系級	科目	授課教師	考試日期	學號	姓名
牙一	普通化學	鄭惠華教授	93 年 1 月 8 日第 1 節		

※①請注意本試題共 5 張。如發現頁數不足及空白頁或缺印，應當場請求補齊，否則缺少部份概以零分計。
②每張試題卷務必填寫(學號)、(姓名)。

牙一普化　鄭惠華教授

1. How to construct a three-dimensional picture of the body by MRI instrument.
 Describe the principle of magnetic resonance imaging. (12%)

2. (a) Calculate the standard enthalpy of formation of gaseous diborane (B_2H_6) using the following thermochemical information:

$$4B(s) + 3O_2(g) \rightarrow 2B_2O_3(s) \quad \triangle H^\circ = -2509.1 \text{ kJ}$$

$$2H_2(g) + O_2(g) \rightarrow 2H_2O(l) \quad \triangle H^\circ = -571.7 \text{ kJ}$$

$$B_2H_6(g) + 3O_2(g) \rightarrow B_2O_3(s) + 3H_2O(l) \quad \triangle H^\circ = -2147.5 \text{ kJ}$$

(b) Pentaborane (B_5H_9) is another in a series of boron hydrides. What experiment or experiments would you need to perform to yield the data necessary to calculate the heat of formation of $B_5H_9(l)$? Explain by writing out and summing any applicable chemical reactions. (9%)

3. Microwave ovens use microwave radiation to heat food. The microwaves are absorbed by moisture in the food, which is transferred to other components of the food. As the water becomes hotter, so does the food. Suppose that the microwave radiation has a wavelength of 11.2 cm. How many photons are required to heat 200ml of coffee from 23°C to 60°C? ((9%)

臺北醫學大學 92 學年度第 一 學期 ~~期中~~ 期末 考試 命(試)題紙

系級	科目	授課教師	考試日期	學號	姓名
牙一	普通化學	張怡怡教授	___年___月___日第___節		

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牙

I. Selecting the best answer (30%)

1. Simplify 1×10^5 μmol and 1×10^4 nm quantities using a unit (A) 100 nmol and 10 mm (B) 100 mmol and 10 mn (C) 100 mmol and 10 μm (D) 100 nmol and 10 μm ... .( )

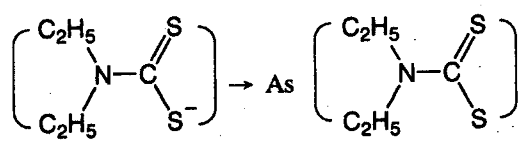
2. The important consideration in selecting a method of analysis are (A) concentration range of the species to be determined (B) the level of accuracy required (C) the number of samples (D) assure sample homogenity. (複選) ... ...( )

3. In the following chemical reaction,

   (A) $H_3AsO_4 + SnCl_2 + 2\ HCl \rightarrow H_3AsO_3 + SnCl_4 + H_2O$

   (B) $H_3AsO_3 + 3\ Zn + 6\ HCl \rightarrow AsH_{3(g)} + 3\ ZnCl_2 + 3\ H_2O$

   (C) $2\ As_2O_5 + 12\ HCl + 3\ O_2 \rightarrow 4\ H_3AsO_4 + 6\ Cl_2$

   (D) $AsH_3 + 6\ Ag^+ + 3$  $+ 6\ Ag + 3\ H^+$

   Arsenic can be separated from other substances that might interfere in the analysis ... ...( )

4. y = Log4.000×10^{-5} = (A) –4.60206 (B) –4.6021 (C) –4.39794 (D) –4.3979 ... ...( )

5. $y = [2.14\ (\pm0.02)^{1/4}$ (A) 1.2102 (±0.0003) (B) 1.210 (±0.003) (C) 1.21 (±0.03) (D) 1.2 (±0.3).....( )

6. The sulfate ion concentration in nature water can be determined by measuring the turbidity that results when an excess of $BaCl_2$ is added to a measured quantity of the sample. A turbidimeter, the instrument used for this analysis, was calibrated with a series of standard Na_2SO_4 solution. The following data were obtained in the calibration:

mg SO_4^{2-}/L, Cx	0.00	5.00	10.00	15.0	20.0
Turbidimeter Reading, R	0.06	1.48	2.28	3.98	4.61

   Assume that there is a linear relationship between the instrument reading and concentration. Calculate the concentration of sulfate in a sample yielding a turbidimeter reading of 3.67 ....( )

