Sixth Guiding Model (Chemistry 2026)

1-Two elements (A, B) from the first transition series, each (A^{+2}, B^{+2}) containing four Single electrons and element (A) is less dense than element (B).

- Which of the following expresses a use for each of (A, B)?

a) (A): in manufacture of soft drink bottles
(B): in reinforced concrete.

b) (A): in plating of metals to protect it from rust
(B): in manufacture of heating coil

c) (A) : in leather tanning and
(B) : in manufacture of surgical tools

d) (A) : in dyes
(B) : catalyst in manufacture of ammonia

2- If you know that the elements (X, Y, Z, and W) are transition elements from the first Transition series.

W: has the highest magnetic moment in the series

Z : its sublevel (d) is filled with electrons.

X : Pairing doubling of electrons in the sublevel (3d) starts after it.

Y: is the first element in the series that does not lose all electrons (4S,3d).

- Which of the following conversions gives a compound with lower energy?

(a) $WO_3 \rightarrow WO$ (b) $ZO \rightarrow Z_2O_3$

(c) $Y_2O_3 \rightarrow YO$ (d) $X_2O_3 \rightarrow XO$

3- Three transition elements (A, B, and C)

-The number of unpaired electrons in (A) decreases when it changes from Atomic state to +2 ion.

-The number of single electrons in element (B) increases when it changes from +2 to +3

- The number of single electrons in element (C) decreases when it changes from +2 to +3 And its radius is equal to that of (A)

Which of the following expresses the correct order of these elements according to their density?

a) A < B < C b) A < C < B C) B < C < A d) B < A < C

4-(A,B,C and D) Four consecutive transition elements from the first transition series, the electronic distribution of ion (B^{3+}) ends with $3d^3$,Which of the following is correct?

a) The magnetic moment of (A) increases with the loss of two electrons.

b) The magnetic moment of (B) increases with the loss of two electrons.

C) The magnetic moment of (C) decreases with loss the first electron from the (d) sublevel

d) The magnetic moment of (D) decreases with the loss of the first electron from the (d) level.

5-Which of the following processes causes an increase in the magnetic moment of iron ions in their compounds?

(a) Heating the compound resulting from adding ammonium hydroxide to iron III chloride above 200°C

(b) Heating the compound resulting from adding iron filings to dilute sulphuric acid.

(c) Heating limonite ore strongly in air.

(d) Heating siderite ore in absence of air.

6- Hydrochloric acid is added to a salt of (X^{2-}) anion, a gas (Y) evolves that oxidizes with the normal oxidizing agents.

-Which of the following applies to the anion (X^{2-}) and the gas (Y)?

	Anion (X^{2-})	Gas (Y)
A	Nitrite	Colorless, turns reddish brown in air.
B	sulphite	Has a pungent odor and turns acidified potassium dichromate solution from orange to green
C	sulphide	Odorless and produces a black precipitate with lead acetate II solution.
d	Carbonate	Colorless , odorless and turns lime water milky

7- Which of the following is not preferred for distinguishing between nitrate and nitrite anions in their salts?

(a) Diluted hydrochloric acid

(b) Hot concentrated sulfuric acid

(c) Potassium permanganate solution acidified with sulphuric acid

(d) Iron II sulfate with drops of concentrated sulphuric acid

8-Add acid (X) to three salts (A, B and C):

-<u>In case of salt (A):</u> a colorless gas evolves, partially oxidized into violet vapors

-<u>In case of salt (B):</u> a colorless gas evolves, partially oxidized Into orange vapors.

-<u>In case of salt (C):</u> a reddish-brown gas evolves.

Which of the following expresses acid (X) and the three salts?

