

ARAB REPUBLIC OF EGYPT MINISTRY OF EDUCATION  
General Secondary Education Certificate Examinations

THE Second MODEL

Answer five Questions only from the following: -

Question 1

A) Choose the correct answer for each of the following : -

1) The alkane which contains more than 17 carbon atoms, is a ..... alkane .

- a) Solid                      b) Liquid
- c) Gaseous                  d) Vapour

2)The third energy level (M) of an atom is saturated with a number of electrons that equal .....

- a) 18                          b) 8
- c) 32                          d) 50

3) Catalytic hydration of ethyne followed by oxidation of the product gives .....

- a) methanoic acid                      b) ethanal
- c) methanol                              d) ethanoic acid

4)Heating of mono chloro benzene with sodium hydroxide solution at high temperature and pressure gives .....

- a) benzene                      b) benzoic acid
- c) phenol                      d) benzyl alcohol

5) Iron oxides are reduced in midrex furnace using .....

- a) hydrogen gas only
- b) carbon monoxide only
- c) natural gas directly
- d) mixture of carbon monoxide and hydrogen .

6) In the galvanic cell, The anode is the ..... Process takes place .

- a) negative pole at which the reduction .
- b) negative pole at which the oxidation .
- c) positive pole at which the reduction .
- d) positive pole at which the oxidation .

**B) Illustrate with symbolic chemical equations, how you can obtain the following : -**

- 1) Ammonia gas from magnesium nitride .
- 2) Dacron .

**C) How can you practically differentiate, with one experiment, between each of the following pairs .**

- 1) Ammonia gas and hydrogen gas .
- 2) Carbolic acid and acetic acid .

## Question 2

**A) Write the scientific expression for each of the following statements : -**

- 1) Half the distance between the centers of two similar atoms in a diatomic molecule .
- 2) A substance that change the rate of the chemical reaction without itself being changed .
- 3) Reaction of esters with ammonia to give the acid amide and alcohol .
- 4) The element in which ( d ) or ( f ) orbitals are partially filled either in the atomic state or in any of its oxidation states .

**B) Explain how you can obtain a pure sample of copper metal from a mass impure copper .**

**C) Give reason for each of the following : -**

- 1) The alkanes are characterized by little chemical reactivity .
- 2) It is difficult to oxidize  $\text{Mn}^{++}$  ion to  $\text{Mn}^{+3}$  ion .
- 3) In preparation of ethyne gas in the lab , before the collection of the gas it must be firstly passed over copper sulphate solution .

D) How many liters of oxygen gas burn 24 gm of carbon completely.

[ C = 12 ]

### Question 3

A) What is meant by each of the following :-

- 1) The pig iron .
- 2) Aufbau ( building – up ) principle .
- 3) Le chatelier's principle .

B) Complete the following :-

- 1) The general molecular formula of alkanes is ..... , where as the general molecular formula of alkenes is .....
- 2) Alkali metal nitrates are partially decomposed by heating into ..... And .....
- 3) Ethanol reacts with sodium metal to give .....and .....
- 4) The oxidation number of oxygen in hydrogen peroxide is ..... While the oxidation number of hydrogen in sodium hydride is .....
- 5) ..... put the first theory about atomic structure , while ..... is the first who classified elements into metals and non -metals .

C) Write only one use of each of the following :-

- 1) Poly propylene ( p.p ) .
- 2) Blast furnace slag .

### Question 4

A) write the structural formula for each of the following: -

- 1) Phthalic acid .
- 2) 3 – methyl – 2 – butanol .
- 3) 4 – chloro - 1 – hexene .

B) Put the sign ( ) in front of the right sentences and the sign (x) in front of the wrong ones of the following :-

- 1) Concentrated sulphuric acid is used for drying ammonia gas ( )
- 2) The chemical formula of limonite ore is  $\text{Fe}_2\text{O}_3$  ( )
- 3) The tertiary alcohols respond to the action of normal oxidizing agents ( )
- 4) A violet colour is formed upon addition of few drops of aqueous iron (III) chloride solution to aqueous phenol solution ( )
- 5) The electrons prefer to occupy separate orbitals before pairing in the sublevels ( )

C) What is the difference between each of the following :-

- 1) Electron affinity and electronegativity .
- 2) Sigma bond and pi bond .

