Jharkhand PGTTCE Exam Pattern 2022

Name of the Subject	Number of Questions	Number of Marks	Duration
Paper I • General Knowledge • Hindi Language	100	100	3 Hours (Per Each Paper)
Paper II (Core Subject)	150	300	
Total	**250**	**400**	

- Paper I contains 100 questions for 100 marks here each correct question carries one mark.
- Paper II contains 150 questions for 300 marks and here each correct question carries 2 marks.
- The time duration for each paper is 3 hours.
- The two papers contain 400 marks with 250 questions in the question papers.

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17. पदों का विकल्प :–

विभिन्न शैक्षणिक योग्यताधारी आवेदकों को अपनी शैक्षणिक योग्यता के अनुसार उपलब्ध पदों के लिए अधिमानता क्रम में विकल्प देना अनिवार्य होगा।

18. <u>परीक्षा का स्वरूप</u> :–

आयोग द्वारा कम्प्यूटर आधारित परीक्षा **(CBT)** ली जायेगी तथा किसी विषय की परीक्षा यदि विभिन्न समूहो में लिया जाता है तो अभ्यर्थियों के प्राप्तांक का Normalisation किया जायेगा। Normalisation का सूत्र अलग से आयोग के वेबसाईट पर प्रकाशित है। कम्प्यूटर आधारित परीक्षा के आधार पर अभ्यर्थियों की मेधा सूची उनके प्राप्तांक के Normalised अंक के आधार पर तैयार किया जायेगा तथा परीक्षाफल प्रकाशन के पश्चात उन्हें Normalised अंक ही दिया जायेगा।

परीक्षा का स्वरूप एवं पाठ्यक्रम :–

(क) परीक्षा एक चरण (मुख्य परीक्षा) में ली जायेगी।

(ख) परीक्षा में सभी प्रश्न वस्तुनिष्ठ एवं बहुविकल्पीय उत्तर युक्त होंगे। प्रश्न पत्र–(1) में एक प्रश्न का पूर्ण अंक 1 (एक) रहेगा, जबकि प्रश्न पत्र– (2) में एक प्रश्न का पूर्ण अंक 2 (दो) होगा।

19. मुख्य परीक्षा के विषय एवं पाठ्यक्रम :–

मुख्य परीक्षा के लिए दो पत्र होंगे। यह परीक्षा दो पालियों में ली जायेगी। प्रत्येक पत्र के परीक्षा की अवधि 3 घंटा की होगी। प्रश्न पत्र– (1) में स्नातक स्तर के प्रश्न पूछे जायेंगे जबकि प्रश्न पत्र– (2) में प्रश्न स्नातकोत्तर स्तरीय होंगे।

क) पत्र–1 (सामान्य ज्ञान एवं हिन्दी भाषा की परीक्षा) – 100 अंक

ख) पत्र–2 (जिस विषय में नियुक्ति होनी है उस विषय की परीक्षा) – 300 अंक

<u>पत्र – 1 (सामान्य ज्ञान एवं हिन्दी भाषा की परीक्षा)</u>

(I) सामान्य ज्ञान –

(क) **सामान्य अध्ययन :–** इसमें प्रश्नों का उद्देश्य अभ्यर्थी की सामान्य जानकारी तथा समाज में उनके अनुप्रयोग के सम्बन्ध में उसकी योग्यता की जाँच करना होगा। वर्तमान घटनाओं और दिन–प्रतिदिन की घटनाओं के सूक्ष्म अवलोकन तथा उनके प्रति वैज्ञानिक दृष्टिकोण जैसे मामलों की जानकारी जिसे रखने की किसी भी शिक्षित व्यक्ति से अपेक्षा की जाती है। इसमें झारखण्ड, भारत और पड़ोसी देशों के संबंध में विशेष रूप से यथा संभव प्रश्न पूछे जा सकते है। सम–सामायिक विषय– वैज्ञानिक प्रगति, राष्ट्रीय/अंतर्राष्ट्रीय पुरस्कार, भारतीय भाषाएं, पुस्तक, लिपि, राजधानी, मुद्रा, खेल–खिलाड़ी, महत्वपूर्ण

घटनाएं। भारत का इतिहास, संस्कृति, भूगोल, पर्यावरण, आर्थिक परिदृश्य, स्वतंत्रता आन्दोलन, भारतीय कृषि तथा प्राकृतिक संसाधनों की प्रमुख विशेषताएं एवं भारत का संविधान एवं राज्य व्यवस्था, देश की राजनीतिक प्रणाली, पंचायती राज, सामुदायिक विकास, पंचवर्षीय योजना।

झारखण्ड राज्य की भौगोलिक स्थिति एवं राजनीतिक स्थिति की सामान्य जानकारी।

(ख) **सामान्य विज्ञान :–** सामान्य विज्ञान के प्रश्न पत्र में दिन–प्रतिदिन के अवलोकन एवं अनुभव पर आधारित विज्ञान की सामान्य समक्ष एवं परिबोध से संबंधित प्रश्न रहेगें, जैसा कि एक सुशिक्षित व्यक्ति से, जिसने किसी विज्ञान विषय का विशेष अध्ययन नहीं किया हो, अपेक्षित है।

(ग) **सामान्य गणित :–** इस विषय में सामान्यतः अंक गणित, प्राथमिक बीजगणित, ज्यामिति, सामान्य त्रिकोणमिति, क्षेत्रमिति से संबंधित प्रश्न रहेगें। सामान्यतः इसमें मैट्रिक/10वी॰ कक्षा स्तर के प्रश्न रहेगें।

(घ) **मानसिक क्षमता जाँच :–** इसमें शब्दिक एवं गैर शब्दिक दोनो प्रकार के प्रश्न रहेंगे। इस घटक में निम्न से संबंधित यथासंभव प्रश्न पूछे जा सकते है– सादृष्य समानता एवं भिन्नता, स्थान कल्पना, समस्या समाधान, विश्लेषण, दृश्य स्मृति, विभेद अवलोकन, संबंध अवधारणा, अंक गणितीय तर्कशक्ति, अंक गणितीय संख्या श्रृंखला एवं कूट लेखन तथा कूट व्याख्या इत्यादि।

(ङ॰) **कम्प्यूटर का मूलभूत ज्ञान (Fundamenal knowledge of Computer):–** इसमें कम्प्यूटर के विभिन्न उपकरणों, एम॰ एस॰ विन्डो ऑपरेटिंग सिस्टम, एम॰ एस॰ ऑफिस एवं इंटरनेट संचालन की विधि की जानकारी से संबंधित प्रश्न पूछे जा सकते है।

(च) झारखण्ड राज्य के भूगोल, इतिहास, सभ्यता संस्कृति, भाषा–साहित्य, स्थान, खान खनिज, उद्योग, राष्ट्रीय आंदोलन में झारखण्ड का योगदान, विकास योजनाएँ, खेल–खिलाड़ी, व्यक्तित्व, नागरिक उपलब्धियाँ,, राष्ट्रीय एवं अन्तर्राष्ट्रीय महत्व के विषय इत्यादि।

(II) **हिन्दी भाषा ज्ञानः–** हिन्दी भाषा ज्ञान के अधीन हिन्दी अपठित अनुच्छेद (Unseen Passage) तथा हिन्दी व्याकरण पर आधारित प्रश्न पूछे जायेंगे।

पत्र – 2 (जिस विषय में नियुक्ति होनी है उस विषय की परीक्षा)

विभिन्न विषयों के लिए प्रश्न पत्र–2 का विस्तृत पाठ्यक्रम **परिशिष्ट–XIII** के रूप में संलग्न है।

परिशिष्ट (XIII)

मुख्य परीक्षा अन्तगर्त प्रश्न पत्र–2 का पाठ्यक्रम

विषय : हिन्दी भाषा एवं साहित्य

(HINDI LANGUAGE & LITERATURE)

क) हिन्दी भाषा का इतिहास

1. अपभ्रंश, अवहट्ट, और पुरानी हिन्दी की भाषिक विशेषताएँ
2. मध्यकाल में अवधी और ब्रज का साहित्यिक भाषा के रूप में विकास
3. उन्नीसवीं शती में खड़ी बोली का साहित्यिक भाषा के रूप में विकास
4. हिन्दी भाषा और नागरी लिपि का मानकीकरण
5. स्वाधीनता संघर्ष के समय राष्ट्रभाषा के रूप में हिन्दी का विकास
6. भारत संघ की राजभाषा के रूप में हिन्दी का विकास
7. हिन्दी का तकनीकी एवं प्रायोजनिक विस्तार
8. हिन्दी की प्रमुख बोलियाँ और उनका पारस्परिक सम्बन्ध
9. मानक हिन्दी की व्याकरणिक संरचना
10. झारखण्ड की भाषाओं और बोलियों का सामान्य परिचय

