

(Choose and mark the correct answer in the Answer Sheet)

A1- Express the equilibrium constant for the following reaction.
 $2 \text{CH}_3\text{Cl}(g) + \text{Cl}_2(g) \rightleftharpoons 2 \text{CH}_3\text{Cl}_2(g) + \text{H}_2(g)$

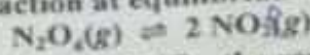
- a- $K = \frac{[\text{CH}_2\text{Cl}_2][\text{H}_2]}{[\text{CH}_3\text{Cl}][\text{Cl}_2]}$ **b- $K = \frac{[\text{CH}_2\text{Cl}_2]^2[\text{H}_2]}{[\text{CH}_3\text{Cl}]^2[\text{Cl}_2]}$** c- $K = \frac{[\text{CH}_3\text{Cl}]^2[\text{Cl}_2]}{[\text{CH}_2\text{Cl}_2]^2[\text{H}_2]}$ d- $K = \frac{[\text{CH}_3\text{Cl}][\text{Cl}_2]}{[\text{CH}_2\text{Cl}_2][\text{H}_2]}$

A2- Determine the missing equilibrium constant.

If $A + B \rightleftharpoons C$ has K_{forward} ; Then $C \rightleftharpoons A + B$ has $K_{\text{reverse}} = ?$

- a- **$K_{\text{reverse}} = 1 / K_{\text{forward}}$** b- $K_{\text{reverse}} = K_{\text{forward}}$ c- $K_{\text{reverse}} = K_{\text{forward}} / 2$ d- $K_{\text{reverse}} = 0$

A3- Consider the following reaction at equilibrium



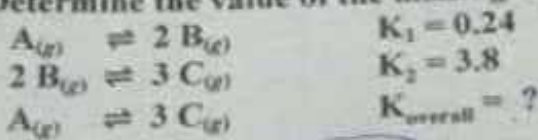
By increasing the concentration of NO_2 , the reaction will go to the _____.

- a- right **b- left** c- up d- down

A4- What is the name of HNO_3 ?

- a- nitric acid b- sulfuric acid c- hydrochloric acid d- acetic acid

A5- Determine the value of the missing equilibrium constant.



0.24×3.8

- a- 4.043 **b- 0.912** c- 0.031 d- 6.335

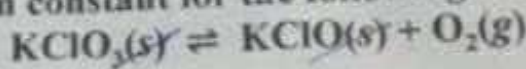
A6- Which of the following is an Arrhenius acid?

- a- H_2SO_4** b- NH_3 c- NaOH d- CH_3CH_3

A7- Calculate the pH of a solution that contains $3.9 \times 10^{-4} \text{ M H}_3\text{O}^+$ at 25°C .

- a- 4.31 **b- 3.41** c- 6.07 d- 2.65

A8- Express the equilibrium constant for the following reaction.

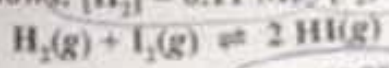


- a- $K = [\text{KClO}]$ b- $K = \frac{[\text{KClO}][\text{O}_2]}{[\text{KClO}_3]}$ c- $K = \frac{[\text{KClO}_3]}{[\text{KClO}][\text{O}_2]}$ **d- $K = [\text{O}_2]$**

A9- What is the name of NaHCO_3 ?

- a- sodium carbonate b- sodium hydroxide **c- sodium bicarbonate** d- potassium hydroxide

A10- Determine the value of K_c for the following reaction if the equilibrium concentrations are as follows: $[H_2] = 0.11 M$, $[I_2] = 0.11 M$, $[HI] = 0.78 M$



- a- $K_c = 90.23$ b- $K_c = 10.11$ c- $K_c = 50.28$ d- $K_c = 88.15$

A11- Which of the following is a Brønsted-Lowry base?

- a- HCl b- NH_3 c- CH_4 d- Cl_2

A12- What is the conjugate acid of HCO_3^- ?

