

Jeddah University

CHEMISTRY (110)

Test Bank (4)

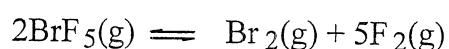
Ch-5-6-7

***Mahmoud Al-Zamil
0508601922***

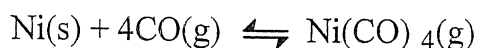
1. Which is the correct equilibrium constant expression for the following reaction?



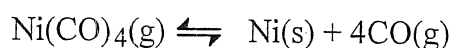
- A. $K_c = [\text{Fe}_2\text{O}_3] [\text{H}_2]^3 / [\text{Fe}]^2 [\text{H}_2\text{O}]^3$
 - B. $K_c = [\text{H}_2] / [\text{H}_2\text{O}]$
 - C. $K_c = [\text{H}_2\text{O}]^3 / [\text{H}_2]^3$
 - D. $K_c = [\text{Fe}]^2 [\text{H}_2\text{O}]^3 / [\text{Fe}_2\text{O}_3] [\text{H}_2]^3$
 - E. $K_c = [\text{Fe}] [\text{H}_2\text{O}] / [\text{Fe}_2\text{O}_3] [\text{H}_2]$
2. The equilibrium constant expression for the reaction below is



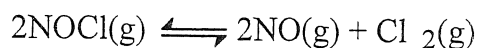
- A. $K_c = [\text{Br}_2] [\text{F}_2] / [\text{BrF}_5]$
 - B. $K_c = [\text{Br}_2] [\text{F}_2]^5 / [\text{BrF}_5]^2$
 - C. $K_c = [\text{Br}_2] [\text{F}_2]^2 / [\text{BrF}_5]^5$
 - D. $K_c = [\text{BrF}_5]^2 / [\text{Br}_2] [\text{F}_2]^5$
 - E. $K_c = 2[\text{BrF}_5]^2 / [\text{Br}_2] 5[\text{F}_2]^5$
3. The equilibrium constant for the reaction



is 5.0×10^4 at 25°C . What is the equilibrium constant for the reaction below?

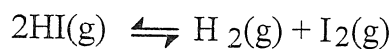


- A. 2.0×10^{-5}
 - B. 2.5×10^9
 - C. 5.0×10^4
 - D. 5.0×10^{-4}
 - E. 2.0×10^{-3}
4. When the following reaction is at equilibrium, which choice is always true?



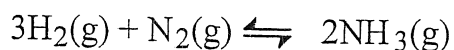
- A. $[\text{NO}] [\text{Cl}_2] = [\text{NOCl}]$
- B. $[\text{NO}]^2 [\text{Cl}_2] = [\text{NOCl}]^2$
- C. $[\text{NOCl}] = [\text{NO}]$
- D. $2[\text{NO}] = [\text{Cl}_2]$
- E. $[\text{NO}]^2 [\text{Cl}_2] = K_c [\text{NOCl}]^2$

5. Calculate K_c for the following reaction.



Given the concentrations of each species at equilibrium are as follows:
[HI] = 0.85 mol/L, [I₂] = 0.60 mol/L, and [H₂] = 0.27 mol/L.

- A. 5.25
 - B. 0.22
 - C. 4.5
 - D. 0.19
 - E. 1.6×10^2
6. For the following nitrogen fixation reaction $K_c = 6.0 \times 10^{-2}$ at 500°C.



If 0.250 M H₂ and 0.050 M NH₃ are present at equilibrium, what is the equilibrium concentration of N₂?

- A. 0.750 M
 - B. 2.7 M
 - C. 0.250 M
 - D. 0.025 M
 - E. 1.85 M
7. Which is not a characteristic property of acids?
- A. Taste sour
 - B. Turn litmus from blue to red
 - C. React with metals to yield CO₂ gas
 - D. Neutralize bases
 - E. React with carbonates to yield CO₂ gas
8. Which is the formula for the hydronium ion?
- A. OH⁻
 - B. H₂O
 - C. H₃O⁺
 - D. H₃O⁻
 - E. H₂O⁺