	Acid (X)	Salt (A)	Salt (B)	Salt (C)
A	Diluted hydrochloric acid	CaI_2	$MgBr_2$	$Pb(NO_3)_2$
B	Concentrated nitric acid	$NaNO_3$	NaI	NaBr
C	Concentrated sulphuric acid	NaBr	$NaNO_3$	NaI
D	Concentrated sulphuric acid	CaI_2	$MgBr_2$	$Pb(NO_3)_2$

9- From the following diagram:

Precipitate (A) Soluble in diluted acids	← $Y_{(aq)}$	$BaCl_{2\,(aq)}$	$X_{(aq)}$ →	Precipitate (B) Soluble in diluted acids

Which of the following is correct?

	solution (X)	precipitation (A)
(a)	Na_2SO_4	$Ba_3(PO_4)_2$
(b)	Na_2CO_3	$BaSO_4$
(C)	Na_2SO_4	$BaCO_3$
(d)	Na_2CO_3	$Ba_3(PO_4)_2$

10-Two salts (A and B)

- Acid of salt (A) is used to detect cation of salt (B).

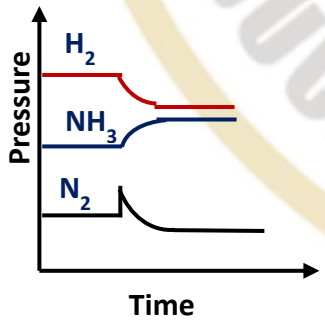
- Acid of salt (B) is used to detect anion of salt (A).

	Salt (A)	Salt (B)
(a)	KCl	$CuSO_4$
(b)	Hg_2SO_4	KCl
(C)	KCl	$PbSO_4$
(d)	K_2SO_4	$NaNO_3$

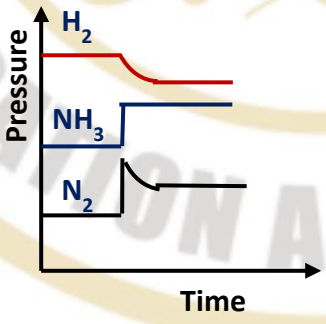
11- Ammonia is prepared in industry by the Haber-Bosch reaction according to the equation: $N_{2\,(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

Which of the following graph represents the effect of increasing the partial pressure of nitrogen gas on the previous equilibrium?

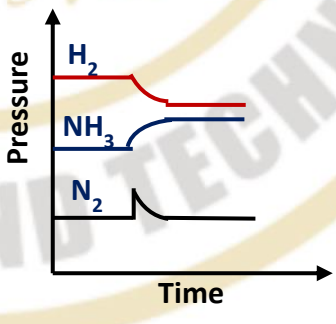
(a)



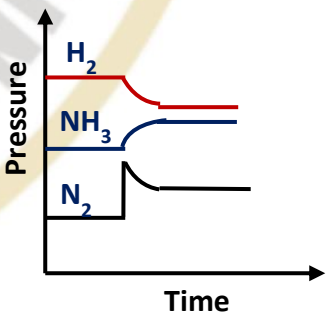
(b)



(C)



(d)



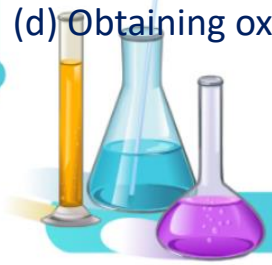
12- All of the following can express system at equilibrium state except:

(a) A saturated solution of salt that is sparingly soluble in water

(b) The dissolution of carbon dioxide gas in water in a closed container

(c) The dissolution of acetic acid in water in an open container

(d) Obtaining oxygen gas by decomposing hydrogen peroxide



13- The following table shows the pH values of four solutions of different acids with the same concentration:

solution	pH
A	1
B	6
C	3

-The correct order of these solutions according to their ionization constant Ka is:

(a) B ≻ A ≻ C (b) A ≻ B ≻ C

(c) C ≻ B ≻ A (d) A ≻ C ≻ B

14- The following balanced reaction at a certain temperature:

$$2A_{(aq)} + 3B_{(aq)} \rightleftharpoons 2C_{(aq)} + 3D_{(aq)}$$

If the concentrations of the reactants and products at equilibrium are:

[A] = 1.5M, [B] = 2.3M, [C] = 3M, [D] = 4.5M

By increasing the concentration of substance (A) and the reaction reaching equilibrium again at the same temperature, then the concentrations at equilibrium become as follows: [A] = 2.5M, [C] = 4M, [D] = 6M

-Which of the following expresses the concentration of substance (B) at equilibrium?

a) 29.96 M

b) 6.98 M

C) 3.83 M

d) 2.64 M

15- According to the following balanced reaction: $COCl_{2\,(g)} = CO_{(g)} + Cl_{2\,(g)}$

When a quantity of $COCl_{2\,(g)}$ is placed in a closed container with a volume of (1) L, at equilibrium the pressure of $Cl_{2\,(g)}$ is equal to (0.3) atm and the total pressure is equal to (0.8) atm, then the value of Kp is:

a) 0.3

b) 2.22

c) 0.45

d) 1.5

16- 16- Acetic acid solution (X) of 0.1M, diluted by adding water to get a solution (Y) Of (0.01M).