ख) हिन्दी साहित्य का इतिहास

1. हिन्दी साहित्य के इतिहास लेखन की परम्परा
2. हिन्दी साहित्य के प्रमुख कालों– आदिकाल, भक्तिकाल, रीतिकाल, आधुनिक काल की प्रमुख साहित्यिक प्रवृत्तियाँ
3. हिन्दी गद्य का विकास और उन्नीसवीं शती का नवजागरण
4. आधुनिक हिन्दी कविता की प्रमुख प्रवृत्तियाँ– छायावाद, प्रगतिवाद, प्रयोगवाद, नई कविता, समकालीन कविता, नवगीत, गजल।
5. हिन्दी उपन्यास की परम्परा और यथार्थवाद
6. हिन्दी कहानी का विकास और प्रमुख कहानीकार
7. हिन्दी नाटक की परम्परा और हिन्दी रंगमंच
8. हिन्दी में आलोचना का विकास और प्रमुख आलोचक
9. हिन्दी गद्य की अन्य विधाएँ–संस्मरण, ललित निबन्ध, आत्मकथा, व्यंग्य, लघुकथा
10. झारखण्ड का हिन्दी साहित्य

ग) पद्य कृतियाँ

1.	कबीर	:	कबीर ग्रंथावली (संपादक– श्यामसुन्दर दास) प्रारंभिक 100 पद
2.	सूरदास	:	भ्रमरगीत सार (संपादक रामचन्द शुक्ल) प्रारंभिक 200 पद
3.	तुलसीदास	:	रामचरितमानस– अयोध्या कांड, कवितावली–उत्तरकांड
4.	सूर्यकांत त्रिपाठी निराला	:	रागविराग (संपादक–रामविलास शर्मा) राम की शक्तिपूजा और सरोज–स्मृति

5.	जयशंकर प्रसाद	:	कामायनी (चिंता, श्रद्धा और लज्जा सर्ग)
6.	रामधारी सिंह दिनकर	:	कुरूक्षेत्र

घ) गद्य कृतियाँ

1.	भारतेन्दु हरिशचन्द्र	:	भारत दुर्दशा
2.	जयशंकर प्रसाद	:	स्कन्दगुप्त
3.	मोहन राकेश	:	आषाढ़ का एक दिन
4.	प्रेमचन्द	:	गोदान
5.	फणीश्वरनाथ रेणु –	:	मैला आंचल
6.	प्रेमचन्द	:	मानसरोवर, भाग – 1
7.	रामचन्द्र शुक्ल	:	चिंतामणि, भाग – 1 (भाग और मनोविकार, श्रद्धा और भक्ति, लोभ और प्रीति, कविता क्या है, काव्य में लोकमंगल की साधनावस्था)

SUBJECT : ENGLISH LANGUAGE & LITERATURE

A. Detailed study of a literary age (19th century).

This part will cover the study of English literature from 1798 to 1900 with special reference to the works of Wordsworth. Coleridge, Shally, Keats, Lamb, Hazlitt, Thackeray, Dickens, Tennyson, Robert Browning Arnold, George Eliot, Caryle Ruskin, Pater.

B. Evidence of first – hand reading will be required. The questions will be designed to test not only the candidate's knowledge of the authors prescribed but also their understanding of the main literary trends during the period. Questions having a bearing on the social and cultural background of the period may be included.

C. This part will require first-hand reading of the texts prescribed and will be designed to test the candidate's critical ability.

1.	Shakespeare	:	As you like it; Henry IV Parts I, II : Hemlet, The Tempest.
2.	Milton	:	Paradise Lost.
3.	Jane Austen	:	Emma
4.	Wordsworths	:	The Prelude
5.	Dickens	:	David Copperfield.
6.	George Eliot	:	Middlemarch
7.	Hardy	:	Jude the Obscure.
8.	Yeats	:	Easter 1916.
	The Second coming	:	Byzantium.
	A Prayer for my Daughter	:	Leada and the Swan
	Sailing to Byzantium	:	Menu.
	The Tower: Among School Children:		Lapois Lazudili.
9.	Eliot	:	The Waste Land
10.	D.H. Lawrence	:	The Rainbow

विषय : संस्कृत शषा और साहित्य

(SANSKRIT LANGUAGE & LITERATURE)

1. संस्कृत भाषा का उद्‌भव और विकास (भारतीय यूरोपीय से मध्य भारतीय आर्य भाषाओं तक) केवल सामान्य रूप रेखा।
2. साहित्य के इतिहास का साधारा ज्ञान साहित्य समीक्षा के प्रमुख सिद्धान्त। महाकाव्य नाटक, गद्य काव्य, गीतिकाव्य और संग्रह–ग्रंथ आदि साहित्यिक विधाओं का उद्‌भव और विकास।
3. प्राचीन भारतीय संस्कृति और दर्शन जिसमें वर्णाश्रम व्यवस्था, संस्कार और प्रमुख दार्शनिक प्रवृत्तियों पर विशेष बल दिया जाए।
4. निम्नलिखित कृतियों का सामान्य अध्ययन
   - (क) काठोपनिषद्
   - (ख) भगवद्‌गीता
   - (ग) बुद्धचरितम (अश्वघोष)
   - (घ) स्वप्न बासवदत्तम्– (भाष)
   - (ड़) अभिज्ञानशाकुन्तलम् (कालिदास)
   - (च) मेघदूतम् (कालिदास)
   - (छ) रघुवंशम् (कालिदास)
   - (ज) कुमारसंभवम् (कालिदास)
   - (झ) मृच्छकटिकम् (शुदक)
   - (ञ) किराताजुनीयम (भारवि)
   - (ट) शिशुपाल वधम् (माध)
   - (ठ) उत्तर रामचरितम् (भवभूति)
   - (ड) मुद्राराक्षस (विशाखा दत्त)
   - (ढ़) नेषधवरितम् (श्रीहर्ष)
   - (ण) राज तरंगिणी (कल्हण)
   - (त) नीतिशतकम् (भतृहरि)
   - (थ) कादम्बरी (वाणभट्‌ट)
   - (द) हर्षचरितम् (वाणभट्‌ट)
   - (ध) दशंकुमारचरितम (दण्डी)
   - (न) प्रबोध चन्द्रोदयम् (कृप्ले मिश्र)
5. **चुनी हुई निम्नलिखित पाठ्य सामग्री के मौलिक अध्ययन का प्रमाणः–पाठ्यग्रन्थ :** केवल इन्ही ग्रंथों से प्रश्न पूछे जायेंगे।
   1. कठोपनिषद् एक अध्याय – तृत्तीय बल्ली (श्लोक 10 से 15 तक)।

2. भगवद्गीता अध्याय 2 (श्लोक 13 से 25 तक)।
3. बुद्धचरित तृतीय सर्ग (श्लोक 1 से 10 तक)।
4. स्वप्न वासवदत्तम् (पृष्ठ अंक)।
5. अभिज्ञान शाकुन्तलम् (चतुर्थ अंक)।
6. मेघदूतम् (प्रारंभिक श्लोक 1 से 10 तक)।
7. किंरतार्जुनीयम् (प्रथम सर्ग)।
8. उत्तर रामचरितम् (तृतीय अंक)।
9. नीतिशतकम् (श्लोक 1 से 10 तक)।
10. कादम्बरी (शुकनासोपपेश)।
11. कौटिल्य अर्थशास्त्र – प्रथम अधिकरण, प्रथम प्रकरण–दूसरा अध्याय शीर्षक विधासमृददेसाह, तत्र अनविकसिकी स्थापना तथा सातवाँ प्रकरण–ग्यारहवाँ अध्याय शीर्षक गू धूरशेत्पतिप निर्धारित संस्करण और पी कांगल कौटिल्य अर्थशास्त्र भाग (1) एक आलोचनात्मक संस्करण मोतीलाल बनारसी दास दिल्ली –1986)।

विषय : अर्थशास्त्र (ECONOMICS)

1. अर्थव्यवस्था का ढाँचा, राष्ट्रीय आय का लेखीकरण।
2. आर्थिक विकल्प (Economical Choice) – उपभोक्ता व्यवहार – उत्पादक व्यवहार और बाजार के रूप।
3. निवेश सम्बन्धी निर्णय तथा आय और रोजगार का निर्धारण–आय, वितरण और वृद्धि के समृद्ध आर्थिक प्रतिरूप।
4. बैंक व्यवस्था–योजनाबद्ध–विकासशील अर्थव्यवस्था के केन्द्रीय बैंक व्यवस्था के उद्देश्य और साधन तथा साख सम्बन्धी नीतियाँ। झारखण्ड के वाणिज्य बैंकों के क्रियाकलाप।
5. करों के प्रकार और अर्थव्यवस्था के बजटीय और राजकोषीय नीति के उद्देश्य और साधन।
6. अंतर्राष्ट्रीय व्यापार प्रशुल्क पद्धति, विनिमय दर, अदायगी शोध, अतंर्राष्ट्रीय मुद्रा व बैंक संस्थान।
7. भारतीय अर्थव्यवस्था, भारतीय अर्थ नीति के निदेशक सिद्धांत, योजनाबद्ध वृद्धि और वितरण न्याय–गरीबी का उन्मूलन। भारतीय अर्थव्यवस्था का संस्थागत ढाँचा–संघीय शासन संरचना–कृषि औद्योगिक क्षेत्र, सार्वजनिक और निजी क्षेत्र, राष्ट्रीय आय, उसका क्षेत्रीय और क्षेत्रीय वितरण कहाँ–कहाँ और कितनी।
8. कृषि उत्पादन–कृषि नीति–भूमि सुधार–प्रौधोगिकीय परिवर्त्तन–औद्योगिक क्षेत्र से सह–सम्बन्ध।
9. औद्योगिक उत्पादन–औद्योगिक नीति। सार्वजनिक और निजी क्षेत्र क्षेत्रीय वितरण–एकाधिकार प्रथा का नियंत्रण और एकाधिकार।
10. कृषि उत्पादों और औद्योगिक उत्पादों के मूल्य निर्धारण सम्बन्धी नीतियाँ अधिप्राप्ति और सार्वजनिक वितरण।

