FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2017
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) Candidate must 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 attempted question will not be considered.
(vii) **Use of Calculator is allowed.**

PART-II

Q. No. 2.	**(a)**	Derive Schrodinger wave equation for motion of a particle in one dimensional box.	**(10)**
	(b)	Solve Schrodinger wave equation to find the expression for wave function energy of a particle in one dimensional box.	**(6)**
	(c)	What is Eigen function and Eigen value? Give examples.	**(4)**
Q. No. 3.	**(a)**	Define heat capacities and molar heat capacities. Prove that C_p-C_v=R for ideal gases.	**(10)**
	(b)	What is Gibbs energy? Derive a relation between standard Gibbs energy change and equilibrium constant.	**(6)**
	(c)	Differentiate spontaneous and non spontaneous process.	**(4)**
Q. No. 4.	**(a)**	State and explain Kohlrausch's law. Give its applications.	**(10)**
	(b)	What is meant by standard deviation? Give its significance in analytical chemistry.	**(6)**
	(c)	Briefly describe conductometric titrations.	**(4)**
Q. No. 5.	**(a)**	Discuss the effect of temperature on rate of chemical reaction on the basis of Arrhenius equation. How can you determine activation energy and pre-exponential factor for a chemical reaction using Arrhenius equation?	**(10)**
	(b)	Derive kinetic equation for 1^{st} order reaction.	**(6)**
	(c)	Prove that half life period for 1^{st} order reaction is independent of initial concentration of reactant.	**(4)**
Q. No. 6.	**(a)**	What is adsorption isotherm? Derive Langmuir adsorption isotherm for adsorption of a gas on solid surface.	**(10)**
	(b)	What is enzyme catalysis? Discuss its kinetics.	**(6)**
	(c)	What are surfactants? Give their properties.	**(4)**
Q. No. 7.	**(a)**	What is electrophoresis? Give its principle and discuss its applications in biochemistry.	**(10)**
	(b)	Give six chemical properties of nitrogen.	**(6)**
	(c)	What is Common ions effect? Give its applications.	**(4)**
Q. No. 8.	**(a)**	State John-Teller theorem. Explain it using suitable examples from coordination complexes.	**(10)**
	(b)	Give postulates of Werner's theory of coordination complexes.	**(6)**
	(c)	Briefly describe nuclear decay rate law for disintegration of radioactive elements.	**(4)**

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Roll Number

CHEMISTRY PAPER-II

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) Candidate must 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 attempted question will not be considered.
(vii) **Use of Calculator is allowed.**

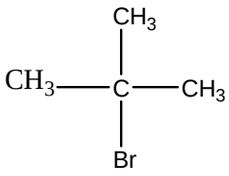
PART-II

Q. No. 2. Write brief notes on the following **(2 each)** **(20)**

(i) Covalent Bond (ii) Hybridization (iii) Isomerism
(iv) Monosaccharides (v) Triglycerides (vi) Electronegativity
(vii) The Inductive Effect (viii) Chemical Shift (ix) Stereoselectivity
(x) Fertilizers

Q. No. 3. **(a)** Give the method of synthesis of the following compounds from an appropriate alkene of your choice with reagents. **(12)**

(i)



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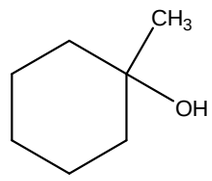

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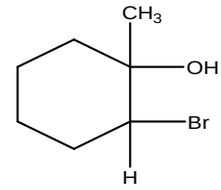

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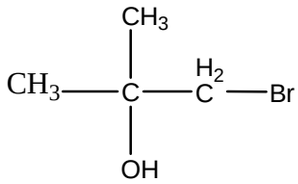

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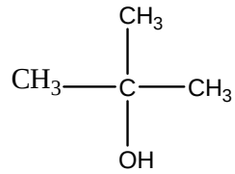

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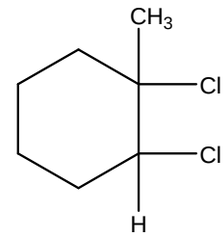
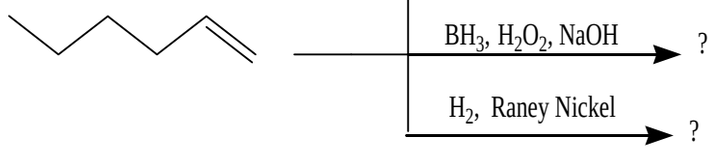


(b) Write the Major product for these Reactions. **(8)**

1.



