TDP (Honours) 2nd Semester Exam., 2018

CHEMISTRY

(Honours)

SECOND PAPER

(Group–A)

Full Marks : 48

Time : 2 hours

The figures in the margin indicate full marks for the questions

Write the answers of each Unit in a separate book

UNIT—I

(Inorganic Chemistry)

(*Marks* : 24)

Answer *any* **two** questions

1. *(a)* Define Lewis concept of acid and base. Give an example of neutralization reaction. Explain with the help of this concept.

(b) Explain with example the limitations of solvent system concept of acid-base.

(c) Discuss the complexing ability of alkali and alkaline earth metals.

(d) Distinguish between electronegativity and electron affinity.

(e) Mention the factors that influence the ionization energy of an element.

(2+1)+3+2+2+2=12

2. (a) Define diagonal relationship with example.

(b) The bond angles in PH_3 and NH_3 are different. Explain.

(c) $Be(OH)_2$ is amphoteric while $Mg(OH)_2$ is basic. Explain.

(d) Why is electron affinity of chlorine higher than that of F?

(e) Arrange the following hydracids in the increasing order of acid strength with justification :

H_2Se, H_2S, H_2Te, H_2O

3+2+2+2+3=12

3. (a) Write notes on (any *two*) :

(i) Bonding in diborane

(ii) Preparation and one use of $LiAlH_4$

(iii) Structure and properties of Marshall's acid

(b) What are interhalogen compounds? Explain with suitable example.

(c) Discuss the structural features of XeF_2 and XeF_4. (2½×2)+3+(2+2)=12

UNIT—II

(Organic Chemistry)

(*Marks* : 24)

Answer *any* **two** questions

4. (a) What do you understand by absolute and relative configurations? Illustrate with suitable examples.

(b) Write the conformational analysis of cyclohexane.

(c) Both *meso*-compound and racemic mixture are optically inactive. What are the reasons?

(d) Define the following with suitable examples :

(i) Stereospecific and stereoselective reactions

(ii) Regioselective reactions

4+3+2+(2+1)=12

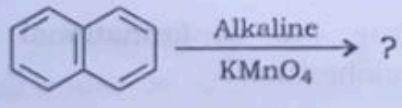
5. *(a)* How can you prepare anthracene from benzene?

(b) Indicate the following compounds as aromatic, anti-aromatic and non-aromatic. Justify your answer :

(i) *(ii)* *(iii)*

(c) Though [10]-annulene has the same number of π electrons as naphthalene but it does not exhibit aromatic character. Why?

(d) Identify the product of the following reaction :



(e) How can you prepare *p*-dinitrobenzene from aniline? 3+3+2+1+3=12

6. *(a)* Why aryl halide does not give nucleophilic substitution reactions under ordinary condition?

(b) How can you prepare *meta*-xylene from mesitylene?

(c) Write the chemical names and structural formulae of TNB and TNT.

(d) What is the structure of the compound formed as a white precipitate when bromine-water is added to aniline?

(e) Complete the reaction and suggest the plausible mechanism (any *one*) :

(i) $C_6H_5OH \xrightarrow[70\ ^\circ C]{CHCl_3,\ NaOH} ?$

(ii) $C_6H_5CHO + (CH_3CO)_2O \xrightarrow[Heat]{CH_3COONa} ?$

3+3+2+1+3=12

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TDP (Honours) 2nd Semester Exam., 2017

CHEMISTRY

(Honours)

.SECOND PAPER (Group—A)

Full Marks : 48

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Write the answer of each Unit in separate book

UNIT—I

(Inorganic Chemistry)

(*Marks* : 24)

Answer *any* **two** questions

1. *(a)* What is HSAB principle? Mention the significance of the principle.

(b) Arrange H_3PO_4, H_3PO_3 and H_3PO_2 in order of increasing acid strength and give reason.

(c) Explain the terms 'conjugate acid' and 'conjugate base' with suitable examples.

(d) Between BCl_3 and BF_3, which is more acidic? Explain. 4+3+3+2=12

2. (a) How is $XeOF_4$ prepared? Write its structure.

