

1- The student is asked to answer (a) or (b): (One Mark)

(a) Rate of chemical reaction. (p. 59)

(b) Reversible reactions. (p. 58)

2- (One Mark)

Due to the presence of single electrons in 4S and 3d orbitals which can be used in the formation of bonds between the atoms of the surface of metal and the reacting molecules, leading to an increase in the concentration of these molecules on the surface of the catalyst that weakens the bond in the reactant molecules and SO decreases the activation energy. (p.15)

3- (One Mark)

Choice (b) $C_n H_{2n-2}$ (p. 147)

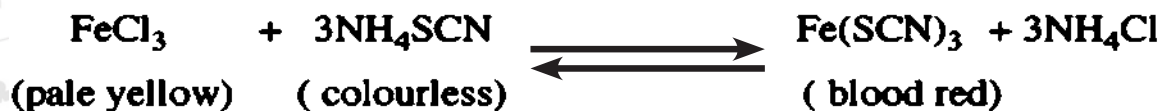
4- (One Mark)

Because in the acidic medium, an organic acid and an alcohol are formed, while in the alkaline medium, a salt of organic acid and an alcohol are formed. (p. 199-200)

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5- (One Mark)



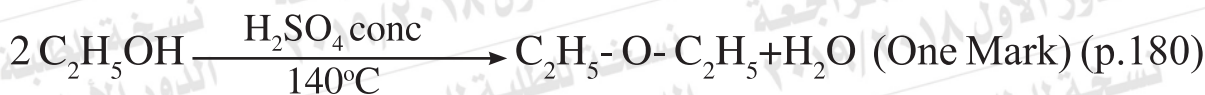
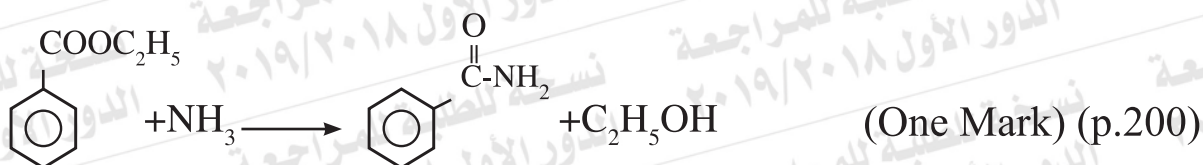
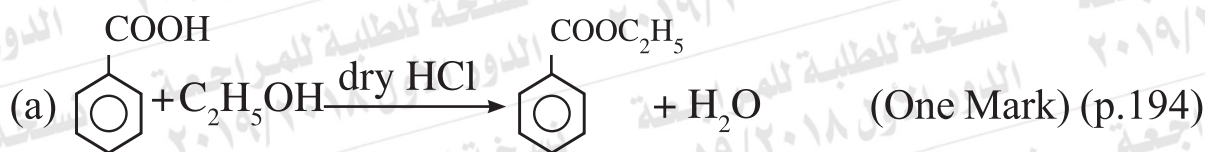
In more FeCl_3 is added, the red color darkens Or by adding ammonium chloride, the pale yellow color is restored.

N.B: Writing the equation labeled with colors gets (One Mark)

6- (One Mark)

Choice (d) Diamagnetic and colourless. (p.14, 16)

7- The student is asked to answer (a) or (b): (Two Marks)



8- (Two Marks)

Cation detected	Group reagent for the cation	Chemical formula of the precipitate formed
First: Calcium cation	Ammonium carbonate solution <u>Or</u> $(\text{NH}_4)_2 \text{CO}_3$ (½ Mark)	calcium carbonate <u>Or</u> Ca CO_3 (p.43) (½ Mark)
Second: Aluminum cation	ammonium hydroxide <u>Or</u> $(\text{NH}_4 \text{OH})$ (½ Mark)	Aluminium hydroxide <u>Or</u> $\text{Al}(\text{OH})_3$ (p.42) (½ Mark)

9- (Two Marks)

First: At the anode: (oxidation)



At the cathode: (reduction)



Second: quantity of electricity (C)

$$= \frac{\text{mass of deposited substance} \times 96500}{\text{Equivalent mass of deposited substance}} \quad (1/2 \text{ Mark})$$

$$= \frac{96500 \times 10.8}{108} = 9650 \text{ C} \quad (1/2 \text{ Mark}) \quad (\text{p.114})$$

Another answer:

To deposit 108g of silver $\xrightarrow{\text{needs}}$ 96500 C (½ Mark)

