrated M.Sc. in Forensic Science with Forensic Biology or Serology or DNA as one of the subjects from a recognized university.
6.	**Serology**	(i) Master's Degree in Zoology or Microbiology or Life Science or Genetics or Biotechnology or Biochemistry or Molecular Biology from a recognized university. or (ii) Integrated M.Sc. in Biology from a recognized university, or (iii) Master's Degree in Forensic Science with Forensic Biology or Serology or DNA as one of the subjects and Botany or Zoology as one of the subjects during all three years at Bachelor of Science level or Bachelor of Science in Forensic Science from a recognized university, or (iv) Integrated M.Sc. in Forensic Science with Forensic Biology or Serology or DNA as one of the subjects from a recognized university.
7.	**Forensic Psychology**	Master's Degree in Psychology or Forensic Psychology with Psychology as Honours or principal subjects at Bachelor of Arts level or Bachelor of Science level from a recognized university.

Sl. No.	Name of the Division	Required Educational Qualifications
8.	**DNA**	(i) Master's Degree in Zoology or Biotechnology or Genetics or Biochemistry or Molecular Biology or Microbiology or Life Sciences from a recognized university. or (ii) Integrated M.Sc. in Biology from a recognized university, or (iii) Master's Degree in Forensic Science with Forensic Biology or Serology or DNA as one of the subjects and Zoology as one of the subjects during all three years at Bachelor of Science level or Bachelor of Science in Forensic Science from a recognized university, or (iv) Integrated M.Sc. in Forensic Science with Forensic Biology or Serology or DNA as one of the subjects from a recognized university.
9	**Cyber Forensic**	(i) Master's Degree (M.Sc. or M.Tech) in Computer Science or Computer Science and Engineering or Information Technology or Cyber Security from a recognized university. or (ii) Master's Degree in Computer Application with Bachelor's degree in Computer Application or Computer Science or Electronics or Physics or Mathematics, or Information Technology from a recognized university, or (iii) Master's Degree in Digital Forensic or Forensic Science with Specialization in Cyber Forensics or Information Security or Computer Science or Information Technology or Cyber Security or Multimedia Forensics or Information Communication Technology or Artificial Intelligence or Data Science or Cyber Security Management or Computer Science & Engineering.
10	**Document**	Master's Degree in Physics or Chemistry or Forensic Science with Chemistry or Physics as one of the subjects at Bachelor of Science level from a recognized university.

Note:- A candidate shall apply for one Division only.

I. SCHEME OF COMPITITIVE EXAMINATION:

Sl. No.	COMPONENT	MARKS
1	Written Examination (Paper-I and Paper-II)	Paper-I:100 Paper-II:300
2	Personality Test or Viva Voce	50
	TOTAL	**450**

II. Written Examination: Written Examination for the post of Scientific Officer Shall consist of two papers are given below;

Paper	Subject	Maximum Marks	Time
Paper-I	**Part A- General English** Questions in this paper shall cover Synonyms, Antonyms, use of common phrases & Idioms, use of appropriate Prepositions and Comprehension, ordering of words in a sentence, ordering of sentences, spotting of errors, use of appropriate and qualifying words etc. Number of questions shall be 50. each carrying equal mark (i.e. One mark). **Part B- General Awareness, General Aptitude and Reasoning.** The questions in this paper shall be to test the candidate's psychology and the general awareness. Questions on reasoning, aptitude, data interpretation and general awareness on Science, current affairs, Geography, History of India and Odisha, Indian constitution, Socio Economic Political Developments, Human rights, fundamentals of Computer, etc. Number of questions shall be 50,each carrying One mark (01).	100	90 minutes (One and half hour)
Paper-II	For each Division there shall be a separate paper. The standard, syllabus and subject for Paper-II against each Division are given below. Number of questions shall be 150, each carrying two (02) marks. (Standard of questions in Paper II- Master's Degree)	300	150 minutes (Two and half hour)

NOTE:

(i) The written examination shall consist of Objective Type- Multiple Choice Questions only.

(ii) There shall be negative marking for each wrong answer/response by the candidates with a deduction of 25% of the marks allotted to each question in both Paper-I and Paper-II.

(iii) **Syllabus:** The syllabus of the Written Examination for Paper-II are as follows:-

SYLLABI FOR WRITTEN EXAMINATION, PAPER-II
BIOLOGY DIVISION

UNIT-I: CELL STRUCTURE, MOLECULES AND THEIR INTERACTION: Structural organization and functions of cell including Plasma membrane, intracellular organelles (Nucleus, Mitochondria, Golgi-bodies. Lysosomes. Endoplasmic reticulum, Peroxysomes) and types and structure of Chromosomes, Cell division and cell cycle. Bio-molecules-Structure, composition and function(carbohydrates, lipids, proteins and nucleic acids), pH, buffer and buffer system, Enzymes- types and their functions, regulation, enzyme inhibition, iso-enzymes. Nucleic acids, their structure and functions, types of DNA and RNA, replication mechanism, Proteins synthesis.

UNIT-II: HUMAN ANATOMY AND PHYSIOLOGY: Tissues of body, epithelia and glands, their classification and functions, connective tissues, cartilage- structure and types, bones-formation, gross structure, fracture and healing, Structure and growth of teeth, types, dentition- pattern and formula, eruption sequence and age determination, dental anomalies and their significance in personal identification, bite marks of human/ animals and their analysis. Structure and functions of major organ systems and their physiology-Integumentary, digestive, skeleton, respiratory, cardiovascular, excretory, muscular and neuromuscular systems, blood physiology.

UNIT-III: ECOLOGY, ENVIRONMENT AND MICROBIOLOGY: Ecosystem and their types, ecological factors, types of pollution, types of waste, BOD, COD, effect on human health, algal blooms and identification and composition, eutrophication and their effects. Various types of planktons, diatoms, preparation and identification and their forensic importance. Diatom tests and its importance in drowning cases, precaution in collection, preservation and forwarding of biological samples for diatom test, methods of isolation of diatoms from different body tissues/ bone marrow and water samples. Soil and water analysis for various microbes, isolation, classification, cell structure of bacteria and fungi, spores, microbes of soil and spoiled food.

UNIT IV: BIOSYSTEMATICS, TAXONOMY, ANIMAL CLASSIFICATION AND GENETICS: Chemotaxonomy, Cytotaxonomy, Molecular Taxonomy and General classification of Animals (classification of Invertebrates upto order, classification of chordates upto class) Mendelian and Non mendelian inheritance, linkage, recombination and crossing over, chromosomal basis of inheritance, sex linked inheritance, mutagenesis, genetic basis of sex determination, extra-nuclear inheritance, chromosomal aberration, Eugenics.

UNIT V: TOOLS AND TECHNIQUES IN BIOLOGY: Tissue preparation- fixation, preparation of paraffin and plastic blocks, sectioning- rotary microtome, cryostat, vibratome and ultrathin sectioning. Staining- various staining techniques- simple and double staining. histochemical staining for bio molecules, Decalcification of bones and tooth, immunocytochemicalstaining. Chromatographic techniques- Paper, TLC, GLC, HPLC, GCMS

Electrophoresis-gel, agar, SDS and rocket, Statistical analysis- data collection and processing regression and correlation, ANOVA analysis, probability, t-test, p value, x2test (Chi square). 3

UNIT- VI: FORENSIC TECHNIQUES: ANTHROPOLOGY: Anatomical description of skeletons of human and animals as relevant to forensics, ossification and identification of bones for determination of age, sex, race, stature etc. forensic anthropometry/ osteometry and tools involved. Determination of personal identity- sex differences in skull, pelvis and other bones. Calculation of stature from long bones, identification of burnt bones. Recovery of and identification of skeletal remains in accident, crimes and mass disasters, recovery, packing and storage of fleshed and burnt bone remains of human/ animal of forensic importance. Skeletal pathology and trauma of bones, facial reconstruction and superimposition, craniofacial superimposition techniques as photographic and video superimposition.

UNIT-VII: PHYSICAL EVIDENCE COLLECTION & PACKAGING OF EXHIBITS FROM CRIME SCENE: Physical evidence, types and importance in a criminal investigation, Protecting a scene of crime - various steps involved, contamination issues. Reconstructing of crime scene, Protection of Packaging & transportation Biological Evidences their documentation and Chain of Custody Legal and court procedure pertaining to expert testimony, admissibility of scientific evidence under 293 CrPC.

MICROSCOPY AND ITS APPLICATION: Basic principles and working of simple Compound, Comparison, Phase-contrast, stereo-zoom, Polarizing, Fluorescence, confocal microscopy, Scanning electron and transmission electron microscope, colorimeter analysis and UV light source.

Spectroscopy: Principle and significance of UV-Vis spectroscopy, Fluorescence spectroscopy, FRET, Luminescence, Circular Dichroism, Infra-Red spectroscopy, Raman spectroscopy, Nuclear Magnetic Resonance, X-ray diffraction, Mass spectrometry

UNIT-VIII: EXAMINATION OF BODY FLUIDS & THEIR STAINS: Introduction to various types of body fluids, Composition, Physical pattern and Identification of seminal stains: Occurence and significance. Species Determination.Age of semen stain.Detailed Laboratory examination of semen stain. Polymorphic Enzymes in semen and their significance.D.N.A.typing of semen sample. Examination of Saliva, Urine, Perspiration and other physiological fluids presumptive tests (U.V. test, Florence test, Spermine (Barberio) test, Choline test, Acid phosphatase test) and confirmatory test including Azoospermic semen stain (p-30, Prostate- specific antigen or PSA. Microscopic examination), Morphological structure of spermatozoa of human and animals, Identification of lochial and menstrual blood stains by microscopic, biochemical and immuno-electrophoretic method, Identification and examination of other body fluids/stains vaginal, saliva, urine, faeces, vomit etc., Secretor and non -secretor. Identification and examination of body tissues of human/animal

IMMUNOLOGICAL TEST: Presumptive & Confirmatory Tests for blood and origin. Application of immunological techniques in forensic serology Determination of species by precipitin test (diffusion method) and Gelelectrophoresis.Innate and Adaptive immunity,B cell/

T cell –structure, development, diversity and recognition.Antigen and Antibodies –structure, types and function of antibody, monoclonal antibodies, antigen, hapten, adjuvants, antigen-antibody interaction and their application.Blood groups- ABO, MN, Rh polymorphic blood groups, Application of ABO blood group in disputed paternity cases, polymorphic enzymes and polymorphic proteins in the reference of forensic serology.HLA antigen.Secretor and non secretor status.Blood grouping in biological fluids other than blood.Determination of ABO blood group by absorption inhibition, absorption elution and mixed agglutination method.