(b) Complete the following reactions :

(i) $XeF_4 + H_2O$ (Partial) $\rightarrow$?

(ii) $XeF_4 + H_2O$ (Complete) $\rightarrow$?

(c) What are clathrate compounds? Can they be considered as true chemical compounds? Give reason for your answer.

(d) Why do alkali metals produce coloured solution in liquid NH_3? Explain. 3+2+4+3=12

3. (a) Complete the following reaction and write the structure of the product formed :

$$B_2H_6 \xrightarrow[\text{High Temp. (473 K)}]{\text{Excess } NH_3} ?$$

(b) Give one example each of oxidizing and reducing property of NH_2OH with chemical equation.

(c) Write the structures of the following :

(i) $H_2S_2O_8$

(ii) I_3^-

(iii) ClF_3

(d) Write short notes on the following (any *two*) :

(i) Ionic carbide

(ii) Peracids of sulphur

(iii) Interhalogen compounds 2+2+3+5=12

UNIT—II

(Organic Chemistry)

(*Marks* : 24)

Answer *any* **two** questions

4. (a) What is quinone?

(b) Write down the product(s) and suggest a plausible mechanism for the following reaction :

$$p\text{-Benzoquinone} + (CH_3CO)_2O \xrightarrow{H^+} ?$$

(c) Write down the products of the following transformation :

$$PhCH_2CH_2Br \xrightarrow[Ether]{Mg} ? \xrightarrow[2)\ Water]{1)\ Cyclohexanone} ?$$

$$\xrightarrow{H_2SO_4} ? \xrightarrow[\Delta]{Se} ?$$

(d) Indicate the following compounds as aromatic, antiaromatic and non-aromatic. Justify your answer :

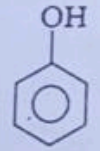
(i) 

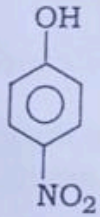
(ii) 

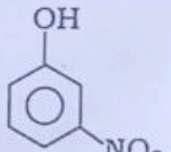
(iii) 

(e) How can you prepare naphthalene from benzene? 1+3+2+3+3=12

5. (a) Arrange the following compounds in order of their increasing acid strength :

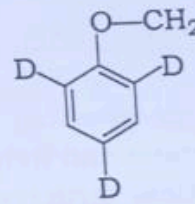
(i) 

(ii) 

(iii) 

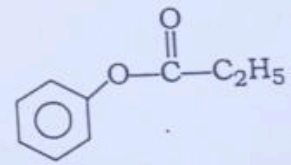
Justify your answer.

(b) Complete the reactions and suggest the plausible mechanisms (any *three*) :

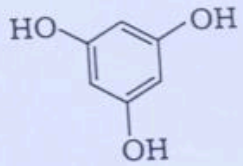
(i) 

$$\xrightarrow{200\ ^\circ C} ?$$

(ii) $C_6H_5CHO \xrightarrow[KCN]{\text{Aq. ethanolic}} ?$

(iii) 

$$\xrightarrow[\text{Temp. below } 100\ ^\circ C]{\text{Anhy. } AlCl_3} ?$$

(iv) 

$$\xrightarrow[HCl]{CH_3CN,\ \text{Anhy. } ZnCl_2} ?$$

(1+2)+(3+3+3)=12

6. (a) Explain the terms 'conformation' and 'configuration' with suitable examples.

(b) How many different Fischer projection formulae can be written for D-lactic acid?

(c) Using Cram's rule, predict the major product of the following reaction :

$$\text{(S)-PhCHOH.COPh} \xrightarrow{\text{LAH}} ?$$

(d) Draw the different Newman projection formulae of *n*-butane and hence predict the stability of these structures.

4+1+4+3=12

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TDP (Honours) 2nd Semester Exam., 2015

CHEMISTRY

(Honours)

SECOND PAPER

Full Marks : 48

Time : 2 hours

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UNIT—I

(Inorganic Chemistry)

(*Marks* : 24)

Answer *any* **two** questions

1. *(a)* State the basic principles of SHAB.

