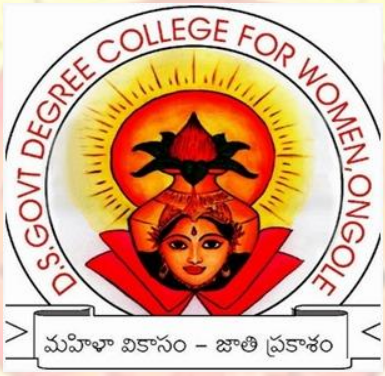
CO – PO MAPPING

FOR

B.Sc. (CHEMISTRY)

(W.E.F 2020-21)



DEPARTMENT OF CHEMISTRY

D. S. GOVT. DEGREE COLLEGE (W), ONGOLE.

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Vision

To become a centre of educational excellence for empowering women in different fields of life by realising their capabilities so that they can take their rightful place in the society.

Mission

- To inculcate the spirit of quality in higher education.
- To trigger skills related to education and life.
- To enhance physical wellbeing.
- To promote social awareness and community service.
- To enlighten women empowerment.
- To Inculcate values for betterment of women.
- To train the students for academic competition.

DEPARTMENT OF CHEMISTRY

B.Sc(CHEMISTRY)

VISION: It is the mission of the department to give young women with access to an education of sufficient caliber so that they may participate in the growth and development of the nation. In addition to our focus on imparting theoretical information, we make it a point to give our students real-world experience in order to better equip them to shape their own lives and the world around them.

MISSION: The mission of the Chemistry Department is to support other academic programs in the college by providing quality chemistry learning experiences, building proactive partnerships with industry, and providing efficient training as well as educational and technical services to society. This will be accomplished within an environment that is innovative and intellectually stimulating.

DEPARTMENT OF CHEMISTRY
B.Sc (BZC & AZC)
PROGRAMME OUTCOMES

PO1. Acquire a comprehensive understanding of domain-specific knowledge and demonstrate their acquired skills effectively during practical transactions within the specific domain.

PO2. Demonstrate proficient analytical and problem-solving skills through the application of critical thinking strategies to address real-world situations effectively.

PO3. Master effective communication, collaborate skilfully with diverse stakeholders, nurture meaningful dialogues, build strong professional bonds in and beyond college.

PO4. Exhibit proficiency in ethically using information from diverse sources, analysing and synthesizing data effectively for real-world research.

PO5. Exemplify ethical standards in personal and professional contexts, appreciate diverse cultures, evaluate social responsibility's impact on well-being, and advocate for women students' betterment.

PO6 . Actively promote social awareness through community service, contributing to a more inclusive and compassionate global community.

PO7. Embrace continuous learning, create professional growth chances, and prioritize personality development and physical well-being for a holistic approach.

PO8. Foster self-confidence, advocate women empowerment, demonstrate expertise for growth in studies, employment, and entrepreneurship, creating a brighter and equitable future.

BOTANY ZOOLOGY CHEMISTRY

PROGRAM SPECIFIC OUTCOMES

PSO 1: Comprehensive Knowledge

- Graduates will demonstrate a deep understanding of Botany, Zoology, and Chemistry principles, fostering interdisciplinary competence.

PSO 2: Research Proficiency

- Graduates will excel in designing and conducting interdisciplinary research projects across the three disciplines.

PSO 3: Environmental Stewardship

- Graduates will address ecological and environmental challenges with sustainable solutions, considering human impacts.

PSO 4: Practical Competence

- Graduates will master laboratory, fieldwork, and data analysis techniques in Botany, Zoology, and Chemistry.

PSO 5: Effective Communication and Ethics

- Graduates will communicate scientific findings effectively and uphold ethical standards in research and practice.

SEM 1 Paper-I
COURSE CODE: CHE1SK
COURSE NAME: Inorganic &Physical Chemistry

CO1: Students will understand the preparation, structures, and applications of p-block elements including Diborane, Borazine, silicones, Phosphonitrilic halides, oxides and oxoacids of Sulphur, Pseudohalogens, and Interhalogen compounds.

