

CSS Past Papers Subject: Chemistry Year: 2016

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(5)

CHEMISTRY PAPER-I

TIME AL	LOW ICQS	ED: THREE HOURS b): MAXIMUM 30 MINUTES	PART-I (MCQS) PART-II	MAXIMUM MARK MAXIMUM MARK	$\begin{aligned} \mathbf{XS} &= 20\\ \mathbf{XS} &= 80 \end{aligned}$				
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) Condidate must write Ω No in the Answer Pook in accordance with Ω No in the Ω Poper									
(v) 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)	Ex	tra attempt of any question or any pa	art of the attempted questi	ion will not be consider	ed.				
(vii) Use of Calculator is allowed.									
PART-II									
O No 2	(a)	What is Schrodinger wave equ	otion? Discuss its imp	ortonoo in quantum	(0)				
Q. No. 2.	(a)	chemistry.	ation? Discuss its imp	ortance in quantum	(0)				
	(b)	Solve the Schrodinger wave equation for a particle in three-dimensional box and (8) find the expression for the energy and wave function							
	(c)	What is a well-behaved function	? What are the requirem	nents of a physically	(6)				
	(0)	acceptable wave function?	-		(0)				
0 N 3			·. · · · · · · · · · · · · · · · · · ·	· ,					
Q. No. 3.	(a) (b)	What is Gibbs free energy? Discuss its significance in chemistry.							
	(0)	collision theory.	in state theory indicating	its advantages over	(0)				
	(c)	Explain 3 rd law of thermodynami	ics. How this law is use	eful to determine the	(6)				
		absolute value of entropy?							
Q. No. 4.	(a)	Define and explain Langmuir adso	rption isotherm. What are	e its limitations?	(8)				
	(b)	What is acid-base catalysis? Discu	ss its significance in cher	nistry.	(6)				
	(c)	What is Phase rule? Discuss its ap	plication in one compone	ent system.	(6)				
Q. No. 5.	(a)	What are solubility product and co	mmon ion effect? Discus	s their significance in	(8)				
		chemical analysis							
	(b)	Valence shell electron pair repulsi	on theory can be used to	predict the shapes of	(7)				
		molecules. Using this theory expla	in the shapes acquired by	BF3 and IF5.					
	(c)	109.5	H ₂ S is slightly less than	the tetranedral angle	(5)				
Q. No. 6.	(a)	Describe main features of crystal	field theory, How this th	neory explains colour	(10)				
-	. /	of coordination complexes?	• *	- 1					
	(b)	Write the electronic configuration	for each of the following:		(4)				
		Ni^{2+} , Cu, Mn $^{2+}$, Cr $^{3+}$	1. · · · · · · · ·	.					
	(c)	what is John-Teller theorem? Expl	lain its significance in coo	ordination chemistry.	(6)				
Q. No. 7.	(a)	What are lanthanides? How are the	ese extracted from their or	res?	(10)				

(b) What is decay law? How half-life and decay constant are related with each



FEDERAL PUBLIC SERVICE COMMISSION **COMPETITIVE EXAMINATION-2016 FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT**

CHEMISTRY PAPER-II

TIME ALL	OWED: THREE HOURS	PART-I (MCQS)	MAXIMUM MARKS = 20 MAXIMUM MARKS = 80				
raki-i(m	QS): WAAIWUWI 50 MIINU LES	rari-ii	$\mathbf{W} \mathbf{A} \mathbf{A} \mathbf{W} \mathbf{U} \mathbf{W} \mathbf{W} \mathbf{A} \mathbf{K} \mathbf{K} \mathbf{S} = 0 \mathbf{U}$				
NOTE: (i)	Part-II is to be attempted on the separ	ate Answer Book.					
(ii)	(ii) Attempt ONLY FOUR questions from PART-II. ALL questions carry EOUAL 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.						
	Ī	PART-II					

Q. No. 2. Write briefly on the following terms:

(iii)

- (i) Hyper-conjugation (ii) Aromaticity (iii) Grignard's reagent S_N1 reaction (iv) (v) Molecular chirality Monosaccharides (vi) Chemical shift Glycolysis (vii) (viii Friedal Craft alkylation (ix) Detergents **(x)**
- Q. No. 3. (a) How would you synthesize each of the following molecule from an alkene of appropriate (8) structure (structure of your choice).



