Model Answer of (First Week)
Final and Graduated Exams 2017

Question (1)

(A) Classify the following organic compounds into :

type of Organic compounds	Alkane	Alkene	Alkyne	Cyclo Alkane	Armotaic	Alcohol	Ether
General Law	C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n-2}	C_nH_{2n}	-	$C_nH_{2n+1}OH$	$C_2H_{2n+2}O$
Organic compounds	C_3H_8	C_3H_6	C_3H_4	C_3H_6	C_7H_8	C_2H_5OH	$CH_3 - O - CH_3$
		Isomer		Isomer		Isomer	Isomer

(B)

P.O.C	A	B	C	D
Acidic radicals	S^{-2}	SO_3^{-2}	$S_2O_3^{-2}$	SO_4^{-2}
		Gas (E)	Gas (G)	
		SO_2	H_2S	

To identify the SO_2 practically : turns a paper wet with orange potassium dichromate acidified by sulphuric acid to green .

$$K_2Cr_2O_{7(aq)} + 3SO_{2(g)} + H_2SO_{4(aq)} \xrightarrow{\text{Conc.}} K_2SO_{4(aq)} + Cr_2(SO_4)_{3(aq)} + H_2O_{(\ell)}$$

orange — green

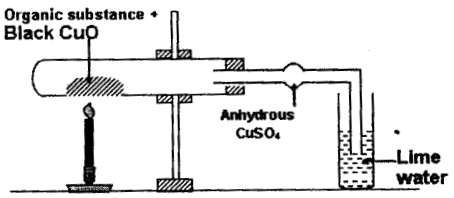
(C)

Element and its atomic no.	Electronic configuration in atomic state	Electronic configuration in oxidation state	Electronic configuration by Hund's rule	No. of unpaired electrons	Arrangement according to magnetic moment	Transition / Non transition	Diamagnetic / Paramagnetic	Coloured / Uncoloured	anomalous / Expected
$_{22}Ti$	$(Ar),4s^2,3d^2$	Ti^{+3}							
		Ar, $3d^1$	↑	1	Second	Transition	Paramagnetic	Coloured	Expected
$_{30}Zn$	$(Ar),4s^2,3d^{10}$	Zn^{+2}							
		Ar, $3d^{10}$	↑↓ ↑↓ ↑↓ ↑↓ ↑↓	Zero	First	Non transition	Diamagnetic	Uncoloured	Expected
$_{24}Cr$	$(Ar),4s^1,3d^5$	Cr^{+3}							
		Ar, $3d^3$	↑ ↑ ↑	3	Third	Transition	Paramagnetic	Coloured	anomalous
$_{26}Fe$	$(Ar),4s^2,3d^6$	Fe^{+2}							
		Ar, $3d^6$	↑↓ ↑ ↑ ↑ ↑	4	Fourth	Transition	Paramagnetic	Coloured	Expected

(D) Test for carbon and hydrogen in organic compounds :

Exp:

Heat the organic substance with copper oxide (CuO) pass the resulting gases over white copper sulphate, then through lime water.



Observation :

- The white copper sulphate turns blue .

- The lime water becomes milky .

Conclusion :-

The organic substance contains :

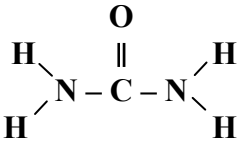
- Carbon which is oxidized to carbon dioxide makes lime water milky .

- Hydrogen which is oxidized to water changes the white $CuSO_4$ into blue $CuSO_4$

$$C + 2CuO \xrightarrow{\text{heat}} CO_2 + 2Cu$$

$$2H + CuO \xrightarrow{\text{heat}} H_2O + Cu$$

(E) Structural Formula for :

(1)	 UREA	(2)	$CH_3 - \underset{\displaystyle CH_3}{\underset{\vert}{CH}} - \underset{\displaystyle CH_3}{\underset{\vert}{CH}} - CH_3$ 2,3-dimethyl butane
(3)	$H_3C - \underset{\displaystyle CH_3}{\underset{\vert}{\overset{\displaystyle CH_3}{\overset{\vert}{C}}}} - CH_3$ 2,2-dimethyl propane	(4)	$H - \underset{\displaystyle Br}{\underset{\vert}{\overset{\displaystyle Cl}{\overset{\vert}{C}}}} - \underset{\displaystyle F}{\underset{\vert}{\overset{\displaystyle F}{\overset{\vert}{C}}}} - F$ Halothan 2-Bromo 2-chloro-1,1,1- tri flouro ethane
(5)	Freons $Cl - \underset{\displaystyle F}{\overset{\displaystyle F}{\overset{\vert}{\underset{\vert}{C}}}} - Cl$ 1,1dichloro 1,1-di flouro methane	Or	$F - \underset{\displaystyle F}{\overset{\displaystyle F}{\overset{\vert}{\underset{\vert}{C}}}} - F$ 1,1,1,1-tetra flouro methane