- a- H_2CO_3 b- H_2O c- OH^- d- CO_3^{2-}

A13- The pH value of the neutral solution is _____.

- a- 7 b- > 7 c- < 7 d- zero

A14- Which of the following is a strong acid?

- a- H_2O b- HF c- $HClO_4$ d- NH_4^+

A15- Calculate the concentration of H_3O^+ in a solution that contains $1.3 \times 10^{-2} M$ OH^- at $25^\circ C$.

- a- $3.5 \times 10^{-13} M$ b- $8.0 \times 10^{-11} M$ c- $7.7 \times 10^{-13} M$ d- $5.0 \times 10^{-12} M$

A16- Consider the following reaction at equilibrium
 $A(g) + B(g) + \text{heat} \rightleftharpoons C(g) + D(g)$

By adding heat, the reaction will go to the _____.

- a- right b- left c- up d- down

A17- The total energy of the universe is _____.

- a- change b- constant c- unknown d- zero

A18- _____ measures the change in internal energy at constant volume.

- a- thermometer b- timer c- bomb calorimeter d- none

A19- The sum of kinetic and potential energies of all particles in the system is _____.

- a- internal energy b- electric energy c- light d- speed

A20- Alkenes always contain a _____.

- a- C - C single bond b- C=C triple bond c- C=C double bond d- C-H bond

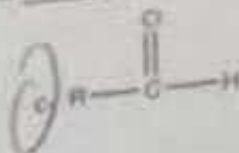
A21- A chemical reaction that gives heat to the surrounding is _____.

- a- exothermic b- acidic c- basic d- endothermic

A22- Butane has _____ carbon atoms.

- a- 6 b- 1 c- 3 d- 4

A23- The general formula for an aldehyde is _____.



A24- What is the name of $CH_3CH_2CH_3$?

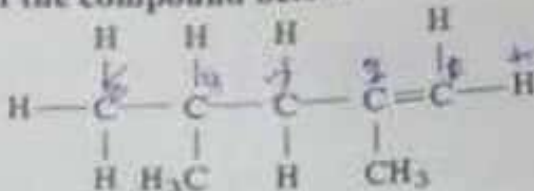
a- methane

b- propane

c- ethane

d- hexane

A25- What is the name of the compound below?



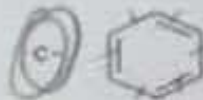
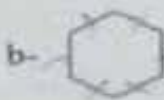
a- 2,4-dimethyl-1-pentene

b- dimethyl-2-butene

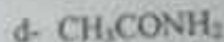
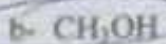
c- 2,4-hexene

d- 2,5-dimethylpentane

A26- The structure of benzene is _____.



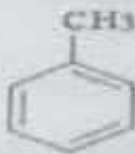
A27- Which of these compounds is an alcohol?



A28- The following reaction would produce _____.



A29- The correct name for the following compound is _____.



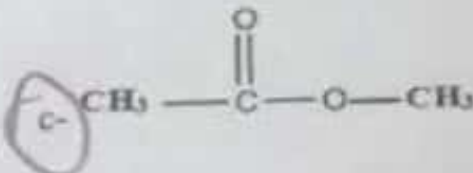
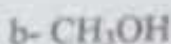
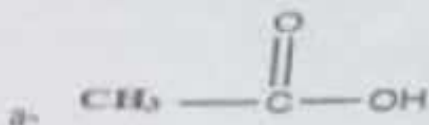
a- chlorobenzene

b- methylbenzene

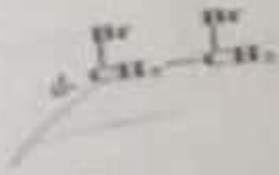
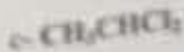
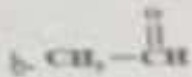
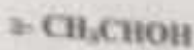
c- ethanal

d- ethylbenzene

A30- Which of the following is an ester?



A31- The following reaction would produce _____



A32- _____ is a polysaccharide.