UNIT-IX : FORENSIC GENETICS AND ROLE OF DNA FINGERPRINTING: History of DNA fingerprinting, utility of DNA fingerprinting in crime investigation in parentage dispute, wild life, veterinary and agriculture etc., Legal and Ethical issues. Collection, preservation and transport of samples viz, semen, saliva, hair, bone, flesh etc for DNA profiling, DNA methodology for isolation, typing, interpretation of results, STR analysis, polymerase chain reaction, types and it's application, mitochondrial analysis, determination of sex & species and racial origin. **Analytical** techniques: Chromatography, Gel filtration, Ion exchange and affinity chromatography, Electrophoresis, SDS-PAGE, AGE, PFGE, Southern, Northern and Western blotting, ELISA, DNA foot printing, PCR, Asymmetric PCR, methylation-specific PCR, Nested PCR, Inverse PCR, reverse transcriptase PCR, Real-time-PCR, Protein sequencing methods, DNA sequencing methods, Next Generation Sequencing RFLP maps, RAPD markers, AFLP markers, SNP analysis.

UNIT-X : WILD LIFE FORENSICS: Wildlife, Importance of protected and endangered species of Animals. National and International scenario of wildlife, Sanctuaries and National parks. Relevant provision of Wildlife and Environmental Act. Types of wildlife crimes, different methods of poaching of wildlife animals, Illegal Trade of wildlife material, Identification and examination of different kinds of wildlife crime exhibits. Examination of fabricated hides, ivory, nail etc. Identification of wildlife and domestic animal.

FORENSIC ENTOMOLOGY: Introduction, History, Significance, Classification and Biology of insects and other arthropods, Life cycle and forensic application of insects, Importance of some bacteria, Micro Organism and Insects in Forensic Science. Determination of time since death (postmortem interval i.e. PMI) - Dipterans larval development & succession on carrion and its relationship to determine time of death, impact of ecological factors on insects developments, rearing insects & calculating PMI, identification of larval instars, determining whether the body has been moved, linking suspect to the scene, Forensic Entomo-toxicology- identification of drugs and toxins from the insects and larvae feeding on the body, collection and preservation of entomological evidence at a crime scene.

HISTOLOGICAL AND ANATOMICAL EXAMINATION OF SOME PLANTS YIELDING DRUG: Morphology and anatomy of plants, types of plants yielding drugs of abuse– opium, cannabis, coca, tobacco. Identification of plants of Cannabis sativa (Ganja & bhang), opium (Papaver somniferum), tobacco (Nicotiana tabacum) etc. in criminal cases.

UNIT- XI :

Foundation of Biochemistry: Cellular and chemical foundations of life, Water: unique properties, weak interactions in aqueous systems, ionization of water, buffering action in biological system.

Carbohydrate chemistry: Structure of classification of monosaccharides, disaccharides, and polysaccharides, Glycolytic pathway, TCA cycle, pentose phosphate pathways, glycogen metabolism.

Lipid Chemistry: Building blocks of lipids - fatty acids, glycerol, ceramide; Structural lipids in membranes – glycerophospholipids; sphingolipids and sterols, Composition and synthesis of lipoproteins and transportation, oxidation of fatty acids, biosynthesis of lipids, cholesterol metabolism.

Protein Chemistry: Structure and classification of amino acids, peptide, polypeptide, Ramachandran plot, protein folding, Primary, Secondary, Tertiary and Quaternary structure of proteins; essential, non-essential and non-standard amino acids.

UNIT-XII :

Molecular Genetics: Structure of chromatin and chromosomes, Central dogma of molecular biology, replication, transcription, translation, regulation of gene expression: transcriptional, translational and post-translational.

UNIT-XIII :

Basic concept of development: Basic features of development in animals, gametogenesis, types of eggs, fertilization, cleavage, and blastula, modification of development in evolution, generation of multicellular embryo, formation of germ layers, patterning of vertebrate body plan.

Reproductive Biology: Reproductive strategies and reproductive cycles in vertebrates, spermatogenesis, oogenesis, hormonal regulation in gametogenesis in male and female, In-vitro fertilization, embryo transfer technology. Nervous System: Organization of nervous system, somatic nervous system; sympathetic and parasympathetic system; structure and function of neuron and glial cells.

Musculo-skeletal System: Bone structure and function; smooth, cardiac and skeleton muscles, muscle contraction.

Endocrinology: Endocrine glands including pituitary, thyroid, etc; hormones, regulation of hormone secretion, peptide hormones and steroid hormones, biochemistry of hormone action.

Immunity: innate and acquired immunity, antibody, major histocompatibility complex, complement systems, T and B-cell maturation and differentiation, antigen processing and presentation, hypersensitive reaction and autoimmune diseases, polyclonal and monoclonal antibodies.

CHEMISTRY DIVISION

Unit I :

Analytical Chemistry : Classification of analytical methods – Classical and Instrumental, volumetric, titrimetric and gravimetric techniques, selection of proper analytical techniques: types and range of determination, accuracy, precision and errors, sample preparation, handling of reagents with safety, density and viscosity measurements.

Statistical Analysis : Mean, Mode, Median, Correlation and Regression analysis, Null Hypothesis, Variance, t-test, Chi-Square test. Type of Data, Measure of central tendency, Dispersion of Data, Correlation, Probability and Proof.

Group Theory: Symmetry elements and operations; Point groups and character tables; Internal coordinates and vibrational modes; symmetry adapted linear combination of atomic orbitals (LCAO-MO); construction of hybrid orbitals using symmetry aspects.

Electrochemistry: Electrochemical cells and cell reactions; Standard electrode potentials; Nernst equation and its relation to ΔG; Electrochemical series, emf of galvanic cells; Faraday's laws of electrolysis; Electrolytic conductance, specific, equivalent and molar conductivity, Kohlrausch's law; Concentration cells.

Unit II :

Analysis of unknown samples :-

Organic: Physical examination, element detection (N, S, Cl, Br, I, F), Functional Group analysis (-OH, -COOH, -NO2, -NH2, -CONH2, -CO-, -CHO, Hydrocarbons).

Reaction Mechanisms: Basic mechanistic concepts – kinetic versus thermodynamic control, Hammond's postulate and Curtin-Hammett principle. Methods of determining reaction mechanisms through kinetics, identification of products, intermediates and isotopic labelling.Linear free-energy relationship – Hammett and Taft equations.Nucleophilic and electrophilic substitution reactions (both aromatic and aliphatic).Addition reactions to carbon-carbon and carbon-heteroatom (N and O) multiple bonds.Elimination reactions. Reactive intermediates – carbocations, carbanions, carbenes, nitrenes, arynes and free radicals. Molecular rearrangements.

Pericyclic Reactions and Photochemistry: Electrocyclic, cycloaddition and sigmatropic reactions. Orbital correlations - FMO and PMO treatments, Woodward-Hoffmann rule. Photochemistry of alkenes, arenes and carbonyl compounds. Photooxidation and photoreduction.Di-π-methane rearrangement, Barton-McCombie reaction, Norrish type-I and II cleavage reaction.

Inorganic: Qualitative analysis of cations and anions with special reference to cations i.e. As, Sb, Pb, Ba, Cu, Hg, Zn and Tl and anions i.e.NO_2^-, NO_3^-,S_2^-, SO_4^{2-}, SO_3^{2-}, halides and cyanides.

Main Group Elements: Hydrides, halides, oxides, oxoacids, nitrides, sulfides – shapes and reactivity. Structure and bonding of boranes, carboranes, silicones, silicates, boron nitride,

borazines and phosphazenes.Allotropes of carbon, phosphorous and sulphur.Industrial synthesis of compounds of main group elements.Chemistry of noble gases, pseudohalogens, and interhalogen compounds.Acid-base concepts and principles (Lewis, Bronsted, HSAB and acidbase catalysis).

Transition Elements: Coordination Chemistry – structure and isomerism, theories of bonding (VBT, CFT, and MOT). Energy level diagrams in various crystal fields, CFSE, applications of CFT, JahnTeller distortion. Electronic spectra of transition metal complexes: spectroscopic term symbols, selection rules, Orgel and Tanabe-Sugano diagrams, nephelauxetic effect and Racah parameter, charge-transfer spectra. Magnetic properties of transition metal complexes. Ray-Dutt and Bailar twists, Reaction mechanisms: kinetic and thermodynamic stability, substitution and redox reactions. Metal-metal multiple bond.

Analysis of poisonous gases: CO, H_2S, PH_3, CH_4 and NH_3.

Salt Analysis

Unit III :

Spectroscopic and other techniques :-

Unifying principles : Electromagnetic radiation, interaction of electromagnetic radiation with matter- absorption, emission, transmission, reflection, refraction, dispersion, polarization and scattering.

Basic principles, instrumentation and applications: UV- Visible, FTIR, NMR, XRD, AAS, Mass, Spectroscopy, Fluorescence and Phosphorescence spectrophotometry, ESR Spectroscopy. Fundamentals of Acids, Bases and Buffers, pH, pKa, and pKb values, principles, instrumentation and applications of pH metry, Potentiometry, Conductometry and Microscopic analysis in forensic Science.

Unit IV:

Chromatography and Electrophoresis

General Principles and types of chromatographic techniques: Paper chromatography, column chromatography, Thin layer chromatography, adsorption chromatography, partition chromatography, Gas chromatography, Gas-liquid chromatography, Ion exchange chromatography, Exclusion (permeation) chromatography, affinity chromatography, HPLC, HPTLC, HPTLC MS, Capillary Chromatography and Electrophoresis.

Unit V :

Basic Organic Chemistry: Important preparations and properties of alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, phenols, carboxylic acids, aldehydes, ketones, amines and nitro compounds.

Unit VI

Proteins: Classification, Structure and Properties, Molecular weight determination, Isoelectric point, coagulation and denaturation. Carbohydrates: Classification, Structure and Reactions. Fats and **Lipids**: Classification, Structure and Reactions. **Alkaloids**: Classification, Isolation and Identification.

Unit VII :

Environmental Pollution- Air, water and soil pollutants, their permissible limits.Standards of potable water, water analysis, sources of water pollution.Analysis of agricultural, Industrial, and domestic effluents.Determination of adulterants in various food commodities.Pesticide analysis in food products. Soaps and detergents: Types and analysis. Detection of substandard fertilizers by chemical and instrumental techniques.Methods for sample collection and preparation, Health Safety Security and Environment Policies.

Unit VIII :

Paints, pigments and dyes- Classification and identification of dyes, analysis of dyes used in Trap cases.Role of dyes in crime investigation.

Paints and pigments: Types and chemical composition, toxic effects on living organisms and identification techniques, authenticity of brands of paints.

Unit IX :

Analysis and estimation of illicit liquor including methyl alcohol, ethyl alcohol, denatured spirit, acetone, chloroform, ether, other solvents and adulterants.Laws pertaining to Excise Act.

Unit X :

Metals, alloys and their types.Identification composition and analysis of metals and alloys by chemical methods and instrumental techniques.Hallmarking of precious metals as per BIS. Trace metal analysis and its forensic importance.

Unit XI :

Extraction, isolation & identification of Alkaloids viz- Morphine, Codeine, Brucine, Strychnine, Nicotine, Atropine, Hyoscyamine, Cocaine, Heroin and Dhatura alkaloids.Extraction, isolation & identification of sedative, depressants, stimulants, opiates and drugs of abuse.