11. बजट की प्रवृत्तियाँ और राजकोषीय वितरण।

12. मुद्रा और साख प्रवृत्तियाँ और नीति–बैंक व्यवस्था और वित्तीय संस्थाएँ।

13. वदेशी व्यापार और अदायगी कोष।

14. भारतीय योजना–उद्देश्य, व्यूह, रचना अनुभव और समस्याएँ।

15. झारखण्ड की अर्थ व्यवस्था :– कृषि एवं उद्योग के सापेक्षिक स्थान, आर्थिक विकास के मार्ग की रूकावटें, गरीबी एवं बेरोजगारी, भूमि सुधार की प्रगति।

विषय : भूगोल (GEOGRAPHY)

1. प्राकृतिक भूगोल

क) **भू–आकृति** (**Geomorphology**)– पृथ्वी के पटल का उद्‌गम तथा विकास, पृथ्वी का संचलन तथा प्लेट विर्वतनिकी, ज्वालामुखी शैल–अपरदन चक्र डेविस तथा नवीन दिमनवीय शुष्क तथा कार्स्ट भू–आकृतियाँ पुनयूवीनत तथा बहुचक्रीय भू–आकृतियाँ।

ख) **जलवायु विज्ञान** (**Climatology**)– वायुमण्डल इसकी संरचना तथा संयोजन, वायु संह्तियाँ तथा सीमाग्र–चक्रवात तथा सम्बन्ध परिघटनाएँ–जलवायु वर्गीकरण कोपेन तथा थार्नवेट–भूजल तथा जल वैज्ञानिक चक्र।

ग) **मृदा तथा वनस्पति** (**Soils and Vegetations**)– मुद्रा उत्पत्ति वर्गीकरण तथा वितरण सवाना तथा मानसून वन जीवोमों के परिस्थितिक पहलू।

घ) **समुद्र विज्ञान** (**Oceanography**)– महासागर तल उच्चावच भारतीय महासागरीय तल का उच्चावच लवणता, धाराएँ तथा ज्वार, समुद्र निक्षेप तथा मूँग चट्‌टाने समु।

ड़) **परिस्थितिक** (**Ecosystem**)–तंत्र, परिस्थिति–तंत्र की संकल्पना, परिस्थिति तंत्र पर मनुष्य का प्रतिवात, विश्व की परिस्थिति का असन्तुलन, पर्यावरण प्रदूषण।

2. **मानव तथा आर्थिक भूगोल** (**Human and Economics Geography**)

क) **भौगोलिक चितंन का विकास** (**Development of Geographical Thought**)– यूरोपीय तथा ब्रिटिश भूगोलज्ञों का योगदान, नियतिवाद तथा सम्भावनावाद, भूगोल में मात्रात्मक तथा व्यवहारात्मक क्रांतियाँ।

ख) **मानव भूगोल** (**Human Geography**)– मानव तथा मानव प्रजातियों का अविर्भाव मानव का सांस्कृतिक विकास विश्व के प्रमुख सांस्कृतिक परिमण्डल–अतंर्राष्ट्रीय प्रवजन, अतीत और वर्तमान विश्व की जनसंख्या का वितरण तथा वृद्धि, जनसांख्यिकीय संक्रमण तथा विश्व जनसंख्या की समस्याएँ।

ग) **बस्ती भूगोल** (**Settlement Geography**)– ग्रामीण तथा नगरीय बस्तियों की संकल्पना, नगरीकरण का उद्‌भव–ग्रामीण बस्ती के प्रतिरूप, नगरीय वर्गीकरण–नगरीय प्रभाव के क्षेत्र तथा ग्रामीण नगरीय सीमान्त नगरों की आन्तरिक संरचना विश्व में नगरीय वृद्धि की समस्याएँ।

घ) **राजनीतिक भूगोल** (**Political Geography**)– राष्ट्र और राज्य की संकल्पनाएँ, सीमान्त सीमाएँ तथा वफर क्षेत्र, केन्द्र स्थल तथा उपांत स्थल की संकल्पना, संघवाद।

ड़) **आर्थिक भूगोल** (**Economic Geography**)– विश्व का आर्थिक विकास मापन तथा समस्याएँ, संसाधन की संकल्पना, विश्व संसाधन, उनका वितरण तथा विश्व समस्याएँ, विश्व ऊर्जा संकट, अभिवृद्धि की सीमाएँ, विश्व कृषि–प्ररूप विज्ञान तथा विश्व के कृषि–क्षेत्र, कृषि अवस्थिति का सिद्धान्त, विश्व उद्योग–उद्योगों की अवस्थिति का सिद्धान्त विश्व औद्योगिक नमूने तथा समस्याएँ, विश्व व्यापार सिद्धान्त एवम् उनके प्रमुख मार्ग।

3. भारत का भूगोल

क) **प्राकृतिक पहलू** (**Physical Aspects**)– भू वैज्ञानिक इतिहास, भू–प्राकृतिक विज्ञान और अपवाह तंत्र भारतीय मानसून का उद्‌गम और क्रियाविधि, मृदा और वनस्पति, भारत में मृदा अपरदन की समस्या एवं उनका निवारण।

ख) **मानवीय पहलू** (**Human Aspects**)– आदिवासी क्षेत्र तथा उनकी समस्याएँ, अन्तर्देशीय परिव्रजन, जनसंख्या वितरण संघनता और वृद्धि जनसंख्या की समस्याएँ तथा नीतियाँ।

ग) **साधन** (**Resources**)– भूमि, खनिज, जल जीववीय और समुद्री साधनों का संरक्षण और उपयोग, पर्यावरण–परिस्थितिक, समस्याएँ और उनका समाधान।

i) **कृषि** (**Agriculture**)– सिचांई फसलों की गहनता, फसलों का संयोजन, हरित क्रांति, भूमि प्रयोग सम्बन्धी नीति, ग्रामीण अर्थ–व्यवस्था–पशुपालन सामाजिक वानिकी और घरेलू उद्योग, भारत के कृषि जलवायु प्रदेश।

ii) **उद्योग** (**Idustrial**)– औद्योगिक विकास का इतिहास, स्थानीकरण कारक–खनिज आधारित, कृषि आधारित तथा वन आधारित उद्योगों का अध्ययन, औधोगिक नीति औधोगिक संकुल और औधोगिक क्षेत्रीकरण।

घ) **परिवहन और व्यापार** (**Transport and Trade**)– सड़कों रेलमार्गों तथा जलमार्गों की व्यवस्था का अध्ययन, अन्तर क्षेत्रीय व्यापार तथा गाँव के बाजार केन्द्रों की भूमिका।

ड़) **बस्तियाँ** (**Settlements**)– ग्रामीण बस्तियों की प्रतिरूप : भारत में नगरीय विकास तथा उनकी समस्याएँ, भारतीय नगरों की आंतरिक संरचना, नगर आयोजन, गंदी बस्तियों तथा नगरीय आवास राष्ट्रीय नगरीकरण नीति।

च) **क्षेत्रीय विकास तथा आयोजन** (**Regional Development and Planing**)– भारत की पंचवर्षीय योजना, बहुस्तरीय आयोजन राज्य जिला तथा खण्ड स्तरीय आयोजन, भारत में विकास के सम्बन्ध में क्षेत्रीय असमानताएँ।

4. झारखण्ड का भूगोल (Geography of Jharkhand)

क) प्राकृतिक विभाग, मृदा समूह, वन, जलवायु, सिचांई कृषि का प्रारूप, सूखा एवं सूखाग्रस्त क्षेत्रों की समस्याएँ एवं समाधान।

ख) **प्रमुख खनिज**–लोहा, ताम्बा, बाक्साइड, अभ्रक, कोयला।

ग) **प्रमुख उद्योग**–लोहा–इस्पात, सीमेंट, आल्यूमिनियम, इंजीनियरिंग, लाह एवं रेशम उद्योग, प्रमुख औद्योगिक क्षेत्र एवं औधोगिक विकास की सम्भावनाएँ।

घ) **झारखण्ड की जनसंख्या–** जनसंख्या वितरण एवं समस्याएँ, झारखण्ड की प्रमुख जनजातियों का अध्ययन, उनकी समस्याएँ एवं समाधान, नगरीकरण का प्रारूप।