### Question 5

A) What is meant by each of the following :-

- 1) The electron cloud .
- 2) Alpha amino acid .
- 3) Converted alcohol .

B) Re-arrange the following steps to obtain ( nitro benzene ) from ( toluene ) . Write the equations of the reactions :-

- \* Dry distillation with soda lime .
- \* Reaction with caustic soda solution .
- \* Oxidation .
- \* Nitration .

C) Show by symbolic chemical equations the following :-

- 1) Reaction of chlorine gas with hot iron, followed by addition of sodium hydroxide solution to the reaction product .
- 2) Reaction of sulphuric acid with sodium hydroxide .

3) The overall chemical reaction in lead storage cell when start producing electric current ( discharging the battery ) .

### Question 6

A) What is the scientific explanation for each of the following: -

1) Conc. Nitric acid has no effect on some metals such as iron and chromium .

2) Acetic acid ( pure 100 % ) is called glacial acid .

3) Although argon ( $_{18}\text{Ar}$  ) is from ( p ) block elements, it is not a representative element .

B) How can you practically test the presence of :-

Carbon and hydrogen elements in an organic compound, Write the symbolic equations.

C) A and B are two elements with oxidation potentials of ( 0.4 ) and ( - 0.6 ) volt . If both elements are divalent,

- What is the expression for the cell formed from both metals ?

- Calculate the electromotive force of the cell and show If electrical current is produced or not and why ?

D) Calculate the PH value of formic acid (  $\text{HCOOH}$  ) provided that its concentration 0.15 mole / liter and its equilibrium constant (  $K_C$  ) equals  $1.8 \times 10^{-4}$

## The Guide Answer

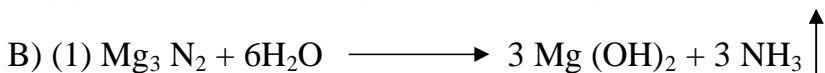
### Question1

\* 10 Marks

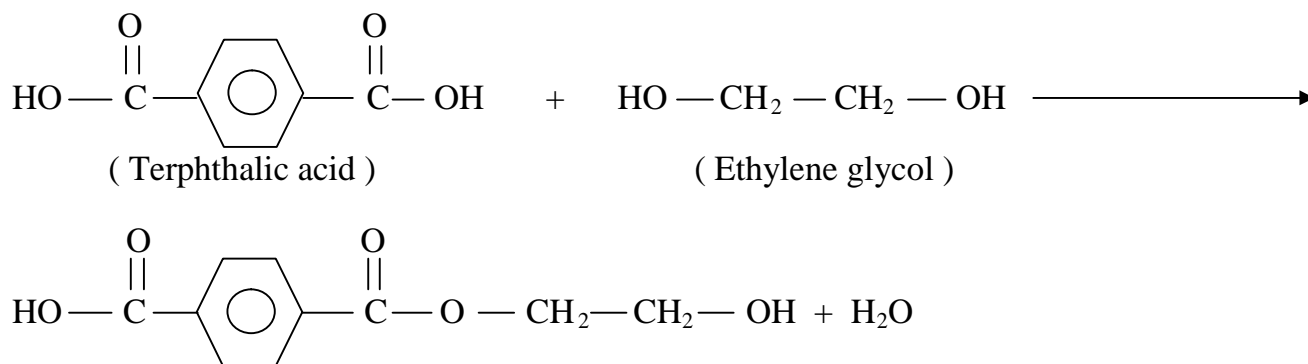
(A) 6 Marks, (B) 2 Marks, (C) 2 Marks

A) (1) a (2) a (3) d

(4) c (5) d (6) b



(2)



C) (1)

| EXP.   | Ammonia gas                                  | Hydrogen gas  |
|--|--|---------------|
| Approach a glass rod wetted with conc. HCL to each of them . | White fumes of ammonium chloride is formed . | No Reaction . |

(2)

| EXP.   | Carbolic acid | Acetic acid            |
|--|---------------|------------------------|
| Add ethyl alcohol and drops of conc. $\text{H}_2\text{SO}_4$ to each of them . | No Reaction   | Fruit odour is smelt . |

## Question 2

\* 10 Marks (A) 2 Marks (B) 3 Marks (C) 3 Marks (D) 2 Marks.