9. Identify the conjugate base of CH_3COOH in the following reaction:



- A. HSO_4^-
 - B. SO_4^{2-}
 - C. CH_3COO^-
 - D. H_2SO_4
 - E. OH^-
10. What is the concentration of H^+ in a 2.5 M HCl solution?
- A. 0
 - B. 1.25 M
 - C. 2.5 M
 - D. 5.0 M
 - E. 10.0 M
11. The OH^- concentration in 1.0×10^{-3} M $\text{Ba}(\text{OH})_2$ is
- A. 0.50×10^{-3} M.
 - B. 1.00×10^{-3} M.
 - C. 2.00×10^{-3} M.
 - D. 1.00×10^{-2} M.
 - E. 0.020 M.
12. Calculate the H^+ ion concentration in lemon juice of pH = 2.4.
- A. 4.0×10^{-2} M
 - B. 250 M
 - C. 0.38 M
 - D. 4.0×10^{-3} M
 - E. 11.6 M
13. Calculate the pH of 3.5×10^{-3} M HNO_3 .
- A. -2.46
 - B. 0.54
 - C. 2.46
 - D. 3.00
 - E. 3.46
14. Calculate the pH of 2.6×10^{-2} M KOH.
- A. 12.4
 - B. 15.6
 - C. 2.0
 - D. 7.0
 - E. 1.59

15. Calculate the hydrogen ion concentration in a solution whose pH is 4.80.
- $1.6 \times 10^{-4} \text{ M}$
 - $1.6 \times 10^{-5} \text{ M}$
 - $1.6 \times 10^{-6} \text{ M}$
 - $4.0 \times 10^{-8} \text{ M}$
 - $8.0 \times 10^{-5} \text{ M}$
16. The pOH of a solution is 10.40 Calculate the hydrogen ion concentration in the solution.
- $3.98 \times 10^{-11} \text{ M}$
 - 3.6 M
 - $4.0 \times 10^{-10} \text{ M}$
 - $2.51 \times 10^{-4} \text{ M}$
 - $1.81 \times 10^{-4} \text{ M}$
17. The general formula for *alkenes* is
- $\text{C}_n\text{H}_{2n+2}$
 - $\text{C}_{2n}\text{H}_{2n}$
 - C_nH_{n+2}
 - C_nH_{2n}
 - $\text{C}_n\text{H}_{2n-2}$
18. The general formula of an *alkane* is
- C_nH_{2n}
 - $\text{C}_n\text{H}_{2n+2}$
 - $\text{C}_n\text{H}_{2n-2}$
 - $\text{C}_n\text{H}_{2n+4}$
 - $\text{C}_n\text{H}_{2n-4}$
19. Which one of these formulas is that of an *unsaturated* hydrocarbon?
- $\text{CH}_3\text{---CH}_2\text{---CH}_3$
 - $\text{CH}_3\text{---CH=CH}_2$
 - $\text{CH}_3\text{---CH}_2\text{---OH}$
 - $\text{CH}_3\text{---O---CH}_2\text{---CH}_3$
 - $$\begin{array}{c} \text{H}_2\text{C} \text{ --- } \text{CH}_2 \\ \quad \backslash \quad / \\ \quad \text{CH}_2 \end{array}$$

20. Which of these molecules is *unsaturated*?

- A. C_3H_8
- B. CH_3OH
- C. C_5H_{10}
- D. CH_4
- E. C_4H_{10}

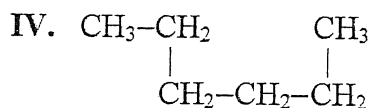
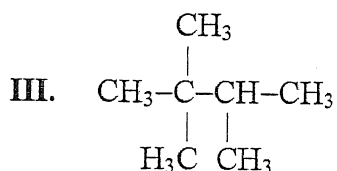
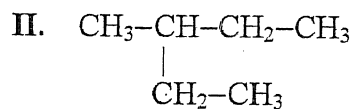
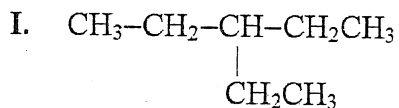
21. The formula $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$ represents

- A. an alkane.
- B. an alkyne.
- C. an alcohol.
- D. an unsaturated hydrocarbon.
- E. a CFC.

