系所組別： 化學系學士班
考試科目： 普通化學　　　　　　　　　　　　　　　　　考試日期：0710，節次：3

※ 考生請注意：本試題 ☑可 □不可 使用計算機

請勿在本試題紙上作答，否則不予計分

I 單選題 (60分，每題3分)

1. What is the organic base that is not found in RNA?
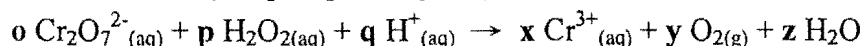a) Uracil　　　b) Cytosine　c) 　Thymine　　　d) Adenine　　e) Guanine (G)

2. How many unpaired electrons does $[Fe(CN)_6]^{3-}$ have?
a) 0　　　b) 1　　　c) 3　　　d) 5　　　e) 2

3. Which of the following statement is not true?
a) the reaction constant might change when the reaction temperature change
b) the reaction constant won't change when the concentration of reactants change
c) the reaction constant might change when the catalyst is added to the reaction
d) the activation of energy for a reaction might change when the catalyst is added
e) the activation of energy for a reaction might change when the reaction temperature change
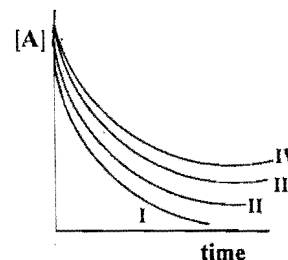
4.. Please balance the following equation (o, p, q, x, y, z are reaction coefficients).　What is the sum of all coefficients (o + p + q + x + y + z)
$$o\ Cr_2O_7^{2-}{}_{(aq)} + p\ H_2O_{2(aq)} + q\ H^+{}_{(aq)} \rightarrow x\ Cr^{3+}{}_{(aq)} + y\ O_{2(g)} + z\ H_2O$$
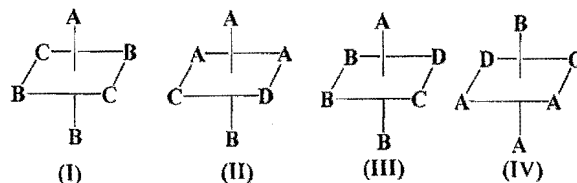a) 18　　　b) 20　　　c) 22　　　d) 24

5.. The graph shows the concentration of reactants versus reaction time in four different first-order reactions.　Which reaction has the largest reaction rate constant?
a) I　　　b) II　　　c) III　　　d) IV
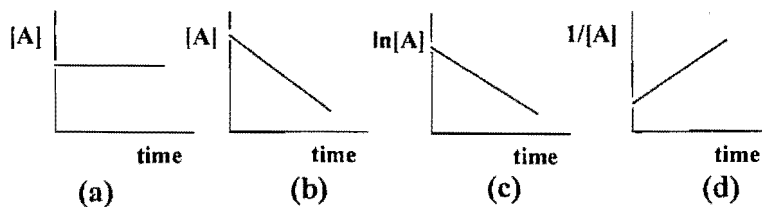

6.. Which of the following pairs are enantiomers?
a) I, II　　　b) I, III　　　c) I, IV　　　d) II, III　　　e) II, IV

7. Which of the following plots shows that the reaction A -> B is the second order reaction?　[A]: the concentration of A;　t: reaction time

(背面仍有題目,請繼續作答)

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$[A]$ $[A]$ $\ln[A]$ $1/[A]$

time (a)   time (b)   time (c)   time (d)

8.　Methyl mercury is eliminated from the body by a first-order process that has a half-life of 70 days. How many days are required for the amount of methyl mercury to drop to 20% of the original value after accidental ingestion?

a) 163 days　　b) 230 days　　c) 40 days　　d) 320 days

9. The rate of formation of dichromate ($Cr_2O_7^{2-}$) ions is 0.32 $mol \bullet L^{-1} \bullet s^{-1}$ in the reaction $2CrO_4^{2-}{}_{(aq)} + 2H^+{}_{(aq)} \to Cr_2O_7^{2-}{}_{(aq)} + H_2O_{(l)}$.　 What is the rate of reaction of chromate ions (CrO_4^{2-}) in the reaction?

a) 0.16 $mol \bullet L^{-1} \bullet s^{-1}$　b) 0.32 $mol \bullet L^{-1} \bullet s^{-1}$　　c) 0.64 $mol \bullet L^{-1} \bullet s^{-1}$　　d) 1.28 $mol \bullet L^{-1} \bullet s^{-1}$

10. Which of the following statements is false?

a) Nucleotides are the monomers of the nucleic acids

b) DNA is ribonucleic acids and RNA is deoxyribonucleic acid

c) Monosaccharides are the monomers of carbohydrates

d) Amino acids are the building blocks for the proteins

11. The reaction　$2NO + O_2 \to 2NO_2$　exhibit the rate law　Rate = $k[NO]^2[O_2]$. Which of the following mechanism is consistent with this rate law?

a.　$NO + O_2 \longrightarrow NO_2 + O$　　Slow
　　$O + NO \longrightarrow NO_2$　　Fast
b.　$NO + O_2 \rightleftharpoons NO_3$　　Fast equilibrium
　　$NO_3 + NO \longrightarrow 2NO_2$　　Slow
c.　$2NO \longrightarrow N_2O_2$　　Slow
　　$N_2O_2 + O_2 \longrightarrow N_2O_4$　　Fast
　　$N_2O_4 \longrightarrow 2NO_2$　　Fast
d.　$2NO \rightleftharpoons N_2O_2$　　Fast equilibrium
　　$N_2O_2 \longrightarrow NO_2 + O$　　Slow
　　$O + NO \longrightarrow NO_2$　　Fast