-Which of the following does not describe solutions (X) and (Y)?

(a) The electrical conductivity of solution (Y) is higher than that of solution (X)

(b) The concentration of hydronium ions in solution (X) is higher than that in (Y)

(c) The pH value of solution (Y) is higher than that of solution (X)

(d) The ionization constant of acid (X) is higher than that of (Y)

17- The reaction that occurs inside an electrochemical cell: -

$$3Cu^{2+} + 2Cr \rightarrow 3Cu + 2Cr^{3+}$$

-knowing that: $Cu^{2+} + 2e^- \rightarrow Cu$, $E^o = +0.340$ V

$Cr \rightarrow Cr^{3+} + 3e^-$, $E^o = +0.740$ V

- Which of the following expresses the type of the cell and its emf value?

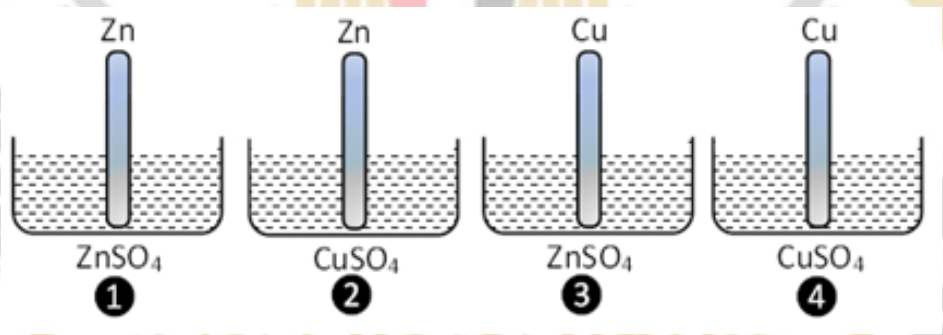
(a) Galvanic cell, (+1.08 V) = emf

(b) Electrolytic cell, (-1.08 V) = emf

(c) Galvanic cell, (+0.4 V) = emf

(d) Electrolytic cell,(-0.4 V) = emf

18- From the following shapes:



Which of the following is correct?

(a) When (1) is connected to (4) with a salt bridge and an external connecting wire, (4) Becomes the anode and (1) becomes the cathode.

(b) A spontaneous reaction occurs in (2) and the concentration of copper ions increases.

(c) When (1) is connected to (4) with a salt bridge and a connecting wire, electrons Spontaneously transfer from (1) to (4).

(d) A spontaneous reaction occurs in vessel (3), and the concentration of Zinc ions Decreases.

19- Two galvanic cells:

The first cell: electrode (X) is the anode, and the hydrogen electrode is the cathode, Giving an emf value of (+0.23) V.

The second cell: electrode (Y) is the cathode and the hydrogen electrode is the anode, Giving an emf value of (+0.8) V.

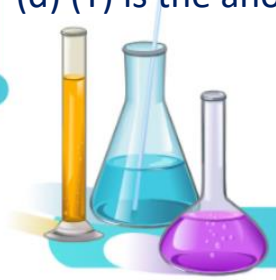
- Which of the following expresses the cell composed of electrodes (X) and (Y)?

(a) (X) is the anode and (Y) is the cathode, emf = 1.03 V

(b) (X) is the anode and(Y) is the cathode, emf = 0.57 V

(c) (Y) is the anode and (X) is the cathode, emf = 1.03 V

(d) (Y) is the anode and (X) is the cathode, emf = 0.57 V



20- The following table shows the oxidation potential of some hypothetical elements:

The element	X	Y	Z	W
Oxidation potential	+ 0.126 V	-0.401 V	-1.420 V	+1.67 V

Which of the following represents the correct protection?