1. **Remember (Knowledge):** Recall the preparation methods of p-block elements like Diborane, Borazine, silicones, Phosphonitrilic halides, and Interhalogen compounds.
2. **Understand (Comprehension):** Explain the structural differences between the various p-block elements and their relevance to their properties.
3. **Apply (Application):** Use your understanding of p-block elements to predict how they might react under specific conditions.
4. **Evaluate (Evaluation):** Assess the effectiveness of different preparation methods for specific applications of p-block elements, considering factors like yield, cost, and environmental impact.

CO2:Students will grasp the characteristics of d-block elements, their electronic configurations, magnetic properties, and ability to form complexes. They'll also comprehend the electronic structure, lanthanide contraction, and differences between lanthanides and actinides. Bonding theories like Valence Bond theory, Free Electron theory, and Band theory will be understood.

1. **Remember (Knowledge):** Recall the electronic configurations and magnetic properties of d-block elements.
2. **Understand (Comprehension):** Explain how the concept of lanthanide contraction influences the properties of lanthanides and actinides.
3. **Apply (Application):** Apply your knowledge of bonding theories to predict the behavior of d-block elements in complex formation.
4. **Analyze (Analysis):** Analyze the factors contributing to the stability of different oxidation states in d-block elements and compare the properties of lanthanides and actinides.

CO3: Students will master concepts such as crystal symmetry, lattice structures, X-ray diffraction, and defects in crystals. They'll explain gas behavior, van der Waal's equation, critical phenomena, and liquid crystal phases. They'll also understand solutions, azeotropes, ionic equilibrium, and colligative properties including RLVP, osmotic pressure, and freezing point depression.

1. **Remembering (Knowledge):** Recall definitions of solids, liquids, and gases, and their intermolecular interactions.
2. **Understanding (Comprehension):** Understand solids have strong forces, fixed shape, and volume. Liquids flow due to weaker forces and take the container's shape. Gases, with weak forces, expand to fill containers.
3. **Applying (Application):** Predict state changes based on temperature. Connect intermolecular forces to state transitions. Apply pressure's impact on gases.
4. **Analyzing (Analysis):** Compare intermolecular forces across states. Analyze state shifts considering intermolecular interactions. Examine particle arrangement influenced by force strength.

CO. No.	Upon the successful completion of the course, students will be able to	POs mapped	Cognitive Level
CO - 1	Understand the preparation, structures, and applications of p-block elements including Diborane, Borazine, silicones, Phosphonitrilic halides, oxides and oxoacids of Sulphur, Pseudohalogens, and Interhalogen compounds.	PO1, PO2, PO3, PO4, PO5	L1, L2, L3, L5
CO - 2	grasp the characteristics of d-block elements, their electronic configurations, magnetic properties, and ability to form complexes. They'll also comprehend the electronic structure, lanthanide contraction, and differences between lanthanides and actinides. Bonding theories like Valence Bond theory, Free Electron theory, and Band theory will be understood.	PO1, PO2, PO3, PO4,	L1, L2, L4, L6
CO - 3	master concepts such as crystal symmetry, lattice structures, X-ray diffraction, and defects in crystals. They'll explain gas behavior, van der Waal's equation, critical phenomena, and liquid crystal phases. They'll also understand solutions, azeotropes, ionic equilibrium, and colligative properties including RLVP, osmotic pressure, and freezing point depression.	PO1, PO2, PO3, PO4, PO7	L1, L2, L3, L4

CO	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	1	1	1
CO2	3	3	3	3	1	1	1	1
CO3	3	3	3	3	1	1	3	1

SEM 1I Paper-II
COURSE CODE: CHE2SK
COURSE NAME: Organic & General Chemistry

CO1: Understand the fundamentals of organic chemistry, covering hydrocarbons, isomerism, and reactions like free radical substitutions and electrophilic aromatic substitution.

1. **Remember (Knowledge):** Recall key principles of organic chemistry, like hydrocarbons and isomerism.
2. **Understand (Comprehension):** Explain the mechanisms involved in free radical substitutions and how isomerism affects properties.
3. **Analyze (Analysis):** Examine complex organic structures and propose reaction pathways considering multiple factors.
4. **Evaluate (Evaluation):** Assess the effectiveness of different reaction mechanisms and strategies in specific contexts.

