FEDERAL PUBLIC SERVICE COMMISSION

Roll Number

COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT, 2013

CHEMISTRY, PAPER-II

TIME ALLOWED:	**(PART-I MCQs)**	**30 MINUTES**	**MAXIMUM MARKS: 20**
THREE HOURS	**(PART-II)**	**2 HOURS & 30 MINUTES**	**MAXIMUM MARKS: 80**

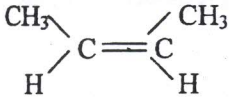
NOTE:(i) First attempt PART-I (MCQs) on separate OMR Answer Sheet which shall be taken back after 30Minutes.
(ii) Overwriting/cutting of the options/answers will not be given credit.
(iii) Use of calculator is allowed

PART-I ((MCQs) (COMPULSORY)

(i) Select the best option/answer and fill in the appropriate Circle ● on the OMR Answer Sheet. (20x1=20)
(ii) Answers given anywhere, other than OMR Answer Sheet, shall not be considered.

The hybridization and geometry of $C_6H_5NH_2$ is:
(a) sp^3, tetrahedral **(b)** sp, linear **(c)** sp^2, pyramidal **(d)** dsp^2, square planar

Which of the following hydrocarbons have the lowest dipole moment?

(a).  **(b)** $CH_3-C{=}C-CH_3$ **(c)** $CH_3-CH_2-C\equiv CH$ **(d)** $CH_2{=}CH-C\equiv CH$

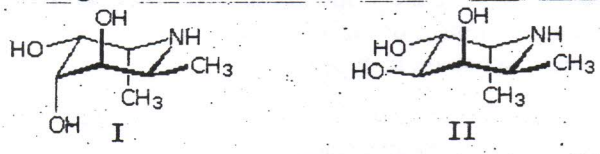
If a reaction consists of several steps, the _____ is the rate determining step.
(a) Specific rate constant **(b)** Steepest **(c)** Slowest step **(d)** Smaller

Half-life is independent of the _____ of reactant for first order reaction.
(a) Order of reaction **(b)** Initial concentration
(c) Amount of radiation absorbed **(d)** Specific rate constant

Which one of the following is not a condensation polymer?
(a) Dacron **(b)** Neoprene **(c)** Melamine **(d)** Glyptal

Bakelite is obtained from phenol by reacting with:
(a) HCHO **b)** $(CH_2OH)_2$ **(c)** CH_3CHO **(d)** CH_3COCH_3

Which of the following statements best describes the relationship of Structures I and II?



(a) They are diastereomers. **(b)** They are different conformations of enantiomers.
(c) They are different conformations of the same compound.
(d) They are identical conformations of the same compound.

Why does the exothermic reaction C(diamond)——> C (graphite) does not occur spontaneously (ΔH=3 KJ mol^{-1})
(a) The density of graphite is less than that of diamond.
(b) Tetrahedral configuration is always more stable than a planar one.
(c) The change from diamond to graphite has high activation energy.
(d) Graphite has delocalized electron.

If the substituents of higher priority are on the opposite sides of the double bond, the alkene has_____ configuration.
(a) *E* configuration **(b)** *Z* configuration **(c)** Planar **(d)** None of these

0. Enantiomers are _____ molecules that are mirror images of one another.
(a) Identical **(b)** Non-identical **(c)** Symmetric **(d)** None of these

1. The three-dimensional arrangement of atoms or groups attached to a chiral centre is called:
(a) Configuration **(b)** Chiral Centre **(c)** Symmetry **(d)** None of these

2. Hammond postulate suggests that "activation energy" of the rate-determining step is _____to the stability of the carbocation intermediate.
(a) Directly proportional **(b)** Inversely proportional
(c) Activation energy is discrete of stability of carbocation **(d)** None of these

3. Heterolytic cleavage of the carbon-halogen bond of alkyl halides may be facilitated by:
(a) Isotopes **(b)** Deionized water **(c)** Metal cations **(d)** None of these

14. Decomposition of Ozone takes place according to the following equation:

$$2O_3\,(g) \longrightarrow 3O_2\,(g)$$

Rate equation for the reaction is rate $K=[O_3]^2\,[O_2]^{-1}$; what is the order of reaction?

(a) Zero **(b)** 1 **(c)** 2 **(d)** 3

15. Carbohydrates have several roles in living organisms e.g.
(a) Photosynthesis in plants **(b)** Used as fertilizers
(c) Act as Hormones in development **(d)** Energy transportaion

16. Which of the statement is **TRUE**?
(a) Alkaloids are found in non-vascular plants **(b)** Alkaloids are usually acidic in nature
(c) Alkaloids are usually basic in nature **(d)** None of these

17. One of the following vitamin helps metabolize carbohydrate and maintain appetite.
(a) Vitamin A **(b)** Vitamin B_2 **(c)** Vitamin B_1 **(d)** Folic acid

18. The sources of vitamin B_{12} are:
(a) Citrus fruits, strawberries, tomatoes, spinach, cabbage and turnips
(b) Vegetable oils, wheat germ, liver, and leafy green vegetables
(c) Liver, kidney, meat, fish, eggs and milk
(d) Carotene from carrots, vegetables and dairy products

19. A chemical compound or mixture of compounds consisting of repeating structural units is called:
(a) Carbohydrate **(b)** Vitamin **(c)** Polymer **(d)** All of these

20. Processes such as catalytic cracking, steam cracking and catalytic reforming are involved in:
(a) Preparation of ethanol **(b)** Petrochemicals **(c)** Food processing **(d)** Preparation of glu