5. विश्व का भूगोल

क) **वृहत् प्राकृतिक क्षेत्रः**— विशेषताएँ, आर्थिक आधार एवं मानव अनुकूलन।

ख) **विकसित देशों के क्षेत्रीय भूगोलः**— कनाडा, यू0एस0ए0, प0यूरोप, रूस, जापान, आस्ट्रेलिया एवं न्यूजीलैण्ड।

ग) **विकासशील देशों के क्षेत्रीय भूगोलः**— द0पू0 एशिया, द0प0एशिया, चीन, दक्षिण अफ्रीका एवं ब्राजील।

6. भौगोलिक विष्लेषण की तकनीकें

क) **मानचित्र**(Map) :— स्केल एवं प्रकार, उपयोग।

ख) **चित्र** (Diagrams):— प्रकार एवं उपयोग।

ग) **प्रक्षेपण**(Projections) :— प्रकार, विशेषताएँ एवं उपयोग।

घ) **दूरस्थ संवेदन एवं भौगोलिक सूचना प्रणाली** (GIS):— आकाशीय चित्र एवं कल्पना, जी0आई0एस0।

विषय : इतिहास (History)

Section-A

1. Sources and approaches to study of early Indian history.
2. Early pastoral and agricultural communities. The archaeological evidence.
3. The Indus Civilization; its origins, nature and decline.
4. Patterns of settlement, economy, social organization and religion in India (c. 2000 to 500 B.C.) : archaeological perspectives.
5. Evolution of north Indian society and culture: evidence of Vedic texts (Samhitas to Sutras).
6. Teachings of Mahavira and Buddha. Contemporary society, early phase of state formation and urbanization.
7. Rise of Magadha; the Mauryan empire. Ashoka‘s inscriptions; his dhamma nature of the Mauryan state.
8. Post-Mauryan period in northern and peninsular India; Political and administrative history, Society, economy, culture and religion. Tamilaham and its society; the Sangam texts.
9. **India in the Gupta and post-Gupta period (to c.750);** Political history of northern and peninsular India, Samanta system and changes in political structure; economy; social structure; culture; religion.
10. **Themes in early Indian cultural history;** languages and texts; major stages in the evolution of art and architecture, major philosophical thinkers and schools; ideas in science and mathematics.

Section-B

1. **India, 750-1200;** Polity, society and economy. Major dynasties and political structures in North India. Agrarian structures. : Indian feudalism; Rise of Rajputs. The Imperial Cholas and their contemporaries in Peninsular India. Village communities in the South. Conditions for women. Commerce mercantile groups and guilds; towns. Problem of coinage. Arab conquest of Sind; the Ghaznavide empire.

2. **India, 750-1200:** Culture, Literature, Kalhana, historian. Styles of temple architecture; sculpture. Religious thought and institutions; Sankaracharya's vedants. Ramanuja. Growth of Bhakti, Islam and its arrival in India. Sufism. Indian science. Alberuni and his study of Indian science and civilization.

3. The 13th Century. The Ghorian invasions. Factors behind Ghorian success. Economic social and cultural consequences. Foundation of Delhi Sultanate. The "Slave" Dynasty. Illtutmish; Balban. "The Khalji Revolution". Early Sultanate architecture.

4. The 14th Century. Alauddin Khalji's conquests; agrarian and economic measures. Muhammad Tughluq's concessions and public works. Decline of the Sultanate. Forcing contacts; Ibn Battuta.

5. Economy society and culture in the 13th and 14th centuries. Caste and slavery under sultanate. Technological changes. Sultanate architecture. (Persian literature: Amir Khusrau, Historiography; Ziya Barani, Evolution of a composite culture. Sufism in North India. Lingayats. Bhakti schools in the south.

6. The 15th and early 16th Century (Political History) Rise of Provincial Dynasties; Bengal, Kashmir (Zainul Abedin), Gujarat, Malwa, Bahmanids. The Vijayanagara Empire. Lodis, Mughal Empire. First phase: Babur, Humayun. The Sur Empire. Sher Shah's administration. The Portuguese colonial enterprise.

7. The 15th and early 16th Century (society, economy and culture). Regional cultures and literatures, provincial architectural styles. Society, culture, literature and the arts in Vijayanagara Empire. Monotheistic movements: Kabir and Guru Nanak. Bhakti Movements: Chaitanya. Sufism in its pantheistic phase.

8. **Akbar:** His conquests and consolidation of empire. Establishment of jagir and mansab systems. His Rajput policy. Evolution of religious and social outlook. Theory of Sulh-i-kul and religious policy. Abul Fazl. thinker and historian. Court patronage of art and technology.

9. Mughal empire in the 17th Century. Major policies (administrative and religious) of Jahangir. Shahjahan and Aurangzeb. The Empire and the Zamindars. nature of the Mughal state. Late 17th Century crisis : Revolts. The Ahom kingdom, Shivaji and the early maratha kingdom.

10. Economy and society, 16th and 17th Centuries. Population. Agricultural and craft production. Towns, commerce with Europe through Dutch, English and French companies - a "trade revolution". Indian mercantile classes, banking, insurance and credit systems. Conditions of peasants, famines. Condition of Women.

11. Culture during Mughal Empire. Persian literature (including historical works) Hindi and religious literatures. Mughal architecture. Mughal painting. Provincial schools of architecture and painting. Classical music. Science and technology. Sawai Jai Singh, astronomer. Mystic eclecticism: Dara Shukoh. Vaishnav Bhakti. Mahrasthra Dharma. Evolution of the Sikh community (Khalsa).

12. First half of 18th Century : Factors behind decline of the Mughal Empire The regional principalities (Nizam's Deccan, Bengal, Awadh). Rise of Maratha ascendancy under the Peshwas. The maratha fiscal and financial system. Emergency of Afghan Power. Panipat, 1761. Internal weakness political cultural and economic, on eye of the British conquest.

Section-C

1. Establishment of British rule in India : Factors behind British success against Indian powers-Mysore. Maratha Confederacy and the Punjab as major powers in resistance; Policy as subsidiary Alliance and Doctrine of Lapse.

2. Colonial Economy : Tribute system. Drain of wealth and "de-industrialisation', Fiscal pressures and revenue settlements (Zamindari, Ryotwari and Mahalwari settlements); Structure of the British raj up to 1857 (including the Acts of 1773 and 1784 and administrative organization).

3. Resistance to colonial rule : Early uprisings; Causes, nature and impact of the Revolt of 1857; Re-organisation of the Raj, 1858 and after.

4. Socio-cultural impact of colonial rule : Official social reform measures (1828-57); Orientalist-Anglicist controversy; coming of English education and the press; Christian missionary activities; Bengal Renaissance; Social and religious reform movements in Bengal and other areas; Women as focus of social reform.

5. Economy 1858-1914 : Railway; Commercialisation of Indian agriculture; Growth of landless labourers and rural indebtedness; Famines; India as market for British industry; Customs removal, exchange and countervailing excise; Limited growth of modern industry.

6. Early Indian **Nationalism :** Social background; Formation of national associations; Peasant and tribal uprising during the early nationalist era; Foundation of the Indian National Congress; The Moderate phase of the Congress; Growth of Extremism, The Indian Council Act of 1909; home Rule Movement; The Government of India Act of 1919.

7. Inter-War economy of India : Industries and problem of Protection; Agricultural distress; the Great Depression; Ottawa agreements and Discriminatory Protection; the growth of trade unions; The Kisan Movement; The economic programme of the Congress 'Karachi resolution, 1931'.

8. Nationalism under Gandhi's leadership: Gandhi's career, thought and methods of mass mobilization; Rowlatt Satyagraha, Khilafat-Non Co-operation Movement. Civil Disobedience Movement. 1940 Satyagraha and Quit India Movement, State People's Movement.

9. Other strands of the National Movement:

a) Revolutionary movements since 1905; (b) Constitutional politics; Swarajists. Liberals, Responsive Co-operation; (c) Ideas of Jawahar Lal Nehru, (d) The Left (Socialists and Communists); (e) Subhas Chandra Bose and the Indian National Army; (f) Communal strands: Muslim League and Hindu Mahasabha; (g) Women in the national movement.

10. Literary and cultural movements : Tagore, Premchand, Subramanya; Bharati, Iqbal as examples only; New trends in art; Film industry; Writers Organisations and Theatre Associations.

11. Towards Freedom : The Act of 1935; Congress Ministries, 1937-1939; The Pakistan Movement; Post- 1945 upsurge (RIN Mutiny, Telangana uprising etc.,); Constitutional negotiations and the Transfer of Power, 15 August 1947).

12. First phase of Independence (1947-64) : Facing the consequences of Partition; Gandhiji's murder; economic dislocation; Integration of States; The democratic constitution, 1950; Agrarian reforms; Building an industrial welfare state; Planning and industrialization; Foreign policy of Non-alignment; Relations with neighbours.