22. How many structural isomers are there of C_4H_{10} ?

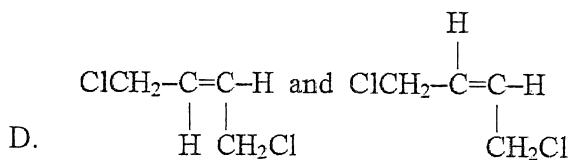
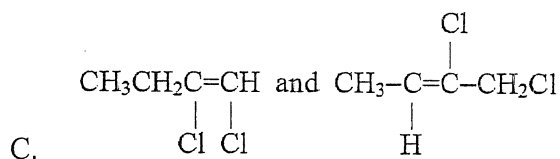
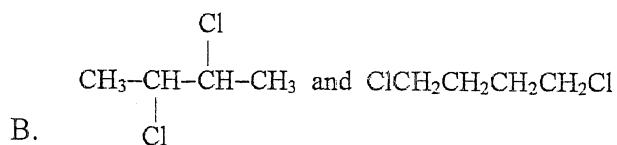
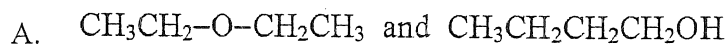
- A. 4
- B. 6
- C. 2
- D. 8
- E. 10

23. Which of these species are *structural isomers* of C_6H_{14} ?

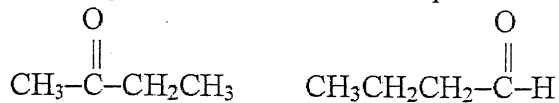


- A. I and II
- B. I and III
- C. II and III
- D. II and IV
- E. III and IV

24. Which of these pairs are *geometric isomers*?



25. The two molecules represented below are examples of



- A. isomers
- B. isotopes
- C. alcohols
- D. carboxylic acids
- E. unsaturated hydrocarbons

26. The two molecules represented below are examples of



- A. geometric isomers.
- B. structural isomers.
- C. optical isomers.
- D. stereoisomers.
- E. none of these

27. Which of these species is an aromatic compound?

- A. C_2H_2
- B. C_6H_{12}
- C. $C_6H_4Br_2$
- D. C_5H_{10}
- E. $C_2H_4Br_2$

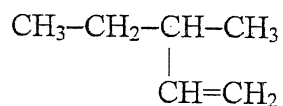
28. The compound that has a triple bond between one pair of carbon atoms is called a/an

- A. alkane.
- B. chlorofluorocarbon.
- C. alkyne.
- D. alkene.
- E. alcohol.

29. The alkane with six carbon atoms is called

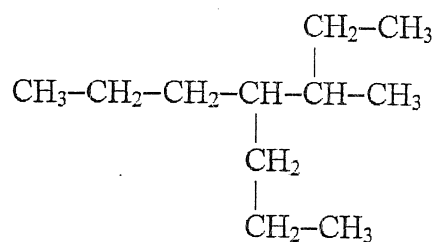
- A. butane.
- B. hexane.
- C. heptane.
- D. butene.
- E. none of these.

30. Which of these is the systematic name for the compound represented below?

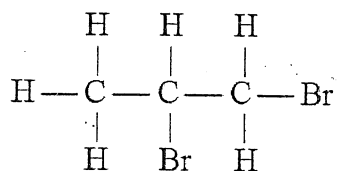


- A. 2-ethylbutane
- B. 3-methylpentene
- C. 3-methyl-1-pentene
- D. 3-methyl-1-hexene
- E. 2-methylhexane

31. The systematic name for the compound represented below is



- A. 4,5-diethylheptane.
 B. 3-propyl-4-ethylhexane.
 C. 3-ethyl-4-propylhexane.
 D. 3-methyl-4-propylheptane.
 E. 2-ethyl-4-propylhexane.
32. Which of these is the systematic name for the compound represented below?



- A. 2,3-dibromopentane
 B. 1,2-dibromopentane
 C. 2,3-dibromopropane
 D. 1,2-propane dibromide
 E. 1,2-dibromopropane

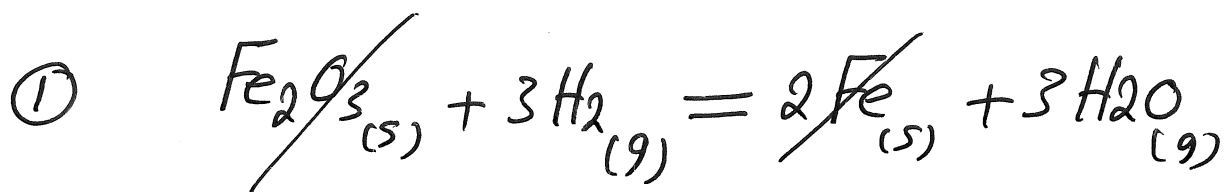
33. The correct structure for 2,3,3-trimethylpentane is