A) (1) The atomic radius.

(2) Catalyst.

(3) Ammonolysis.

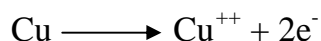
(4) The transition element.

B) In this process, electrolytic cell is used :-

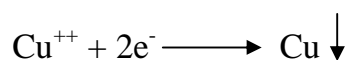
- The ( impure copper ) is connected to the + ve pole ( anode ) while a (pure copper wire ) is connected to the – ve pole ( Cathode ) and ( Copper II sulphate solution ) acts as electrolyte .

- When the electric current passes :

\* Oxidation process takes place at the anode



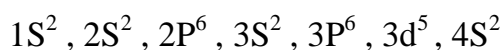
\* Reduction process takes place at cathode



\* Pure copper atoms precipitate at the cathode .

C) (1) Because in alkanes, The carbon atoms are combined together by the strong sigma bonds, This bonds cannot be broken easily .

(2) The electronic configuration of  $_{25}\text{Mn}$  is :

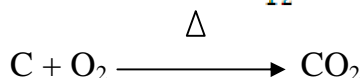


In case of  $\text{Mn}^{++}$ , The ion is more stable due to the half-field of the (  $3\text{d}^5$  ) sublevel, and it is very difficult to be oxidized into  $\text{Mn}^{+3}$

(3) To remove the phosphine gas (  $\text{PH}_3$  ) and the hydrogen sulphide (  $\text{H}_2\text{S}$  ) produced from the impurities which are found in calcium carbide .

D) 24gm of carbon

$$\text{No. of carbon moles} = \frac{24}{12} = 2 \text{ moles}$$



i.e. to burn 2 moles of carbon, we need 2 moles  $\text{O}_2$

$$1 \text{ mole} \longrightarrow 22.4 \text{ liters}$$

$$2 \text{ mole} \longrightarrow ?$$

$$\text{The volume of } \text{O}_2 = \frac{2 \times 22.4}{1} = 44.8 \text{ liters.}$$

### Question 3 :

\* 10 Marks

(A) 3 Marks

(B) 5 Marks

(c) 2 Marks

A) (1) Pig iron :

It is the iron coming out of the blast furnace, which contains ( 95% ) iron and about (4% ) carbon with about (1% ) manganese, silicon, phosphorus and sulphur .

(2) Aufbau ( building – up ) principle :

Electrons occupy the sublevels in the order of increasing their energy, the lowest energy sublevels are filled first .

(3) Le chatelier's principle :

The changes in any of the conditions of a chemical equilibrium such as concentration, pressure or temp. cause shift the equilibrium in the direction which will oppose this change .

- |                                     |   |                            |
|-------------------------------------|---|----------------------------|
| B) (1) $\text{C}_n \text{H}_{2n+2}$ | , | $\text{C}_n \text{H}_{2n}$ |
| (2) metal nitrite                   | , | oxygen                     |
| (3) Sodium ethoxide                 | , | hydrogen gas               |
| (4) -1                              | , | -1                         |
| (5) Dalton                          | , | Brezelius.                 |

C) (1) Poly propylene ( p.p ) :

is used in manufacturing carpets, cases and cans.

(2) Slag :

Is used in the brick industry, cement or as asphalt .



