9. Consider the chemical equilibrium:

$$N_2O_{4(g)} \leftrightharpoons 2\,NO_{2(g)}$$

If the concentration of N_2O_4 is doubled and the reaction is allowed to reach equilibrium, then at equilibrium:

a) K_c would become twice of its original value.
b) K_c would become half of its original value.
c) K_p would double and K_c would remain unchanged.
d) $K_p = K_c$.
e) K_p would not change its original value.

10. When a sample of 0.640 mole of NOCl was placed in a 1.00 L container at 700 K, and the reaction was allowed to reach equilibrium, the equilibrium concentration of Cl_2 was 0.120 M.
Calculate the equilibrium constant K_c for the reaction:

$$2\,NOCl_{(g)} \leftrightharpoons 2NO_{(g)} + Cl_{2(g)}$$

a) 0.0302 b) 0.0432 c) 0.0514 d) 0.0609 e) 0.0847

11. For the equilibrium:

$$2\,NO_{(g)} \leftrightharpoons N_{2(g)} + O_{2(g)}, \quad K_c = 100.0 \text{ at } 2000\,^{\circ}C$$

If 0.070 mol NO, 0.70 mol N_2 and 0.50 mol O_2 are placed in a 2.0 L container at 2000 °C and allowed to react, then:

a) The system remains unchanged.
b) The reaction will go in the reverse direction.
c) The concentration of NO will decrease.
d) ΔG° for the reaction is positive at 2000 °C.
e) The concentration of N_2 will decrease.

ONE&A

19. Given that ΔG°_f for $COCl_{2(g)} = -206$ kJ/mol and ΔG°_f for $CO_{(g)} =$ −137 kJ/mol. For the following reaction at 82 °C,

$$COCl_{2(g)} \rightarrow CO_{(g)} + Cl_{2(g)}$$

K_p is about:

a) 7×10^{-11} b) 4×10^{-12} c) 6×10^{-13}

d) 2×10^{-11} e) 8×10^{-12}

20. For the reaction: $2\,N_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_{2(g)}$, $\Delta G^\circ_{298} = -32$ kJ/mol. Which of the following statements is correct ?

a) The reaction is always spontaneous at all conditions.
b) The reaction is always nonspontaneous at all conditions.
c) K_p for this reaction is less than 1.0 at 298 K.
d) The reaction could be non spontaneous at very high partial pressures of $NO_{2(g)}$ and $O_{2(g)}$.
e) The reaction could be non spontaneous at very high partial pressure of $N_2O_{5(g)}$.

21. Which of the following statements is correct concerning a galvanic cell?

a) The salt bridge can be replaced by a conducting wire.
b) Positive ions move from anode solution into the salt bridge .
c) The anode is the positive electrode.
d) Electrons flow from the cathode to the anode through the external wire.
e) Oxidation occurs at the cathode.

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12. Consider the following reaction:

$$CO_3^{2-}{}_{(aq)} + H_2O_{(l)} \rightleftharpoons OH^-_{(aq)} + HCO_3^-{}_{(aq)}$$

Which of the following statements is **correct**?

a) $CO_3^{2-}{}_{(aq)}$ is the conjugate base of $HCO_3^-{}_{(aq)}$.
b) $H_2O_{(l)}$ acts as a base.
c) $OH^-_{(aq)}$ is the conjugate acid of $H_2O_{(l)}$.
d) $HCO_3^-{}_{(aq)}$ is the conjugate acid of $H_2O_{(l)}$.
e) $OH^-_{(aq)}$ is a weak base.

13. Calculate the pH of 0.045 M $Ba(OH)_2$ aqueous solution.

a) 12.85 b) 12.95 c) 13.04 d) 13.11 e) 13.56

14. A solution was made by dissolving 0.65 mole of formic acid (HCOOH) and 0.12 mole sodium formate (HCOONa) in water to make a 1.5 L solution. Given that K_a for formic acid = 1.7×10^{-4}. Calculate the pH of the solution.

a) 4.50 b) 4.62 c) 4.31 d) 3.23 e) 3.04

15. Which of the following statements is **true**?

a) A perfect crystal at 0 °C and 1 atm pressure must have zero entropy.
b) When any spontaneous change occurs the entropy of the universe must decreases.
c) For any spontaneous change, there is an increase in the enthalpy of the system.
d) 1 mol of $H_2O_{(s)}$ at 0.0 °C must have less entropy than1 mol of $H_2O_{(l)}$ at 0.0°C.
e) For any spontaneous change, there is a decrease in the enthalpy of the universe.