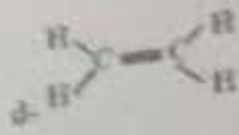
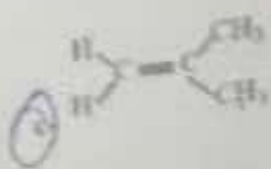
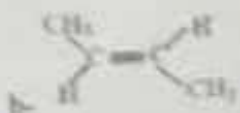
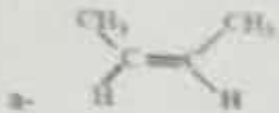
a- starch

b- glucose

c- DNA

d- fats

A33- Which of the following is a "cis" isomer?



A34- Amino acids are linked together by a _____

a- ketone group

b- double bond

c- single bond

d- peptide bond

A35- Which of the following is a biopolymer?

a- nucleic acid

b- ketone

c- carboxylic acid

d- ester

A36- How many isomers are there for butene (C_4H_8)?

a- 0

b- 2

c- 3

d- 4

A37- Which of the following is a carbohydrate?

a- phospholipid

b- glucose

c- DNA

d- fats

A38- How many hydrogen atoms in the following structure?



a- 10

b- 12

c- 15

d- 17

A39- What are the functional groups in amino acids?

a- (-CHO + -COOH)

b- (-NH₂ and -COOH)

c- (-OH + -CO)

d- (-CHO + -O-)

A40- Which of following is an organic compound?

a- HCl

b- NaOH

c- NaCl

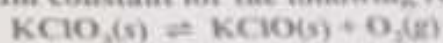
d- CH₄

Good Luck

D9- Calculate the pH of a solution that contains $7.8 \times 10^{-6} \text{ M OH}^-$ at 25°C .

- a- 8.89 b- 3.41 c- 6.07 d- 2.65

D10- Express the equilibrium constant for the following reaction.



- a- $K = [\text{KClO}]$ b- $K = \frac{[\text{KClO}][\text{O}_2]}{[\text{KClO}_3]}$ c- $K = \frac{[\text{KClO}_3]}{[\text{KClO}][\text{O}_2]}$ d- $K = [\text{O}_2]$

D11- What is the name of H_3PO_4 ?

- a- nitric acid b- phosphoric acid c- hydrochloric acid d- acetic acid

D12- What is the name of Na_2CO_3 ?

- a- sodium carbonate b- sodium hydroxide c- sodium bicarbonate d- potassium hydroxide

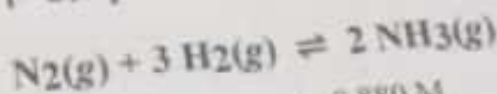
D13- What is the conjugate base of NaOH ?

- a- H_2CO_3 b- H_2O c- OH^- d- CO_3^{2-}

D14- Which of the following is a Brønsted-Lowry acid?

- a- NH_4^+ b- NH_3 c- CH_4 d- Cl_2

D15- Calculate the value of $[\text{N}_2]_{\text{eq}}$ if $[\text{H}_2]_{\text{eq}} = 2.0 \text{ M}$, $[\text{NH}_3]_{\text{eq}} = 0.5 \text{ M}$, and $K_c = 2$.



- a- 0.023 M b- 0.016 M c- 0.880 M d- 0.105 M

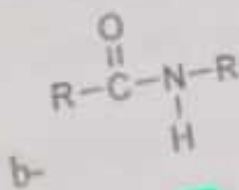
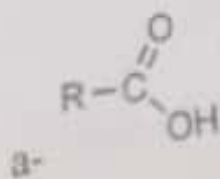
D16- The pH value of acidic solution is _____.

- a- 7 b- > 7 c- < 7 d- zero

D17- Which of following is an organic compound?

- a- HCl b- NaOH c- NaCl d- $\text{CH}_3\text{CH}_2\text{CH}_3$

D18- The structure of a peptid bond is

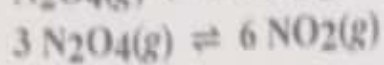


- c- CH_4 d- CH_3NH_2

D19- Determine the value of the missing equilibrium constant.



$$K_c = 1.46$$



$$K_c = ?$$

a- 3.11

b- 9.12

c- 0.031

d- 6.335

D20- Calculate $[\text{H}_3\text{O}^+]$ in an aqueous solution with a pH of 9.85 at 25 °C.