### Question 4:

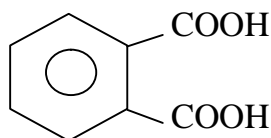
\* 10 Marks

(A) 4.5 Marks

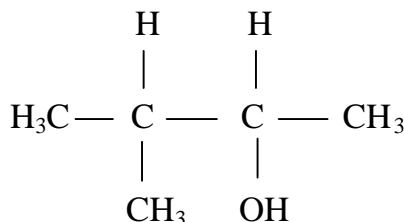
(B) 2.5 Marks

(c) 3 Marks

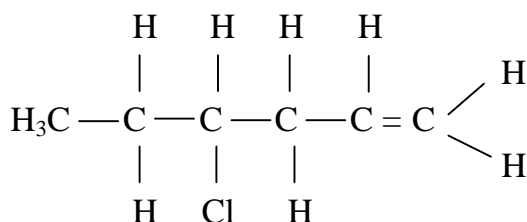
A) (1) Phthalic acid



(2) 3- methyl -2- butanol



(3) 4- Chloro -1-hexene



B) (1) ×

(2) ×

(3) ×

(4)

(5)

C) (1)

| Electron affinity  | Electronegativity  |
|--|--|
| 1-The amount of energy released when an extra electron is added to a neutral gaseous atom .<br>2-it refers to the atom in its single state .<br>3-it represented by energy terms . | 1-The tendency of the atom to attract the electrons of the chemical bond to it self .<br>2-it refers to the combined atom .<br>3-It represented by relative values . |

(2)

| The sigma-bond ( )  | The pi-bond ( )   |
|---|---|
| 1-it is formed as a result of the overlap of atomic orbitals along an axis .<br>2-The overlapped orbitals are on one line ( collinear overlap )<br>3-e.g :<br>* The overlap of $SP^2$ with $SP^2$ or S with $SP^2$ in ethylene molecule . | 1-it is formed as a result of the overlap of atomic orbitals side by side .<br>2-The overlapped orbitals are parallel ( collateral overlap ).<br>3-e.g :<br>*The overlap of $P_z$ with $P_z$ in ethylene molecule . |

## Question 5

\* 10 Marks

(A) 3 Marks

(B) 4 Marks

(c) 3 Marks

A) (1) The electron cloud :-

It is the region of space around the nucleus where there is a great probability of finding the electron.

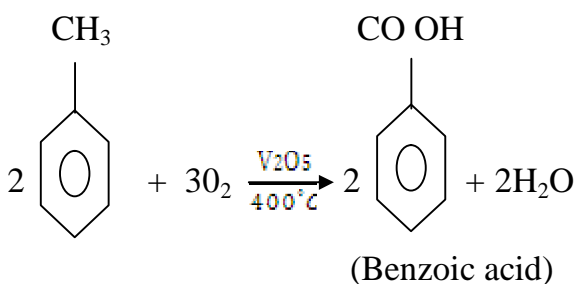
(2) Amino acid from the ( $\alpha$ ) amino type:-

It is the amino acid in which the amino group is attached to the ( $\alpha$ ) carbon atom which is directly attached to the carboxylic group.

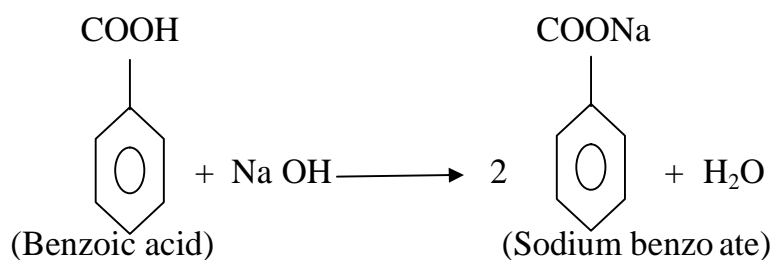
(3) The converted alcohol:-

It is ethanol with some additives. These additives may be poisonous such as methanol, pyridine, coloured dyes and water to be used as fuel.