(a) (X) Anodic protection for (W)
(b) (Z) Anodic protection for (Y)
(c) (W) Cathodic protection for (Y)
(d) (Y) Cathodic protection for (X)

21- Which of the following expresses the reaction that occurs at the anode of an electrolytic cell for molten potassium bromide?

(a) $2K^+ + 2e^- \rightarrow 2K^0$
(b) $2Br^- \rightarrow Br_2 + 2e^-$
(c) $2K^+ \rightarrow 2K^0 - 2e^-$
(d) $Br_2 + 2e^- \rightarrow 2Br^-$

22- Which of the following is correct for negative hydroxide ions in a fuel cell?

(a) Consumed as a result of the reduction reaction and formed as a result of the Oxidation reaction.
(b) Consumed as a result of the oxidation reaction and formed as a result of the Reduction reaction.
(c) Its concentration decreases at cathode
(d) Its concentration increases at anode

23- Compounds (X and Y) are hydrocarbon derivatives where:

(X): is produced from the chlorination of the compound resulting from the dry Distillation of sodium acetate by replacing three hydrogen atoms .

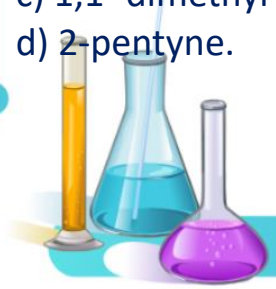
(Y): is produced from the dehydration of 2-chloro ethanol at 180^oC.

- Which of the following represents (A or B)?

(a) (X): Alkane derivative used in dry cleaning.
(b) (Y): Alkane derivative used as a raw material in the manufacture of floor insulation.
(c) (X): Alkene derivative was used as anesthetic.
(d) (Y): Alkene derivative used as a raw material in the manufacture of water hoses.

24- Which of the following compounds burns completely to produce (5) moles of CO_2 and (5) moles of water vapor?

A) 2-methyl butane
B) 2,2- dimethyl -2-butene.
c) 1,1- dimethyl cyclo propane.
d) 2-pentyne.



25- (X and Y) are two isomers of the formula C_4H_8O with different functional groups If (X) turns acidified potassium dichromate to green, while (Y) has no effect on Acidified potassium dichromate.

-Which of the following represents (X) or (Y)?

a) X: 2-methyl-1-propanol.
b) Y: 2-methyl propanal.
C) X: 2-methyl propanal.
d) Y: 3-methyl-2-butanone.

26- The corresponding structure of one of polymers:-

- Which of the following expresses the monomer properties of this polymer?

a) It reacts by addition according to Markownikoff's rule.
b) It reacts with HBr to give 1-bromo-butane.
C) It reacts with catalytic hydration to give 2-butanol.
d) It reacts with bromine to give 2,2-dibromo butane.

27- Three organic compounds:

(A) : C_2H_4O
(B) : C_2H_6O
(C) : C_2H_4 :

- Which of the following is correct?

a) Oxidation of both (A, C) produces an acid used in the manufacture of dyes.
b) Oxidation of both (A, B) produces an acid used in the manufacture of insecticides.
c) (B) produced from reduction of (A), and difficult to be oxidized
d) Reduction of (A) and oxidation of (C) gives the same products

28- A compound has the molecular formula: C_7H_7NO

-Which of the following esters can be used to prepare that compound?

a) C_6H_5 COO-CH_3
b) C_6H_5-OOC- CH_3
c) C_6H_5CO-NH_2
d) CH_3-COO-CH_3

29- (X, Y and Z) are three hydrocarbon derivatives have the following molecular Formulas:

(X): CH_2O
(Y): C_2H_6O
(Z): $C_2H_6O_2$

-Which of the following represents (X, Y and Z)?