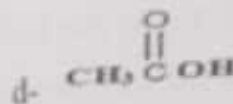
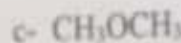
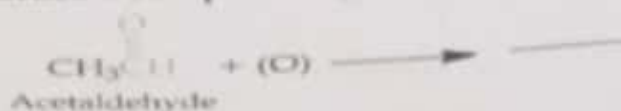
a- $5.5 \times 10^{-13} \text{ M}$

b- $8.0 \times 10^{-11} \text{ M}$

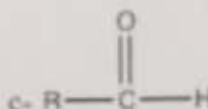
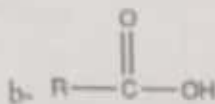
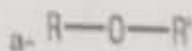
c- $7.7 \times 10^{-13} \text{ M}$

d- $1.4 \times 10^{-10} \text{ M}$

D21- The following reaction would produce _____.



D22- The general formula for an aldehyde is _____.



D23- Which of the following is a Lewis acid?

a- BF_3

b- NH_3

c- CH_4

d- NaOH

D24- Alkynes always contain a _____.

a- C - C single bond

b- $\text{C}\equiv\text{C}$ triple bond

c- $\text{C}=\text{C}$ double bond

d- $\text{C}=\text{H}$ bond

D25- Which of the following is a weak acid?

a- H_2O

b- HF

c- HCl

d- HBr

D26- Consider the following reaction at equilibrium



The adding additional of CaCO_3 has on the reaction equilibrium.

a- right effect

b- no effect

c- up effect

d- down effect

D27- Express the equilibrium constant for the following reaction.
$$\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightleftharpoons 2 \text{NH}_3(\text{g})$$

- a- $K = \frac{[\text{NH}_3]^6}{[\text{N}_2]^3[\text{H}_2]^3}$ b- $K = \frac{[\text{N}_2][\text{H}_2]^3}{[\text{NH}_3]^2}$ c- $K = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3}$ d- $K = \frac{[\text{NH}_3]^{1/2}}{[\text{N}_2][\text{H}_2]^{1/3}}$

D28- The structure of methyl benzene is _____.



D29- Which of the following is a monosaccharide?

- a- phospholipid b- fructose c- DNA d- fats

D30- The name for the compound with the formula $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ is

- a- propanol b- butane c- pentanol d- butanol

D31- _____ is a polysaccharide.

- a- cellulose b- glucose c- DNA d- fats

D32- The number of σ (sigma) bonds in $\text{CH}_3\text{-CH=C-CH-CH}_2\text{-CH=CH-CH}_3$ is ..

- a- 19 b- 15 c- 13 d- 18

D33- Which of the following is a biopolymer?

- a- proteins b- ketone c- carboxylic acid d- ester

D34- Which one of the following is not an alcohol?

- a- butanal b- methanol c- ethanol d- propanol

D35- What are the functional groups in amino acids?

- a- (-CHO + -COOH) b- (-NH₂ + -COOH) c- (-OH + -CO) d- (-CHO

D36- Which of these compounds is an amide?

- a- CH_3NH_2 b- CH_3OH c- CH_3OCH_3 d- CH_3CO

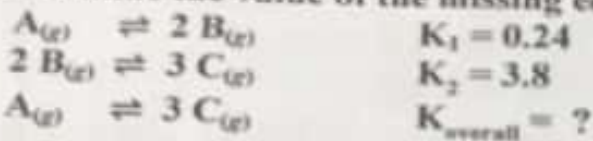
(Choose and mark the correct answer in the Answer Sheet)

D

D1- What is the name of NaHCO_3 ?

- a- sodium carbonate b- sodium hydroxide c- sodium bicarbonate d- potassium hydroxide

D2- Determine the value of the missing equilibrium constant.