(F)

A	B	C
1	c	5
2	e	4
3	f	1
4	b	3
5	d	2
6	a	6

Question Two

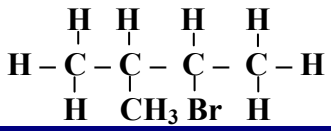
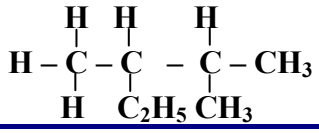
(A) Scientific Expression :

1- Isomerism
2- Cyclo alkane
3- Transition elements
4- Water gas
5- galvanization
6-bicarbonate
7- Qualitative analysis
8- Bromine fumes
9- Soda lime
10- Dry distillation

(B) IUPAC System :

(1)	2- methyl pentane	(2)	1-chloro-2-methyl propane
(3)	3-ethyl-2-methyl pentane	(4)	2,3-dimethyl pentane
(5)	2-bromo hexane	(6)	2-methyl butane

(C)

	Wrong (Mistake)	Correct (Proper) answer
(1)	3-Bromo-2-methyl butane 	$CH_3 - \underset{\displaystyle CH_3}{\underset{\vert}{CH}} - \underset{\displaystyle Br}{\underset{\vert}{CH}} - CH_3$ 2-Bromo-2-methyl butane
(2)	2-ethyl-3-methyl butane 	$CH_3 - \underset{\displaystyle CH_3}{\underset{\vert}{CH}} - \underset{\displaystyle CH_2 \; CH_3}{\underset{\vert}{CH}} - CH_3$ 2,3-dimethyl pentane

(3)	2-ethyl pentane $CH_3 - \underset{\underset{C_2H_5}{|}}{CH} - CH_2 - CH_2\ CH_3$	$CH_3 - \underset{\underset{CH_3}{|}}{\underset{\underset{CH_2}{|}}{CH}} - CH_2 - CH_2 - CH_3$ 3-methyl Hexane
(4)	2-methyl-3,3-dichloro butane $CH_3 - \underset{\underset{CH_3}{|}}{CH} - \underset{\underset{Cl}{|}}{\overset{\overset{Cl}{|}}{C}} - CH_3$	$CH_3 - \underset{\underset{CH_3}{|}}{CH} - \underset{\underset{Cl}{|}}{\overset{\overset{Cl}{|}}{C}} - CH_3$ 2, 2-dichloro-3-methyl butane
(5)	2,3-di theyl butane $CH_3 - \underset{\underset{C_2H_5}{|}}{CH} - \underset{\underset{C_2H_5}{|}}{CH} - CH_3$	$CH_3 - \underset{\underset{CH_3}{|}}{\underset{\underset{CH_2}{|}}{CH}} - \underset{\underset{CH_3}{|}}{\underset{\underset{CH_2}{|}}{CH}} - CH_3$ 3,4-dimethyl hexane
(6)	1-chloro-2-chloroethane $\underset{\underset{Cl}{|}}{CH_2} - \underset{\underset{Cl}{|}}{CH_2}$	$\underset{\underset{Cl}{|}}{CH_2} - \underset{\underset{Cl}{|}}{CH_2}$ 1,2-dichloro ethane

(D) Give reasons for :

1- Because 4s and 3d sublevels have close energy, on ionization the atom starts to lose electrons from 4s then from 3d in sequence .

2- Because to presence of the 4s and 3d electrons which can be used in the formation of bonds between the atoms of the surface of metal and the reacting molecules leading to the increase of concentration of these molecules on the surface of the catalyst weaken the bond in the reactant molecules and so decrease the activation energy which help to increase rate of chemical reaction.

3- Due to formation HI which is colourless it partially oxidized quickly by H_2SO_4 acid and violet fumes formed as follows :

$$2KI_{(s)} + H_2SO_{4(aq)} \xrightarrow[\text{heat}]{\text{Conc.}} K_2SO_{4(aq)} + 2HI_{(g)}$$

$$2HI_{(g)} + H_2SO_{4(aq)} \xrightarrow[\text{heat}]{\text{Conc.}} H_2O_{(\ell)} + SO_{2(g)} + I_{2(v)}$$

4- Due to the ability of Carbon atom to :

a) Combine with itself or with others atoms by different kinds of bonds it might connect through single, double and triple bonds .

b) Join together with different methods, straight chains, branched chains , homocyclic or heterocyclic .