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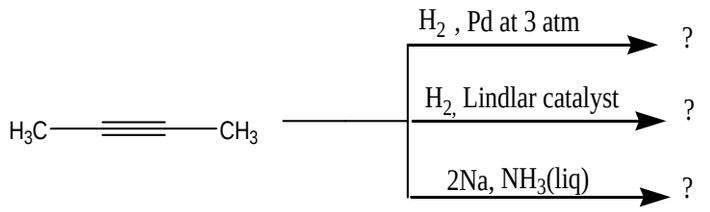

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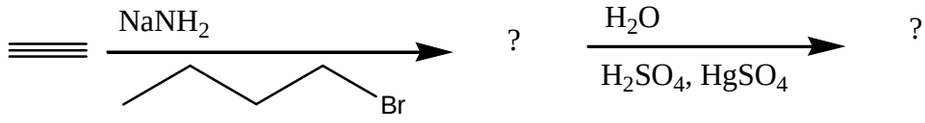
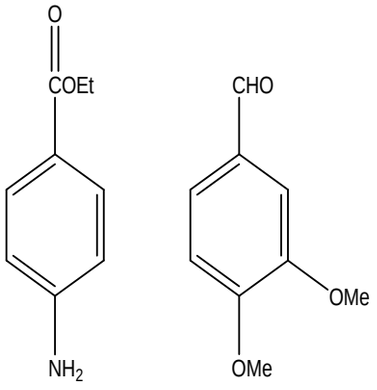


CHEMISTRY PAPER-II

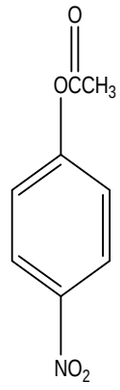
Q. No. 4. **(a)** What is aromaticity? Explain the Hückel criteria for aromaticity. **(6)**

(b) Write names of the following compounds. **(4)**



A

B



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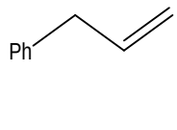
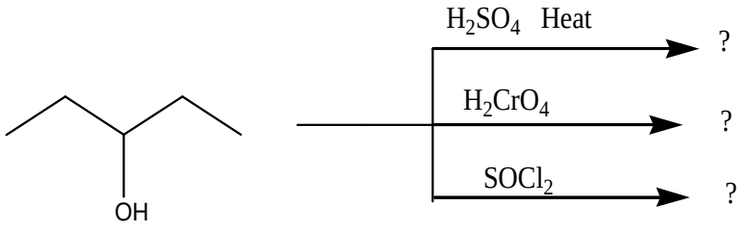


D

(c) Write the reaction and mechanism of Friedel Craft alkylation and acylation reaction. **(10)**

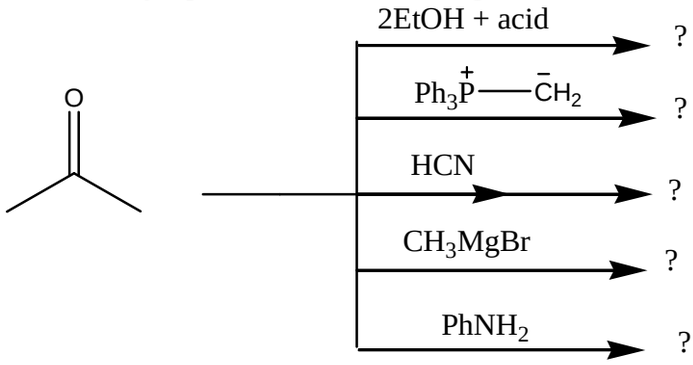
Q. No. 5. **(a)** What is Grignard reagent? What are its applications? How would you prepare Grignard reagent starting from an alkyl halide of your choice. **(8)**

(b) Give the Product of the following reactions: **(3)**



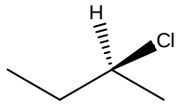
(c) Give the IUPAC nomenclature of Aldehydes and Ketones. **(4)**

(d) Give the major products of the following reactions. **(5)**

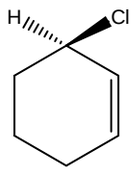


Q. No. 6. **(a)** What is stereoisomerism? Give an account of different types of stereoisomerism. **(5)**

(b) Assign an R or S configuration to the chiral center in each molecule. **(9)**



I



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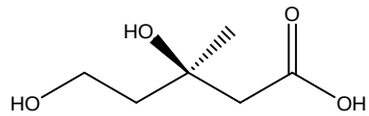
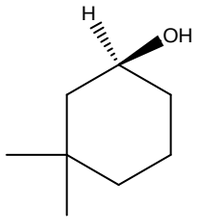


