Jeddah University

CHEMISTRY (110)

Final Exam

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

A1- Express the equilibrium constant for the following reaction.

$$2\,CH_2Cl_2(g) + Cl_2(g) \rightleftharpoons 2\,CH_2Cl_2(g) + H_2(g)$$

a- $K = \frac{[CH_2Cl_2][H_2]}{[CH_2Cl_2][Cl_2]}$ b- $K = \frac{[CH_2Cl_2][H_2]}{[CH_2Cl_2]^2[Cl_2]}$ c- $K = \frac{[CH_2Cl_2]^2[H_2]}{[CH_2Cl_2]^2[Cl_2]}$ d- $K = \frac{[CH_2Cl_2][Cl_2]}{[CH_2Cl_2][H_2]}$

A2- Determine the missing equilibrium constant.

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

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

A3- Consider the following reaction at equilibrium

$$N_2O_4(g) \rightleftharpoons 2\,NO_2(g)$$

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.

$A_{(g)} \rightleftharpoons 2\,B_{(g)}$ $K_1 = 0.24$

$2\,B_{(g)} \rightleftharpoons 3\,C_{(g)}$ $K_2 = 3.8$

$A_{(g)} \rightleftharpoons 3\,C_{(g)}$ $K_{overall} = ?$

a- 4.043 b- 0.912 c- 0.031 d- 6.339

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 3.9×10^{-4} M H_3O^+ at 25 °C.

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

A8- Express the equilibrium constant for the following reaction.

$$KClO_3(s) \rightleftharpoons KClO(s) + O_2(g)$$

a- $K = [KClO]$ b- $K = \frac{[KClO][O_2]}{[KClO_3]}$ c- $K = \frac{[KClO_3]}{[KClO][O_2]}$ d- $K = [O_2]$

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: $[H_2] = 0.11\ M$, $[I_2] = 0.11\ M$, $[HI] = 0.78\ M$

$$H_2(g) + I_2(g) \rightleftharpoons 2\,HI(g)$$

a- $K_c = 50.23$ b- $K_c = 50.33$ c- $K_c = 50.28$ d- $K_c = 88.55$

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

a- HCl b- NH_4 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 1.3×10^{-2} M OH^- at 25 °C.

a- 7.7×10^{-13} M b- 8.0×10^{-13} M c- 7.7×10^{-13} M d- 5.0×10^{-12} M

A16- Consider the following reaction at equilibrium

$$A(g) + B(g) + heat \rightleftharpoons C(g) + D(g)$$

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- unkown d- zero

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

a- thermometer b- timer c- bomb calorimetry 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

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

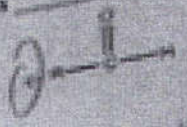
a- exothermic b- acidic c- basic d- endothermic

A22- Butane has _____ carbon atoms

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

A

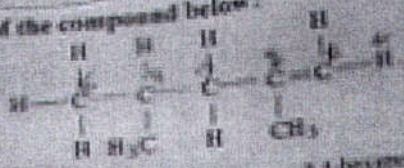
A23- The general formula for an aldehyde is _____

a-  b-  c-  d- 

A24- What is the name of $CH_3CH_2CH_3$?

a- methane b- propane c- ethene d- butane

A25- What is the name of the compound below?



a- 2,4-dimethyl-1-pentene b- dimethyl-3-hexene c- 2,4-hexene d- 2,5-dimethylpentane

A26- The structure of benzene is _____.

a-  b-  c- 

A27- Which of these compounds is an alcohol?

a- CH_3NH_2 b- CH_3OH c- CH_3OCH_3 d- CH_3CONH_2

A28- The following reaction would produce _____.