Unit XII :

Medicinal Chemistry: General drugs, Designer Drugs, Drugs of abuse, mode of administration and pharmacological action of drugs of forensic importance. Drugs Act, Excise Act and NDPS Act.

Unit XIII: Narcotics drugs and psychotropic substances: Definition, types, appearance, production and chemical characteristics. Common terminology of various drugs.Drug action on

central nervous system.Sampling and analytical techniques for qualitative & quantitative analysis.

Unit XIV: - Plants of Narcotic importance and their morphology: Papaversomniferum, Cannabis sativa, Coca plant and analysis of their active constituents. Psychotropic substances: Amphetamines, Benzodiazepines and their derivatives. Barbiturates, Lysergides, Mascalines and Psilocybin etc.

Unit XV :Petroleum Products: Definition, types, sampling methods, specifications and characteristics as per BIS. Analytical tools for qualitative and quantitative analysis of petroleum products. Principles of techniques and Instruments used in detection of adulterants in petroleum products.

Unit XVI :Hydrocarbons : Cracking and reforming of hydrocarbons, distillation range of fuel oils of petroleum origin; Gasoline, Kerosene, diesel etc. and their correlation with GLC. Analysis of Lubricating oil, Grease, paints, adhesives and synthetic fibers.Determination of relative density, flashpoint, viscosity index, cetane number, octane number and dyes.

Unit- XVII :Arson and Burning cases: Legal definition of Arson and its motives. Types and chemistry of fire, fire safety and fire fighting techniques. Prevention of fire, Role of forensic science in investigation of fire, cause of ignition and evidence collection. Arson residue examination: Arson debris, burnt articles, flammable liquids, their collection, preservation and analysis. Dowry death cases: Investigation and analysis.

Unit- XVIII :Explosive: General aspects of explosive, their composition, properties and classification-high and low, Primary and secondary, military and commercial etc. Explosion theory, Explosive and improvised explosive devices. Theory and types of Non-explosive explosions.Sampling and analysis of debris from explosion sites. Laws: IPC Sections related to Arson and Explosives; EC Act; Petroleum Act.

CYBER FORENSIC DIVISION

1. Computer Fundamental, Operating System and File System- Computer System- History and development, Computer Organization and Architecture: Cache memory. Primary and Secondary Storage devices, Input- Output device. Operating System and File System- Operating system, layered architecture/logical structure of operating system, types of OS, virtual machine, OS services, Process management, Memory management, Virtual Memory. Overview of operating system in Linux & windows. File System concepts, naming, attributes, operations, types, structure, file organization & access (Sequential, Direct, Index Sequential) methods, memory mapped files, directory structures.

2. Computer Network and Internet concepts- Introduction of computer networks, Network architecture, Introduction to TCP/IP Model, compare TCP/IP to (OSI) reference model, Network protocol: FTP, Telnet, DNS, DHCP, SNMP, SMTP, POP3 etc. Basic Mobile communication network Model, Wi-Fi network, Bluetooth, Broadband and optical fibre. Concept of IP address and their version IPv4 and IPv6, Web Hosting Concepts and Domain name Registration Process.

3. Cyber Security- Information security concepts, Overview: Background and current scenario, types of attacks, goals for security, E-commerce security, steganography. Security threats and

vulnerabilities, overview of security threats, weak/strong passwords, insecure network connections, malicious code, programming bugs, cybercrime and cyber terrorism, information warfare and surveillance, virus, Trojan, worms, botnet, ransomware, shells.

4. Analyst Application Security- Basic Security concepts: hardware and software vulnerabilities. Password Cracking and Prevention: Introduction, password cracking techniques, dictionary based attack, brute force attack, cracking common files password, cracking web based password, password reset flaws, password change flaws, cracking Wi-Fi password, counter measures for users, counter measures for system administrators. Authentication & Authorization vulnerabilities: Authentication concepts, scenarios, user enumeration, direct page requests, parameter modification, lack of SSL at login pages, bypassing weak CAPTCHA mechanisms, login without SSL, Authorization: RBAC, authorization bypassing, parameter tampering, forceful browsing, rendering based authorization, client side validation attacks, insecure direct object reference. Input vulnerabilities: SQL injection, common implementation mistakes – authentication bypassing using SQL injection, cross site scripting.

5. Database Management System, Security and Vulnerabilities- Contents of the Subject Introduction: Overview of DBMS, Advantages of DBMS, Basic DBMS terminology. Data modeling using the Entity Relationship Model: mapping constraints, Generalization, Aggregation, Specialization, Extended ER model, relationships of higher degree. Relational model: Storage Organizations for Relations, Relational Algebra, Set Operations, Relational Calculus, Concepts of Alternate key, candidate key, primary key, Foreign key, Integrity Rules, Data Dictionary. Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions. Database Vulnerabilities, Threats & Physical Security: external and internal database threats; flaws in perimeter security. Data security policy: database security risks; database security testing: database auditing models and tools; user management strategies; maintenance policy, assessment and (counter) measures.

6. Information System Security and Cryptography- Cryptographic System, Classification of Cryptographic System, Substitution-Permutation Network, Feistel structure, Block Ciphers: DES, Double DES, AES, Stream Ciphers: LFSR, RC. Public Key Cryptography, RSA, Discrete Logarithm Problems, Diffie-Hellman, DSA, PKI. Data Integrity, Hash Functions: MD5, SHA, Message Authentication Codes. Emerging Application: Email Security, SSL/TLS, Web Security, Access Controls, Malwares, Firewalls, and Intruders. Digital Signature, User authentication - Token based, Biometric, Remote user authentication, Intrusion detection systems, honey pots, Denial of Service.

7. Malware Analysis- Goals of Malware Analysis, AV Scanning, Hashing, Finding Strings, Packing and Obfuscation, PEfile format, Static, Linked Libraries and Functions, Static Analysis tools, Virtual Machines and their usage in malware analysis, Sandboxing, Basic dynamic analysis, Malware execution, Process Monitoring, Viewing processes, Registry snapshots, Creating fake networks. Live malware analysis, dead malware analysis, analyzing traces of malware, system calls, api calls, registries, network activities. Anti-dynamic analysis techniques, VM detection techniques, Evasion techniques, Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching. Android Malware Analysis: Android architecture, App development cycle, APKTool, APKInspector, Dex2Jar, JD-GUI, Static and Dynamic Analysis.

8. Machine Learning and Big Data Analysis- Machine Learning Introduction: Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias. Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search. Big data storage and analysis, comparison with other systems, rational database management system, grid computing, volunteer computing, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies.

9. Ethical Hacking and Wireless Hacking- Securing permission: Securing file and folder permission, Using the encrypting file system, Securing registry permissions. Securing service: Managing service permission. Wireless Hacking: Wireless Foot printing, Wireless Scanning and Enumeration, Gaining Access, Tools that exploiting WEP Weakness, Denial of Services Attacks, Firewalls: Firewalls landscape, Firewall Identification-Scanning Through firewalls, packet Filtering, Application Proxy Vulnerabilities, Denial of Service Attacks, Motivation of DoS Attackers, Types of DoS attacks, Generic DoS Attacks. Remote Control Insecurities, Discovering Remote Control Software, Connection, Weakness.VNC, Microsoft Terminal Server and Citrix ICA, Advanced Techniques Session Hijacking, Web Hacking, Web server hacking, web application hacking, Hacking the internet Use, Malicious Mobile code, SSL fraud, Email Hacking, IRC hacking, Global counter measures to Internet User Hacking.

10. Foundation of Multimedia Forensic and Image Processing- Introduction of digital signals: audio, image and video; Digitization process: sampling and quantization; Image Enhancement Techniques: Spatial and frequency domain; Image Compression Techniques: Introduction, lossy and lossless compression, Run length coding, scalar and vector quantization, JPEG and JPEG 2000 compression techniques; Image description and representation techniques: Introduction, boundary descriptor: chain code and shape number, regional descriptor: color and texture descriptors; Introduction to pattern clustering and classification. Basics of Multimedia; Devices for capturing image and video: digital camera and its components, acquisition process of digital image and video; Standards for video transmission; NTSC and PAL. Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing. Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods. Image Restoration Filtering, Inverse Filtering . Color Fundamentals: Color Models, Pseudo color Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression.

11. Mobile Forensics and Mobile Technology- Generation of mobile phones, types of mobile phones, basics of mobile phones and their components, identification of mobile phones, operating systems. Mobile phone technology: e.g. Asynchronous Transfer Mode (ATM), Wireless Applications Protocols (WAP), Advanced Mobile Phone System (AMPS), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Cellular Networks: GSM, GPRS, EDGE, UMTS, LTE, VoLTE. Mobile phone data acquisition by manual, logical, file system extraction and physical, Advanced Acquisition techniques.Overview of mobile forensic software.

12. Computer Forensics and DVR Forensic- Basics of computer forensics, acquisition methods, image format (Raw, DD, SMART, AFF, E01 etc.), disk and file encryption techniques, file signature analysis, windows registry analysis, artifacts recognition from slack space and unallocated space, metadata analysis. Basics of DVR and NVR, Types of CCTV camera and their characteristics, Operating Systems, enhancement of video and Authentication of video. Overview of Computer and DVR forensics software and tools: write blockers, imaging, and cloning devices.

13. Network Forensics and Cloud Forensics- Introduction to cloud technology, secure cloud bases services, Cloud based Applications: Facebook, Instagram, Telegram, WhatsApp, Facebook Messenger. Monitoring computer networks and activities, live packet capturing, network intrusion detection, Types of Network Attack. Searching and collection of digital evidence from the network.Cell Site Analysis, CDR Analysis, Tower Dump, IP tracing, web domains analysis, IPDR Analysis, Mobile Phone tracing, Email Tracing.

14. Modern Digital devices and Digital Technologies- Modern digital Devices: Computer, Laptop, tablet, Mobile Phones, PoS, ATM machine, Smart watch, Drone, IoT devices. Crypto Currency, Blockchain Technologies, Cloud computing, Artificial Intelligence, Deep fake video technology, Dark Web, Anonymous browsing techniques.

15. Cyber Crimes & IT Act- Cyber space, cyber-crimes and types of cyber-crimes, Social media-use and misuse, hacking, unauthorized access, spoofing, phishing, cyber terrorism, cyber stalking, social engineering, DOS and DDOS attack, skimming, financial crimes, identity theft, Trojans, viruses, logic bombs, malware attack. The Information Technology Act, 2000 and its amendments.Related and relevant section of IPC, Indian Evidence Act, Indian Telegraph Act.

Search, seizure and Collection of digital evidence, Significance of hash value, chain of custody.