To deposit 10.8g of silver $\xrightarrow{\text{needs}}$ ×
(quantity of electricity = $\frac{10.8 \times 96500}{108} = 9650 \text{ C}$ (½ Mark)

Or, $1 \text{ M} \longrightarrow 1 \text{ F}$
 $0.1 \text{ M} \longrightarrow \text{X}$
 $\text{X} = 0.1 \text{ F}$ (½ Mark)

quantity of electricity = $0.1 \times 96500 = 9650 \text{ C}$ (½ Mark)

10- The student is asked to answer (a) or (b): (One Mark)

(a) Anodic protection (Anodic cover) (p.107)

(b) Rusting (p.105)

11- (One Mark)

$$K_{sp} = [Al^{3+}] [OH^{-}]^3$$

$$= [10^{-6}] [3 \times 10^{-6}]^3$$

$$= 27 \times 10^{-24}$$

(p.81)

12- (One Mark)

Because of stopping the oxidation and reduction reactions, consequently stopping the flow of the electric current in the external circuit of the cell. (p. 92-93)

13- (One Mark)

Choice (b) 1,2 - dibromoethane. (p.141)

14- (One Mark)

- Steps:

Put two equal masses of zinc metal, one in the form of powder, the other in the form of a block, independently in a test tube.

- Add to each, an equal volume of dil. hydrochloric acid.

Observation:

The reaction with zinc powder is completed in a shorter time than that with the zinc block.

Conclusion:

As the exposed surface area of the reactants increases, The rate of the reaction increases. (p.61)

15- (One Mark)

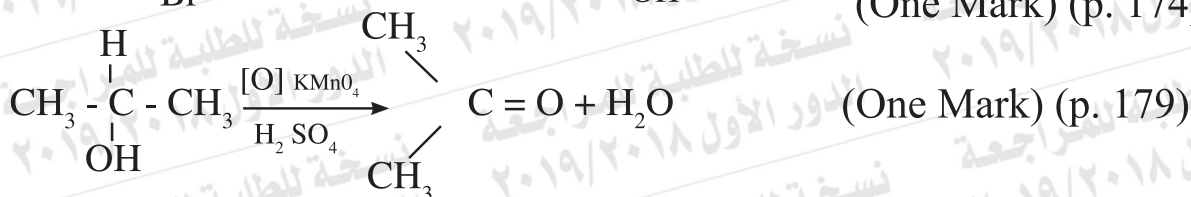
${}_{29}\text{Cu} : [\text{Ar}] 4\text{S}^1, 3\text{d}^{10}$

Because the atom is more stable when (3d) sublevel is completely filled. (p.8-9)

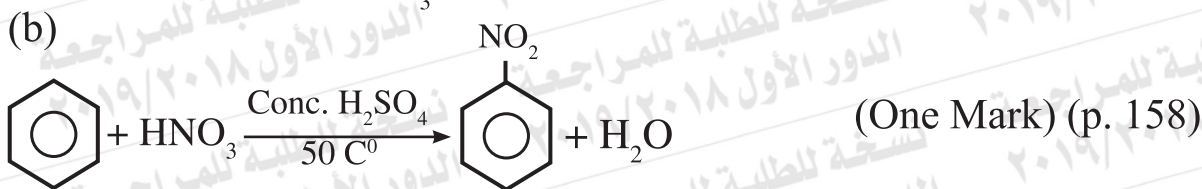
16- The student is asked to answer (a) or (b): (Two Marks)



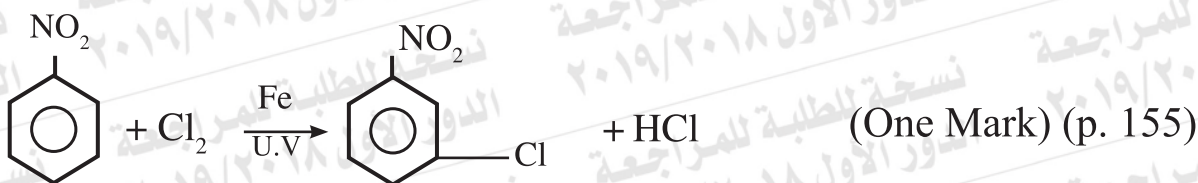
(One Mark) (p. 174)



(One Mark) (p. 179)

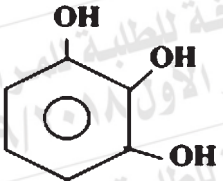


(One Mark) (p. 158)