(b) Classify hard and soft acids from the given list :

H^+, Mn^0, Mn^{7+}, Pb^{2+}, Pb^{4+}, Ag^+

(c) Classify hard and soft bases from the given list :

H_2O, PR_3, R_2Se, NH_3, F^-, R_3As

(d) Discuss the bonding in B_2H_6 and draw the structure.

(e) Why does NH_4Cl in liquid ammonia act as an acid but Cs_2SO_3 in liquid sulphur dioxide act as a base? 3+1½+1½+3+3=12

2. (a) Compare and contrast the chemistry of N and P in respect of their—

(i) electron gain enthalpy;

(ii) ionization enthalpy;

(iii) strength of oxyacids;

(b) Discuss the structure of XeF_4.

(c) Why does the ionic conductance of alkali metal ions in aqueous medium increase down the group?

(2+2+2)+3+3=12

3. Write notes on any *three* of the following :

4×3=12

(a) Hydroxylamine

(b) Per acids of sulphur

(c) Bonding of diborane

(d) Interhalogen compounds

UNIT—II

(Organic Chemistry)

(*Marks* : 24)

Answer *any* **two** questions

4. (a) Draw the Fischer projection formulae for

(i) (*S*) – Ph CH(NH_2)CH_2OH

(ii) (2*R*, 3*S*)-2,3-dihydroxy pentane

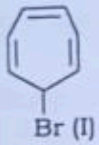
(b) Assign *R* / *S* configuration to the following molecules :

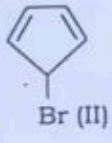
(c) Explain 'enantiomers' and 'diastereomers' with suitable examples.

(d) The optical rotation of a solution of sodium iodide and (+)-2-iodopentane in acetone slowly goes to zero. How can you explain this observation? 4+2+4+2=12

5. (a) *p*-benzoquinone is a planer system with six π electrons within the ring but it is not an aromatic compound. How can you explain this?

(b) Why is the compound having structure (I) gives yellow precipitate with aq. $AgNO_3$ instantly while compound (II) is completely inert?

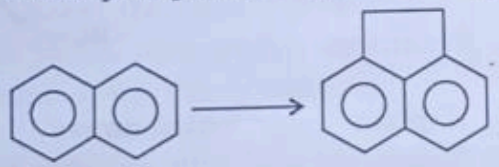

Br (I)


Br (II)

(c) Explain the reactivity of C—9/10 position of anthracene towards electrophilic substitution.

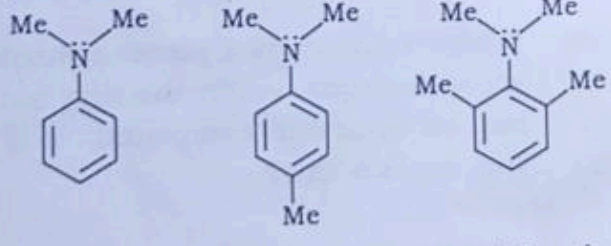
(d) Among pyrole, furan and pyridine, which is more basic and why?

(e) How can you perform the following?



2+2+3+2+3=12

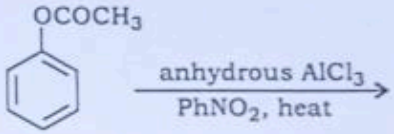
6. (a) Arrange the following organic amines in order to their basic strength with justification :

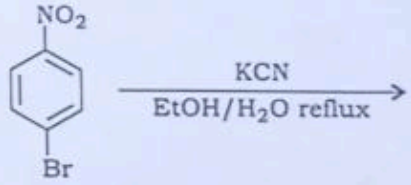


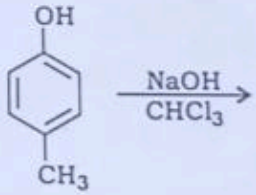
(Continued)

(b) What is benzoin condensation? Why is 4-nitrobenzaldehyde inert toward this condensation?

(c) Identify the product(s) and suggest plausible mechanism for the following reactions (any *two*) :

(i) 

(ii) 

(iii) 

3+3+(3+3)=12

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