13. **Enlightenment and Modern ideas:**

1. Renaissance Background
2. Major Ideas of Enlightenment: Kant, Rousseau
3 Spread of Enlightenment outside Europe
4. Rise of socialist ideas (to Marx)

14. Origins of Modern Politics;

1. European States System
2. American Revolution and the Constitution.
3. French revolution and after math. 1789-1815.
4. British Democratic Politics, 1815-1850, Parliamentary Reformers, Free Traders, chartists.

15. Industrialization:

1. English Industrial Revolution : Causes and impact on Society
2. Industrialization in other countries; USA, Germany, Russia, Japan
3. Socialist Industrialization : Soviet and Chinese.

16. Nation-State System:

1. Rise of Nationalism in 19th century
2. Nationalism : state-building in Germany and Italy
3. Disintegration of Empires through the emergence of nationalities.

17. Imperialism and Colonialism:

1. Colonial System (Exploitation of New World, Trans-Atlantic Slave Trade, Tribute from Asian Conquests

2. Types of Empire; of settlement and non-settlement: Latin America, South Africa, Indonesia, Australia.

3. Imperialism and Free Trade ; The New Imperialism

18. Revolution and Counter-Revolution:

1. 19th Century European revolutions

2. The Russian Revolution of 1917-1921

3. Fascist Counter-Revolution, Italy and Germany.

4. The Chinese Revolution of 1949

19. World Wars:

1. 1st and 2nd World Wars as Total Wars: Societal Implications

2. World War I: Causes and Consequences

3. World War II: Political Consequence

20. Cold War:

1. Emergence of two Blocks

2. Integration of West Europe and US Strategy: Communist East Europe

3. Emergence of Third World and Non-Alignment

4. UN and Dispute Resolution

21. Colonial Liberation:

1. Latin America-Bolivar

2. Arab World-Egypt

3. Africa-Apartheid to Democracy

4. South-East Asia-Vietnam

22. Decolonization and Underdevelopment:

1. Decolonization : Break up of colonial Empires : British, French, Duth

2. Factors constraining Development: Latin America, Africa

23. Unification of Europe:

1. Post War Foundations : NATO and European Community

2. Consolidation and Expansion of European Community/European Union.

24. Soviet Disintegration and the Unipolar World:

1. Factors in the collapse of Soviet communism and the Soviet Union, 1985-1991

2. Political Changes in East Europe 1989-1992

3. End of the Cold War and US ascendance in the World

4. Globalization

विषय : भौतिक शास्त्र (Physics)

A. MECHANICS, THERMAL PHYSICS AND WAVES AND OSCILLATIONS

1. Mechanics : Conservation Laws, Collisions, impact parameter, scattering cross-section, centre of mass and lab systems with transformation of physical quantities, Rutherford Scattering. Motion of a rocket under constant force field. Rotating frames of reference, Coriolis force, Motion of rigid bodies, Angular momentum, Torque and procession of a top, Gyroscope, Central forces, Motion under inverse square law, Kepler's Laws, Motion of Satellites (including geostationary). Galilean Relativity, Special Theory of Relativity, Michelson-Morley Experiment, Lorentz Transformations - addition theorem of velocities, Variation of mass with, Velocity, Mass- Energy equivalence. Fluid dynamics, streamlines, 51emagnetiz, Bernoullis Equation with simple applications.

2. Thermal Physics : Laws of thermodynamics, Entropy, Carnot's cycle. Isothermal and Adiabatic Changes, Thermodynamic Potentials Maxwell's relations. The Clausius-Clapeyren equation reversible cell, Joule-Kelvin effect etc. fan Boltazmann Law, Kinetic Theory of Gases, Maxwell's Distribution Law of velocities, Equipartition of energy, Specific heats of gases. Mean Free path, Brownian Motion. Black Body radiation, specific heat of solid-Einstean & Dbye theories, wein's Law, Planck's Law. Solar Constant. Thermalionization and Stellar spectra-production of law temperatures using adiabatic 51emagnetization and dilution refrigeration, Concept of negative temperature.

3. Waves and Oscillations : Oscillations, Simplo harmonic motion, stationary and travelling waves, Damped harmonic motion. Forced oscillation & Resonance. Wave equation, Harmonic Solutions, Plane and Spherical waves. Superposition of waves, Phase and Group velocities, Beats Huygen's principle. Interference. Differaction-Fresnee and Fraunhofer. Diffraction by straight edge, Single and multiple slits, Resolving power of grating and Optical Istiments. Ravleigh Criterion. Polarization; Production and Detection of polarized light (linera. circular and elliptical). Laser sources (Helium-Neon, Ruby, and semiconductor diode). Concept of spatial and temporal coherence. Diffraction as a Fourier transformation. Fresnel and Fraunhofer diffraction by rectangular and circular apertures, Holography, theory and applications.

B. ELECTRICITY & MAGNETISM, MODERN PHYSICS AND ELECTRONICS

1. Electricity & Magnetism : Coulmb's Law, Electric field. Gauss's Law. Electric-potential, Possion and Laplace equations for a homogeneous dielectric, uncharged conducting Plane. Magnetic Shell Magnetic induction and field strength. Blot-Savart law and applications. Electro-magnetic induction, Faraday's Lenz's laws, Self and mutual inductances. Alternating currents. L.C.R circuits series and parallel resonance circuits, quality factor. Kirchoffs laws with application. Maxwell's equations and electromagnetic waves, Transverse nature of electromagnetic waves. Poynting vector, magnetic fields in matter—dia, para, ferro antiferro and ferri magnetism (qualitative approach only).

2. Modern Physics : Bohr's theory of hydrogen atom. Electron spin, Optical and X-ray Spectra. Stern- Gerlach experiment and spatial quantization. Vector model of the atom, spectral terms, fine structure of spectral lines. J-J and L-S coupling. Zeeman effect,

paull's exclusion principle, spectral terms of two equivalent and non-equivalent electrons. Gross and fine structure of electronic band Spectra. Raman effect Photoelectric effect. Compton effect, debroglie waves. Wave particle duality and uncertainty principle. Schrodinger wave equation with application to (i) particle in a box. (ii) motion across a step potential, One dimensional harmonic oscillator Eigen values and Eigen functions. Uncertainty Principle Radio activity, Alpha, beta and gamma radiations. Elementary theory of the alpha decay. Nuclear binding energy. Mass Spectroscopy, Semi empirical mass formula. Nuclear fission and fusion. Elementary Reactor physics. Elementary particles and their classification. Strong, and Weak Electromagnetic interactions. Particle accelerators ; Cyclotron. Linear accelerations, Elementary ideas of Super conductivity.

3. **Electronics :** Band theory of Solids : Conductors, insulators and semiconductors, Intrinsic and extrinsic semiconductors. P-N junction. Thermist of, Zenner diodes and transistors for rectification, amplification, oscillation modulation and detection of r.f. waves. Transistor receiver. Television Logic Gates.

विषय : रसायन शास्त्र (Chemistry)

1. **Atomic structure, Periodic properties and chemical bonding** — Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of Ψ and Ψ^2, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of S, p, and d orbitals, Aufbau and Pauli's exclusion principles, Hund's rule, electronic configuration classification of elements as s, p, d and f-blocks.

   Periodic tables and periodic properties (atomic and ionic radii, ionization energy, electron affinity, electro-negativity) and their trends in periodic table, Their applications in chemical bonding.

   Covalen bonding. V.B. Theory, VSEPR Theory, M O. Theory, homonuclear and heteronuclear diatomic molecules, bond order and magnetic properties.

   Resonance, hydrogen bonds and vimder Waals forces. Ionic solids - Born-Haber cycle, Fajaris rule.

2. **Gaseous states** — Postulates of kinetic theory of gases, deviation from ideal behavior of van der Waal's equation of state. Critical temperature, pressure and volume. Liquification of gases, Critical constants and vander Waals constants, the law of corresponding states, reduced equation of state Molecular velocities — r:m.s. velocity, average velocity, most probable velocity. Maxwell's distribution of molecular velocities.

3. **Solid State** — Space lattice, Unit cell. Laws of crystallography. X-ray diffraction by crystals. Bragg's equation coordination number radius ratio rule, detects in crystals and their magnetic and electric behavior semi-conductors and super conductors

4. **Thermodynamics** — Law of thermodynamics, work, heat, energy. State functions — E, H, S and G and their significance criteria for chemical equilibrium and spontaneity of reactions. Variations of free energy with T, P and V Gibbs Helmhotts equation. Entropy changes in gases for reversible and irreversible processes. Hess law Bond energy.

5. **Chemical kinetics and catalysis** — Order and molecularity, chemical kinetics and its scope, rate of a reaction, factors influencing rate of reaction. Rate equations of zero, first and second order reactions. Pseudo order, half life and mean life. Determination of order of reactions. Theories of chemical kinetics — collision theory, transition state theory, Arrhenius equation, concept of activation energy, effect of temperature on rate constant.

   Catalysis, characteristics of catalysed reactions, theories of catalysis, examples.

6. **Electrochemistry** — Electronic conduction in electrolytic solutions, specific, equivalents and molar conductance, effect of dilution on them, cell constant, experimental method of determining conductance.