- A.
$$\begin{array}{ccccccc} & & \text{CH}_3 & & \text{CH}_3 & & \\ & & | & & | & & \\ \text{CH}_3 & - & \text{CH} & - & \text{C} & - & \text{CH}_2\text{CH}_3 \\ & & & & | & & \\ & & & & \text{CH}_3 & & \end{array}$$
- B.
$$\begin{array}{ccccccc} & & \text{CH}_3 & & \text{CH}_3 & & \\ & & | & & | & & \\ \text{CH}_3 & - & \text{C} & - & \text{CH} & - & \text{CH}_2\text{CH}_3 \\ & & | & & & & \\ & & \text{CH}_3 & & & & \end{array}$$
- C.
$$\begin{array}{ccccccc} \text{CH}_3 & - & \text{CH} & - & \text{CH} & - & \text{CH} & - & \text{CH}_3 \\ & & | & & | & & | & & \\ & & \text{CH}_3 & & \text{CH}_3 & & \text{CH}_3 & & \end{array}$$
- D.
$$\begin{array}{ccccccc} \text{CH}_3 & - & \text{CH} & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_3 \\ & & | & & | & & & & \\ & & \text{CH}_3 & & \text{CH}_2 & - & \text{CH}_3 & & \end{array}$$

33. The group of atoms that is responsible for the characteristic properties of a family of organic compounds is called a/an _____ group.

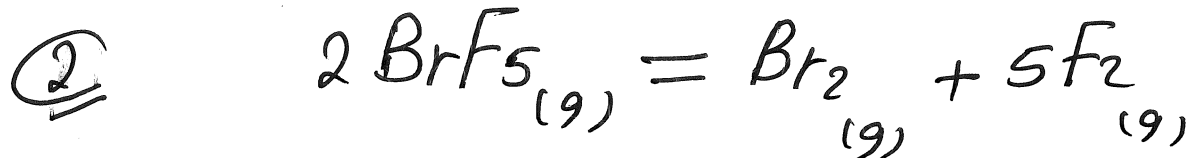
- A. hydrocarbon
B. functional
C. ether
D. enzyme
E. polyatomic ion
34. Organic compounds with the general formula R-O-R (where R is an alkyl group) are called
- A. alkenes.
B. alcohols.
C. ethers.
D. aldehydes.
E. organic acids.

38. The name for the compound with the formula $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ is
- A. propanol.
 - B. propane.
 - C. butanol.
 - D. pentane.
 - E. pentanol.
39. Which type of organic compound does *not* contain a carbonyl group?
- A. ethers
 - B. carboxylic acids
 - C. ketones
 - D. aldehydes
 - E. esters
40. A gas is compressed in a cylinder from a volume of 20 L to 2.0 L by a constant pressure of 10.0 atm. Calculate the amount of work done on the system.
- A. $1.01 \times 10^4 \text{ J}$
 - B. -180 J
 - C. $1.81 \times 10^4 \text{ J}$
 - D. $-1.81 \times 10^4 \text{ J}$
 - E. 180 J
41. A calorimeter
- A. is equal to the molar enthalpy of a reaction.
 - B. is a dieting aid.
 - C. is an indicator of a spontaneous reaction.
 - D. is a device used to measure the transfer of heat energy.
 - E. is useful in measuring the amount of heat released by endothermic reactions.
42. The work done on the surroundings by the expansion of a gas is $w = -P\Delta V$.
- True
False



$$K_c = \frac{[\text{H}_2\text{O}]^3}{[\text{H}_2]^3}$$

Ⓒ ✓



$$K_c = \frac{[\text{F}_2]^5 [\text{Br}_2]}{[\text{BrF}_5]^2}$$

Ⓑ ✓

③ $\text{المعادلة ٢ على اتجاه العكس}$

$$K_2 = \frac{1}{K_1}$$

$$K_2 = \frac{1}{5 \times 10^4}$$

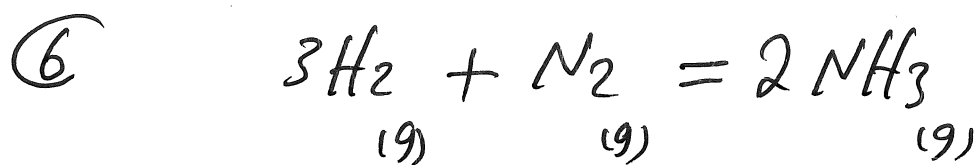
$$K_2 = 2 \times 10^{-5} \quad \text{Ⓐ} \checkmark$$