DNA DIVISION

I- BIOCHEMISTRY - Introduction to basic concepts, Ionic Equilibrium, Chemistry of bio-molecules, Nucleic acids, Protein structure, Enzymes, Enzyme kinetics. Carbohydrate metabolism, Lipid metabolism, Nitrogen metabolism, Nucleic acid metabolism, Prokaryotic Gene Expression, Regulation of prokaryotic genes expression and operon, Eukaryotic gene expression: DNA binding proteins, Transcription factors (TFs), Eukaryotic RNA polymerase, Characterization of TATA box, Gene expression and Chromosome remodeling, Regulation of gene expression at transcriptional level.

Bioenergetics and Metabolism: Survey of metabolism: carbon, oxygen, nitrogen cycle catabolism, use of mutants and isotopes in the study of metabolism, compartmentation, food chain and energy flow. Cell bioenergetics: First and second law of thermodynamics, internal energy, enthalpy, entropy, concept of free energy, standard free energy, change of a chemical reaction, redox potentials ATP and high energy phosphate compounds. Electron transport chain and oxidative phosphortylation.

II- MOLECULAR BIOLOGY – Extracellular matrix and cell-cell interaction, Nucleus, Chromosomes, Cell cycle, Apoptosis, Cancer, Viruses, Bacteria, Bacterial plasmids, Cyanobacteria, Fungi, Microbial metabolism, Microbial pathogenesis. Medically important bacteria: Mode of infection and pathogenesis of Staphylococcus, Clostridium, Streptococcus,

Enteropathogenic bacteria, Salmonella and Mycobacterium. Water and Osmoregulation, Cytoplasmic fluidity, Membrane-Structure and Function. Concept of membrane electrical potential, Cell Receptors, Signal Transduction, Intracellular Membrane and Protein Flow, Fluid Flow Circulation in Humans.

DNA: Chemical composition of DNA, C-value paradox, DNA replication Prokaryotic DNA replication, Eukaryotic-replication, DNA damage, RNAs: types, Genetic Engineering, restriction enzymes, DNA Modifying enzymes, Cloning vectors, Cloning hosts. Post transcriptional processing of RNA: Processing of rRNA, Processing of pre-tRNA, Pre-mRNA processing. Capping and polyadenylation, Splicing, Pre-mRNA Editing, Self splicingintrones, Informosomes, mRNA stability and turn over, Genetic code, Prokaryotic Translation. Eukaryotic translation, Translational apparatus, Regulation of protein synthesis, Post translational processing, Processing of Pre-pro-proteins. Protein stability and turnover.

Cell signalling: Hormones and their receptors, cell surface receptor, signalling through G-protein coupled preceptors, signal transduction pathways, second messengers, regulation of signalling pathways.

Mammalian systems: Stem cells- Different kinds of stem cells and their characters, transformation into different types, cell types-molecular approach, Bone marrow, multipotent stem cells, Hematopoietic stem cells and their mode of differentiation and development into a variety of circulatory cells. Molecular approach Embryonic cells-pleuripotent cells, induction of differentiation and the factors and the mechanism. Stem cell engineering, applications and prospects.

Renewal of tissues and tissue engineering: Renewal of cells that are lost in adult tissues such as epidermal cells, mammary gland cells, photoreceptor cells in retina, liver cells. Differentiation and development of muscle cells-embryonic somites to myoblasts, myogenic genes and expression, muscle developmental factors such as MEFs and MRFs, terminal differentiation of myoblasts.

III- GENETICS - Mendelism, Extensions of Mendelian principles, Evolution of genes concept, Linkage and chromosomal mapping, Inbreeding depression and Heterosis, sex linkage and sex determination, chromosomal and gene mutations.Population genetics, Quantitative genetics, Evolutionary genetics. Cytogenetic aspects of cell division, Variation at the genetic level: DNA markers – VNTR, STR, microsatellite, SNP and their detection techniques – RFLP, genotyping, RAPD, AFLP etc.), Construction of DNA libraries, Genome sequencing Molecular Evolution, Techniques for studying bacteriophages and Transposable phage (phage Mu).

Chromosomal anomalies and Techniques in the study of chromosome and their applications: Short term (lymphocyte) and long term (fibroblast) cultures, chromosome preparations, karyotyping, banding, chromosome labeling. *In situ* hybridization, chromosome painting, comparative genome hybridization (CGH), somatic cell hybrids and gene mapping, premature chromosome condensation.

Variation at the genetic level: DNA markers – VNTR, STR, microsatellite, SNP and their detection techniques – RFLP, genotyping, RAPD, AFLP etc. Gene expression: Basic processes and Gene regulation and Introduction to Human Genetics: History of early perception, development and documentation; genome organization; Chromosome structure, function and

implications for disease. Study tools in Human Genetics: Human genome mapping methods; Physical mapping: Introduction to physical map markers- Human genome analysis: Conception, mapping cloning and sequencing, Outcome- Generation of 'OMICS' era, significant leads.

IV- MICROBIOLOGY - Diversity OfProkaryvoticAnd Eukaryotic Microbes.Archaea, Bacteria, Fungal Systematics and Diversity, Mycorrhizal fungi, Agriculturally important toxigenic fungi, secondary metabolites from fungi, Genomics and Biodiversity of yeast, Antagonistic interactions in yeasts, Biotechnological application of yeasts.

Virology: Animal Viruses Classification, Morphology and Chemistry of Viruses, Working with viruses, Virus replication Strategies, Replication patterns of specific viruses. Pathogenesis of viral infection, Anti-viral strategies prevention and control of viral diseases. Plant and microbial viruses classification, Morphology and Chemistry of Viruses.

Microbial Pathogenicity: Classical view of microbial pathogenicity, Molecular microbial pathogenicity, Emerging and re-emerging pathogens, Molecular mycological epidemiology, Environmental change and infectious diseases, Anti microbial resistance, newer vaccines, Rapid diagnostic principles. –

V- BIOTECHNOLOGY

Organization of structure and functions of prokaryotic and eukaryotic cells

a. Cell wall and cell membrane: physical structure of biological membranes in prokaryotes and eukaryotes, lipid bilayer, membrane proteins, other constituents, diffusion, osmosis, active transport regulation of intracellular transport and electrical properties.

b. Structural organization and functions of cell organelles, Cytoskeletons structure and motility function.

c. Organization of genomes: genes and chromosomes, operon unique and repetitive DNA interrupted genes, gene families structure of chromatin and chromosomes, heterochromatin. euchromatin, transposons.

d. Cell division and cell cycle. Apoptosis, Necrosis and Autophagy.

Recombinant DNA Technology and Applications: Restriction and Modification systems in E. coli and their use in recombinant library constructions. Restriction and Modifications enzymes and their uses. Basic techniques for RDT including Agarose gel electrophoresis, PAGE, Pulse field electrophoresis. Basic Biology of plasmids including their replication, copy number, incompatibility of plasmids and development of Plasmid Vectors.Cloning and expressions vectors. Basic DNA sequencing methods, introduction to Next Generation Sequencing (NGS) Polymerase chain reaction and its application in research. Oligonucleotide synthesis, purification and its application in screening of libraries, cloning and mutagenesis, Synthetic gene assembly.Strategies for constructing cDNA libraries and screening using Nucleic acid and antibody probes. Subtractive Libraries, Expression based strategies for cloning of functional genes, differential mRNA display. Strategies for constructing Genomic libraries and screening using nucleic acid probes.Understanding of operon Lac, Trp, Arabinose, Tetracycline and their

application in studying biological processes and development of vectors.Use of tags to aid solubility and purification of DNA safety guidelines and regulatory aspects.

VI- IMMUNOLOGY AND PHYSIOLOGY - Cells and molecules involved in innate and adaptive immunity, antigens, antigen city and immunogenicity B and T cell epitomes, structure and function of antibody molecules, generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell-mediated immune responses, primary and secondary immune modulation, the complement system, Toll-like receptors, Cell-medicated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired.

Physiology: Blood and cardiovascular System, Digestive System, Muscular system, Respiratory system, Nervous system, Sense organs, Excretory, Endocrinology and Reproductive system.

VII- TOOLS AND TECHNIQUES -

a. Isolation and purification of DNA (gDNA and mtDNA), RNA and Protein.
b. Biochemical Methods: Chromatography Ion exchange, Gel Filtration and Affinity chromatography. Electrophoresis: Native and SDS-PAGE, Iso electric focusing 2D-PAGE and its applications.
c. UV/VIS spectrophotometer, Beer-Lambert's law and its use in determination of protein/nucleic acid concentration.
d. Polymerase Chain Reaction and Real Time PCR Technique: Basic concept and application.
e. Fluorescence, Spectroscopy: Basic concepts of excitation and emission Quenching, Theory and application of FRET.
f. Sterilization Technique : Basic concept and application.
g. Centrifugation: basic concepts of centrifugation. Calculation of g value from RPM. Density gradient centrifugation. Sedimentation velocity and Sedimentation equilibrium, Separation of sub-cellular components and macromolecules using high speed and ultracentrifugation.
h. Microscopy: Bright field, phase contrast fluorescence, confocal and electron microscopy.

a. Isotope Tracer Technique: Types of radiations measurement scintillation and gamma counters Background noise quenching, Applications interaction of radiation with matter, passage of neutrons through matter interaction of gamma rays with matter units of measuring radiation absorption. Radiolysis of water, free radicals in water Autoradiography.

j. Biostatistics and Computer Applications: Measures of central tendency and dispersion: mean, median range, standard deviation and variance. Correlation and simple linear regression. Sampling: Sampling techniques, sampling errors, framing Hypothesis, level of significance, tests of significance (F & t test), chi-square test. Computer Oriented statistical techniques. Frequency table of single discrete variable, computation of mean, variance and standard deviation, t-test correlation coefficient.

VIII- FORENSIC SCIENCE –

1. Definition and scope of forensic science- History and Development of forensic science, organization of the forensic science laboratory. Central and state forensic science laboratories, Directorate of forensic sciences. Functions of a forensic scientist.
2. Physical Evidence: Their significance, class and individual characteristics, identification and individualization of physical evidence, locards's exchange principle mobile forensic science laboratory and its deployment in scenes of crimes.
3. The scene of Crime: Crime scene search for physical evidence, photography, sketching, collection, preservation, packing and transportation of evidence, maintaining the chain of custody.
4. Microscopy: principles and different types of microscopes and its forensic applications.
5. Types and distribution of body fluids: Blood, blood stains, semen, seminal stains, urine (formation, composition, properties); amniotic fluid, sweat (formation, composition, properties); saliva, vaginal fluid, epithelial cells, etc., their analysis and forensic significance.
6. Wild life DNA analysis and its applications in forensic science.
7. Intellectual Property Rights (IPR) and its importance in DNA profiling with case studies.
8. Forensic DNA profiling –International, national and state level cases

FORENSIC PSYCHOLOGY

1. Biological basis of Behavior-

The Central and Peripheral Nervous Systems – Structure and functions.

Methods of Physiological Psychology: Invasive methods – Anatomical methods, degeneration techniques, lesion techniques, chemical methods, microelectrode studies. Non-invasive methods – EEG, Scanning methods.