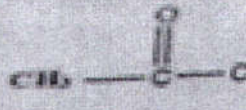
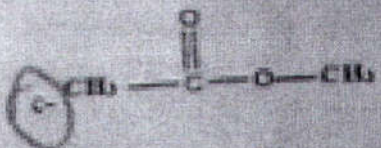
$CH_3CH_2OH + (O) \longrightarrow$ _____ $+ H_2O$

a-  b- CH_3OH c- CH_3OCH_3 d- 

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?

a-  b- CH_3OH c-  d- CH_3CH_3

A

A31- The following reaction would produce ________.

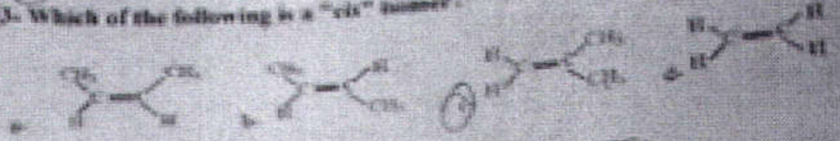
$CH_2 = CH_2 + Br_2 \longrightarrow$

a- CH_3CHOH b- CH_3-CHO c- CH_3CHCl_2 d- $BrCH_2-CH_2Br$

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 bonds 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- 6 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- (-NH$_2$ and -COOH) c- (-OH + -CO) d- (-CHO + -O-)

A40- Which of following is an organic compound?

a- HCl b- NaOH c- NaCl d- CH_4

Good Luck

(1)

(1) $2CH_3Cl_{(g)} + Cl_{2(g)} = 2CH_2Cl_{2(g)} + H_{2(g)}$

$$K_c = \frac{[CH_2Cl_2]^2[H_2]}{[CH_3Cl]^2[Cl_2]}$$ (b)

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(2) العادلة (2) عكس اتجاه العادلة (1) :.

$$K_{reverse} = \frac{1}{K_{forward}}$$ (a)

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(3) $N_2O_{4(g)} = 2NO_{2(g)}\uparrow$

(a) shieft to left

---

(4) HNO_3 Nitric acid

(a)

---

(5) $K_3 = K_1 \times K_2$

$= 0.24 \times 3.8 = 0.912$ (b)

(6) (2)

(a) H_2SO_4 Arrhenius acid.

$$H_2SO_4 \longrightarrow 2H^+ + SO_4^{--}$$

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(7) $pH = -\log[H_3O^+]$

$pH = -\log[3.9 \times 10^{-4}]$

$pH = 3.41$ (b)

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(8) $KClO_{3(s)} = KCl_{(s)} + O_{2(g)}$

$K_c = \frac{[O_2]}{1} = [O_2]$ (d)

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(9) $NaHCO_3$ sodium bicarbonate

(c)

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(10)

$K_c = \frac{[HI]^2}{[H_2][I_2]}$ $K_c = \frac{0.78^2}{0.11 \times 0.11}$

$K_c = 50.28$ ⓒ

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(11) ⓑ NH_3 (gain H^+ ions)

$$NH_3 + H^+ \longrightarrow NH_4^+$$

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(12) HCO_3^- (base) $\xrightarrow{+H^+}$ H_2CO_3

* C-acid

ⓐ

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(13) ⓐ $pH = 7$ neutral solution

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(14) ⓒ $HClO_4$ (strong acid).

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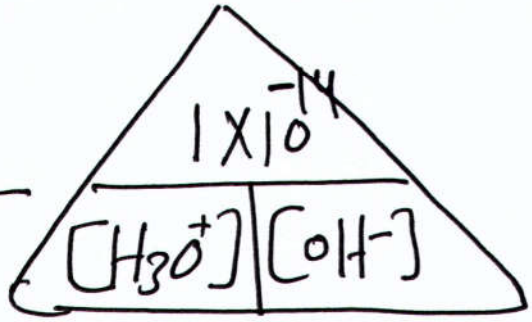
(15) $[H_3O^+] = \dfrac{1 \times 10^{-14}}{1.3 \times 10^{-2}}$