- a- 4.043 b- 0.912 c- 0.031 d- 6.335

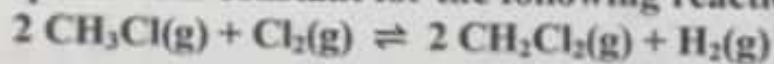
D3- Which of the following is an Arrhenius acid?

- a- H_2SO_4 b- NH_3 c- NaOH d- CH_3CH_3

D4- Calculate the pH of a solution that contains $3.9 \times 10^{-4} \text{ M H}_3\text{O}^+$ at 25°C .

- a- 4.31 b- 3.41 c- 6.07 d- 2.65

D5- Express the equilibrium constant for the following reaction.



- a- $K = \frac{[\text{CH}_2\text{Cl}_2][\text{H}_2]}{[\text{CH}_3\text{Cl}][\text{Cl}_2]}$ b- $K = \frac{[\text{CH}_2\text{Cl}_2]^2[\text{H}_2]}{[\text{CH}_3\text{Cl}]^2[\text{Cl}_2]}$ c- $K = \frac{[\text{CH}_3\text{Cl}]^2[\text{Cl}_2]}{[\text{CH}_2\text{Cl}_2]^2[\text{H}_2]}$ d- $K = \frac{[\text{CH}_3\text{Cl}][\text{Cl}_2]}{[\text{CH}_2\text{Cl}_2][\text{H}_2]}$

D6- Complete the missing equilibrium constant.

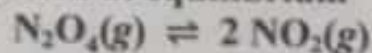
If $A + B \rightleftharpoons C$ has $K_{\text{forward}} = [C]/[A][B]$; Then $C \rightleftharpoons A + B$ has $K_{\text{reverse}} = \dots\dots$

- a- $K_{\text{reverse}} = 1 / K_{\text{forward}}$ b- $K_{\text{reverse}} = K_{\text{forward}}$ c- $K_{\text{reverse}} = K_{\text{forward}} / 2$ d- $K_{\text{reverse}} = 0$

D7- What is the name of HNO_3 ?

- a- nitric acid b- sulfuric acid c- hydrochloric acid d- acetic acid

D8- Consider the following reaction at equilibrium



By increasing the concentration of NO_2 , the reaction will go to the _____.

- a- right b- left c- up d- down

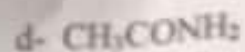
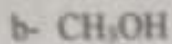
D9- The pH value of the neutral solution is _____.

- a- 7 b- > 7 c- < 7 d- zero

D10- Which of the following is a strong acid?

- a- H_2O b- HF c- HClO_4 d- NH_4^+

D21- Which of these compounds is an alcohol?



D22- What is the name of $\text{CH}_3\text{CH}_2\text{CH}_3$?

a- methane

b- propane

c- ethane

d- hexane

D23- A chemical reaction that gives heat to the surrounding is _____.

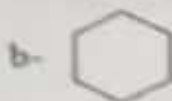
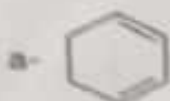
a- exothermic

b- acidic

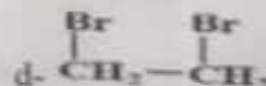
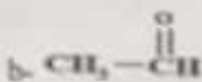
c- basic

d- endothermic

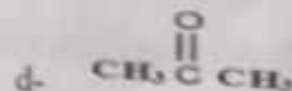
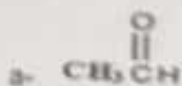
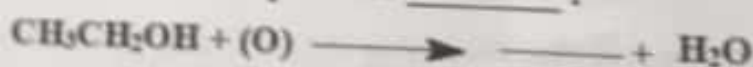
D24- The structure of benzene is _____.



D25- The following reaction would produce _____.



D26- The following reaction would produce _____.



D27- Which of the following is a carbohydrate?