Glandular system: Types and functions, Biological basis of Motivation: Hunger, Thirst, Sleep and Sex. Biological basis of Emotion: The Limbic system, Hormonal regulation of behavior. Genetics and behavior.

2. Perception and Learning-

Perception: Concept of Perceptual Organization & Illusions, Role of motivation and learning in perception, Learning Process, Fundamental theories: Thorndike, Guthrie, Hull, Classical Conditioning: Procedure, phenomena and related issues, Instrumental learning: Phenomena, Paradigms and theoretical issues; Reinforcement: Basic variables and schedules; Behavior modification and its applications, Cognitive approaches in learning: Latent learning, observational learning. Verbal learning.

3. Memory, Forgetting and Thinking-

Memory processes: Encoding, Storage, Retrieval, Stages of memory: Sensory memory, Short-term memory (Working memory), Long-term Memory (Declarative – Episodic and Semantic; Procedural), Theories of Forgetting: Interference, Retrieval Failure, Decay, Motivated forgetting.

Language and Thought Problem solving: Type, Strategies, and Obstacles, Decision-making: Types.

4. Intelligence and Personality-

Intelligence: Concept & Theories, Determinants of Personality: Biological and Socio-cultural, Approaches to the study of Personality: Psychoanalytical, Neo-Freudian, Social learning, Trait and Type, Cognitive, Humanistic, Existential, Transpersonal psychology. Other Theories: Rotter's Locus of Control, Seligman's Explanatory styles, Kohlberg's theory of Moral development.

5. Motivation and Emotion-

Basic motivational concepts: Instincts, Needs, Drives, Arousal, Incentives, Motivational Cycle. Approaches to the study of Motivation: Psychoanalytical, Ethological, S-R Cognitive, Humanistic Exploratory behavior and curiosity, Zuckerman's Sensation seeking achievement, affiliation and power, motivational competence, Self-regulation flow.

Emotions: Physiological correlates emotion regulation.

6. Social Psychology-

Social perception Attitude and its change within cultural context; Prosocial behavior Group and Social influence [Social Facilitation; Social loafing]; Social influence [Conformity, Peer Pressure, Persuasion, Compliance, Obedience, Social Power, Reactance], Group dynamics, Theories of intergroup relations [Minimal Group Experiment and Social Identity Theory, Relative Deprivation Theory, Realistic Conflict Theory, Balance Theories, Equity Theory, Social Exchange Theory], Applied Social Psychology: Environment and Law; Crowding.

7. Human Development: Stress and Coping-

Developmental processes: Nature, Principles, and Factors in development, Stages of Development. Successful aging. Various aspects of development: Sensory-motor, cognitive, language, emotional, social and moral. Conflicts: Sources and types, Stress and Coping: Concept, Models, Type A, B, C, D behaviors, Stress management strategies [Biofeedback, Music therapy, Breathing exercises, Progressive Muscular Relaxation, Guided Imagery, Mindfulness, Meditation, Yogasana, Stress Inoculation Training].

8. Psychopathology and Interventions-

Psychopathology: Concept, Classification and Causes, Psychotherapies: Psychoanalysis, Person-centered, Gestalt, Existential, Acceptance-Commitment Therapy, Behavior Therapy, REBT, CBT, MBCT, Play Therapy, Positive psychotherapy, Transactional Analysis, Dialectic behavior Therapy, Art Therapy, Performing Art Therapy, Family Therapy. Applications of Theories of Motivation and Learning, Counseling: Process, skills, and techniques.

9. Research Methodology-

Research: Meaning, Purpose, and Dimensions. Research Problems, Variables and Hypothesis, Sampling. Ethics in conducting and reporting research, Paradigms of research: Quantitative, Qualitative, Mixed methods approach, Methods of Research: Observation, Survey [Interview,

Questionnaires], Experimental, Quasi-experimental, Field studies, Cross- Cultural Studies, Narratives, Case studies, Research Designs: Meaning and Types.

10. Psychological Testing-

Types and Characteristics of Psychological Tests. Ethical Issues in Psychological Testing, Areas of Testing: Intelligence, Neuropsychological tests, Personality assessment, Interest inventories and Attitude Applications of psychological testing in various settings: Clinical & Forensic settings.

11. Forensic Psychology-

Definition and scope of Forensic Psychology-Historical perspective; Developmental Theories, Role and responsibility of Forensic Psychologist, Legal Concepts and Evidence related Issues, Interrogative techniques, Forensic Psychology in India, Concept of Cyber Psychology: Cyber Pornography, Cyber bullying.

12. Forensic Psychological Assessment and Investigating Techniques-

Forensic Psychological Assessment and Crime Investigation Tools, Detection of deception, Methods for detection of deception. Interview and interrogation, Non-verbal detection, Forensic Statement Analysis, Hypnosis Layered Voice Analysis, Psychological Autopsy, Narco-Analysis & Brain – Mapping, Eye Detect System, Current research in detection of deception/truth finding mechanisms, Eye witness testimony, Impact of Crime on Victim & Psychological Aid to Victim, Rehabilitation of Criminals.

13. Psychological Disorder and Criminal Behavior -

Concept and theories of Criminal Behavior, Punishment & type of Punishment, Psychology of Aggression & Violence, Emerging Crime trends in India, Prevention of Crime Juvenile delinquency and cause and prevention. Mentally ill offenders, Psycho-Path offenders. Serial killers, Criminal Profiling, Crime Scene Profiling, Sex- Offenders, Child Abuse & Domestic Violence, Psychological Profiling of Terrorist, Drug related Crime.

14. Psychology and Court –Room & Legal Aspect in Forensic Psychology-

Types of Court and role of psychologists – criminal, juvenile, civil & family court, Criminal Competency, Understanding court process and punishment.Effect of Attorney, Judges, Jurors & Defenders, Expert Testimony (Definition and Section under Indian Evidence Act), Requirements from the Investigating Officer, Consent (Article 21(3), Important Judgements (Selvi&Orsvs State of Karnataka, etc), Admissibility of Forensic Report in Court (Section 293 Cr. Mental Health and Law Supreme Court Judgment and NHRC Guideline.

15. Polygraph-

Meaning of Polygraph, Physiological Aspects (GSR/Blood Pressure/Respiration/Motor Activity), Psychological Aspects (Flight/Fight Response/Autonomic Nervous System), Sensors

of Polygraph (Pneumograph/cardio – sphygmograph/galvanograph) Testing Procedure (Pre – test Interview/Examination, Proper/Post Test Interview) Types of Questionnaires (MGQT/POT/Card Test/Affirmative Test, etc), Polygraph and Autonomic Nervous System, Limitation in Polygraph, False Positive & False Negative Advantages and Limitations of Polygraph Examination.

PHYSICS DIVISION

Unit-I : Frame of reference, inertial and non inertial frames, Rotating frame of reference, Coriolis force conservation Laws. Collisions, impact parameter, centre of mass frame and analysis of collision in centre of mass frame and lab systems., rotational motion of rigid bodies, moment of inertia, products of inertia, conservation of angular momentum. Central forces, motion under inverse square law forces, Special Theory of Relativity, Michelson-Morely experiment, Lorentz Transformations-addition of velocities, Time dilation and length contraction, variation of mass with velocity, mass-energy equivalence.

Unit-II :Oscillations, simple harmonic motion, damped harmonic motion, forced oscillation and resonance. Wave equation, harmonic solutions, plane and spherical waves, superposition of waves, beats, stationary waves Doppler's Effect, phase and group velocities.Conditions of interference, Newton's rings and Michelson's interferometer.Diffraction-Fresnel and Fraunhofer, diffraction by plain transmission grating, Rayleigh criterion, resolving power of grating and telescope.

Unit-III :Electric field and potential, Gauss's law. Poisson's and Laplace equations, dielectrics and polarization, Electromagnetic induction, transformer.Transient behaviour of R-C, and R-L, circuits, time constant.Response of an L-C-R circuit for alternating voltages; series and parallel resonance, band-width and Q-factor.Maxwell's equations and their application to plane electromagnetic wave.Poynting vector. Vector and scalar potentials; Wave equations in isotropic dielectrics, reflection and refraction at the boundary of two dielectrics; Fresnel's relations; Total internal reflection; Normal and anomalous dispersion; Lasers, He-Ne and Ruby lasers, spatial and temporal coherence.

Unit-IV :DeBorglie waves. Photo-electric effect, Compton effect, wave-particle duality, Uncertainty principle and its applications (like - size of H-atom, zero point energy, wave packet, finite width of energy levels). Schrodinger wave equation with applications for free particle potential step or particle in a one dimensional box, extension of results to three dimensional case ,Hydrogen spectrum, electron spin, Stern-Gerlachexperiment, space-quantisation, characteristic and continuous x-rays.

Unit-V :Band theory of solids - conductors, insulators and semiconductors; Bloch Theorem, effective mass, Electric conduction in metals, Sommerfeld theory of electrical conductivity, specific heat of solids - Einstein and Debyetheories. Electronic specific heat, Widemann Franz law, Hall effect. Magnetic properties of materials: para,diaferro,anti-ferroandferrimagnetism.CuricandCurie-WeissLaws. Elements of superconductivity. Meissner effect, Josephson junctions and applications; Elementary ideas about high temperature superconductivity.

Unit-VI :Kirchhoff's law, Thevenin, Norton and maximum power-transfer theorems. p-n junction diode, ideal diode equation, use of diode for rectification, zener diode and its use in

voltage regulation. Transistor, its biasing, common emitter amplifier.Digital electronics-Boolean identities, De Morgan's laws, logic gates and truth tables; Simple logiccircuits.

UNIT -VII : Forensic Physics: Introduction and scope, tools and techniques, examination of vehicle in case of road traffic accident, skid marks evaluation. Physical Evidences: types and importance. Forensic Statistics: Types of data, measure of central tendency, dispersion of data, correlations and probability and proof. **Glass:** Types of glass and their composition-soda-lime, boro-silicate, safety glass, laminated, light-sensitive, tampered/ toughened, wire glass, coloured glass. Matching and comparison.Forensic examinations of glass fractures-concentric and radial fractures.Colour, fluorescence, physical measurements, specific gravity examination and elemental analysis of glass evidence.**Paint**: Types of paint and their composition, macroscopic and microscopic analysis of paint pigments, pigment distribution, micro-chemical analysis-solubility test, pyrolysis gas chromatography, TLC, colorimetric analysis, IR spectroscopy and X-ray diffraction, elemental analysis, mass spectrometer, interpretation of paint evidence.

UNIT -VIII :Fibre: Types of fibres, forensic aspects of fibre examination- fluorescence, optical properties, refractive index, birefringence, dye analysis. Physical fit and chemical testing.TLC, IR-micro spectroscopy. Miscellaneous Evidences: wire, broken bangles, seals, counterfeit coins, ropes/ strings, synthetic fibers etc their introduction & forensic examination. Tool Marks: theory, types of tool marks, and their forensic examination, Restoration methods of obliterated marks.