④ $\text{at equilibrium} \quad \text{عند التوازن}$

$$[\text{Cl}_2][\text{NO}]^2 = [\text{NOCl}]^2 \quad \text{Ⓑ} \checkmark$$

⑤
$$K_c = \frac{[H_2][I_2]}{[HI]^2}$$
 (B)

$$K_c = \frac{0.60 \times 0.27}{[0.85]^2} \quad K_c = 0.22$$



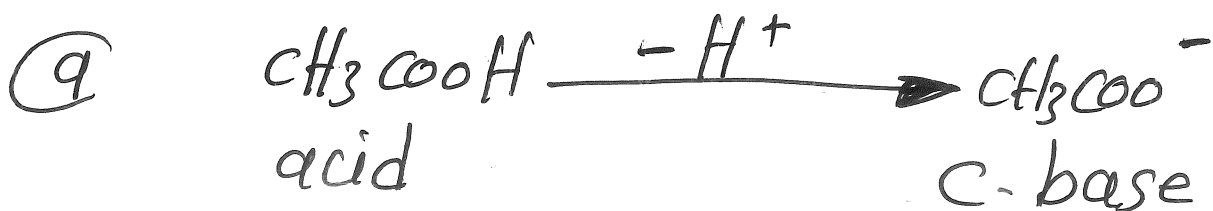
$$K_c = \frac{[NH_3]^2}{[H_2]^3[N_2]}$$

$$6 \times 10^{-2} = \frac{(0.05)^2}{(0.25)^3 \times [N_2]}$$

$$[N_2] = 2.7 \quad 14$$

⑦ (C) ← تتفاعل الجوف مع لفلزان
 ↑ H₂ و يتكسر غاز

⑧ (C) H₃O⁺ hydronium ion



(C)

(10) HCl strong acid

$$[H^+] = 2.5 \text{ M}$$

(c) ✓

(11) $Ba(OH)_2$ strong base

$$[OH^-] = 1 \times 10^{-3} \text{ M}$$

(b) ✓

(12) $[H^+] = 10^{-pH}$

(d) ✓

$$[H^+] = 10^{-2.4}$$

$$[H^+] = 4 \times 10^{-3} \text{ M}$$

(13) HNO_3 s. acid

$$pH = -\log [H_3O^+]$$

$$= -\log [3.5 \times 10^{-3}]$$

$$pH = 2.46$$

(c) ✓

(14) KOH s. base

$$pOH = -\log [OH^-]$$

$$pOH = -\log [2.6 \times 10^{-2}]$$

$$pOH = 1.6$$

$$pH = 14 - 1.6 = 12.4$$

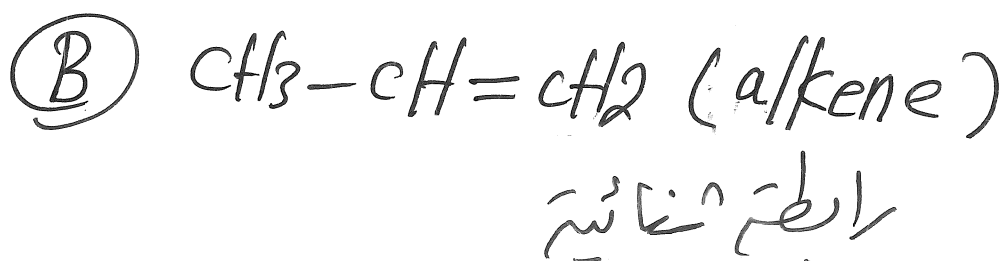
(a) ✓

(15) $[H^+] = 10^{-pH}$
 $= 10^{-4.8}$
 $= 1.6 \times 10^{-5} \text{ M}$ (b) ✓

(16) $pOH = 10.40$ $pH = 14 - 10.40 =$
 $pH = 3.6$
 $[H^+] = 10^{-pH}$
 $[H^+] = 10^{-3.6}$ (d) ✓
 $= 2.5 \times 10^{-4} \text{ M}$