	(X)	(Y)	(Z)
a)	Ketone	aliphatic Ether	Primary dihydric alcohol
b)	Aldehyde	Primary monohydric alcohol	Primary dihydric alcohol
C)	Carboxylic acid	Monohydric secondary alcohol	Aliphatic ester
d)	Aldehyde	aliphatic Ether	Carboxylic acid

30 - Three organic compounds (A, B and C):-

- When adding excess of NaOH to the three compounds:

(B): Consumes quantity of NaOH double that consumed by (A)

(C): doesn't react

-When heating (A) with (C), the produced compound is used as a flavor

Which of the following represents compounds (A), (B), and (C)?

a) (A) :$C_3H_6O_3$, (B) :$C_7H_6O_3$, (C) : C_2H_6O

b) (A) :$C_7H_6O_3$, (B) $C_3H_6O_3$, (C) C_2H_6O

c) (A) :C_2H_6O, (B): $C_3H_6O_3$, (C) :$C_7H_6O_3$

d) (A): $C_3H_6O_3$,(B): C_2H_6O,(C): $C_7H_6O_3$

31- The following table shows the molecular formulas of organic compounds:

A	B	C
$C_3H_8O_3$	$C_3H_8O_2$	$C_2H_4O_2$

-Which of the following represents the correct order of the compounds (C, B, A) according to boiling point?

(a) C > B > A (b) A > C > B (c) B > A > C (d) A > B > C

32- Which of the following is the correct IUPAC name for the product of hydrolysis of the compound $C_6H_5OOCCH_3$ in an acidic medium?

a) Acetic acid and hydroxy benzene b) Ethanoic acid and phenol

c) Methanol and benzoic acid d) Methyl alcohol and benzoic acid

33- (Y, X) are two consecutive transition elements in the first transition series, each of them has a compound in its highest oxidation state act as an oxidizing agent.

- Which of the following is correct?

a) (X) is used as a catalyst in the ammonia industry.

b) (Y) is used in car springs

C) The alloy consisting of element (Y) and the element following it with non-metals is Characterized by acid resistance.

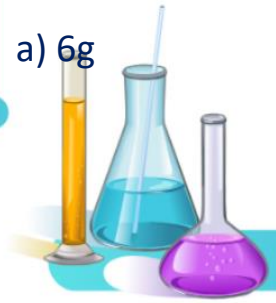
d) The alloy consisting of the two elements between which (X and Y) are located With carbon is characterized by hardness.

34- (12 g) of a mixture of sodium phosphate and potassium iodide is dissolved in water and excess of silver nitrate solution is added to it, forming a yellow precipitate with a mass of (X g). Then, an excess of ammonium hydroxide solution is added, leaving a precipitate with a mass of (8.5 g).

- Which of the following expresses the mass of the precipitate (X)?

(Ag=108, K=39, Na=23, I=127, P=31, O=16, N=14)

a) 6g b) 8.5g c) 15.25g d) 23.82g



35-If you know that (16 mL) of potassium hydroxide solution is needed to titrate (32 mL) of sulphuric acid.

-which of the following expresses the concentration of sulphuric acid?

a) Equal to the concentration of potassium hydroxide

b) Half the concentration of potassium hydroxide

c) Quarter The concentration of potassium hydroxide

d) Four times the concentration of potassium hydroxide.

36- If you know that the solubility of magnesium carbonate $MgCO_3$ in water at a temperature of 25ºC is equal to (4.4×10^{-5} mol / 100 mL), then the solubility product (Ksp) of this salt is equal to:

(a) 4.16×10^{-11}

(b) 1.9×10^{-7}

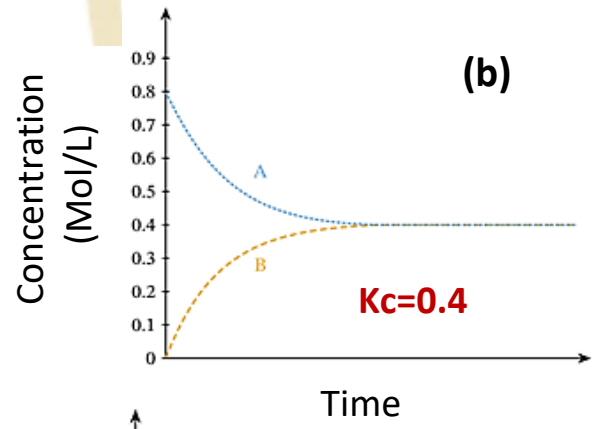
(c) 19.36×10^{-10}

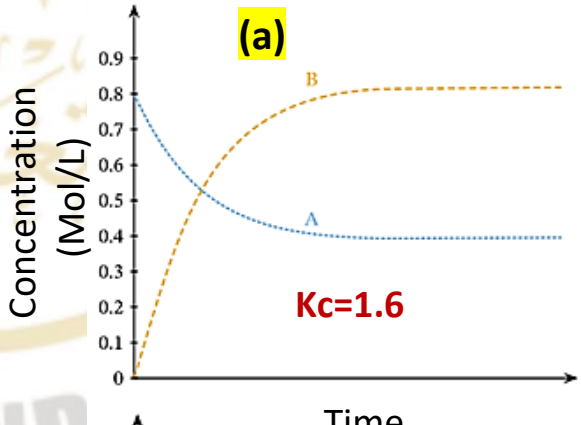
(d) 6.44×10^{-4}

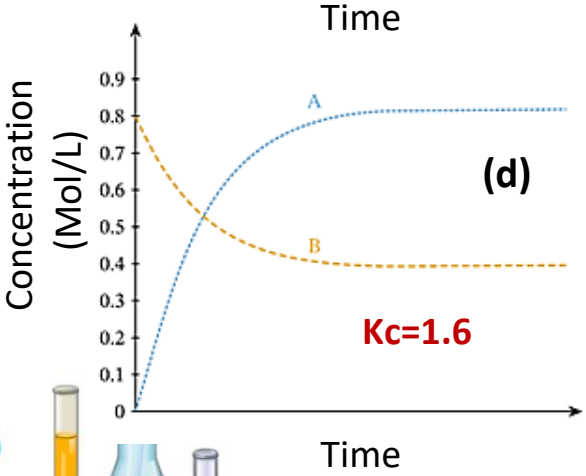
37-When (0.8) moles of substance (A) are placed in a (1L) and equilibrium is reached according to the following equation: $A_{(aq)} \rightleftharpoons 2B$

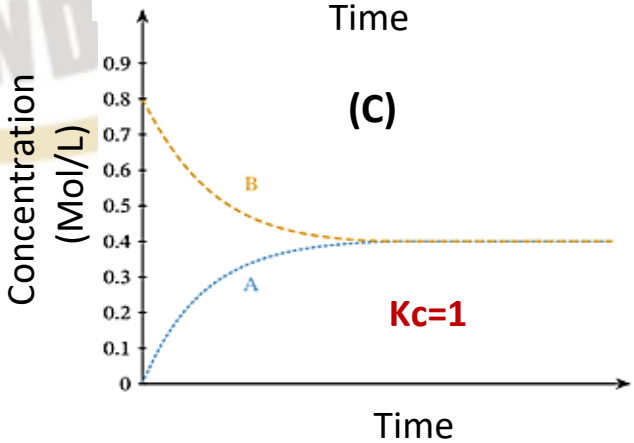
It is found that (0.4) moles of substance (A) are converted to (B).

Which of the following represents the equilibrium state and equilibrium constant for this reaction?









38-The amount of electricity required to precipitate (1 mol) of Au^{3+} can precipitate (1.5 mol) of:

(a) Na^{+}

(b) Mg^{2+}

(c) Cu^{+}

(d) Al^{3+}

39- Permanganate ions MnO_4^- can be prepared by electrolysis of a solution containing manganese ions Mn^{2+} according to the following reaction:

$$Mn^{2+} + 4\ H_2O \rightarrow MnO_4^- + 8H^+ + 5e-$$

- The amount of electricity required to prepare 0.2 mol of permanganate ions is equal to:

a) 48250 C

b) 193000 C

c) 19300 C

d) 96500 C

40-Three organic compounds with the molecular formula C_3H_8O

(X): Decolorizes acidified potassium permanganate solution and forms a compound That reacts with sodium carbonate.

(Y): Decolorizes acidified potassium permanganate solution and forms a compound That does not respond to acidity test.

(Z): Does not decolorize acidified potassium permanganate solution.

-Which of the following expresses the number of methyl groups in each of (X, Y and Z)?