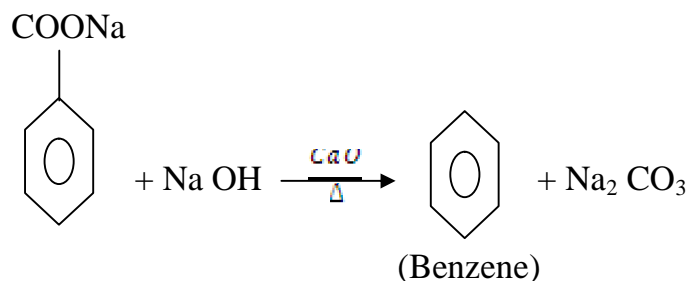
B) (1) Oxidation:-



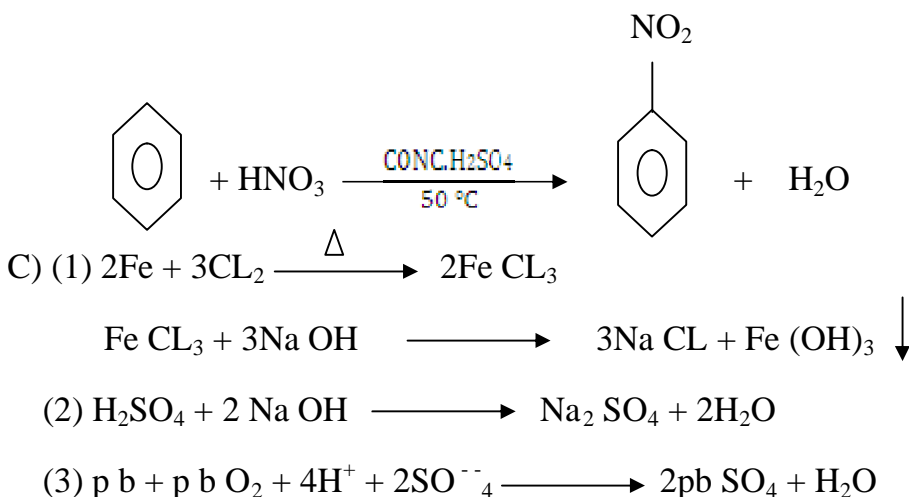
(2) Reaction with caustic soda solution :-



(3) Dry distillation with soda lime :-



(4) Nitration :-



### Question 6

\* 10 Marks (A) 3 Marks (B) 3 Marks (C) 2 Marks (D) 2 Marks

A) (1) This is due to Passivity :

Passivity of the metal is due to the oxidizing property of the acid, so a layer of the metal oxide is formed, This layer is non-porous layer. So it protects the metal from further reaction.

(2) Because it freezes at  $16^\circ\text{C}$  forming solid crystals as ice.

(3) Because argon is from noble gases which are characterized by having energy levels completely filled with electrons While the representative elements are characterized by complete filling of all the energy levels with electrons except the highest one.

B) Detection of carbon and hydrogen in organic compounds:

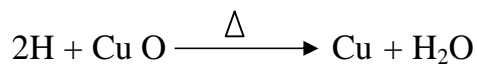
Procedure:-

(1) Heat organic substance with copper oxide ( $\text{CuO}$ ) in a test tube.

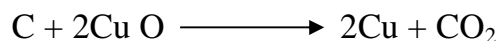
(2) Pass the resulting gases over anhydrous white copper sulphate ( $\text{CuSO}_4$ ) Then through clear lime water.

Observation :-

(1) The white colour of anhydrous copper sulphate turns in to blue .



(2) Lime water turns turbid.



Conclusion :-

Organic compounds contains mainly carbon and hydrogen.

C) Element (A) acts as (The anode).

Element (B) acts as (The cathode).

The cell diagram is  $\text{A} / \text{A}^{++} // \text{B}^{++} / \text{B}$

e.m.f = oxidation potential of anod + Reduction pot. Of cathode

$$= 0.4 + 0.6 = 1 \text{ volt.}$$

e.m.f = +ve value

∴ The cell producing electric current.

$$\text{D) Hydrogen ions concentration} = \sqrt[4]{1.8 \times 10 \times 0.15}$$

$$= 0.52 \times 10^{-2} \text{ mole / liter.}$$

$$\text{pH} = -\log 0.0052 = 2.28.$$