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Answer each of the following questions and put (X) on the corresponding choice on the front page:

1. Which of the following compounds has the **lowest** boiling point?

   a) $CH_3CH_2CH_2OH$ b) $CH_3CH_2CH_2CH_2OH$ c) CH_3CH_2CN

   d) $CH_3CH_2CH_2CH_3$ e) $CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}CH_3$

2. The vapor pressure of white phosphorus (P_4) is 10.0 torr at 34.0 °C and 100.0 torr at 69.0 °C. Calculate the heat of vaporization of P_4 (in kJ/mol).

   a) 67.4 b) 57.5 c) 47.3 d) 40.2 e) 34.6

3. Which of the following statements is **incorrect**:

   a) The gas can be liquefied below its critical temperature.
   b) The critical temperature for a substance is higher than its normal boiling point.
   c) At triple point gaseous, liquid and solid phases co-exist at equilibrium.
   d) The gas cannot be liquefied above critical temperature at any pressure.
   e) The solid can be sublimed if heated at pressure higher than triple point pressure.

4. Calculate the mass present (mass %) of 1.2 M aqueous sucrose solution .Given that the molar mass of sucrose = 342 g/mol and the density of the solution = 1.10 g/mL.

   a) 37.3 b) 18.6 c) 42.8 d) 48.4 e) 59.5

لم تنتهِ ... للشوِ بدأنا

شيماء الفيومي 17/16 /19/18/15

25. Given

$E^o_{Fe2+/Fe} = -0.41$ V
$E^o_{Ag+/Ag} = +0.80$ V

K for the following equilibrium at 298 K is about:

$$2\,Ag^+ + Fe \rightleftharpoons Fe^{2+} + 2\,Ag$$

a) 3×10^{31} b) 4×10^{46} c) 7×10^{34} d) 9×10^{40} e) 6×10^{52}

26. Given:

$Al^{3+} + 3e^- \rightarrow Al(s)$, $E^o_{Al3+/Al} = -1.66$ V
$Fe^{2+} + 2e^- \rightarrow Fe(s)$, $E^o_{Fe2+/Fe} = -0.41$ V

Calculate ΔG^o for the reaction(in kJ/mol reaction):

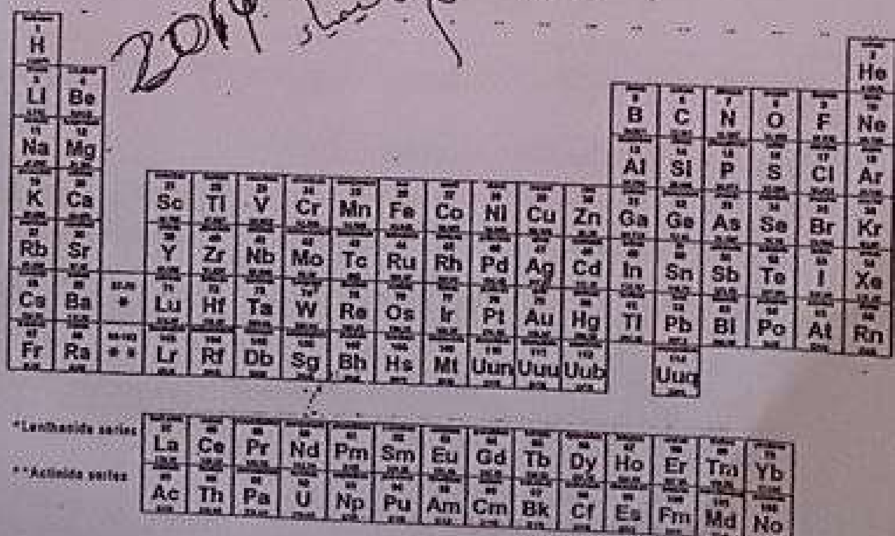
$$3Fe^{2+} + 2\,Al(s) \rightarrow 2Al^{3+} + 3Fe$$

a) – 724   b) –521   c) –828   d) – 462   e) –886

27. If a current of 3.60 A is passed through molten $CaCl_2$ for 3.20 hr, calculate the mass of Cl_2 produced, (molar mass of Cl = 35.5 g/mol).