CO2: Comprehend chemical bonding theories such as Valence Bond theory and Molecular Orbital theory. Describe the properties of colloids and the principles of adsorption. Apply the HSAB principle to analyze bonding in various combinations.

1. **Remember (Knowledge):** Recall bonding theories such as Valence Bond theory and Molecular Orbital theory.
2. **Apply (Application):** Utilize the HSAB principle to predict and analyze bonding in various combinations.
3. **Analyze (Analysis):** Examine complex chemical structures and deduce the most appropriate bonding theories for their explanation.
4. **Evaluate (Evaluation):** Assess the suitability of different adsorption processes in specific chemical applications.

CO3: Explore stereochemistry, chirality, and different types of isomers. Define enantiomers, diastereomers, and configurations (D,L, R,S, E,Z) with practical examples. Explain techniques to separate racemic mixtures.

1. **Remember (Knowledge):** Recall definitions related to stereochemistry, including chirality and enantiomers.
2. **Understand (Comprehension):** Explain the concept of optical activity and its connection to specific rotation.
3. **Apply (Application):** Utilize stereochemistry principles to classify chiral molecules and determine their configurations.
4. **Create (Synthesis):** Devise innovative strategies for synthesizing optically pure compounds through advanced stereochemical control.

CO. No.	Upon the successful completion of the course, students will be able to	POs mapped	Cognitive Level
CO - 1	Understand the fundamentals of organic chemistry, covering hydrocarbons, isomerism, and reactions like free radical substitutions and electrophilic aromatic substitution.	PO1, PO2, PO4, PO7	L1, L2, L3, L5

CO - 2	Comprehend chemical bonding theories such as Valence Bond theory and Molecular Orbital theory. Describe the properties of colloids and the principles of adsorption. Apply the HSAB principle to analyze bonding in various combinations	PO1, PO2, PO4, PO7	L1, L3, L4, L5
CO - 3	Explore stereochemistry, chirality, and different types of isomers. Define enantiomers, diastereomers, and configurations (D,L, R,S, E,Z) with practical examples. Explain techniques to separate racemic mixtures.	PO1, PO2, PO3, PO4, PO5, PO7, PO8	L1, L2, L3, L6

CO	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	3	1	1	3	1
CO2	3	3	1	3	1	1	3	1
CO3	3	3	3	3	3	1	3	3

SEM 1II Paper-III
COURSE CODE: CHE3SK
COURSE NAME: ORGANICCHEMISTRY&SPECTROSCOPY

CO1: Understand the chemistry of halogenated hydrocarbons, including methods of preparation, properties, and nucleophilic substitution reactions. Comprehend the preparation, properties, and relative reactivity of alcohols and phenols, as well as important rearrangements and reductions.

1. **Remember**: Recall the methods of preparation for halogenated hydrocarbons and identify their properties.
2. **Understand**: Explain the mechanisms of nucleophilic substitution reactions (SN1, SN2, SNi) and analyze their stereochemical aspects.
3. **Apply**: Apply the principles of relative reactivity to predict the outcome of nucleophilic substitution reactions in various halide compounds.
4. **Evaluate**: Assess the suitability of different nucleophilic substitution mechanisms based on reaction conditions and solvent effects.

CO2: Comprehend the structure, reactivity, preparation, and properties of carbonyl compounds. Apply mechanisms of various carbonyl reactions, including condensations, reductions, and additions. Understand α-substitution reactions and their significance.

1. **Remember**: Recall the preparation methods and properties of carbonyl compounds.
2. **Understand**: Explain the mechanisms of nucleophilic additions and addition-elimination reactions with ammonia derivatives.
3. **Apply**: Apply the knowledge of carbonyl reactions to predict product formation in various reactions, such as condensations, reductions, and additions.
4. **Create**: Devise novel synthetic routes using carbonyl compounds and design experiments to synthesize specific products.

CO3: Master the preparation, properties, and reactions of carboxylic acids and their derivatives. Analyze reactions of acid chlorides, anhydrides, esters, and amides. Understand the principles of molecular spectroscopy, including rotation, vibration, and electronic spectra.