12.　The figure shows the change in potential energy as a function of reaction progress for a reaction.

Which of the following descriptions is NOT correct?

a)　A represent the activation energy
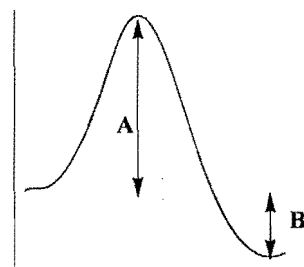
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b) B represent the net change in energy in going from reactant to product
c) If the catalyst is used for the reaction, A will change
d) If the catalyst is used for the reaction, B won't change
e) If the reaction of the temperature is changed, A will change

13. ^{145}Gd is a proton rich nuclide and unstable.　Which of the process might a ^{145}Gd nucleus not undergo to begin to reach stability?
   a) β^- emission　　b) proton emission　　c) β^+ emission　　d) electron capture

14. For the hypothetical reaction B → C at 310 K, the standard free energy of formation for compound C is 176.4 kJ/mol.　$\Delta G° = -31.4$ kJ/mol.　Calculate the standard free energy of compound B.
   a)　207.8 kJ/mol　　b)　-207.8 kJ/mol　　c)　145.0 kJ/mol
   d)　-145.0 kJ/mol

15. Which of the following chemical is a base?
a) BF_3　b) SO_2　(c) MgH_2　(d) $B(OH)_{3(s)}$

16. An unknown concentration of NH_3 solution is titrated by HCl solution.　The color change for indicators at different pH values are shown in the table below.　Which of the followings is the right indicator for this titration? (a)　phenolphthalein　　(b) alizarine yellow R　　　(c) methyl red　d) crystal violet　　e) thymol blue
   Table. The color change for indicators at different pH values.

indicator	酸型顏色	變色範圍	鹼型顏色
crystal violet	黃	0---2	藍
thymol blue	紅	1---3	黃
	黃	8---9	藍
methyl orange	紅	3---5	黃
methyl red	紅	4---6	黃
bromthymol blue	黃	6---8	藍
litmus	紅	6---8	藍
phenolphthalein	(無色)	8---10	紅
alizarine yellow R	黃	10---12	紅

17. Which of the followings is the right trend for the strength of acids?

(背面仍有題目,請繼續作答)

編號： 13

國立成功大學一〇〇學年度轉學生招生考試試題

共 **5** 頁，第 **4** 頁

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a) $HOClO$ < $HOClO_2$ < $HOClO_3$ < $HOCl$
b) $HOClO_2$ < $HOClO_3$ < $HOCl$ < $HOClO$
c) $HOClO_3$ < $HOCl$ < $HOClO$ < $HOClO_2$
d) $HOCl$ < $HOClO$ < $HOClO_2$ < $HOClO_3$

18. Which of the followings is the buffer solution

a = 1.0 L solution (0.50 M NaOH + 0.5 M HCl)

b = 1.0 L solution (0.50 M NaCl + 0.50 M NaOH)

c = 1.0 L solution (0.50 M NH_4OH + 0.5 M NH_4Cl)

d = 1.0 L solution (0.50 M NaCl + 0.50 M HCl)

19. A solution is made by mixing hexane and ethanol. Which of the following statement(s) is correct?
a) The solutions exhibit negative deviations from Raoult's law. b) ΔH_{mix} for the solutions should be exothermic. c) The intermolecular forces are stronger in the solution than in either pure hexane or pure ethanol. d)The temperature of the solution decrease while mixing two components together.

20. Which of the following element is not metalloid? a) Sb b) As c) Sn d) Ge

## II 簡答題 (40 分, 每題 4 分)

1.. What is the monomer for the polystyrene?

2.. Mixing 500 mL of 0.20 M CH_3COOH solution and 500 mL of 0.20 M CH_3CO_2Na solution, what is the final pH value ? (Ka for CH_3COOH =1.8x10^{-5})

3. Consider the vapor pressure versus temperature plot for three different substances A, B, and C.
If the three substances are CH_4, SiH_4, and NH_3, match each curve to the correct substances.
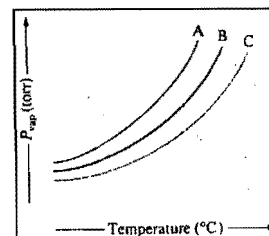
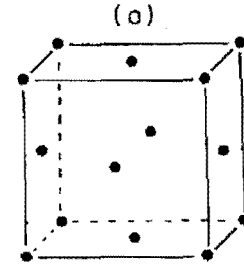4. Considering the phase diagram on the right, which phase is denser?
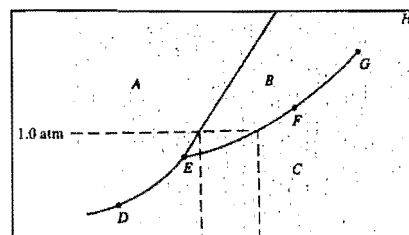
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5. Silver (Ag) crystallizes in a cubic closest packed structure, shown on the right . The radius of a silver atom is 1.44 Å. Calculate the density of solid silver. What is the efficiency of the close packing:

(a)

6. What is the simplest known member of Boranes?

Regarding to NO, NO^+, NO^-

7. Which one is(are) diamagnetic?.

8. Which one has the largest bond energy?

9.. Which one has the free radical?

10. Qualitatively draw the crystal field splitting for a trigonal bipyramidal complex ion.(Let the z axis be perpendicular to the trigonal plane.)