5- Alkanes are saturated hydrocarbons because all bonds between carbon atoms are single bond of sigma type, while alkenes are unsaturated hydrocarbons because there is a double bond between the two carbon atoms .

(E) 1- The first basic radical : Al^{+3}

$$AlCl_{3(aq)} + 3NaOH_{(aq)} \xrightarrow[\text{wise}]{\text{drop}} 3NaCl_{(aq)} + Al(OH)_{3(s)}$$

$$Al(OH)_{3(s)} + NaOH_{(aq)} \xrightarrow{\text{excess}} NaAlO_{2(aq)} + 2H_2O_{(\ell)}$$

The second basic radical : Fe^{+3}

$$FeCl_{3(aq)} + 3NaOH_{(aq)} \longrightarrow 3NaCl_{(aq)} + Fe(OH)_{3(s)}$$

The third basic radical : Fe^{+2}

$$FeCl_{2(aq)} + 2NaOH_{(aq)} \longrightarrow 2NaCl_{(aq)} + Fe(OH)_{2(s)}$$

2- The first acidic radical : SO_3^{-2} (sulphite)

$$Na_2SO_{3(s)} + 2HCl_{(aq)} \xrightarrow{\text{dil}} 2NaCl_{(aq)} + H_2O_{(\ell)} + SO_{2(g)}$$

The second acidic radical : NO_2^{-1} (Nitrite)

$$NaNO_{2(s)} + HCl_{(aq)} \xrightarrow{\text{dil}} NaCl_{(aq)} + HNO_{2(aq)}$$

$$3HNO_{2(aq)} \xrightarrow{\text{heat}} HNO_{3(aq)} + H_2O_{(\ell)} + 2NO_{(g)}$$

$$2NO_{(g)} + O_{2(g)} \longrightarrow 2NO_{2(g)}$$

The third acidic radical : $S_2O_3^{-2}$ (Thiosulphate)

$$Na_2S_2O_{3(s)} + 2HCl_{(aq)} \xrightarrow{\text{dil}} 2NaCl_{(aq)} + H_2O_{(\ell)} + SO_{2(g)} + S_{(s)}$$

(F) Write chemical equations :

1- (a) $BaCl_{2(aq)} + Na_2SO_{4(aq)} \longrightarrow 2NaCl_{(aq)} + BaSO_{4(s)}$

(b) $2NaHCO_{3(aq)} + MgSO_{4(aq)} \longrightarrow Mg(HCO_3)_{2(aq)} + Na_2SO_{4(aq)}$

$$Mg(HCO_3)_{2(aq)} \xrightarrow{\text{heat}} MgCO_{3(s)} + H_2O_{(\ell)} + CO_{2(g)}$$

(c) $CH_3COONa + NaOH \xrightarrow[\text{heat}]{CaO} Na_2CO_{3(s)} + CH_{4(g)}$

(d) $CH_{4(g)} + Cl_{2(g)} \xrightarrow{UV} CH_3Cl_{(g)} + HCl_{(g)}$

$CH_3Cl_{(g)} + Cl_{2(g)} \xrightarrow{UV} CH_2Cl_{2(g)}\ HCl_{(g)}$

$CH_2Cl_{2(g)} + Cl_{2(g)} \xrightarrow{UV} CHCl_{3(g)} + HCl_{(g)}$

$CHCl_{3(g)} + Cl_{2(g)} \xrightarrow{UV} CCl_{4(\ell)} + HCl_{(g)}$

(e) $C_8H_{18} \xrightarrow[\text{high temp.}]{\text{high pressur}} C_4H_{10(g)} + C_4H_{8(g)}$

butane butene

2- How can you obtains :

(1) $CH_3COONa_{(s)} + NaOH_{(s)} \xrightarrow[\text{heat}]{CaO_{(s)}} Na_2CO_{3(s)} + CH_{4(g)}$

$$CH_{4(g)} \xrightarrow[\text{absence of air}]{1000^{\circ}C} C_{(s)} + 2H_{2(s)}$$

black carbon

(2) $CH_{4(g)} + H_2O_{(v)} \xrightarrow{725^{\circ}C} (CO_{(g)} + 3H_{2(g)})$

water gas

(3) $Na_2S_{(aq)} + 2AgNO_{3(aq)} \longrightarrow Ag_2S_{(s)} + 2NaNO_{3(aq)}$ (only)

black ppt

Finished Answer