1. **Remember**: Recall the general methods of preparation and typical reactions of carboxylic acids.
2. **Understand**: Explain the mechanisms of reactions involving carboxylic acid derivatives, including esterification and hydrolysis.
3. **Apply**: Apply knowledge of carboxylic acid reactions to predict product formation and understand degradation reactions.
4. **Evaluate**: Evaluate the efficiency of different synthetic pathways for carboxylic acid derivatives and propose improvements.

CO. No.	Upon the successful completion of the course, students will be able to	POs mapped	Cognitive Level
CO - 1	Understand the chemistry of halogenated hydrocarbons, including methods of preparation, properties, and nucleophilic substitution reactions. Comprehend the preparation, properties, and relative reactivity of alcohols and	PO1, PO2	L1, L2, L3, L5

	phenols, as well as important rearrangements and reductions.		
CO - 2	Comprehend the structure, reactivity, preparation, and properties of carbonyl compounds. Apply mechanisms of various carbonyl reactions, including condensations, reductions, and additions. Understand α-substitution reactions and their significance.	PO1, PO2, PO4,	L1, L2, L3, L6
CO - 3	Master the preparation, properties, and reactions of carboxylic acids and their derivatives. Analyze reactions of acid chlorides, anhydrides, esters, and amides. Understand the principles of molecular spectroscopy, including rotation, vibration, and electronic spectra.	PO1, PO2, PO4, PO8	L1, L2, L3, L5

CO	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	1	1	1	1	1
CO2	3	3	1	3	1	1	1	1
CO3	3	3	1	3	1	1	1	3

SEM IV - Paper IV
COURSE CODE: CHE4SKA
COURSE NAME: INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

CO1: Understand organometallic compounds and nitrogen-containing functional groups. Explore their properties, reactions, and synthesis methods. Study photochemistry and thermodynamics, including laws and spectroscopy techniques.

1. **Remember**: Recall the properties and classifications of organometallic compounds and nitrogen-containing functional groups.
2. **Understand**: Explain the principles and mechanisms behind the reactions of organometallic compounds and nitrogen-containing functional groups.
3. **Analyze**: Examine the relationships between reactants, products, and reaction conditions in organometallic and nitrogen-containing functional group reactions.
4. **Evaluate**: Critically assess the suitability and efficiency of different synthetic routes involving organometallic compounds and nitrogen-containing functional groups for specific chemical transformations.

CO2: Learn about carbohydrates, amino acids, and proteins, including their structures, properties, and reactions. Gain knowledge of heterocyclic compounds and their significance.

1. **Remember**: Recall the structures and properties of carbohydrates, amino acids, and proteins.
2. **Understand**: Explain the roles and functions of carbohydrates, amino acids, and proteins in biological systems.
3. **Analyze**: Investigate the interactions and biochemical pathways involving carbohydrates, amino acids, and proteins to understand their contributions to cellular processes.
4. **Create**: Develop hypotheses or models to explain complex biochemical processes and propose new experiments or studies to investigate these processes further.

CO3: Explore molecular spectroscopy, including its principles and applications. Understand photochemical processes, laws of photochemistry, and thermodynamics concepts.

1. **Remember**: Recall the fundamental principles and laws governing spectroscopy and thermodynamics.
2. **Understand**: Explain the relationships between molecular properties and spectroscopic data, as well as the implications of thermodynamic principles on chemical processes.
3. **Analyze**: Examine spectroscopic data to deduce molecular structures and use thermodynamic concepts to predict reaction outcomes.
4. **Evaluate**: Critically evaluate the reliability of spectroscopic data and the thermodynamic feasibility of chemical reactions, considering experimental conditions and limitations.