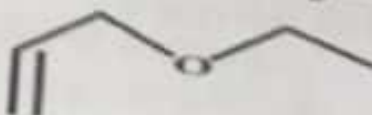
a- phospholipid

b- glucose

c- DNA

d- fats

D28- How many hydrogen atoms in the following structure?



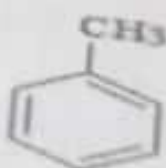
a- 10

b- 12

c- 15

d- 17

D29- The correct name for the following compound is _____.



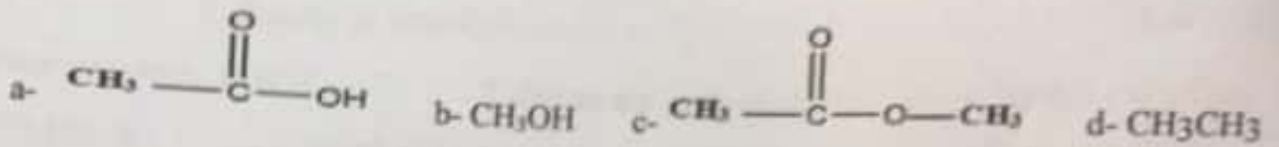
a- chlorobenzene

b- methylbenzene

c- ethanal

d- ethylbenzene

D30- Which of the following is an ester?



D31- _____ is a polysaccharide.

- a- starch b- glucose c- DNA d- fats

D32- The sum of kinetic and potential energies of all particles in the system is _____.

- a- internal energy b- electric energy c- light d- speed

D33- Which of these species is an aromatic compound?

- a- C_2H_2 b- C_6H_{12} c- $\text{C}_6\text{H}_4\text{Br}_2$ d- C_3H_{10}

D34- Amino acids are linked together by a _____.

- a- ionic bond b- double bond c- single bond d- peptide bond

D35- How many isomers are there for butene (C_4H_8)?

- a- 0 b- 2 c- 3 d- 4

D36- Which of the following is a biopolymer?

- a- nucleic acid b- ketone c- carboxylic acid d- ester

D37- What are the functional groups in amino acids?

- a- $(-\text{CHO} + -\text{COOH})$ b- $(-\text{NH}_2 + -\text{COOH})$ c- $(-\text{OH} + -\text{CO})$ d- $(-\text{CHO} + -\text{O}-)$

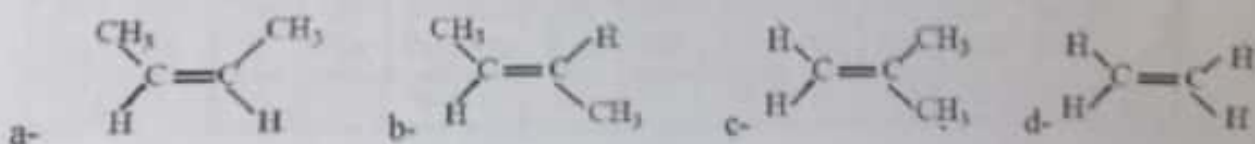
D38- What is the conjugate acid of HCO_3^- ?

- a- H_2CO_3 b- H_2O c- OH^- d- CO_3^{2-}

D39- Which of the following is a Brønsted-Lowry base?

- a- HCl b- NH_3 c- CH_4 d- Cl_2

D40- Which of the following is a "cis" isomer?



D41- The number of π bonds in $\text{CH}_3\text{-CH=C-CH-CH}_2\text{-CH-CH-CH}_3$ is

a- 3

b- 4

c- 5

d- 7

D42- Which of these compounds is an amide?

a- CH_3NH_2

b- CH_3OH

c- CH_3OCH_3

d- CH_3CONH_2

D43- What is the pOH value of 5.2×10^{-4} M HNO_3 solution?

a- 10.72

b- 11.22

c- 1.99

d- zero

D44- Which one of these statements about Lewis acids is *true*?

- a- All Lewis acids have H atoms bonded to O atoms.
- b- Lewis acids are electron pair acceptors.
- c- Lewis acids are electron pair donors.
- d- None of these

Good Luck