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CSS Past Papers

Subject: Chemistry

Year: 2019

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FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2019
FOR RECRUITMENT TO POSTS IN BS-17
UNDER THE FEDERAL GOVERNMENT

Roll Number

CHEMISTRY, PAPER-I

TIME ALLOWED: THREE HOURS	**PART-I (MCQS) MAXIMUM MARKS = 20**
PART-I(MCQS): MAXIMUM 30 MINUTES	**PART-II MAXIMUM MARKS = 80**

NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**
(ii) Attempt **ONLY FOUR** questions from **PART-II**. **ALL** questions carry **EQUAL** marks.
(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the question will not be considered.
(vii) **Use of calculator is allowed.**

PART-II

Q. 2.	**(a)**	Describe the assumption of Bohr's atomic model. Based on Bohr's calculation, establish the energy expression of the rotation of electrons in Hydrogen like atomic species.	(8)	
	(b)	Derive de-Broglie's equation for the dual nature of matter. Apply this equation for microscopic and macroscopic properties of substances.	(6)	
	(c)	What are the postulates of Quantum Mechanics?	(6)	**(20)**
Q. 3.	**(a)**	What is Third law of thermodynamics? How it is used to determine the entropies of substance.	(7)	
	(b)	Discuss the isothermal expansion of a gas and derive the equation for the work done due to expansion of a gas.	(7)	
	(c)	Explain the law of corresponding states.	(6)	**(20)**
Q. 4.	**(a)**	Deduce the rate expression for 2^{nd} order reaction where both the concentration terms are same. What is the half-life period for the 2nd order reaction?	(10)	
	(b)	What is activation energy? How it can be determined?	(5)	
	(c)	Write a note on Transition state theory of reaction rates.	(5)	**(20)**
Q. 5.	**(a)**	Develop a relation among phase, component and degree of Freedom. Draw a complete diagram for water system.	(10)	
	(b)	What is catalysis? Differentiate between positive and negative catalysis.	(6)	
	(c)	What is stoichiometry? Explain it with help of examples.	(4)	**(20)**
Q. 6.	**(a)**	State and explain Lowry-Bronsted theory and Lewis theory of acids and bases. In what way Lewis theory differs from Bronsted theory.	(8)	
	(b)	Explain with the help of examples why pH of a buffer solution does not change significantly on small addition of acids and bases.	(6)	
	(c)	What are indicators? How a suitable indicator can be chosen? Discuss.	(6)	**(20)**
Q. 7.	**(a)**	Give an account of phenomena of isomerism in co-ordination compound with suitable example.	(8)	
	(b)	Describe the extraction of thorium from mozite sand.	(6)	
	(c)	Compare the properties of lanthanides and actinides?	(6)	**(20)**
Q. 8.	**(a)**	Explain Kohlrausch's Law? Give its applications.	(7)	
	(b)	What is meant by transport number of ions? Give different methods for determination of transport number.	(7)	
	(c)	What is specific conductance? How it can be determined by using Wheatstone bridge?	(6)	**(20)**

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CHEMISTRY, PAPER-II

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PART-I(MCQS): MAXIMUM 30 MINUTES	**PART-II MAXIMUM MARKS = 80**

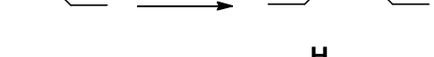
NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**
(ii) Attempt **ONLY FOUR** questions from **PART-II**. **ALL** questions carry **EQUAL** marks.
(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the question will not be considered.
(vii) **Use of Calculator is allowed.**

PART – II

Q. No. 2. **(a)** Elaborate the optical isomerism with appropriate examples. (10)
(b) Express the resolution and its applications. (5)
(c) Explain the geometric isomerism in cyclic compounds. (5) **(20)**

Q. No. 3. **(a)** Prepare a plausible synthesis for each of the following transformation: (12)

A.



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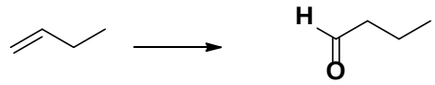

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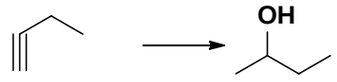

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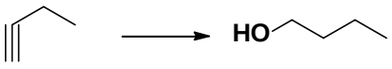

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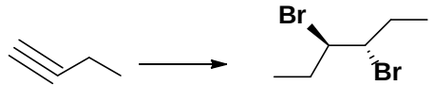

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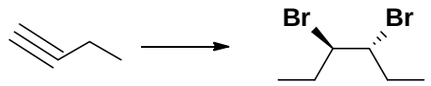

(b) Explain the type of hybridization in 1,3-Butadiene. (4)
(c) Mention any three methods for preparation of Alkynes. (4) **(20)**

Q. No. 4. **(a)** Describe the necessary conditions and reagents required to convert benzene into the following. (8)
Nitrobenzene, Ethyl benzene, cyclohexane, Benz-aldehyde, Benzoic acid, and Chlorobenzene.
(b) Draw all possible structures of aromatic compounds with the formula C_9H_{12} containing the benzene ring. (6)
(c) How do you account for the fact that phenol is more easily attacked by electrophiles than nitrobenzene? (6) **(20)**

Q. No. 5. **(a)** Outline stepwise reaction mechanism for the following reactions: (8)
(i) SN1 reaction between bromoethane and NaOH.
(ii) SN2 reaction between 2-chloro-2-methyl propane and NaCN.
(b) Discuss the various factors, nature of substrate, solvent, catalyst, and the leaving group in SN2 reaction. (8)
(c) How does methyl iodide react with the following reagents? (4) **(20)**
Acetic acid, Mg, Alcoholic KOH and Na.

CHEMISTRY, PAPER-B

Q. No. 6.	**(a)**	Describe two methods for preparation of salicylic acid? How would you convert it into (a) Phenol, (b) Salol, (c) Benzoic acid and (d) Aspirin? Give its at least two medicinal uses.	(10)	
	(b)	How will you obtain the following from suitable mono carboxylic acid? (a) Iso-butane (b) Butanone (c) Benzamide (d) Propionaldehyde.	(6)	
	(c)	Describe the mechanism of esterification of an acid.	(4)	**(20)**
Q. No. 7.	**(a)**	An unknown substance shows a molecular ion peak at m/z=170 with a relative intensity of 100.The M+1 peak has relative intensity of 13.2 and the M+2 peak has an intensity of 1.00. What is the molecular formula for this substance?	(10)	
	(b)	Mention the various tools to interpret the mass spectra.	(5)	
	(c)	What is the nitrogen rule? Explain it with suitable examples.	(5)	**(20)**
Q. No. 8.	**(a)**	Elucidate the various steps involved in Glycolysis.	(12)	
	(b)	Express the role of ATP in Glycolysis.	(4)	
	(c)	Describe the pathway that leads to the formation of Lactic acid.	(4)	**(20)**

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