CO. No.	Upon the successful completion of the course, students will be able to	POs mapped	Cognitive Level
CO - 1	Understand organometallic compounds and nitrogen-containing functional groups. Explore	PO1, PO2, PO4	L1, L2, L4, L5

	their properties, reactions, and synthesis methods. Study photochemistry and thermodynamics, including laws and spectroscopy techniques.		
CO - 2	Learn about carbohydrates, amino acids, and proteins, including their structures, properties, and reactions. Gain knowledge of heterocyclic compounds and their significance.	PO1, PO2, PO5	L1, L2, L4, L6
CO - 3	Explore molecular spectroscopy, including its principles and applications. Understand photochemical processes, laws of photochemistry, and thermodynamics concepts.	PO1, PO2, PO4, PO7	L1, L2, L4, L5

CO	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	3	1	1	1	1
CO2	3	3	1	1	3	1	1	1
CO3	3	3	1	3	1	1	3	1

SEM IV - Paper V
COURSE CODE: CHE4SKB
COURSE NAME: INORGANIC &PHYSICAL CHEMISTRY

CO1: Understand coordination compound nomenclature. Explain structural and stereoisomerism. Grasp Valence Bond Theory (VBT) and its limitations.

1. **Remember**: Recall the rules for coordination compound nomenclature.
2. **Understand**: Explain the principles behind coordination compound naming conventions.
3. **Apply**: Use nomenclature rules to name coordination compounds correctly.
4. **Analyze**: Differentiate between coordination compounds based on their nomenclature, identifying isomers and stereochemistry.

CO2: Describe inorganic reaction mechanisms. Analyze ligand substitution reactions and trans-effect. Explore factors affecting metal complex stability and their applications.

1. **Remember**: Recall basic information about inorganic reaction mechanisms.
2. **Understand**: Explain the fundamental concepts of inorganic reaction mechanisms.
3. **Analyze**: Analyze different types of ligand substitution reactions and their mechanisms.
4. **Evaluate**: Evaluate the factors influencing metal complex stability and assess their practical applications.

CO3: Explain the Phase Rule and phase diagrams. Understand conductance, Debye-Huckel-Onsagar's equation, and kinetics. Comprehend reaction rates, order, integrated rate equations, and activation energy.

1. **Remember**: Recall the Phase Rule and its components.
2. **Understand**: Explain the Phase Rule's principles and its relevance to phase diagrams.
3. **Apply**: Apply the Phase Rule to interpret phase diagrams of different systems.
4. **Create**: Develop phase diagrams for specific systems based on the Phase Rule.

CO. No.	**Upon the successful completion of the course, students will be able to**	**POs mapped**	**Cognitive Level**
CO - 1	Understand coordination compound nomenclature. Explain structural and stereoisomerism. Grasp Valence Bond Theory (VBT) and its limitations.	PO1, PO2, PO4, PO7	L1, L2, L3, L4
CO - 2	Describe inorganic reaction mechanisms. Analyze ligand substitution reactions and trans-effect. Explore factors affecting metal complex stability and their applications.	PO1, PO2, PO3, PO4	L1, L2, L4, L5
CO - 3	Explain the Phase Rule and phase diagrams. Understand conductance, Debye-Huckel-Onsagar's equation, and kinetics. Comprehend reaction rates, order, integrated rate equations, and activation energy.	PO1, PO2, PO3, PO4, PO7	L1, L2, L3, L6

CO	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	3	1	1	3	1
CO2	3	3	3	3	1	1	1	1
CO3	3	3	3	3	1	1	3	1

SEM V - Paper VI
COURSE CODE: CHE5SKG
COURSE NAME: Course6-D: Environmental Chemistry

CO1: Grasp the fundamentals of environmental chemistry. Recognize human activities' impact on the environment. Differentiate between renewable and nonrenewable resources.

1. **Remember:** Recall the key concepts and definitions related to environmental chemistry.
2. **Understand:** Explain the impact of human activities on the environment and its various segments.
3. **Apply:** Apply environmental knowledge to differentiate between renewable and nonrenewable resources.
4. **Analyze:** Analyze the consequences of specific human activities on the environment, considering both natural resources and pollutants.

CO2: Analyze air and water pollution sources and their effects. Evaluate methods to monitor and control pollution. Assess the toxic effects of chemicals in the environment.

1. **Remember:** Recall the major sources of air and water pollution.
2. **Understand:** Explain the effects of different types of pollution on the environment, including climate change and toxic emissions.
3. **Apply:** Apply knowledge of pollution sources to evaluate and suggest methods for monitoring and controlling pollution.
4. **Evaluate:** Assess the effectiveness of pollution control methods and propose improvements as needed.