	(X)	(Y)	(Z)
A	1	0	2
B	2	1	2
C	2	2	1
D	1	2	2

41-(A) and (B) are hydroxyl organic compounds, the (O-H) bond in compound (A) is Longer and weaker than that in compound (B) .

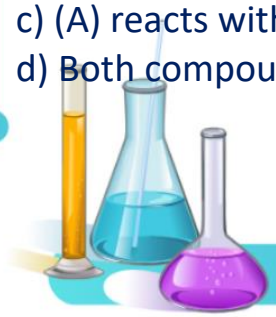
-Which of the following is correct?

a) (A and B) react with sodium hydroxide

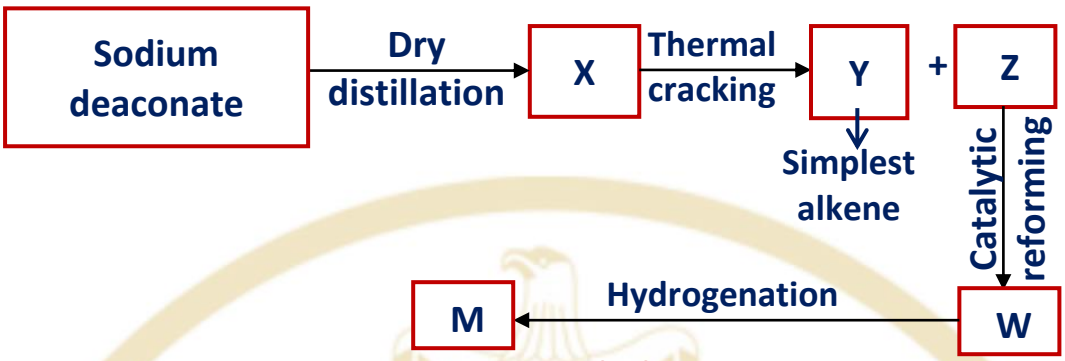
b) (A and B) react with HCl acid

c) (A) reacts with sodium hydroxide while (B) does not react

d) Both compounds (A) and (B) can be detected with $FeCl_3$ solution



42-From the following diagram:



- Which of the following describes compound (M)?

A) (M): Saturated cyclic hydrocarbon, W: Oxidizes to an aromatic acid

B) (M): Cyclohexane , W: Oxidizes to an aromatic acid

c) (M): Aromatic hydrocarbon , W: gives substitution derivatives in the para position

d) (M): Aliphatic hydrocarbon , W: gives substitution derivatives in the meta position

43- Three organic acids (A, B, C):

(A): Produced by the reaction of a 3 moles of caustic soda with 1mole of 1,1,1-Trichloroethane.

(B): Produced by the fermentation of lactose in milk by certain types of bacteria.

(C): Reacts with methanol to form a substance used to remove rheumatic pain

- Which of the following represents the above acids?

a) (A) :$C_2H_4O_2$, (B) :$C_3H_6O_3$, (C) : $C_7H_6O_3$

b) (A) :$C_3H_6O_3$, (B): $C_2H_4O_2$, (C) : $C_7H_6O_3$

C) (A) :$C_2H_4O_2$, (B): $C_7H_6O_3$, (C) : $C_3H_6O_3$

d) (A) : $C_3H_6O_3$, (B):$C_7H_6O_3$, (C) : $C_2H_4O_2$

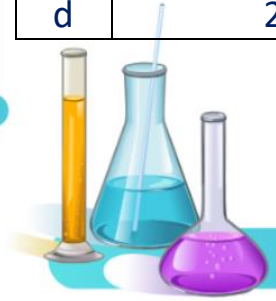
44-(X and Y) are carboxylic acids with the following molecular formulas:

(X): ($C_7H_6O_3$)