PART-II

NOTE: **(i)** **Part-II** is to be attempted on the separate **Answer Book.**
(ii) Candidate must write **Q. No.** in the **Answer Book** in accordance with **Q. No.** in the **Q. Paper.**
(iii) Attempt **ONLY FOUR** questions from **PART-II. ALL questions carry EQUAL marks.**
(iv) Extra attempt of any question or any part of the attempted question will not be considered.
(v) **Periodic Table of Elements is available on page-4.**
(vi) **Use of calculator is allowed.**

Q.2. **(a).** Why do we use the three p-orbitals ($2p_x$, $2p_y$, $2p_z$) alone to form the three equivalent hybrid orbitals on carbons? **(05)**

(b). Give an example of an element that undergoes sp hybridization in forming covalent bonds with other elements. What is the value of the angle between the bonds that result from *s – sp* overlap of atomic orbitals. **(05)**

(c). What do you mean by luminiscence? What are its types? **(10)**

Q.3. **(a).** The rate constant of a reaction is 1.2×10^{-3} sec^{-1} at 30^0 C and 2.1×10^{-3} sec^{-1} at 40^0 C. Calculate the energy of activation of the reaction. **(10)**

(b). What is *E/Z* system of configuration. Why it is preferred over *cis-/trans*-system of nomenclature in alkenes? **(10)**

Q.4. **(a).** Arrange the following functional groups in increasing order of stability of carbocation? **(05)**

$(CH_3)_3C^+$, CH_3^+, $CH_3CH_2^+$, $(CH_3)_2CH^+$, $CH_2{=}CH{-}CH_2^+$, $C_6H_5CH_2^+$

(b). How can we prepare an aldehyde by following reactions. Give atleast ONE representative example for each of these reactions. **(10)**

(i) Oxidation of 1^0 and 2^0 alcohols (b) Friedel-Crafts acylation
(c) Hydration of alkynes (d) Glycol clevage

(c). Draw the structures of the following compounds: **(05)**

(i) benzyl alcohol (ii) 3-pentanol (iii) 2,3-dihydroxyhexane
(iv) 2-sulfhydrylbutane (v) 3-pentanethiol

Q.5. **(a).** What are drying oils. For what purpose they are used? **(10)**

(b). How can you differentiate between trans-unsaturated and cis-unsaturated fatty acids. Which are more hazardous to health? Explain with the help of example. **(10)**

Q.6. **(a).** Give at least one representative example of the following reactions. **(10)**

(i) Termination reaction (ii) Disproportionation reaction
(iii) Addition polymerization (iv) Friedel Crafts alkylation
(v) Claisen condensationn

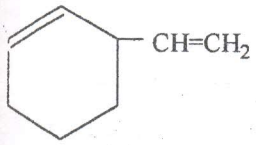
(b). What do you mean by gels? How are they classifed? **(10)**

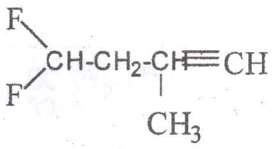
CHEMISTRY, PAPER-II

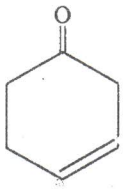
Q.7. **(a).** What are the applications of colloids? **(10)**

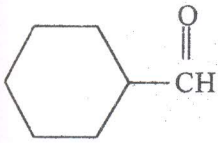
(b). What are the applications of emulsions? Also give the harmful effects of emulsions. **(10)**

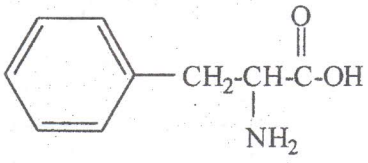
Q.8. Name the following structures: **(20)**

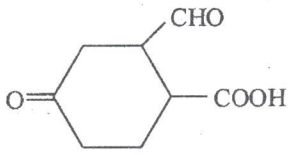
(i) 

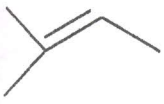
(ii) 

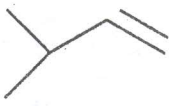
(iii) 

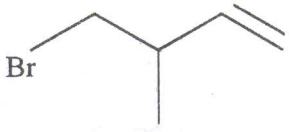
(iv) 

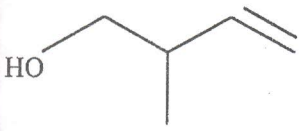
(v) 

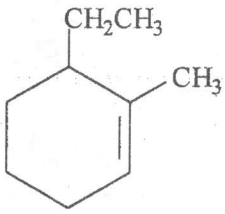
(vi) 

(vii) 

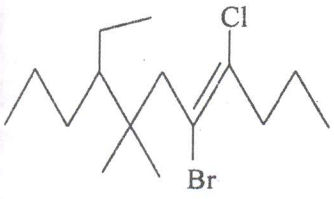
(viii) 

(ix) 

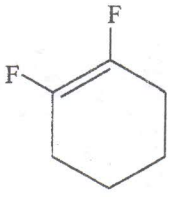
(x) 

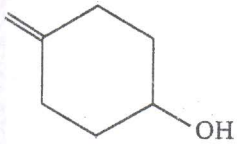
(xi) 

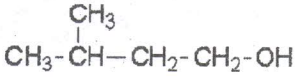
(xii) 

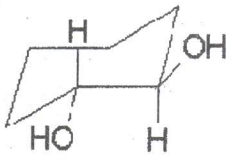
(xiii) 

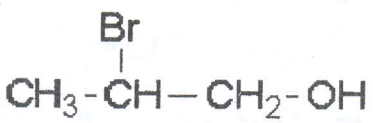
(xiv) $CH_3(CH_2)_{14}CH_3$

(xv) 

(xvi) 

xvii) 

(xviii) 

(xix) 

(xx)