III



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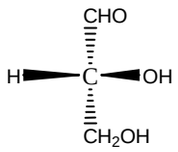
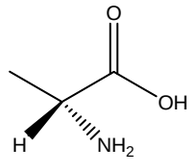
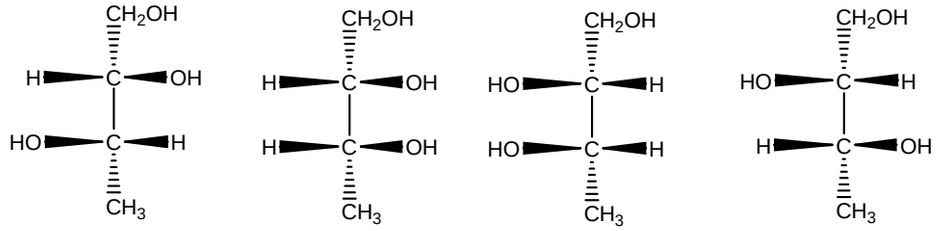


V



VI

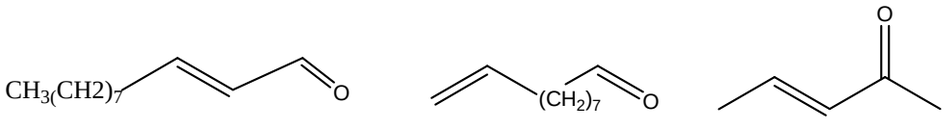
(c) In the following molecules identify that which are diastereomers and which are enantiomers? **(6)**



I II III IV

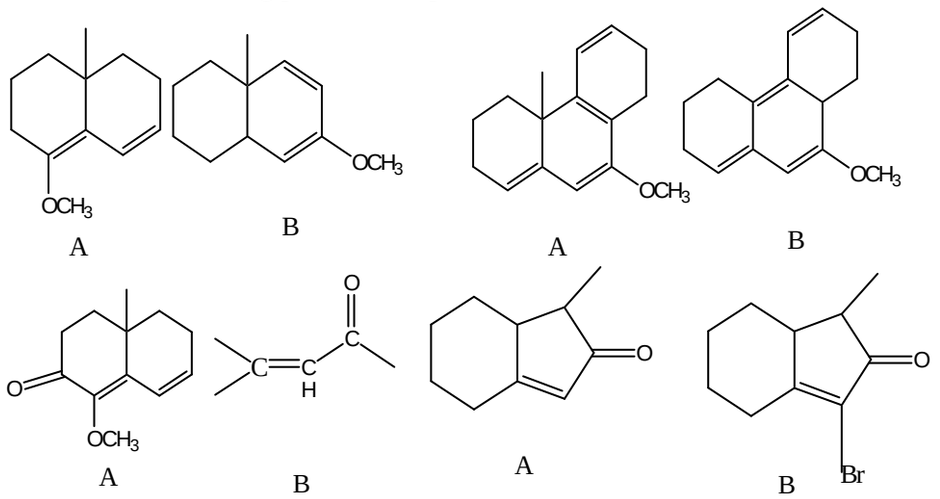
Q. No. 7. **(a)** What is the difference between Dispersive IR Spectrometer and Fourier Transform (FT)-IR Spectrometer. **(5)**

(b) Differentiate the following on the basis of IR. **(3)**



A B C

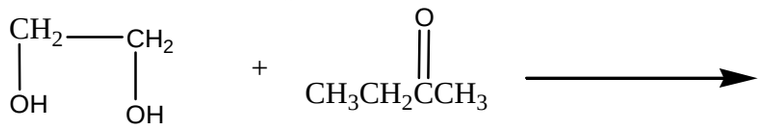
(c) Differentiate the following pairs of compounds on the basis of UV. **(8)**



A B A B

A B A B

(d) Deduce the structure of the product of the given reaction from the following data. **(4)**



The product has

IR: Four strong bands that appear in the range of 1200 to 1020 cm^{-1}

NMR: 3 Proton triplet at 0.8ppm, 3 Proton singlet at 1.3ppm, 2 proton quartet at 1.8ppm and 4 proton multiplet at 4.0ppm

Q. No. 8. Write notes on any **FOUR** of the following: **(5 each)** **(20)**

(a) Reactions of Monosaccharides
(b) Biosynthesis of Cholesterol
(c) Primary structure of Polypeptides and Protein.
(d) Prostaglandins
(e) Synthesis of Peptides

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