(One Mark) (p. 155)

17- (Two Marks)

	Chemical name	Structural formula
First	2 - chloro - 4 - methyl - 2 - pentene. (One Mark) (p.139)	$\begin{array}{ccccccc} \text{H} & \text{Cl} & \text{H} & \text{CH}_3 & \text{H} & & \\ & & & & & & \\ \text{H} - \text{C} & - \text{C} = & \text{C} - & \text{C} - & \text{C} - \text{H} & & \\ & & & & & & \\ \text{H} & & & \text{H} & \text{H} & & \end{array}$
Second	Pyrogallol	 <p>(One Mark) (p.182)</p>

18- (Two Marks)

the molar mass of $\text{FeCl}_3 = 56 + 35.5 \times 3 = 162.5 \text{ g}$

the mass of Crystallization water = $5.41 - 3.25 = 2.16 \text{ g}$ (½ Mark)

	Crystallization water	unhydrated matter	
No. of moles	$\frac{2.16}{18} = 0.12$	$\frac{3.25}{162.5} = 0.02$	(½ Mark)
ratio of Moles	$\frac{0.12}{0.02} = 6$	$\frac{0.02}{0.02} = 1$	(½ Mark)

The number of molecules of crystallization water = 6 molecules

(½ Mark)

Another answer:

Mass of crystallization water = $5.41 - 3.25 = 2.16 \text{ g}$

(½ Mark)

The molar mass of $\text{FeCl}_3 = 162.5 \text{ g}$

The mass of unhydrated iron (III) chloride $3.25 \text{ g} \longrightarrow 2.16 \text{ g}$

The molar mass of FeCl_3 (162.5g) \longrightarrow Xg of water (½ Mark)

X (the mass of crystallization water) = $\frac{2.16 \times 162.5}{3.25} = 108 \text{ g}$

(½ Mark)

Number of moles of crystallization water = $\frac{108}{18} = 6 \text{ mole}$

Number of molecules of crystallization water = 6 molecules (½ Mark)

19- The student is asked to answer (a) or (b): (One Mark)

(a) Paramagnetic Property. (p.13)

(b) Sintering process. (p. 18)

20- The student is asked to answer (a) or (b): (One Mark)

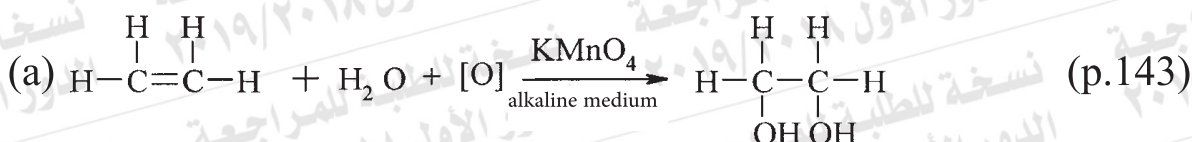
(a) The Total reaction in the Fuel Cell:



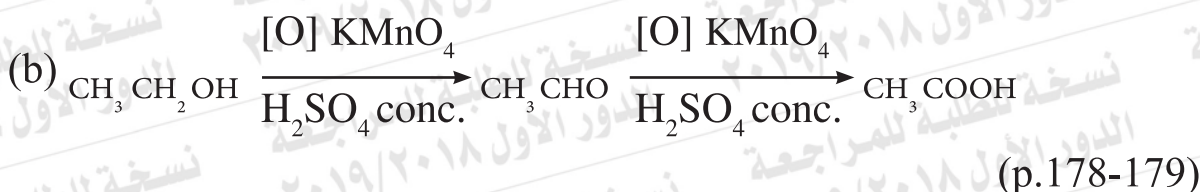
(b) The Total reaction in lithium ion battery.



21- The student is asked to answer (a) or (b): (One Mark)



Or, In case of adding acidified KMnO_4 , no reaction



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22- (One Mark)

Because it maintains its durability at high temperatures. (p.5)

23- (One Mark)

Choice (a) neutral. (p. 45)

24- (One Mark)

Choice (b) lead atoms oxidize and the concentration of acid decreases.