UNIT-IX : Building Materials: Cement- composition, types, Forensic Analysis- bromoform test, fineness test, ignition-loss test, Identification of adulterated cement. Mortar and concrete analysis. Soil: Types and composition of soil, sample preparation, removal of contaminants, colour, turbidity test, pH measurements, microscopic examination, density gradient analysis, ignition-loss test, elemental analysis.

UNIT -X : Audio and Video Analysis and Tape Authentication: theory of voice production, theory of voice identification, acoustics of speech, the sound spectrograph, voice comparison - standards and methods of voice comparison, voice spectrograph and its significance. Speech recognition and speaker identification.

SEROLOGY DIVISION

UNIT-I : CELL STRUCTURE, MOLECULES AND THEIR INTERACTION: Structural organization and functions of cell including Plasma membrane, intracellular organelles (Nucleus, Mitochondria, Golgi-bodies, Lysosomes, Endoplasmic reticulum, Peroxysomes) and types and structure of Chromosomes, Cell division and cell cycle. Bio-molecules-Structure, composition and function (carbohydrates, lipids, proteins and nucleic acids), pH, buffer and buffer system, Enzymes- types and their functions, regulation, enzyme inhibition, iso-enzymes. Nucleic acids, their structure and functions, types of DNA and RNA, replication mechanism, Proteins synthesis.

UNIT-II: HUMAN ANATOMY AND PHYSIOLOGY: Tissues of body, epithelia and glands, their classification and functions, connective tissues, cartilage- structure and types, bones-formation, gross structure, fracture and healing, Structure and growth of teeth, types, dentition-pattern and formula, eruption sequence and age determination, dental anomalies and their significance in personal identification, bite marks of human/ animals and their analysis. Structure and functions of major organ systems and their physiology-Integumentary, digestive, skeleton,

respiratory, endocrine, nervous, cardiovascular, excretory, reproductive, muscular and neuromuscular systems, blood physiology.

UNIT-III: ECOLOGY, ENVIRONMENT AND MICROBIOLOGY: Ecosystem and their types, ecological factors, types of pollution, types of waste, BOD, COD, effect on human health, algal blooms and identification and composition, eutrophication and their effects. Various types of planktons, diatoms, preparation and identification and their forensic importance. Diatom tests and its importance in drowning cases, precaution in collection, preservation and forwarding of biological samples for diatom test, methods of isolation of diatoms from different body tissues/bone marrow and water samples. Soil and water analysis for various microbes, isolation, classification, cell structure of bacteria and fungi, spores, microbes of soil and spoiled food.

UNIT IV: BIOSYSTEMATICS, TAXONOMY, ANIMAL CLASSIFICATION AND GENETICS: Chemotaxonomy, Cytotaxonomy, Molecular Taxonomy and General classification of Animals (classification of Invertebrates upto order, classification of chordates upto class) Mendelian and Non mendelian inheritance, linkage, recombination and crossing over, chromosomal basis of inheritance, sex linked inheritance, chromosomal aberration, Eugenics.

UNIT V: TOOLS AND TECHNIQUES IN BIOLOGY: Tissue preparation- fixation, preparation of paraffin and plastic blocks, sectioning- rotary microtome, cryostat, vibratome and ultrathin sectioning. Staining- various staining techniques- simple and double staining, histochemical staining for bio molecules, Decalcification of bones and tooth, immunocytochemicalstaining. Chromatographic techniques- Paper, TLC, GLC, HPLC, GCMS, Electrophoresis-gel, agar, SDS and rocket; Statistical analysis- data collection and processing, regression and correlation, ANOVA analysis, probability, t-test, p value, x2test (Chi square). Centrifugation (Definition, principles and uses), Auto clave, Incubator, Hot air oven, UV chamber, Laminar Air Flow, Water Purification System and Forensic Mobile Multispectral Imaging System.

UNIT- VI: FORENSIC TECHNIQUES: ANTHROPOLOGY: Anatomical description of skeletons of human and animals as relevant to forensics, ossification and identification of bones for determination of age, sex, race, stature etc. forensic anthropometry/ osteometry and tools involved. Determination of personal identity- sex differences in skull, pelvis and other bones. Calculation of stature from long bones, identification of burnt bones. Recovery of and identification of skeletal remains in accident, crimes and mass disasters, recovery, packing and storage of fleshed and burnt bone remains of human/ animal of forensic importance. Skeletal pathology and trauma of bones, facial reconstruction and superimposition, craniofacial superimposition techniques as photographic and video superimposition.

UNIT-VII :

PHYSICAL EVIDENCE COLLECTION & PACKAGING OF EXHIBITS FROM CRIME SCENE: Physical evidence, types and importance in a criminal investigation, Protecting a scene of crime – various steps involved, contamination issues. Reconstructing of crime scene, Protection of Packaging & transportation Biological Evidences their documentation and Chain of Custody Legal and court procedure pertaining to expert testimony, admissibility of scientific evidence under 293 CrPC.

MICROSCOPY AND ITS APPLICATION : Basic principles and working of simple, Compound, Comparison, Phase-contrast, stereo-zoom, Polarizing, Fluorescence, confocal microscopy, Scanning electron and transmission electron microscope, colorimeter analysis and UV light source. Spectroscopy: Principle and significance of UV-Vis spectroscopy, Fluorescence spectroscopy, FRET, Luminescence, Circular Dichroism, Infra-Red spectroscopy, Raman spectroscopy, Nuclear Magnetic Resonance, X-ray diffraction, Mass spectrometry.

UNIT-VIII :EXAMINATION OF BODY FLUIDS & THEIR STAINS: Introduction to various types of body fluids, Composition, Physical pattern and Identification of seminal stains: Occurence and significance. Species Determination. Age of semen stain.Detailed Laboratory examination of semen stain.Polymorphic Enzymes in semen and their significance.D.N.A.typing of semen sample. Examination of Saliva, Urine, Perspiration and other physiological fluids presumptive tests (U.V. test, Florence test, Spermine (Barberio) test, Choline test, Acid phosphatase test) and confirmatory test including Azoospermic semen stain (p-30, *Prostate-specific antigen* or PSA, Microscopic examination), Morphological structure of spermatozoa of human and animals, Identification of lochial and menstrual blood stains by microscopic, biochemical and immuno-electrophoretic method, Identification and examination of other body fluids/stains–vaginal, saliva, urine, faeces, vomit etc., Secretor and non –secretor. Identification and examination of body tissues of human/animal.

IMMUNOLOGICAL TEST: Presumptive & Confirmatory Tests for blood and origin. Application of immunological techniques in forensic serology Determination of species by precipitin test Gel-diffusion method and Gel-electrophoresis. Innate and Adaptive immunity, B cell /T cell –structure, development, diversity and recognition.Antigen and Antibodies – structure, types and function of antibody, monoclonal antibodies, antigen, hapten, adjuvants, antigen-antibody interaction and their application.Blood groups- ABO, MN, Rh polymorphic blood groups, Application of ABO blood group in disputed paternity cases, polymorphic enzymes and polymorphic proteins in the reference of forensic serology.HLA antigen.Secretor and non secretor status.Blood grouping in biological fluids other than blood.Determination of ABO blood group by absorption inhibition, absorption elution and mixed agglutination method.

UNIT-IX: FORENSIC GENETICS AND ROLE OF DNA FINGERPRINTING: History of DNA fingerprinting, utility of DNA fingerprinting in crime investigation in parentage dispute, wild life, veterinary and agriculture etc., Legal and Ethical issues. Collection, preservation and transport of samples viz, semen, saliva, hair, bone, flesh etc for DNA profiling, DNA methodology for isolation, typing, interpretation of results, STR analysis, polymerase chain reaction, types and it's application, mitochondrial analysis, determination of sex & species and racial origin. **Analytical techniques**: Chromatography, Gel filtration, Ion exchange and affinity chromatography, Electrophoresis, SDS-PAGE, AGE, PFGE, Southern, Northern and Western blotting, ELISA, DNA foot printing, PCR, Asymmetric PCR, methylation-specific PCR, Nested PCR, Inverse PCR, reverse transcriptase PCR, Real-time-PCR, Protein sequencing methods, DNA sequencing methods, Next Generation Sequencing RFLP maps, RAPD markers, AFLP markers, SNP analysis.

UNIT-X: WILD LIFE FORENSICS: Wild life, Importance of protected and endangered species of Animals. National and International scenario of wild life, Sanctuaries and National parks.Relevant provision of wild life and environmental act.Types of wildlife crimes, different methods of poaching of wildlife animals, Illegal Trade of wildlife material. Identification and examination of different kinds of wildlife crime exhibits.Examination of fabricated hides, ivory, nail etc.Identification of Wild life and domestic animal.

FORENSIC ENTOMOLOGY: Introduction, History, Significance, Classification and Biology of insects and other arthropods, Life cycle and forensic application of insects, Importance of some bacteria, Micro Organism and Insects in Forensic Science. Determination of time since death (postmortem interval i.e. PMI) - Dipterans larval development & succession on carrion and its relationship to determine time of death, impact of ecological factors on insects developments, rearing insects & calculating PMI, identification of larval instars, determining whether the body has been moved, linking suspect to the scene, Forensic Entomo-toxicology- identification of drugs and toxins from the insects and larvae feeding on the body, collection and preservation of entomological evidence at a crime scene.

HISTOLOGICAL AND ANATOMICAL EXAMINATION OF SOME PLANTS YIELDING DRUG: Morphology and anatomy of plants, types of plants yielding drugs of abuse – opium, cannabis, coca, tobacco. Identification of plants of Cannabis sativa (Ganja & bhang), opium (Papaversomniferum), tobacco (Nicotianatabacum) etc. in criminal cases.

UNIT-XI :Foundation of Biochemistry: Cellular and chemical foundations of life, Water: unique properties, weak interactions in aqueous systems, ionization of water, buffering action in biological system. **Carbohydrate chemistry:** Structure of classification of monosaccharides, disaccharides, and polysaccharides, Glycolytic pathway, TCA cycle, pentose phosphate pathways, glycogen metabolism. **Lipid Chemistry:** Building blocks of lipids - fatty acids, glycerol, ceramide; Structural lipids in membranes – glycerophospholipids; sphingolipids and sterols; Composition and synthesis of lipoproteins and transportation, oxidation of fatty acids, biosynthesis of lipids, cholesterol metabolism. **Protein Chemistry**: Structure and classification of amino acids, peptide, polypeptide, Ramachandran plot, protein folding, Primary, Secondary, Tertiary and Quaternary structure of proteins; essential, non-essential and non-standard amino acids. **Nucleic acid chemistry**: Structure of purine, pyrimidine, nucleoside & nucleotides, De-Novo synthesis of purine and pyrimidine, Synthesis of nucleoside di- and triphosphates, deoxynucleotides, degradation of purine and pyrimidine nucleotides, salvage pathways of nucleotides synthesis, different types of DNA and RNA, Watson-Crick model of DNA, Structure of mRNA, tRNA and rRNA.