- (6) (b) Write the expected major product of the reaction of propyne with each of the following reagents.
 - (i) Cu₂Cl₂, O₂, pyridine (iv) H₂O, HgSO₄, H₂SO₄ (ii) Na, ND₃
 - Di-isoamylborane, then NaOH, H₂O₂ (v)
 - [(CH₃)₂CHCH₂CH₂]₂BD Di-isoamylborane, then CH₃CO₂D (vi) then CH₃CO₂H
- (6)

CH₂OH (i) CHO (ii)



(2 each) (20)

CHEMISTRY PAPER-II

(i)

- (b) Draw the structures of the following molecules:
 - 5-(2,2-Dimethylpropyl)nonane (vi) 4-(2-Ethylbutyl)decane

(vii)

- (ii) 2,3-Dimethylhept-3-ene
- (iii) 1-Chloro-1-methoxy-2methylbut-1-ene
- (viii 5,5-Dichloro-3-methylhepta-3,6-

5-Ethyl-4,6-dimethylhept-4-en-2-yne

(iv) 6-Chloro-2-nitrooct-1-en-3-yne (ix) 6-bromo-5-chloro-9-

nitropentadecane

dien-1-yne

- (v) 8-Chloro-7-methoxy-5-methyl- (x) 6-chloroocta-1,3-diyne 4-nitroundec-5-ene
- (c) (i) The structure(I) given below has significant dipole moment. Which end of (2) the molecule would you expect to owe positive charge, and which tend to be negative.



(ii) The structure(II) given below is a component of certain oral contraceptives: (3)



Locate in this structure an example of each of the following bonds or atoms

- A highly polarized covalent bond
- Sp-hybrid carbon atoms
- A nearly unpolarized covalent bond

Q. No. 5.

(a)

Consider the reaction of bromocyclohexane with each of the four reagents below, and (7) answer the questions below. Also write down the reaction mechanism in each case.

H_2O	OH_	CH ₃ COOH	CH ₃ COO ⁻
(<i>i</i>)	<i>(ii)</i>	(iii)	(<i>vi</i>)

- (i) What is the most important type of reaction mechanism in each case?
- (ii) Which reagent gives the most elimination product?
- (iii) Which reagent is most useful in synthesizing the alcohol?
- (b) Evaluate each of the possible alcohol syntheses below as being good (the desired (5) alcohol is major or only product), not so good (the desired alcohol is a minor product, or worthless).

(i)
$$CH_3CH_2CI \longrightarrow CH_3CH_2OH$$
 (iv
 $O_2SOH_3C \longrightarrow CH_3 \xrightarrow{OH, H_2O, \Delta} CH_3OH$
(ii) $H_3CCHCH_3 \xrightarrow{OH, H_2O, \Delta} H_3CCHCH_3$
(iii) $H_3COCH_3 \xrightarrow{OH, H_2O, \Delta} CH_3OH$ (v) OH, H_2O, Δ
Page 2 of 4

(c) Write the major product(s) of each of the following reactions. It is implied that aqueous work-up has taken place in all those cases that require it to obtain the organic product.



Q. No. 6. (a) The two isomers of carvone are given below. Which is **R** and which is **S**?





(b) The structure of compound given below is a sugar called (-)-arabinose. Its (3) specific rotation is -105°.



- (i) Draw enantiomer(s) of (–)-arabinose
- (ii) Draw diastereomer(s) of (-)-arabinose
- (iii) Does (-)-arabinose have any optically inactive diastereomers? If it does, draw one.
- (c) Assign E,Z designation to the following structures.

(7)





CHEMISTRY PAPER-II

- (d) Draw the structures of the product(s) described for each reaction. Specify all (8) aspects of the stereochemistry.
 - (i) Stereospecific anti addition of bromine to cis- and trans-cinnamic acid.
 - (ii) Methanolysis of S-3-bromooctane with 6% racemization.
 - (iii) Stereospecific syn thermal elimination of acetic acid from 1R,2Sdiphenylpropyl acetate
 - (iv) Stereoselective epoxidation of bicyclo[2.2.1]hept-2-ene proceeding 94% fromtheexo face.
- Write a brief account on the following: Q. No. 7.
- (c) Primary structure of Proteins
- (b) Classification of Amino acids (d) Glycogenesis
- Q. No. 8. (a). Differentiate following using IR Spectroscopy?

(a) Biological importance of starch



(b). What type of electronic transition are possible in the following compounds? (2)

- (i) Butadiene (iii) Acetaldehyde
- (ii) Diethyl ether Trimethylamine (iv)
- (c). How will you distinguish the following compounds using UV/Visible (4) spectrophotometer?



Give the chemical shift of the following compounds for each proton (d).



(5) (e). The mass spectrum of compound shows following peaks: m/e= 120, relative intensity=20% (M⁺ peak), m/e= 105, relative intensity=80%, m/e= 77, relative intensity=96%, m/e= 43, relative intensity=35%. Assign the structure which would be expected. Page 4 of 4

(4)

(20)

(5 each)

(5)