$= 7.7 \times 10^{-13}$ M ⓒ

16 $A + B + \uparrow heat = C + D$ 4

(a) Right

---

17 (b) constant

---

18 (c) bomb calorimeter

* constant volume

---

19 @ internal energy = k + potential E

---

20 (c) alkenes ($\dot{C}=\dot{C}$)

* carbon-carbon double bond

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21 @ Exothermic تفاعل طارد

(gives heat to the surrounding)

(22) Butane C_4H_{10} (d) 4 carbon atoms (5)

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(23) aldehyde $R-\overset{\overset{O}{\|}}{C}-H$ (c)

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(24) $CH_3CH_2CH_3$

(b) propane

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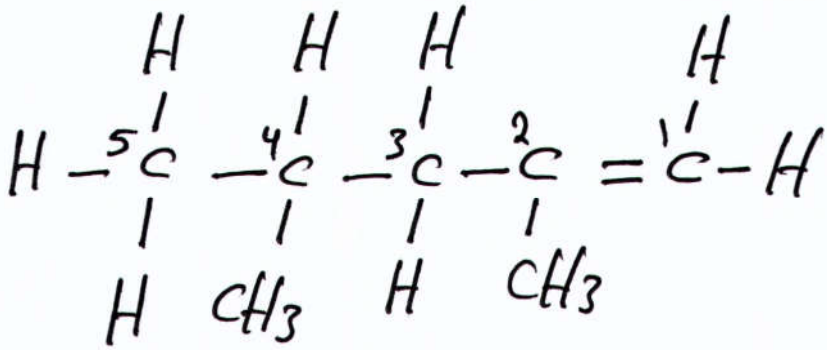
(25)



* 2,4 dimethyl-1-pentene (a)

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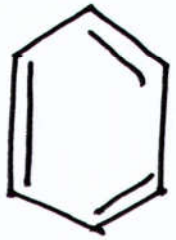
(26) (c)  Benzene

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(27) (b) CH_3OH alcohol كحول

(28)

$$CH_3-CH_2OH + (O) \longrightarrow CH_3-\overset{\overset{O}{\|}}{C}-H$$

1°-alcohol

الدهيد

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(29)

(b) methylbenzene

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(30) Ester $R-\overset{\overset{O}{\|}}{C}-O-R'$

(c) $CH_3-\overset{\overset{O}{\|}}{C}-O-CH_3$

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(31)

$$CH_2=CH_2 + Br_2 \longrightarrow \underset{\underset{Br}{|}}{CH_2}-\underset{\underset{Br}{|}}{CH_2}$$

(d)

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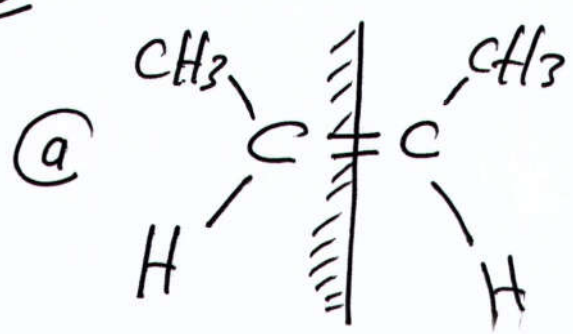
(32) starch (Polysaccharides)

النشا

33



ⓐ cis

34

ⓓ peptide bond رابطة أميدية

35

ⓐ nucleic acid (biopolymer)

36

* C_4H_8 has ④ isomers

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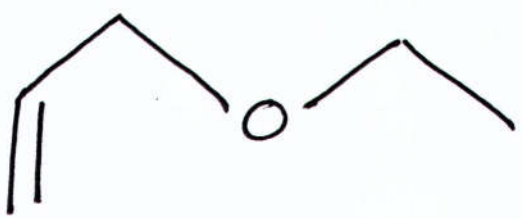
37 ⓑ glucose.

38



* ⓐ 10 H atoms

39 amino acids (-NH_2 and -$COOH$)

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40 (d) CH_4 alkane (organic compound)