UNIT-XII: Enzyme chemistry: Enzyme definition, basic principle of enzyme action, activation energy, General characteristics of enzymes; nature of enzymes - protein and non-protein (ribozymes – RNaseP, abzymes), apoenzyme, holoenzyme. Fischer's lock and key hypothesis, nomenclature and classification of enzymes, mechanisms of action various enzymes including chymotrypsin, lysozyme. **Enzyme kinetics:** Kinetics of single substrate reaction, Michaelis-Menten equation, Lineweaver-Burk plot, Eadie-Hofstee and Hanes plot. Determination of KM and Vmax, Kcat, specificity constant. Enzyme Inhibition: Reversible and irreversible inhibition, kinetics of bi-substrate reaction. **Enzyme regulation:** Allosteric enzymes, symmetrical and sequential model, Hill's coefficients, cooperativity, Enzyme regulation and feedback control, enzyme activity regulation by post translational modification.

UNIT-XIII: Classical genetics: Mendelian and non-Mendelian inheritance, genetic linkage, recombination and crossing over, chromosomal basis of inheritance, mutagenesis, genetic basis of sex determination, extra-nuclear inheritance. **Molecular Genetics:** Structure of chromatin and chromosomes, Central dogma of molecular biology, replication, transcription, translation, regulation of gene expression: transcriptional, translational and post-translational. **Cell Biology:** Membrane models, chemical composition of membrane, membrane proteins, endocytosis, phagocytosis, liposomes and its application. Structure and functions of intracellular organelles

such as nucleus, mitochondria, endoplasmic reticulum, golgi apparatus, lysosomes, plastids, peroxisomes.

UNIT-XIV Basic concept of development: Basic features of development in animals, gametogenesis, types of eggs, fertilization, cleavage, and blastula, modification of development in evolution, generation of multicellular embryo, formation of germ layers, patterning of vertebrate body plan. **Reproductive Biology:** Reproductive strategies and reproductive cycles in vertebrates, spermatogenesis, oogenesis, hormonal regulation in gametogenesis in male and female, In-vitro fertilization, embryo transfer technology. **Nervous System**: Organization of nervous system, somatic nervous system; sympathetic and parasympathetic system; structure and function of neuron and glial cells. **Musculo-skeletal System:** Bone structure and function; smooth, cardiac and skeleton muscles, muscle contraction. **Endocrinology:** Endocrine glands including pituitary, thyroid,etc; hormones, regulation of hormone secretion, peptide hormones and steroid hormones, biochemistry of hormone action. **Immunity:** innate and acquired immunity, antibody, major histocompatibility complex, complement systems, T and B-cell maturation and differentiation, antigen processing and presentation, hypersensitive reaction and autoimmune diseases, polyclonal and monoclonal antibodies.

UNIT-XV Blood: Components & functions of blood, lymph, CSF; Plasma and serum, major plasma proteins, Erythrocytes, Leukocytes, Platelets- structure and function; role of platelets in coagulation, Biochemical mechanism of blood clotting and fibrinolytic system. **Glycogen storage diseases:** Von Gierke, Pompe, Cori and McArdle. Anemia and amino acid metabolism: Hemophilia and thrombosis, Hemoglobin, sickle cell anemia, thalasemia, phenylketonuria, alkaptonuria, albinism, etc. **Electrolyte and acid balance:** Acid-base balance, regulation of electrolyte and water balance, renin-angiotensin system in human body. Clinical analysis: Functional test of liver, kidney, thyroid, pancreas, tissue biopsy, liquid biopsy, circulating nucleotides as molecular diagnosis.

UNIT-XVI: Immunological techniques: Immuno-electrophoresis, immune-precipitation, agglutination, RIA, ELISA, FACS, immune-fluorescence microscopy, Immuno-electron microscopy, Fluorescence In-situ hybridization (FISH), Chromatin immuno-precipitation. **Statistics:** 2test.χData collection and processing, Regression and Correlation, ANOVA analysis Probabilities; t-test, p-value;

TOXICOLOGY DIVISION

Unit I :

Analytical Chemistry : Classification of analytical methods – Classical and Instrumental, volumetric, titrimetric and gravimetric techniques, selection of proper analytical techniques: types and range of determination, accuracy, precision and errors, sample preparation, handling of reagents with safety, density and viscosity measurements.

Statistical Analysis : Mean, Mode, Median, Correlation and Regression analysis, Null Hypothesis, Variance, t-test, Chi-Square test. Type of Data, Measure of central tendency, Dispersion of Data, Correlation, Probability and Proof.

Group Theory: Symmetry elements and operations; Point groups and character tables; Internal coordinates and vibrational modes; symmetry adapted linear combination of atomic orbitals (LCAO-MO); construction of hybrid orbitals using symmetry aspects.

Electrochemistry: Electrochemical cells and cell reactions; Standard electrode potentials; Nernst equation and its relation to ΔG; Electrochemical series, emf of galvanic cells; Faraday's laws of electrolysis; Electrolytic conductance, specific, equivalent and molar conductivity, Kohlrausch's law; Concentration cells.

Unit II :

Analysis of unknown samples :-

Organic: Physical examination, element detection (N, S, Cl, Br, I, F), Functional Group analysis (-OH, -COOH, -NO2, -NH2, -CONH2, -CO-, -CHO, Hydrocarbons).

Reaction Mechanisms: Basic mechanistic concepts – kinetic versus thermodynamic control, Hammond's postulate and Curtin-Hammett principle. Methods of determining reaction mechanisms through kinetics, identification of products, intermediates and isotopic labelling.Linear free-energy relationship – Hammett and Taft equations.Nucleophilic and electrophilic substitution reactions (both aromatic and aliphatic).Addition reactions to carbon-carbon and carbon-heteroatom (N and O) multiple bonds.Elimination reactions. Reactive intermediates – carbocations, carbanions, carbenes, nitrenes, arynes and free radicals. Molecular rearrangements.

Pericyclic Reactions and Photochemistry: Electrocyclic, cycloaddition and sigmatropic reactions. Orbital correlations - FMO and PMO treatments, Woodward-Hoffmann rule. Photochemistry of alkenes, arenes and carbonyl compounds. Photooxidation and photoreduction.Di-π-methane rearrangement, Barton-McCombie reaction, Norrish type-I and II cleavage reaction.

Inorganic: Qualitative analysis of cations and anions with special reference to cations i.e. As, Sb, Pb, Ba, Cu, Hg, Zn and Tl and anions i.e.NO_2^-, NO_3^-,S_2^-, SO_4^{2-}, SO_3^{2-}, halides and cyanides.

Main Group Elements: Hydrides, halides, oxides, oxoacids, nitrides, sulfides – shapes and reactivity. Structure and bonding of boranes, carboranes, silicones, silicates, boron nitride, borazines and phosphazenes.Allotropes of carbon, phosphorous and sulphur.Industrial synthesis of compounds of main group elements.Chemistry of noble gases, pseudohalogens, and interhalogen compounds.Acid-base concepts and principles (Lewis, Bronsted, HSAB and acidbase catalysis).

Transition Elements: Coordination Chemistry – structure and isomerism, theories of bonding (VBT, CFT, and MOT). Energy level diagrams in various crystal fields, CFSE, applications of CFT, JahnTeller distortion. Electronic spectra of transition metal complexes: spectroscopic term symbols, selection rules, Orgel and Tanabe-Sugano diagrams, nephelauxetic effect and Racah parameter, charge-transfer spectra. Magnetic properties of transition metal complexes. Ray-Dutt and Bailar twists, Reaction mechanisms: kinetic and thermodynamic stability, substitution and redox reactions. Metal-metal multiple bond.

Analysis of poisonous gases: CO, H_2S, PH_3, CH_4 and NH_3.

Salt Analysis

Unit-III :

Spectroscopic and other techniques:-

Unifying principles : Electromagnetic radiation, interaction of electromagnetic radiation with matter- absorption, emission, transmission, reflection, refraction, dispersion, polarization and scattering. Basic principles, instrumentation and applications: UV- Visible, FTIR, AAS, Mass, Spectroscopy, Fluorescence and Phosphorescence spectrophotometry, ESR. Fundamentals of Acids, Bases and Buffers, pH, pKa, and pKb values, principles, instrumentation and applications of pH metry, Potentiometry, Conductometry and Microscopic analysis in forensic science.

Unit-IV : Chromatography and Electrophoresis: General Principles and types of chromatographic techniques: Paper chromatography, column chromatography, Thin layer chromatography, adsorption chromatography, partition chromatography, Gas chromatography, Gas-liquid chromatography, Ion exchange chromatography, Exclusion (permeation) chromatography, affinity chromatography, HPLC, HPTLC, HPTLC MS, Capillary Chromatography and Electrophoresis.

Unit-V : Basic Organic Chemistry: Important preparations and properties of alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, phenols, carboxylic acids, aldehydes, ketones, amines and nitro compounds.

Unit-VI :Proteins: Classification, Structure and Properties, Molecular weight determination, Isoelectric point, coagulation and denaturation. Carbohydrates: Classification, Structure and Reactions. Fats and Lipids: Classification, Structure and Reactions. Alkaloids: Classification, Isolation and Identification.

Unit-VII :Forensic Toxicological examination and significance, Poison : Definition, classification, mode of action, chemical nature, methods of poison administration, Classification of poisoning : Accidental, homicidal and suicidal. Symptoms of poisoning and antidotes, Collection and preservation of toxicological exhibits in poisoning cases. Postmortem examination and postmortem changes, Medicolegal aspects of wounds, Modes of death.

Unit-VIII : Different methods of extraction and isolation of poisons from visceral organs and other biological specimens : Solvent extraction, distillation/steam distillation, micro diffusion, dialysis, dry ashing and wet digestion.

Pharmacology : Metabolism and excretion of poisons - Introduction, pathways of drug metabolism, nonsynthetic and synthetic pathways like oxidation, hydroxylation, N-and O-dealkylation, sulphoxide formation, conjugation, acetylation, methylation of drugs/poisons as exemplified by alcohols, aldehydes, ketones, aliphatic amines, phenols, cyanide, barbiturates, opiates, benzodiazepines and amphetamines.

Unit-IX :Analysis of volatile poisons, toxic metals and non-metallic anions in biological fluids. Analysis of pesticides :Organochlorinated, Organophosphorous, Synthetic pyrethroids, Carbamates, Aluminium phosphide and Zinc phosphide in visceral tissues.

Unit-X : Methods of analysis of acidic and neutral drugs in biological fluids, salicylic acid, benzoic acid, aspirin, meprobamate, barbiturates etc. Method of analysis of basic drugs of abuse from biological specimens : Opium and its alkaloids, atropine, strychnine, brucine, cocaine, amphetamines and its derivatives, benzodiazepines, LSD, ketamine, methaqualone and nicotine. Method of analysis of mechanical poisons- Glass, diamond and hair. Plant poisons and their examination :Dhatura, Atropa belladonna, Marking nut, Nux vomica, Oleander, Aconite, Abrus, Cannabis, Croton and poisonous fungi.