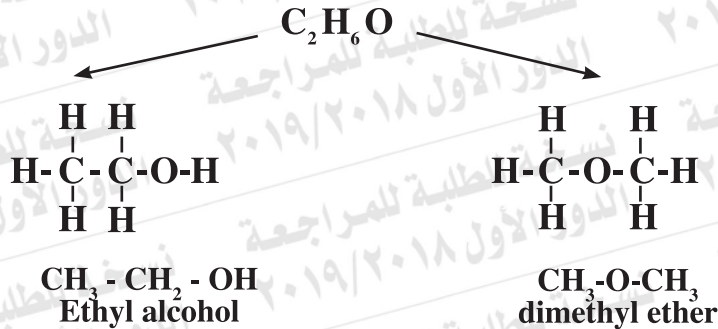
25- (Two Marks)

$[H_3O^+] = \sqrt{K_a \times C_a} = \sqrt{1 \times 10^{-2} \times 0.01} = 1 \times 10^{-2} \text{ mol/L}$ (One Mark)

$pH = -\text{Log} [H_3O^+] = -\log 1 \times 10^{-2} = 2$ (One Mark) (p.76)

26- (Two Marks)

First:



(One Mark) (p.128)

Second:

Reaction with Sodium

- Dimethyl ether + Sodium \longrightarrow No Reaction

- Ethyl alcohol + Sodium \longrightarrow Sodium ethoxide + hydrogen

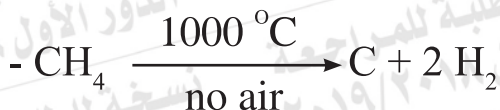
(One Mark)

(Or any other correct method to distinguish between them)

27- (Two Marks)



(One Mark) (P.135)



(One Mark) (P.138)

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28- The student is asked to answer (a) or (b): (One Mark)

(a) Ethylene glycol.

(b) Marookh oil (Methyl salicylate)

29- (One Mark)

Because it gives with bauxite a molten which is characterized by having a low melting point and low density. so, it facilitates the separation of aluminium. (p.116)

30- (One Mark)

Choice (b) chlorine gas evolves at the anode. (p. 107)

31- (One Mark)

$$K_c = \frac{[PCl_5]}{[PCl_3][Cl_2]} \quad (1/2 \text{ Mark})$$

$$K_c = \frac{(4)}{(0.8)(0.3)} = 16.6 \quad (1/2 \text{ Mark}) \quad (p.62)$$

32- (One Mark)

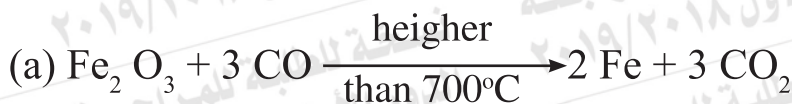
Choice (d) : unsaturated cyclic. (p. 130)

33- (One Mark)

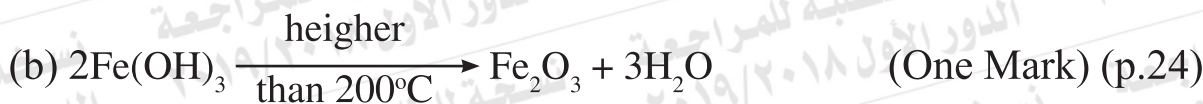
Because it combines with water molecule by a co-ordinate bond, forming hydronium ion $[H_3O^+]$ that it is attracted to the lone pair electrons in the oxygen atom of water molecule.

(p. 70)

34- The student is asked to answer (a) or (b): (Two Marks)



Or



35- (Two Marks)



$$\frac{M_a V_a}{n_a} = \frac{M_b V_b}{n_b}$$

(One Mark)

$$\frac{0.1 \times 18}{1} = \frac{M_b \times 25}{2}$$

$$M_b = 0.144 \text{ M.}$$

mass of pure NaOH = Volume (L) \times molar concentration \times molar mass

$$= 1 \times 0.144 \times 40 = 5.76\text{g} \quad (1/2 \text{ Mark})$$

$$\text{The percentage of NaOH} = \frac{5.76}{6} \times 100 = 96\% \quad (1/2 \text{ Mark})$$

Another answer:

$$\frac{M_a V_a}{n_a} = \frac{M_b V_b}{n_b}, \quad \frac{0.1 \times 18}{1} = \frac{M_b \times 25}{2}, \quad \therefore M_b = 0.144 \text{ M} \quad (1/2 \text{ Mark})$$

$$\text{Number of moles} = \text{Volume (L)} \times \text{concentration} = 0.144 \times 1 = 0.144 \text{ mol.}$$

(1/2 Mark)

Mass of pure NaOH = Number of moles \times molar mass of NaOH =

$$0.144 \times 40 = 5.76\text{g} \quad (1/2 \text{ Mark})$$

$$\text{The percentage of NaOH} = \frac{\text{mass of NaOH}}{\text{mass of sample}} \times 100 = \frac{5.76}{6} \times 100 = 96\%$$