   (A) 14.0 mg SO_4^{2-} (B) 14.7 mg SO_4^{2-} (C) 14.9 mg SO_4^{2-} (D) 15.0 mg SO_4^{2-} (E) 15.1 mg SO_4^{2-}

7. The best way of estimating the bias of an analytical method is by the analysis of (A) standard reference materials (B) independent analysis (C) blank determination (D) variation in sample size... ... ...( )

8. A common cause of (A) constant error (B) proportional errors (C) instrument errors (D) personal errors in the presence of interfering contaminants in the sample ... ...( )

9. For the treatment of outliers, if the Q test indicates (1) tetention (2) rejection, consider reporting the central value with (1) ( ) (2) ( ) (A) mean (B) median (C) range (D) confidence limit of the set.

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II. In a volumetric determination,
Initial burette reading 0.23mL (±0.02mL)
Final burette reading 8.76mL (±0.03mL).
From the data, find the standard deviation of the volume for the titration data. (6%)

III. The following results were obtained for the determination of ppm P in blood serum: 4.40, 4.42, 4.60, 4.48, 4.50. Determine whether the result is an outlier or should be retained at the 95% confidence level. (8%)

IV. A new automated procedure for determining glucose in serum (Method A) is to be compared with the established method (Method B). Both methods are performed on serum for the same six patients to eliminate patient-to-patient variability. Do the following results confirm a difference in the two methods at the 95% confidence level? (10%)

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6
Method A glucose, mg/L	1044	720	845	800	957	650
Method B glucose, mg/L	1028	711	820	795	935	639
Difference, mg/L	16	9	25	5	22	11

V. Suppose that 0.50 mg of precipitate is lost as a result of being washed with 200 mL of wash liquid. Calculate the relative errors for
(a) the precipitate weighs 500 mg
(b) the precipitate weighs 50 mg
(c) what kind of systematic errors is present? (9%)

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VI. Express the Concentration 3.0 μM in ppm (mol. wt.=200). (7%)

Table 1 Values of *t* for Various Levels of Probability

Degrees of Freedom	Factor for Confidence Interval 80%	90%	95%	99%	99.9%
1	3.08	6.31	12.7	63.7	637
2	1.89	2.92	4.30	9.92	31.6
3	1.64	2.35	3.18	5.84	12.9
4	1.53	2.13	2.78	4.60	8.60
5	1.48	2.02	2.57	4.03	6.86
6	1.44	1.94	2.45	3.71	5.96
7	1.42	1.90	2.36	3.50	5.40
8	1.40	1.86	2.31	3.36	5.04
9	1.38	1.83	2.26	3.25	4.78
10	1.37	1.81	2.23	3.17	4.59
11	1.36	1.80	2.20	3.11	4.44
12	1.36	1.78	2.18	3.06	4.32
13	1.35	1.77	2.16	3.01	4.22
14	1.34	1.76	2.14	2.98	4.14
∞	1.29	1.64	1.96	2.58	3.29

Table 2 Critical Values for F at the 5% Level

Degrees of Freedom (Denominator)	Degrees of Freedom (Numerator) 2	3	4	5	6	12	20	∞
2	19.00	19.16	19.25	19.30	19.33	19.41	19.45	19.50
3	9.55	9.28	9.12	9.01	8.94	8.74	8.66	8.53
4	6.94	6.59	6.39	6.26	6.16	5.91	5.80	5.63
5	5.79	5.41	5.19	5.05	4.95	4.68	4.56	4.36
6	5.14	4.76	4.53	4.39	4.28	4.00	3.87	3.67
12	3.89	3.49	3.26	3.11	3.00	2.69	2.54	2.30
20	3.49	3.10	2.87	2.71	2.60	2.28	2.12	1.84
∞	3.00	2.60	2.37	2.21	2.10	1.75	1.57	1.00

Table 3 Critical Values for the Rejection Quotient Q*

Number of Observations	Q_{crit} 90% Confidence	95% Confidence	99% Confidence
3	0.941	0.970	0.994
4	0.765	0.829	0.926
5	0.642	0.710	0.821
6	0.560	0.625	0.740
7	0.507	0.568	0.680
8	0.468	0.526	0.634
9	0.437	0.493	0.598
10	0.412	0.466	0.568

*Reproduced from D. B. Rorabacher, *Anal. Chem.*, **1991**, *63*, 139. By courtesy of the American Chemical Society.