(19) unsaturated (Alkene, Alkyne)



(15) $[H^+] = 10^{-pH}$
 $= 10^{-4.8}$
 $= 1.6 \times 10^{-5} \text{ M}$

(b) ✓

(16) $pOH = 10.40$ $pH = 14 - 10.40 =$
 $pH = 3.6$

$[H^+] = 10^{-pH}$
 $[H^+] = 10^{-3.6}$
 $= 2.5 \times 10^{-4} \text{ M}$

(d) ✓

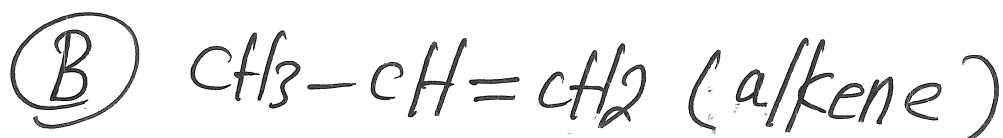
(17) alkene C_nH_{2n}

(d) ✓

(18) alkane C_nH_{2n+2}

(b) ✓

(19) unsaturated (Alkene, Alkyne)



ألكين

20 unsaturated غير مشبع

c C_5H_{10} (alkene)

21 d unsaturated (double bond)

22 C_4H_{10} (butane)

2 isomers

عدد الروابط	عدد المتكافئات
C_3H_8	0
C_4H_{10}	2
C_5H_{12}	3

23 C_8H_{14} isomers.

d II, IV

24 geometric isomers (cis, trans)

d ✓

(25)

(a) isomers قاتلان



(26)

(b) structural isomers



(27)

aromatic C_nH_{2n-6}



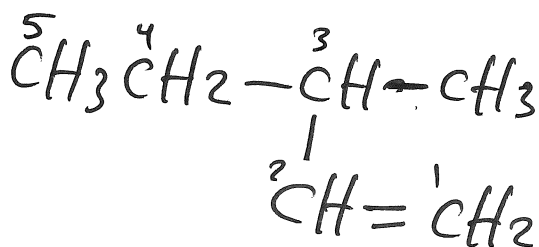
(28)

triple bond (alkyne) C

(29)

C_6H_{14} hexane.

(30)



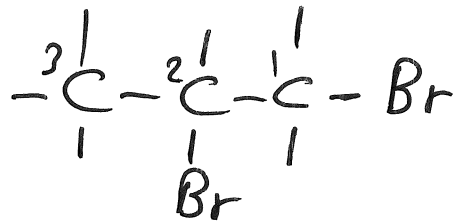
3-methyl-1-pentene

C

31

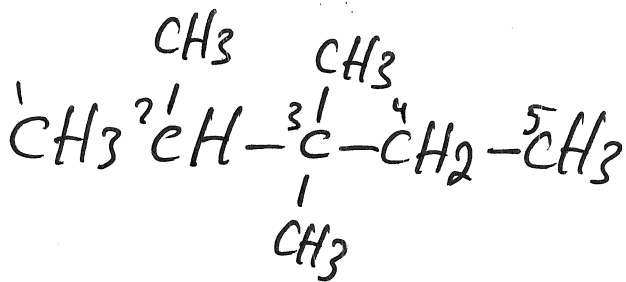
(d) 3-methyl-4-propyl hexane.

32



(E) 1,2 dibromopropane.

33



2,3,3 trimethyl pentane

(a) ✓

33

(b) functional group مجموعہ وظیفہ

34

ROR (c) ethers الاثيرات

35

carboxyl group $\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{OH} \end{array}$
 $-\text{COOH}$

© ✓

36

ester

RCOOR

$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}-\text{C}-\text{O}-\text{R} \end{array}$

37

ketone كيتون

$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}-\text{C}-\text{R} \end{array}$