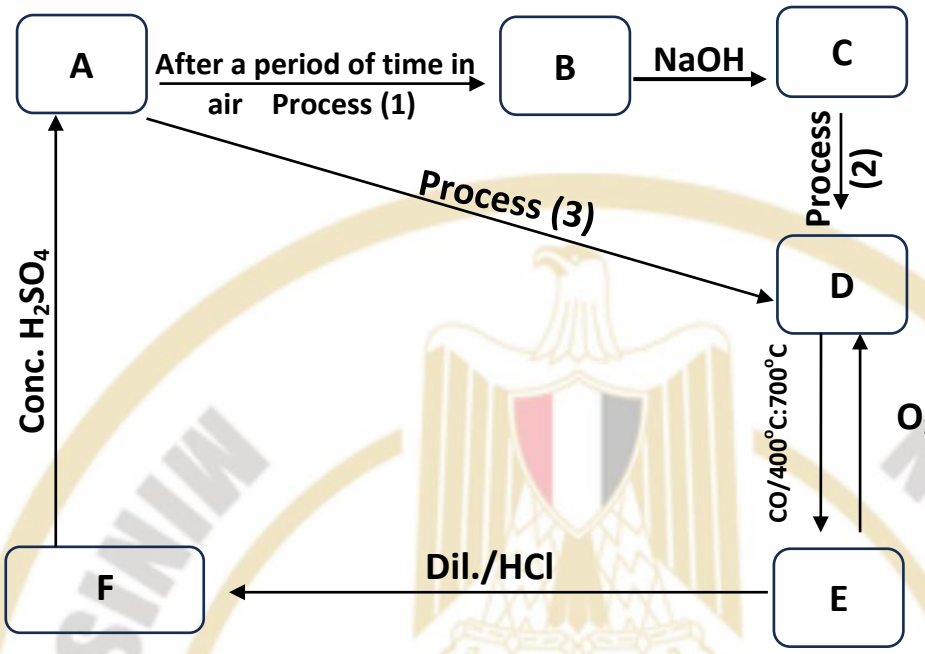
(Y): ($C_3H_6O_3$)

-Which of the following expresses the reaction of one mole of (X and Y) with the substances listed in the table?

	Number of required Na moles for the acid (Y)	Number of required Na moles for the acid(X)	Number of required NaOH moles for the acid(Y)	Number of required NaOH moles for the acid (X)
a	1	1	1	1
b	2	2	1	2
C	2	2	2	1
d	2	2	2	2

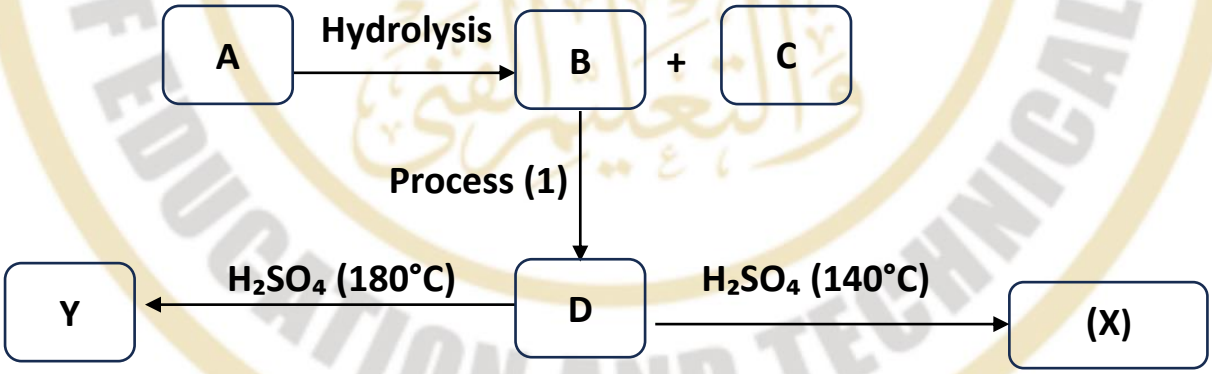


45- From the following diagram: -



(1) Write the chemical formulas for (F, B).
(2) What is the number of the process that represents thermal decomposition and Don't accompanied with change in magnetic moment of iron?
(3) What is the name of the process number (3)?

46- From the following diagram: -



-Knowing that (C, B) are isomers:

1- Write the chemical formulas for (X) and (C).
2- Name process number (1).
3- Write the IUPAC name of the compound that yields a sodium organic salt in One process
4- Write the structural formulas of the alcoholic isomer of compound (X) that Does not oxidize with normal oxidizing agents