   Migration of ions and Kohlrausch, law. Arrhenius theory of electorlytic dissociation and its limitations, weak and strong electrolytes Ostwald's dilution law, its uses and limitations Debye - Huckel Onsager's equation (elementary treatment) Transport number - definition, determination by Hittor method.

   Galvanic cells, electrodes and electrode reactions, Nernst equation, E.M.F. of cells, Hydrogen electrode, electrochemical series, concentration cell and their applications p^H. Buffer solutions theory of buffer action,

7. **Transition and inner transition metals and complexes** — General characteristics of d-block elements, co-ordination components - nomenclature, isomerism and bonding in complexes V.B. theory and crystal field theory. Werners theory, eAN metal carbonyls, cyclopentadienys, olefin and acetylene complexes.

   Compounds with metal-metal bonds and metal atom clusters.

   General chemistry of f-block elements Lanthanides and actinides - ionic radic, separation, oxidation states, magnetic and spectral properties.

8. **Non-aqueous solvents** — Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liqued NH3 and liquid SO_2.

9. **Photochemistry** — Interaction of radiation with matter, difference between thermal and photochemical processes. Lawa of photochemistry — Grothus-Drapper law, stark-Einstein law, Jablonski diagram. Fluerescence. phosphorescence, Quantum yield Photoelectric cells.

10. **Hard and soft arids and bases** — Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness, symbiosis, theoretical basis of hardness and softness, symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

11. **Structure and Binding** — Hybridization, bond lengths and bind angles bond energy, localized and delocalized chemical bond, van der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyperunjugation, aromaticity, inductive and field effects, hydrogen bonding.

12. **Mechanism of organic reactions** — Homolytic and heterolytic bond breaking, types of reagents - carbocations. and nucleophiles, types of organic reactions, Reactive

intermediates - Carbocations, carbanions, free radicals, carhbenes, arynes and nitrenes (with examples) Different types of addition, substitution and elimination reactions - SN^1, SN^2, SN^i, E_1, E_2, E_{1cb} etc.

13. **Stereochemistry of Organic Compounds** — Isomerism, Optical isomerism - elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity properties of enantiomers, chiral and achiral moleculers with tar stereogenic centres, diastereomers. threo and erythro diastereomers, meso compounds, resolution of enantiomers. inversion, retention and racemizarion.

    Relative and absolute configuration requence rule, D & L and R & S nomenclature.

    Geometric isomerism: Determination of configuration of geometric isomers - E & Z nomenclature, geometric isomerism ot oximes and alecyclic compounds. Configuration and confurmation, conformations of ethane, butane and cyclohexane.

14. **Organometallic Compounds** — Organometallic compounds of Mg. Li & Zn their formation, preparation, structure and systhetic applications.

15. **Organic Synthesis via enolates** — Acidity of **α**-llydrogens, preparation, properties and synthetic applications of diethyl malonate and eithyl acctoacetate, keto-enol tautomeins.

16. **Carbohydrates** — Classification and nomenclature Monosacharides, mechanism of asazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses and ketoses, Anomers and epimers Formation of glycosides, ethers and esters Ring structure of glucose and fructose mechanism of mutarotation.

17. **Polymers** — Addition or chain growth polymerization. Free radical vingt polymerization, ionic vingl polymerizations, Ziegler - Natta polymerization and vinigl polymers. Condensation or step-growth polymerization, Polyesters, polyamider, phenol-formaldelyde resins, urea-formaldelyde resins, epoxy.resins and polyurethanes.

    Natural and synthetic rubbers. Inorganic polymeric systems - silicones and phosphazenes, nature of bonding in triphosphazenes

18. **Study of following types of organic compounds:**

a. Alkanes and cycloalkanes — Preparation of alkanes - wartz reactions Kolbe reaction, Corey - House reaction etc physical and chemical properties, free-radical halogenation of alkanes - reactivity and selectivity.

    Cycloalkanes : Nomenclature, formation, properties - Baeger's strain theory

b. Alkenes, cyclocalkenes, Diencs & Alkynes — Mechanism of dehydration of alcohols, and delydrogenation of alkyl halides, regioselectivity in alcohol dehydration. The saytzeff rule, Hofmanu elimination Mechanisn involved in hydrogenation, electrophilic and free radical additions, markownikoffs rule, kharasch effect, hydroboration - oxidation, oxymercuration - reduction, Epoxidation, Ozonolysis, hydration, hydroxyltion and oxidation with KMnOu. Polymenization.

    Substitution at the allylic and vinylic positions of alkenes. Uses Dienes: Classificatin, preparation, properties Alkyness : Preparation, properties, acidic reactions of alkynes,

mechanism of electrophilic and nucleophilic addition reactions, hydroboration - oxidation, metal-ammonia reductins, oxidation and polymerization.

c. Arenes and Aromaticity — Aromaticity : The Huckel rule, arematic ions, M.O. diagram, anti-aromatic, Aromatic electrophilic substitution — Mechanism, role of **σ** and **π** complexes. Mechanism of nitration, halogenters sulphonation, mercuration and Friedel Crafts reaction. Energy profile diagram, activating and deactivating substituents, orientation, ortho-para ratio. Side-chain reactions of benzene derivatives. Birch reduction.

19. **Study of some reactions** — Pinacol - pinacotone rearrangement, aldol reaction, perkin reaction. Cannizzaro's reaction, Mannich reaction, Clemmensen reduction, claisen rearrangement, Peimer Tiemann reaction, Friedel crafts reaction, Fries rearrangement. Reformatsky reaction.

20. **Spectroscopy** — Basic principles of the following type of spectroscopy and their applications in determining structures.

a. UV - Visible spectroscopy

b. IR - "

c. NMR - "

d. Mass - "

e. ESR - "(cemplexes)

SUBJECT : MATHEMATICS

1. **Linear Algebra**: Vector space, Linear dependence and independence, Subspace, bases, dimension, Finite dimensional vector spaces.

   Matrices: Cayley- Hamilton theorem, eigenvalues and Eigen vectors, matrix of transformation, row and colum reduction, echelon form, rank, equivalence, congruence and similarity. Reduction to canonical forms. Orthogonal and unitary reduction of quadratic and hermitian forms, positive definite quadratic forms.

2. **Calculus** : Real numbers, bounded sets, open and closed sets, real, sequences, limits, continuity, differenticibility, mean value theorems, Taylor's theorem with remainders, indeterminate form, maxima and minima, asymptotes, functions of several variables, continuity, differentiability, partial deriavatives, maxima and minima, Lagranges methods of multipliers, jacobian, Raimann's definition of definite integrals. Indefinite integrals, infinite & improper integrals, beta & beta gamma functions, double and tripe integrals (evaluation techniques only), areas, surface and volumes, centre of gravity.

3. **Analytic geometry**: Cartesian and polar co-ordinates in two and three dimensions, second degree equations in two and three dimensions, reduction to canonical forms, straight lines, shortest distance between two skew lines plane, sphere, cone, cylinder, paraboloid, ellipsoid, hyperboloid of one and two sheets and their properties.

4. **Ordinary differential equations**: Formulation of differential equation, order and degree, equations of first order and first degree, integrating factors, equations of first order but not of first degree, calariaut's equation, singular solution.

Higher order linear equations with constant coefficients, complementary functions and particular integrals, general solution, Euler-Cauchy equation.

Second order linear equations with variable coefficients, determination of complete solution when one solution is known, method of variation of parameters.

5. **Dynamics, Statics and Hydrostatics**: Degree of freedom and constraints, rectilinear motion, simple harmonic motion, motion in a plane projectile, constrained motion, work and energy, conservation of energy, motion under impulsive forces, kepler's law, orbit under central forces, motion of varying mass, motion under resistance.

   Equilibrium of a system of particles, work and potential energy, friction, common catenary, principle of virtual work, stability of equilibrium, equilibrium of forces in three dimensions.

   Pressure of heavy fluids, equilibrium of fluids under a given system of forces, Bernoulli's equation, center of pressure, thrust on curved surfaces, equilibrium of floating bodies, stability of equilibrium, metacenter, pressure of gases.

6. **Vector analysis**: Scalar and vector fields, triple products, differentiation of vector function of scalar variable, gradient, divergence and curl in Cartesian, cylindrical and spherical co-ordinates and their physical interpretation. Higher order derivatives, vector identities and vector equations.

   Application to geometry: Curves in spaces, curvature and torsion, Serret-Frenet formulae Gauss and Stoke's theorem, Green's identities.

7. **Algebra**: Groups, Sub groups, normal subgroups, homomorphism of groups, quotient groups basic isomorphism theorem, Sylow's theorem, permutation groups, Cayley theorem. Rings and ideals, principal ideal Domains, Unique Factorisation Domains and Euclidean Domains, and Euclidean Domains, field extensions, finite fields.

8. **Complex Analysis**: Analytic function, Cauchy-Riemann equations, Cauchy's theorem Cauchy's integral formula, power series, taylor's series, Laurent's series, Singularities, Cauchy Rasidue theorem, Contour integration, Conformal mapping, Bilinear transformation.