(1/2 Mark)

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36- (Two Marks)



37- The student is asked to answer (a) or (b): (One Mark)

(a) Quantitative analysis. (p.33)

(b) Standard solution. (p.44)

38- The student is asked to answer (a) or (b): (One Mark)

(a) Due to Markownikoff's rule, the hydrogen atom of the reagent is added to the carbon atom that carries a large number of hydrogen atoms, while the halogen atom is added to the carbon atom which carries the least number of hydrogen atoms. (p.142)

(b) Because each acid molecule is linked to another molecule by two hydrogen bonds, while the two molecules of alcohol are linked by only one hydrogen bond. (p.191)

39- The student is asked to answer (a) or (b): (One Mark)

(a)

Reagent	Sodium bromide	Sodium iodide
Silver nitrate Or Ag NO ₃ (p.39)	white - yellow ppt. is formed that darkens in sunlight, and dissolves slowly in conc. Ammonia solution (½ Mark)	yellow ppt. is formed which is insoluble in ammonia solution (½ Mark)

(b)

Reagent	Sodium sulphite	Sodium sulphide
Silver nitrate	White ppt. is formed that turns black by heating. (½ Mark) (p.36)	black ppt. is formed (½ Mark) (p.37)

40- (One Mark)

First: Increasing Temperature: The rate of ammonia formation decreases.

(½ Mark) (p.64)

Second: Increasing Pressure : The rate of ammonia formation increases.

(½ Mark) (p.65)

41- (One Mark)

Choice (b) ammonium acetate solution.

(p.61)

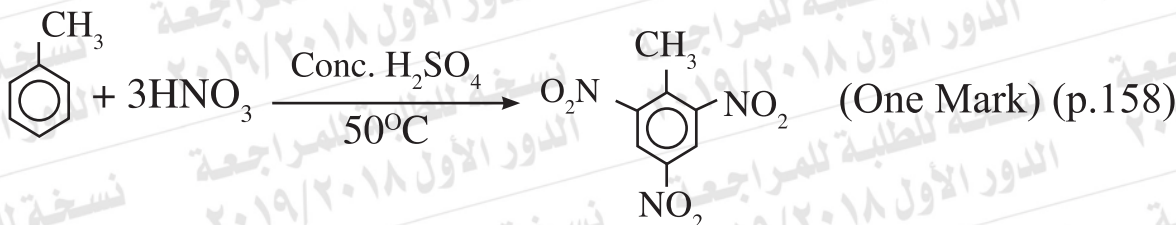
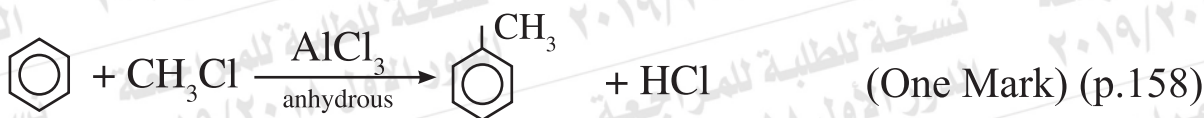
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42- The student is asked to answer (a) or (b): (One Mark)

Name	One use
Poly vinyl chloride (PVC) (p.146)	Drainage tubes - plastic tube-shoes - hoses -electric wire insulators - floors - oilbottles. (1/2 Mark)
- Teflon (p.146)	Cooking utensils - surgical threads. (1/2 Mark)

43- (Two Marks)



44- (Two Marks)

First: emf = The difference of the oxidation potentials of the two half cells

Or = The difference of the reduction potential of the two half cells.

Or = The oxidation potential of the anode + the reduction potential of the cathode.

$$= 1.03 + (-0.23) = 0.8 \text{ V} \quad \text{(One Mark) (p.96)}$$

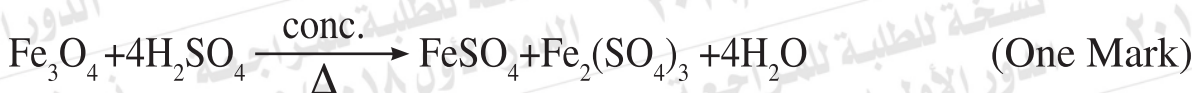
Second: The cell diagram:



45- (Two Marks)



(One Mark) (p.22)



In case of iron, SO_2 gas evolves that has bad (Irritating) smell.