a) 10.5 g   b) 12.4 g   c) 13.3g   d) 11.9 g   e) 15.3 g

اتحاد قسم الكيمياء 2014



5. A solution was made by dissolving 3.36 g of benzene (Molar mass = 78.1 g/mole) in 462 g of cyclohexane.
Given: Freezing point of pure cyclohexane is 6.60 °C and its K_f is 20.0 °C/m. Calculate the **freezing point of the solution.**

a) 3.93 °C b) 4.22 °C c) 4.35 °C d) 4.74 °C e) 5.61 °C

6. Which of the following aqueous solutions has the lowest osmotic pressure at same temperature?

a) 0.2 M $MgSO_4$ b) 0.2 M $CaCl_2$ c) 0.2 M glucose

d) 0.2 M NaCl e) 0.2 M acetic acid (a weak acid)

7. For the reaction:

$$2NO_{(g)} + 2H_{2(g)} \rightarrow N_{2(g)} + 2H_2O_{(g)}$$

The following set of data was obtained:

Initial [NO],M	Initial [H_2],M	Initial rate, M/s
0.185	0.133	4.80×10^{-4}
0.185	0.266	1.92×10^{-3}
0.370	0.133	9.60×10^{-4}

The value of rate constant (k) for the reaction is:

a) 0.101 b) 0.116 c) 0.128 d) 0.135 e) 0.147

8. For a second order reaction,

A → Products, rate constant, $k = 0.120$ $L.mol^{-1}.s^{-1}$.
If the initial concentration of A is 1.40 M, calculate its molar concentration after 18.0 seconds.

a) 0.464 b) 0.418 c) 0.380 d) 0.348 e) 0.253

OMEGA كيمياء لأقوى

16. For the reaction

$$2\,SO_{3(g)} \rightarrow 2\,SO_{2(g)} + O_{2(g)}$$

$\Delta H^\circ = +198.0$ kJ/mol and $\Delta S^\circ = +186.8$ J/mol.K

Under standard conditions, which of the following statements is correct?

a) The reaction is spontaneous at all temperatures.
b) The reaction is nonspontaneous at all temperatures.
c) The reaction is spontaneous at temperatures higher than 1100 K.
d) The reaction is spontaneous at temperature below 1000 K .
e) The reaction is at equilibrium at 1000 K.

17. Which of the following processes would be expected to have negative ΔS value?

a) $2\,NO_{(g)} + O_{2(g)} \rightarrow 2\,NO_{2(g)}$
b) $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$
c) $H_2O_{(l)} \rightarrow H_2O_{(g)}$
d) $Br_{2(s)} \rightarrow Br_{2(g)}$
e) $2\,HgO_{(s)} \rightarrow 2\,Hg_{(l)} + O_{2(g)}$

18. Consider the reaction:

$$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$$

Given: ΔH_f° for $NH_{3(g)} = -45.9$ kJ/mol , S° for $N_{2(g)} = 192$ J/mol.K., S° for $H_{2(g)} = 131$ J/mol.K. and S° for $NH_{3(g)} = 193$ J/mol.K. Calculate ΔG° (kJ/mol) for above reaction at 243 °C(in kJ/mol).

a) 18.8 b) 14.6 c) 10.9 d) 24.8 e) 30.8

OMEGA للتميز عنوانك

22. Balance the following redox equation in acidic medium.

$$Fe^{2+}_{(aq)} + MnO_4^-{}_{(aq)} \rightarrow Fe^{3+}_{(aq)} + Mn^{2+}_{(aq)}$$