9. **Operations Research**: Linear programming problems, basic solution, basic feasible solution and optimal solution. Graphical method and simplex method of solution, Duality, Transportation and assignment problems.

   Analysis of steady state and transient solution for queueing system with poisson arrivals and exponential service time.

   Deterministic replacement models, sequencing problem with two machines and n jobs, 3 machines and n jobs (special case).

10. **Mathematical Modeling**

   (a) Difference and differential equation growth models: Single species population models, Population growth an age structure model. The spread of technological innovation.

   (b) Higher order linear models - A Model for the detection of diabetes.

(c) Nonlinear population growth models: prey- predator models, Epidemic growth models.

(d) An Application in environment: Urban wastes water management planning models.

(e) Models from political science: Proportional representation (cumulative and comparison voting) models.

11. **Partial differential equations**: Curves and surfaces in three dimensions, formulation of partial differential equations, solutions of equations, solutions of equation of type dx/P=dy/Q=dz/R; orthogonal trajectories, pfaffian differential equations, partial differential equations of the first order, solution by Cauchy's method of characteristics, charpit's method of solution, linear partial differential equations of the second order with constant coefficients, equations of vibrating string, heat equation, Laplace equations.

12. **Probability**: Notion of probability: Random experiment, Sample space, axioms of probability, Elementary properties of probability, equally likely outcome problems.

Random variables: Concept, cumulative distribution function, discrete and continuous random variables, expectations, mean, variance, moment generating function.

Discrete distribution: Binomial, geometric, poisson.

Continuous distribution: Uniform, Exonential, Normal, Conditional probability, and conditional expectation, Bayes theorem, independence, computing expectation by conditioning.

Bivariate random variables: Joint distribution, Joint and Conditional distributions.

Functions of random variables: Sum of random variables, the law of large number and central limit theorem, approximation of distributions.

13. **Mechanics and fluid dynamics**: Generalised co- ordinates, holonomic and non-holonomic systems D'Alembert's principle and Langrage's equation, Hamilton equations, moment of inertia, motion of rigid bodies in two dimensions.

Equation of continuity, Euler's equations of motion for inviscid flow, stream-lines, path of a particle, potential flow. Two dimensional and axisymytric motion, sources and sinks, votex motion, flow past a cylinder and a sphere, method of images, Navier- Stocke's equation, for a viscous fluid.

14. **Discrete Mathematics**: Introduction to graph theory: graphs and degree sum theorem, connected graph, bi-partite graphs, trees, Eulerian and Hammiltonian graph, plane graph and Euler's theorem, planar graphs, 5-color theorem, marriage theorem.

15. **Logic** : Logical connectives negation, quantifiers, compound statement, Truth table, Tautologies, Boolean algebra- Lattices, geometrical lattices and algebraic structures, duality, distributive and complemented lattices, boolean lattices and boolean algebras, boolean functions and expressions, design and implementation of digital networks, switching circuits.

SUBJECT : COMMERCE

1. Accounting, Auditing and taxation

a) **Accounting as a financial information system-** Impact of behavioral sciences-Methods of accounting of changing price levels with particulars reference to current Purchasing Power (CPP) accounting Advanced problems of company accounts- Amalgamation absorption and reconstruction of companies- Accounting of holding companies-Valuation of shares and goodwill. Controllership functions-property control legal and management.

b) **Important provisions of the Income Tax Act. 1961-** Definition – charge of Income tax – Exemptions Depreciation and Investment allowance-Simple problems of computation of income under the various heads and determination of assessable income – Income tax authorities.

c) **Nature and functions of Cost Accounting** – Cost classification – Techniques of segregating semi-variable costs into fixed and variable components – Job costing – FIFO and weighted average methods or calculating equivalent units of production – Reconciliation of cost and financial accounts – Marginal Costing – Cost-volume- profit relationship; Algebraic formulae and graphical representation-Shut-down point-Techniques of cost control and cost reduction-Budgetary control-flexible Budget – Standard costing and variance analysis responsibility accounting-Bases of charging overheads and their inherent fallacy costing for pricing decisions .

d) **Significance of the attest function-** Programming the audit-works-Valuation and verification of assets, fixed, wasting and current assets – Verification of liabilities – Audit of limited companies – appointment status, power, duties and liabilities of the auditor – Auditor's report-Audit of share capital and transfer of shares – Special point in the audit of banking and insurance companies.

2. BUSINESS FINANCE AND FINANCIAL INSTITUTIONS.

a) Concept and scope of Financial Management: Financial goals of corporations – Capital budgeting; Rules of the thumb and Discounted cash flow approaches – Incorporating uncertainty in investment decisions – Designing an optimal capital structure – Weighted average cost of capital and the controversy surrounding the Modigliani and miller model, sources – of raising short-term, intermediate and long-term finance – Role of public and convertible debentures – Norms and guidelines regarding debt-equity rations, - Determinants of an optimal dividend policy-optimizing models of James E.walter and John Lintner-Forms of dividend payment – Structure of working capital and the variable affecting the level of difference of components – Cash flow approach of forecasting working capital needs – Profiles of working capital in Indian industries – Credit management and credit policy – Consideration to tax in relation to financial planning and cash flow statements.

b) **Organisation and deficiencies of Indian money Market structure of assets and liabilities of commercial banks** – Achievements and failures of nationalisation – Regional rural banks – Recommendations of the Tandon (P.L.) study group on following

of bank credit, 1976 and their revision by the chore (K.B.), committee, 1979 – An assessment of the monetary and credit policies of the Reserve bank of India – Constituents of the Indian Capital Market – Functions and working of All India term Financial institutions (IDBI, IFCI, ICICI, and IRCI) – Investment policies of the Life Insurance corporation of India and the Unit Trust of India – Present state of stock exchanges and their regulation.

c) **Provision of the Negotiable Instruments Act, 1881.**

d) **Crossings and endorsements with particular reference to statutory protection to the paying and collecting bankers –** Salient Provision of the Banking Regulation Act, 1949 with regard to chartering, supervision and regulation of banks.

3. **Organization Theory and Industrial Relations.**

a) ORGANISATION THEORY:

i) **Nature and concept of organization**: Organization goals Primary and secondary goals Single and Multiple goals, ends – means chain-Displacement, succession, expansion and multiplication of goals – Formal organization: Type, Structure-Line and Staff, functional matrix, and project – Informal organization – functions and limitations.

ii) **Evolution of organisation theory**: (classical, Neo-classical and system approach – Bureaucracy Nature and basis of power, sources of power, power structure and politics-Organisation behaviour as a dynamic system: technical social and power systems interrelations and interactions – Perception-Status system: Theoretical and empirical foundations of Maslow, Megergore, Horzberg, Likert, Vroom, porter and Lawler, Odam and Human Models of motivation. Morale and productivity- Leadership; Theories and styles- Management of Conflicts in organization – Transactional Analysis – Significance of culture to organisatons. Limits of rationality simon- March approach. Organisation change, adaptation, growth and development-Organisation control and effectiveness.

4. INDUSTRIAL RELATIONS:

Nature and scope of industrial relations, Industrial labour in India and its commitment – Theories of unionism- Trade union movement in India – Growth and structure-Role of outside leadership-Workers education and other problems-Collective bargaining-approaches conditions, limitation and its effectiveness in Indian conditions-Workers participation in management: philosophy, rational, present day state of affairs and its future prospects.

Prevention and settlement of industrial disputes in India: preventive measures, settlement machinery and other measures in practice- industrial relations in public enterprises- Absenteeism and labour turn-over International Labour Organisation and India- Role of personnel department in the organization- Executive development, personnel policies, personnel audit and personnel research.

SUBJECT : BIOLOGY

PART (A) - ZOOLOGY

A general survey, Classification and relationship of the various phyla.

Protozoa: Study of the structure, bionomica and life history of paramaecium, Monocyotis, malarial parasite, Trypanosoma and Leishmania.

Locomotion, nutrition and reproduction in protozoa.

Porifera : Canal system, skeleton and reproduction.

Coelenterata: Structure and life history of Obelia and Aurelia, polymorphism in hydrozoa, coral formation, metagenesis, phylogenetic relationship fo Cinidaria & Acnidaria.

Helminths: Structure and life history of planaria, Fasciola, Taenia & Ascaris. Parastic adaptation, Helminths in relation to man.

Anneliada : Nereis, earthworm and leech: coelom & metamerism: modes of life in polychactes.

Arthopoda: Palemon Scorpion, Cockroach, larval forms and parasitism in Crustacea, mouth part vision and respiration in arthropods, social life and metamorphosis in insects. Importance of peripatus.

Mollusea, unio Pila, Oyster culture and pearl formation, cephalopods, Torsion and Detorsion in Gastropada.

Echinodermata: General organization, larval forms and affinities of Echinodermata.

General organization and characters, outline classification and inter-relationship of protochordata, pisces, Amphibia, Reptillia, Aves and mammalia.

Neoteny and retrogressive metamorphosis.