RCOR

© CH_3COCH_3

38

$\text{C}_4\text{H}_9\text{OH}$ butanol

39

© ethers

$\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}- \end{array}$

الأكسجين
كيتون
عطر
إستر

$$\begin{aligned}
 (40) \quad w &= -P(\Delta V) \\
 &= -10(2-20) \\
 &= 180 \quad \text{atm.L}
 \end{aligned}$$

$$\rightarrow w = 180 \times 101.3 = 1.8 \times 10^4 \text{ J}$$

(41) (d) calorimeter, measure the transfer of heat energy

(42) @ True $w = -P\Delta V$

أسئلة إرشادية للاختبار النهائي

1. A reaction is said to be reversible that can proceed in.....
(a) forward (b) reverse (c) forward and reverse (d) very fast

2. The equilibrium constant for the following reaction is



- (a) $k = \frac{[\text{NO}_2]^4 [\text{O}_2]}{[\text{N}_2\text{O}_4]^2}$ (b) $k = \frac{[\text{N}_2\text{O}_4]^2}{[\text{NO}_2]^4 [\text{O}_2]}$ (c) $k = \frac{[\text{NO}_2]^4 [\text{O}_2]}{[\text{N}_2\text{O}_4]}$ (d) $k = \frac{[\text{NO}_2]^4 [\text{O}_2]^2}{[\text{N}_2\text{O}_4]}$

- 3- NH_3 is a base because it

- a- donates a proton water b- accepts a proton from water
c- produces H^+ in aqueous solution d- produces OH^- in aqueous solution

4. The chemical formula of Sodium bicarbonate is.....

- (a) Na_2CO_3 (b) NaOH (c) NH_3 (d) NaHCO_3

5. The formula of Citric acid is.....

- (b) $\text{H}_2\text{C}_2 \text{H}_3\text{O}_2$ (b) $\text{H}_3\text{C}_6 \text{H}_5\text{O}_7$ (c) $\text{HC}_2\text{H}_3\text{O}_2$ (d) H_2CO_3

6. Internal energy (E) of system is.....

- a) kinetic energy b) potential energy c) kinetic and potential energy d) heat

7. We measure change in internal energy by.....

- a) Coffee – cup Colorimeter b) Ammeter c) Bomb Colorimeter d) Colorimeter

8. An endothermic reaction.....

- a) Absorbed heat from the surrounding b) Gives off heat to the surrounding
c) A chemical reaction with negative ΔH d) A chemical reaction with zero ΔH

9. Hydrocarbon compounds composed of only.....

- a) Hydrogen and oxygen b) Hydrogen and carbon c) Carbon and nitrogen
d) Hydrogen and flour

10. The name of $\text{CH}_3\text{CH}_2\text{CH}_3$ is.....

- a) Ethane b) Butane c) Propane d) Propene

11. Molecular formula for benzene is.....

- a) C_6H_{14} b) C_2H_6 c) C_6H_{10} d) C_6H_6

12. Which of the following is ethanol?

- a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ b) $\text{CH}_3\text{CH}_2\text{OH}$ c) CH_3COH d- $\text{CH}_3\text{CO}_2\text{H}$

13. All of the following is biopolymers except.....

- a) Protein b) Polysaccharides c) lipids d) Nucleic acid

14. Molecular formula of Glucose is

- a) $\text{C}_6\text{H}_{12}\text{O}_6$ b) $\text{C}_5\text{H}_{10}\text{O}_5$ c) $\text{C}_6\text{H}_{14}\text{O}_6$ d) $\text{C}_6\text{H}_6\text{O}_{12}$

15. Example of ether

- a) CH_3OH b) CH_3COH c) CH_3COCH_3 d) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$

① c Forward and reverse (\rightleftharpoons)

②
$$K_c = \frac{[O_2][NO_2]^4}{[N_2O_4]^2}$$
 a ✓

③ b NH_3 a base
$$NH_3 + H_2O \longrightarrow NH_4^+ + Cl^-$$

④ d $NaHCO_3$

⑤ citric acid $C_6H_8O_7$

b ✓

⑥ internal energy (E) = kinetic + ...

c ✓


⑦ c Bomb calorimeter

⑧ Endothermic Reaction $\Delta H = +$
 $\Delta H > 0$

① absorb heat

⑨ ② Hydrocarbon (C, H only)

⑩ C_3H_8 propane ③ ✓

⑪ Benzene C_6H_6 

⑫ Ethanol (alcohol)
④ CH_3CH_2OH
 C_2H_5OH ✓

⑬ ⑤ lipids الدهون

(14) glucose جلوكوز



(15) Ether R-O-R