The ratio of the coefficients MnO_4^- : H_2O in the balanced equation is:

a) 1:4 b) 4:1 c) 1:1 d) 1:8 e) 8:1

23. Given the standard half-cell potentials:

$$E^\circ_{Pb2+/Pb} = -0.13\ V$$
$$E^\circ_{Fe2+/Fe} = -0.41\ V$$
$$E^\circ_{Cr3+/Cr} = -0.74\ V$$
$$E^\circ_{Zn2+/Zn} = -0.76\ V$$

Which of the following would reduce Cr^{3+} to Cr under standard conditions ?

a) Pb^{2+} b) Pb c) Fe d) Zn^{2+} e) Zn

24. Given the following half reaction :

$$Ag^+ + e^- \rightarrow Ag(s), \quad E^\circ_{Ag+/Ag} = +0.80\ V$$

$$Zn^{2+} + 2e^- \rightarrow Zn(s), \quad E^\circ_{Zn2+/Zn} = -0.76\ V$$

Calculate E for the following reaction:

$$Zn^{2+}(1.0\times10^{-4}) + 2Ag \rightarrow Zn + 2Ag^+(0.10)$$

a) – 1.41 V b) – 1.47V c) - 1.62 V d) – 1.65V e) – 1.56V

لا ينال المفاخر من رضي بالصف الآخر ...

OMEGA

Chem. Dept
Univ. of Jordan.

Chemistry 102.
Final Exam.

Date: 5/6/2014.
Time: 120 min.

Name: ..... Reg. No.: .....

Section No.: ..... Seat No.....

Useful Constants and Relations

1 atm= 760 torr; R = 8.314 J. mol^{-1}. K^{-1}=0.0821 atm. L. mol^{-1}. K^{-1}; $\Delta G^o=\Delta H^o - T\Delta S^o$

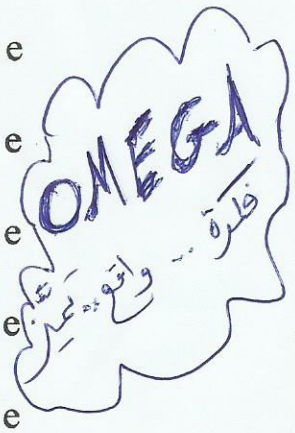
$\ln\frac{P_2}{P_1}=\frac{\Delta H_{vap}}{R}\left(\frac{1}{T_1}-\frac{1}{T_2}\right)$; $\pi = iMRT$; $\Delta T= ik.m$; $1/[A_t]- 1/[A_o]=kt$; $\ln\frac{[A]_o}{[A]_t}=kt$

$\Delta G=\Delta G^o + RT\ln Q$; $pH = pK_a + \log [base]/[acid]$, $E = E^o - \frac{0.0257}{n}\ln Q$

$\Delta G^o = -RT\ln K = -nFE^o$, F = 96500 Coul/mole e^-, $K = {}^oC + 273.2$

Answer Sheet

1.	a	b	c	d	e	15.	a	b	c	d	e
2.	a	b	c	d	e	16.	a	b	c	d	e
3.	a	b	c	d	e	17.	a	b	c	d	e
4.	a	b	c	d	e	18.	a	b	c	d	e
5.	a	b	c	d	e	19.	a	b	c	d	e
6.	a	b	c	d	e	20.	a	b	c	d	e
7.	a	b	c	d	e	21.	a	b	c	d	e
8.	a	b	c	d	e	22.	a	b	c	d	e
9.	a	b	c	d	e	23.	a	b	c	d	e
10.	a	b	c	d	e	24.	a	b	c	d	e
11.	a	b	c	d	e	25.	a	b	c	d	e
12.	a	b	c	d	e	26.	a	b	c	d	e
13.	a	b	c	d	e	27.	a	b	c	d	e
14.											



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16. For the reaction

$$2\ SO_{3(g)} \rightarrow 2\ SO_{2(g)} + O_{2(g)}$$

$\Delta H^\circ = +198.0$ kJ/mol and $\Delta S^\circ = +186.8$ J/mol.K

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OMEGA للتميز عنوان

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