BALLISTIC DIVISION

Unit-I : Frame of reference, inertial and non inertial frames, Rotating frame of reference, Coriolis force, conservation Laws. Collisions, impact parameter, centre of mass frame and analysis of collision in centre of mass frame and lab systems, rotational motion of rigid bodies, moment of inertia, products of inertia, conservation of angular momentum. Central forces, motion under inverse square law forces, Special Theory of Relativity, Michelson-Morely experiment, Lorentz Transformations-addition of velocities, Time dilation and length contraction, variation of mass with velocity, mass-energy equivalence.

Unit-II :Oscillations, simple harmonic motion, damped harmonic motion, forced oscillation and resonance. Wave equation, harmonic solutions, plane and spherical waves, superposition of waves, beats, stationary waves, Doppler's Effect, phase and group velocities. Conditions of interference, Newton's rings and Michelson's interferometer. Diffraction-Fresnel and Fraunhofer, diffraction by plain transmission grating, Rayleigh criterion, resolving power of grating and telescope.

Unit-III :Electric field and potential, Gauss's law. Poisson's and Laplace equations, dielectrics and polarization, Electromagnetic induction, transformer. Transient behaviour of R-C, and R-L, circuits, time constant. Response of an L-C-R circuit for alternating voltages; series and parallel resonance, band-width and Q-factor.

Maxwell's equations and their application to plane electromagnetic wave. Poynting vector. Vector and scalar potentials; Wave equations in isotropic dielectrics, reflection and refraction at the boundary of two dielectrics; Fresnel's relations; Total internal reflection; Normal and anomalous dispersion; Lasers, He-Ne and Ruby lasers, spatial and temporal coherence.

Unit-IV : De Borglie waves, Photo-electric effect, Compton effect, wave-particle duality, Uncertainty principle and its applications (like - size of H-atom, zero point energy, wave packet, finite width of energy levels). Schrodinger wave equation with applications for free particle potential step or particle in a one dimensional box, extension of results to three dimensional case, Hydrogen spectrum, electron spin, Stern-Gerlach experiment, space-quantisation, characteristic and continuous x-rays.

Unit-V : Band theory of solids - conductors, insulators and semiconductors; Bloch Theorem, effective mass, Electric conduction in metals, Sommerfeld theory of electrical conductivity, specific heat of solids - Einstein and Debye theories. Electronic specific heat, Widemann Franz

law, Hall effect. Magnetic properties of materials: para, dia, ferro, anti-ferro and ferrimagnetism. Curie and Curie – Weiss Laws.Elements of superconductivity, Meissner effect, Josephson junctions and applications; Elementary ideas about high temperature superconductivity.

Unit-VI :Kirchhoff's law, Thevenin, Norton and maximum power-transfer theorems. p-n junction diode, ideal diode equation, use of diode for rectification, zener diode and its use in voltage regulation. Transistor, its biasing, common emitter amplifier.Digital electronics-Boolean identities, De Morgan's laws, logic gates and truth tables; Simple logiccircuits.

Unit-VII :History and development of firearms, their classification and characteristics, various components of small arms, bore and caliber, relation between bore number of shoguns and internal cross sectional diameter of their barrels, choke- purpose, degrees and types, different automatic mechanisms used in small arms- blow back, retarded blow- back, short recoil operated, long- recoil operated and gas operated mechanisms; rifling, methods to produce rifling, trigger and firing mechanisms.

Projectile- velocity determination, determination of velocity of shot-charge, techniques of dismantling/assembling of various types of firearms, identification of origin- various marks on firearms, improvised/Country- made/imitative firearms, and their constructional features, comparative merits of different bores of shotguns, silencers, Headspace and its importance.

Unit-VIII :Types of ammunition, classification and constructional features of different types of cartridges, types of primers and priming compositions. Propellants and their compositions-black, smokeless and semi-smokeless powders, various additives in propellants like stabilizers, chemicals for reducing flash, non- hygroscopic agents, chemicals for conversion of propellants into progressive burning, etc, velocity and pressure characteristics under different conditions. Identification of origin, head stamp markings on cartridges, improvised ammunition, safety aspects for handling of firearms and ammunition.

Unit – IX : Principles and practice of identification of firearms, ammunition and their components how different parts of firearms acquire individual characteristics during their manufacture, types of marks produced during firing process on cartridge cases-firing-pin marks, breech- face marks, chamber marks, extractor and ejector marks, marks on bullets, striation marks of lands and grooves, various factors affecting nature of these marks, measurement of rifling details, i.e., number/ direction of lands and grooves, pitch of rifling etc, imprinted on fired bullets, determination of make/ model of the suspected firearm, techniques of obtaining test materials from various types of weapons and process of their linkage with fired ammunition, photomicrography, non- submission of photomicrographs along with report, presence of matching and non- matching characteristics on evidence and test cartridge cases and bullets, source correspondence, number of matching points, furnishing of opinion- definite positive, definite negative, no definite etc., writing of reports, automatic bullet and cartridge comparison systems, linkage of fired shots with suspected shot gun, effects of erosion, corrosion etc., effect of human decomposition on bullet striations.

Unit-X : Determination of range of firing, burning scorching, blackening, tattooing, metallic fouling, GSR distribution and dispersion of pellets, factors affecting these phenomena, the stringing of shots, effect of stringing on pattern, cartwheel pattern, balling, determination of range of firing in case of country- made firearms, characteristics of contact shots, distinction between blackening and lead/dirt ring, abrasion, back scatter effect, Walker's test around gun-shot holes in clothes, tests of presence of tattooing around gun- shot holes in skin/ head, IR

photography of tattooing around gun-shot holes in dark- coloured clothes, use of various instrumentation techniques for estimation of range of firing, effective, killing and extreme ranges.

Testing of barrel wash, chemical tests for testing for testing of lead/copper around gun-shot holes in clothes, skin and other objects, use of instrumentation techniques in identification of gun-shot holes.Use of instrumentation techniques for analysis of propellant particles found on hands of shooter, fired cartridge case, barrel and target.

DOCUMENT DIVISION

Unit-I:

Frame of reference, inertial and non inertial frames, Rotating frame of reference, Coriolis force Conservation Laws. Collisions, impact parameter, centre of mass frame and analysis of collision in centre of mass frame and lab systems, rotational motion of rigid bodies, moment of inertia, products of inertia, conservation of angular momentum. Central forces, motion under inverse square law forces, Special Theory of Relativity, Michelson-Morely experiment, Lorentz Transformations-addition of velocities, Time dilation and length contraction, variation of mass with velocity, mass-energy equivalence.

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Oscillations, simple harmonic motion, damped harmonic motion, forced oscillation and resonance. Wave equation, harmonic solutions, plane and spherical waves, superposition of waves, beats, stationary waves Doppler's Effect, phase and group velocities.Conditions of interference, Newton's rings and Michelson's interferometer.Diffraction-Fresnel and Fraunhofer, diffraction by plain transmission grating, Rayleigh criterion, resolving power of grating and telescope.

Unit-III :

Electric field and potential, Gauss's law.Poisson's and Laplace equations, dielectrics and polarization, Electromagnetic induction, transformer.Transient behaviour of R-C, and R-L, circuits, time constant.Response of an L-C-R circuit for alternating voltages; series and parallel resonance, band-width and Q-factor.Maxwell's equations and their application to plane electromagnetic wave.Poynting vector. Vector and scalar potentials; Wave equations in isotropic dielectrics, reflection and refraction at the boundary of two dielectrics; Fresnel's relations; Total internal reflection; Normal and anomalous dispersion; Lasers, He-Ne and Ruby lasers, spatial and temporal coherence.

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De Borglie waves. Photo-electric effect, Compton effect, wave-particle duality, Uncertainty principle and its applications (like - size of H-atom, zero point energy, wave packet, finite width of energy levels). Schrodinger wave equation with applications for free particle potential step or particle in a one dimensional box, extension of results to three dimensional case ,Hydrogen spectrum, electron spin, Stern-Gerlachexperiment, space-quantisation, characteristic and continuous x-rays.

Unit-V:

Band theory of solids conductors, insulators and semiconductors; Bloch Theorem, effective mass, Electric conduction in metals, Sommerfeld theory of electrical conductivity, specific heat of solids Einstein and Debyetheories. Electronic specific heat, Widemann Franz law, Hall effect. Magnetic properties of materials: para, diaferro,anti-ferroandferrimagnetism. Curieand Curie-WeissLaws.Elements of superconductivity, Meissner effect, Josephson junctions and applications; Elementary ideas about high temperature superconductivity.

Unit-VI:

Kirchhofl's law, Thevenin, Norton and maximum power-transfer theorems.p-n junction diode, ideal diode equation, use of diode for rectification, zener diode and its use in voltage regulation. Transistor, its biasing, common emitter amplifier.Digital electronics-Boolean identities, Morgan's laws, logic gates and truth tables; Simple logiccircuits.

Unit-VII:

Forensic Document Examination: - Legal aspects of forensic document examination, 293Crpc., Section 45 evidence act, definition of expert.Indian Penal Code Under sections 420,468,471,120B, 302, 306, 498A, Copy right act, 489A, B, C, D & E, Office Secret act. Classification of documents; Disputed/ Specimen/ Admitted; Care, handling, preservation of documents; Preliminary examination of case documents, Principle of handwriting examination; Importance of natural variations, Holographic documents.Physiology of handwriting, various writing features--terminology and definitions, general characteristics of handwriting, individual characteristics of handwriting. Nature and types of forgeries, characteristics of genuine forged signatures, their detection, identification of line quality, artificial and natural tremor.

Unit-VIII:

Classification of Erasures: - Chemical & Physical erasures and techniques involved for their detection and decipherment, Sequence of strokes, working principle & features and applications of Spectral Comparators, principle and working of Electrostatic Detection apparatus and its applications. Ink examination, chemical composition of different types of inks, destructive and non-destructive techniques involved in differentiation of ink. Writing instruments, working of fountain pen, ball pen, gel pen, writing inks, Printing inks and printing toners. Viscosity, Surface tension, Capillary rise.

Unit-IX:

Paper examination: - Physical comparison parameters, chemical composition, sizing & loading materials, tensile strength, comparison techniques: destructive & non-destructive. Serrated edges rubber examination. Physical evidences: Examination of printed labels, wrappers, impressions, Facsimile document/ signature examination. Photocopy and scanned documents: process of scanning, identifying features. Charred documents: preservation and examination techniques involved.

Unit-X:

Printed document examination: Printing technology, examination of type-script, classification of printers: identification of printed matter, different printing technologies, Examination of computer printouts, Concept of digital signature. Examination of security documents: Currency notes, Passport, Visa, Various identity cards, Stamp papers, travel documents. OVI ink, thermal ink. Examination of credit, debit and other plastic cards.