A general study of comparative account of the various systems of vertebrates.

Pisces : Locomotion, migration and respiration in fishes: structure and affinities Dipnoi

Ambhibia: Origin o Amphibia; distribution, anatomical peculiarities and affinities of urodela and Apoda parental Care.

Reptiles: Origin of Reptiles; adaptise radiation in reptiles. Fossil reptiles; poisonous & non poisonous snakes of India; poison apparatus of snake.

Aves: Origin of birds; flightless birds; aerial adaptation and migration of birds.

Origin of mammals; homologies of ear ossicles in mammals; dentition and phylogenetic relations of protothria and Mehtatheria. Endicrine glands (Pituitary, thyroid, Parathyroid, Adrenal, Pancreas, Gonads).

Comparative anatomy of various system of vertebrates (Integument, Heart, Aortic, Arches, Kidney, Brain)

Environment : Abiotic factors and their role; Biotic factors – Intra and inter-specific relations. Biogeochemical Cycles, green house effect, ozone depletion, Eco logical succession, Biomes ecotones.

Animal : Organisation at population and community levels, ecological successions.

Ecosystem: Concept, components, fundamental operation, energy flow, biogeo-chemical cycles food chain and tophic levels.

Adaptation in fresh water, marine and terrestrial habitats.

Pollution in air, water and land.

Wild life in India and its conservation.

Sustainable production in agriculture, Integrated Pest manager.

Ethology-

General survey of various types of animal behaviour.

Role of harmones and pheromones in behavior.

Biological clock, seasonal rhythms, tidal, seasonal and circadian rhythm.

Neuro-endocrine control of behaviour.

Methods of studying animals behaviour.

Biostatistics-

Methods of sampling, frequency distribution and measures of central tendency. Standard deviation, standard error and standard deviance, correction and regression and chi-square and f-test, student t-test.

Economics Zoology-

Parasitism, commensalism & host parasite relationship.

Parasitic protozoans, helminthis and insects of man and domestic animals.

Insect pests of crops and stored products.

Benefical insects.

Pisciculture and induced breeding, Apiculture, sericulture, Lac culture, pearl culture, prawn culture.

Cell Biology Genetics, Evolution & Systematics.

Cell Biology- Structure and function of cell and cytoplasmic constituents; structure of nucleus, Plasma membrane, mitochondria golgibodies, endo-plasmic reticulum and ribosomes, cell division; mitotic spindle and chromosome movements and meiosis.

Genetics- Gene structure and function; Watson- Crick model of DNA, replication of DNA Genetic code; protein synthesis cell differentiation; sexchomosomes and sex determination.

Mendelian laws of inheritance recombinations, linkage and linkage maps, multiple, allels; mutation (natural and induced), mutation and evolution, meiosis, chromosome number and from, structural rearrangements; polyploidy; cytoplasmic inheritance, regulation of gene expression in Prokaryotes and eukaryotes; biochemical genetics, elements of human genetics; normal and abnormal karyotypes; genes and diseases. Eugenics, DNA- finger printing.

Evolution and Systematic- Origin of life, history of evolutionary thought Lamarck and his works. Darwin and his works, sources and nature of organic variation, Natural selection, hardy-weinberg law, cryptic and warning colouration mimicry; Isolation mechanisms and their role. Insular fauna. Concept of species and sub- species, principles of classification, phylogeny of

horse, elephant, camel, origin and evolution of man, principles and theories of continental distribution of animals, zoogeographical realms of the world.

Bio-Chemistry, Physiology and Embryology- Biochemistry: Structure of carbohydrates, lipids, aminoacids, proteins, and nueleic acids, glycolysis and krebs cycle, oxidation and reduction, oxidative phosphorylation, energy conservation and release, ATP, cyclic AMP, saturated and unsaturated fatty acids, cholesterol, streroid, hormones; Types of enzymes, mechanism of enzyme action, immunoglobulius and immunity, vitamins and coenzymes; Hormone, their classification, biosynthesis & functions.

Physiology with special reference to mammals; composition of blood, blood groups in man coagulation, oxygen and carbondioxide transport, hemoglobin, breathing and its regulation; nephron and urine formation, acid-base balance and homeostasis, temperature regulation in man, mechanism of conduction along axon and across synapes, neurotransmitters, vision, hearing and other receptors; types of muscles, ultra structures and mechanism of contraction of skeltal, muscle; role of salivary gland, liver, pancreas, and intestinal glands, indigestion, absorption of degested food, nutrition and balanced diot of man mechanism of action of steroid and peptide hormones, role of hypo-thalamus, pituitary thyroid, parathyroid, pancreas, adrenal, testis, ovary and pineal organs and their inter-relationships, physiology of reproduction in humans, hormonal control of development in man and insects, pheromones in insects.

Embryology: Gametogenesis, fertilization, types of eggs, cleavage, development upto gastrulating in branchiostoma, frog and chick; Fate maps of frog and chick; Metamorphosis in frog; Formation and fate of extra embryonic membranes in chick; Types of placenta in mammals, function of placenta in mammals; organisers. Regeneration, genetic control of development. Organogenesis of central nervous system, sense organs heart and kidney of vertebrate embryos. Aging and its implication in relation to man. Invastiveness of polacenta, in vitro fertilization, embryo transfer, cloning.

SUBJECT : BIOLOGY

PART (B) - BOTANY

1. **Microbiology and Plant Pathology**: Viruses, bacteria, Plasmids: Structure and reproduction. General account of infection, phytoimmunology. Application of microbes in agriculture, industry, medicine and pollution control in air, soil and water. Important plant diseases in India with special reference to Jharkhand State caused by virus, bacteria, mycoplasma and fungi. Mode of infection and dissemination. Physiology of parasitism and methods of control. Myco-toxin.

2. **Cryptogams**: Range of structure and reproduction, and evolutionary aspects. Ecology and economic importance of algae, fungi bryophytes and pteridophytes.

3. **Phanerogams**: Anatomy: meristem and secondary growth. Embryology: Micro-and megasporogenesis, fertilization, endosperm, apomixis and polyembryony. Palynology and its application. Comparison of the system of classification of angiosperms. Modern trends in bio-systematics. Taxonomic and economic importance of Cycadaceae, Pinaceae, Gnetaceae, Magnoliaceae, Ranunculaceae, Brassicaceaae, Rosaceaae, Leguminosae,

Euphorbiaceae, Malvaceae, Dipterocarpaceae, Umbelliferae, Asclepiadaceae, Verbenaceae, Solanaceae, Rubiaceae, Cucurbitaceae, Asteraceae, Poaceae, Arecaceae (Palmae) Liliaceae, Musaceaae and Orchidaceae.

4. **Plant Utility and Exploitation**: Origin of cultivated plants. Study of plant as a source of food, fodder, forage, fatty oils, wood and timber, fibre, paper, rubber, beverage, alcohol, drugs, narcotics, resin and gums, essential oils, dyes, mucilage, insecticides and pesticides, plant indicators, ornamentation; and energy plantation with special knowledge about the conservation of forests of Jharkhand.

5. **Morphogenesis**: Polarity, symmetry, Plant tissue culture technique, differentiation and dedifferentiation of cells and organs, totipotency. Factors of morphogenesis. Protoplast culture and somatic hybridization. Applications of protoplast cell, tissue and organ culture.

6. **Cell Biology**: General knowledge of modern tools and techniques in the study of cytology. Prokaryotic and eukaryotic cell-ultra-structure details. Function of the organelles including membranes. Detailed studies of cell division-Mitosis and Meiosis. Numerical and structural variation in chromosomes and its significance. Study of polytene and lampbrush chromosome-structure, behaviour, cytological significance.

7. **Genetics and Evolution**: Development of genetics, gene concept. Mendelism, post-mendelian development, Structure and role of nucleic acids. Genetic code and regulation of gene expression. Mutation and evolution, Polyploidy and its role in evolution and plant breeding. Multiple factors, linkage and crossing over, Gene mapping, Sex chromosome and sex-linked inheritance. Male Sterility, its significance in plant breeding. Cytoplasmic inheritance, Elements of human genetics. Transgenesis, genetic engineering, organic evolution-evidences, mechanism and theories. Plant genetic resources and their conservation.

8. **Physiology and Biochemistry**: Detailed studies of plant, soil, and water relations. Mineral nutrition and ion transport. Mineral deficiences. Photosynthesis. mechanism and importance. Photosystem I and II, photorespiration. Respiration and fermentation. Nitrogen fixation and nitrogen metabolism. Protein synthesis. Enzymes, importance of secondary metabolites. Phytochromes. Physiology of flowering. Growth substances, their chemical nature and application in agriculture and horticulture. Agrochemicals. Stress physiology, dormancy, storage and germination of seeds.

9. **Ecology**: Ecological factors, concepts and dynamics of community. Plant succession. Concept of biosphere, Conservation of ecosystem. Pollution and its control. Forest types of India. Afforestation, deforestation, social forestry, and endangered endemic plant with special reference to Jharkhand.

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(परीक्षा नियंत्रक)