CO3: Evaluate ecosystem structures and functions. Examine energy flow and biogeochemical cycles. Analyze biodiversity levels and their significance.

1. **Remember:** Recall the basic components and functions of ecosystems.
2. **Understand:** Explain the concepts of energy flow, trophic levels, and biogeochemical cycles in ecosystems.
3. **Apply:** Apply knowledge of ecosystem structures and functions to evaluate the ecological impact of specific scenarios.
4. **Create:** Develop strategies to preserve and enhance biodiversity at different levels, considering local, national, and global contexts.

CO. No.	Upon the successful completion of the course, students will be able to	POs mapped	Cognitive Level
CO - 1	Grasp the fundamentals of environmental chemistry. Recognize human activities' impact on the environment. Differentiate between renewable and nonrenewable resources.	PO1, PO4,	L1, L2, L3, L4
CO - 2	Analyze air and water pollution sources and their effects. Evaluate methods to monitor and control pollution. Assess the toxic effects of chemicals in the environment.	PO2, PO4	L1, L2, L3, L5

CO - 3	Evaluate ecosystem structures and functions. Examine energy flow and biogeochemical cycles. Analyze biodiversity levels and their significance.	PO1, PO2, PO4, PO6	L1, L2, L3, L6

CO	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	1	3	1	1	1	1
CO2	1	3	1	3	1	1	1	1
CO3	3	3	1	3	1	3	1	1

SEM V - Paper VII
COURSE CODE: CHE5SKH
COURSE NAME: Course7- D: Green Chemistry and Nanotechnology

CO1: Define green chemistry and its importance. Explain the principles and goals of green chemistry. Evaluate the "greenness" and atom economy of various reactions.

1. **Remember**: Define green chemistry and its importance.
2. **Understand**: Explain the principles and goals of green chemistry.
3. **Apply**: Evaluate the "greenness" and atom economy of various reactions.
4. **Analyze**: Compare the environmental impact of different chemical processes.

CO2: Select appropriate solvents, including aqueous phases, ionic liquids, and solid-supported synthesis. Describe the uses and benefits of supercritical CO2. Utilize microwave and ultrasound-assisted methods for green synthesis.

1. **Remember**: Recall various solvents used in green chemistry.
2. **Understand**: Describe the uses and benefits of supercritical CO2 in green synthesis.
3. **Apply**: Utilize appropriate solvents, such as aqueous phases, ionic liquids, and solid-supported synthesis, in practical scenarios.
4. **Analyze**: Assess the efficiency and sustainability of green synthesis methods.

CO3: Define nanoscience and nanotechnology. Compare bottom-up and top-down approaches in nanomaterial synthesis. Discuss the properties, synthesis, and applications of nanoparticles in green chemistry.

1. **Understand**: Differentiate between bottom-up and top-down approaches in nanomaterial synthesis.
2. **Apply**: Discuss the properties and applications of nanoparticles in green chemistry.
3. **Evaluate**: Evaluate the environmental implications of using nanotechnology in green chemistry.
4. **Create**: Propose innovative ways to integrate nanotechnology for greener chemical processes.

CO. No.	Upon the successful completion of the course, students will be able to	POs mapped	Cognitive Level
CO - 1	Define green chemistry and its importance. Explain the principles and goals of green chemistry. Evaluate the "greenness" and atom economy of various reactions.	PO1, PO2, PO4, PO8.	L1, L2, L3, L4
CO - 2	Select appropriate solvents, including aqueous phases, ionic liquids, and solid-supported synthesis. Describe the uses and benefits of supercritical CO2. Utilize microwave and ultrasound-assisted methods for green synthesis.	PO1, PO2, PO8.	L1, L2, L3, L4

CO - 3	Define nanoscience and nanotechnology. Compare bottom-up and top-down approaches in nanomaterial synthesis. Discuss the properties, synthesis, and applications of nanoparticles in green chemistry.	PO1, PO2, PO4, PO8.	L2, L3, L5, L6

CO	PO							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	3	1	1	1	3
CO2	3	3	1	1	1	1	1	3
CO3	3	3	1	3	1	1	1	3