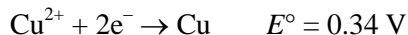


下列元素週期表資料，可供回答問題之參考

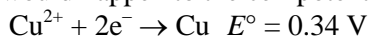
1 H 1.0															2 He 4.0		
3 Li 6.9	4 Be 9.0											5 B 10.8	6 C 12.0	7 N 14.0	8 O 16.0	9 F 19.0	10 Ne 20.2
11 Na 23.0	12 Mg 24.0											13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.0	17 Cl 35.5	18 Ar 40.0
19 K 39.1	20 Ca 40.1	21 Sc 45.0	22 Ti 47.9	23 V 50.9	24 Cr 52.0	25 Mn 54.9	26 Fe 55.8	27 Co 58.9	28 Ni 58.7	29 Cu 64.0	30 Zn 65.4	31 Ga 69.7	32 Ge 72.6	33 As 74.9	34 Se 79.0	35 Br 80.0	36 Kr 83.8

- 下列各 100.0 mL 的五種溶液含相同重量的溶質，何者摩尔浓度最大？Each of the following five solutions has the same mass of solute in 100.0 mL of solution. Which one has the highest molar concentration?  
 (A) KCl (B) NaCl (C) NaF  
 (D) Na<sub>2</sub>SO<sub>4</sub> (E) CaCl<sub>2</sub>
- 气体动力学理论的假设不包含下列那一项？The assumptions of the kinetic theory of gas do not include which of the following?  
 (A) 气体是由细颗粒组成，且粒子做随机运动。 Gas is composed of fine particles which are in random motion.  
 (B) 气体粒子之间的平均距离远大于粒子自身 Gas particles are very small compared to the average distance between the particles.  
 (C) 气体粒子与容器内壁的碰撞为弹性碰撞 Collision of gas particles collide with the walls of container is elastic.  
 (D) 气体粒子的平均速度与绝对温度成正比 The average velocity of gas particles is directly proportional to the absolute temperature.  
 (E) 以上叙述皆正确 All of the above are correct.
- 气体的实际压力与理论压力的关系为何？How is the observed pressure of a gas related to the ideal pressure?  
 (A) 实际压力小于理论压力 The observed pressure is less than the ideal pressure.  
 (B) 实际压力大于理论压力 The observed pressure is greater than the ideal pressure.  
 (C) 两者相等 They are equal.  
 (D) 两者关系与气体有关 The relationship depends on the gas.  
 (E) 以上皆非 None of the above

4. 下列兩個半反應發生在原電池中，在標準條件下，電極各產生何種物質？The following two half-reactions take place in a galvanic cell. At standard conditions, what species are produced at each electrode?



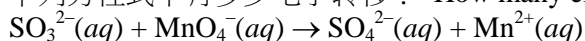
- (A) 陽極產生 Sn，而陰極產生  $\text{Cu}^{2+}$  Sn is produced at anode, and  $\text{Cu}^{2+}$  is produced at the cathode.  
 (B) 陽極產生 Sn，而陰極產生 Cu Sn is produced at the anode, and Cu is produced at the cathode.  
 (C) 陰極產生 Sn，而陽極產生  $\text{Cu}^{2+}$  Sn is produced at the cathode, and  $\text{Cu}^{2+}$  is produced at the anode.  
 (D) 陰極產生 Cu，而陽極產生  $\text{Sn}^{2+}$  Cu is produced at the cathode, and  $\text{Sn}^{2+}$  is produced at the anode.  
 (E) 陽極產生 Cu，而陰極產生  $\text{Sn}^{2+}$  Cu is produced at the anode, and  $\text{Sn}^{2+}$  is produced at the cathode.
5. 制作一電池：銅電極放置於硝酸銅溶液，銀電極放置於硝酸銀溶液。若增加  $\text{Ag}^{+}$  的濃度，電池電位會如何變化？To make a cell, a copper electrode is immersed in a solution of copper nitrate and a silver electrode in a solution of silver nitrate. If the concentration of  $\text{Ag}^{+}$  is increased what would happen to the cell potential?



- (I) 無法判斷 Cannot determine. (II) 會下降 It would decrease.  
 (III) 不變 It would remain constant. (IV) 會增加 It would increase.

- (A) I,II,III (B) I, III (C) II,IV  
 (D) IV (E) 其他的組合 Other combination.

6. 下列方程式中有多少電子轉移？How many electrons are transferred in the following reaction?



- (A) 2 (B) 3 (C) 4 (D) 6 (E) 10

7.  $\text{C}_4\text{H}_8$  共有多少個同分異構物（含立體異構物）？How many isomers are there of  $\text{C}_4\text{H}_8$  (including stereoisomers)?

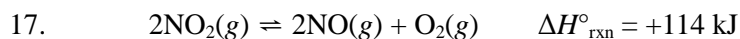
- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

8. 下列關於 *trans*-2-butene 的敘述何者正確？Which of the following statements regarding *trans*-2-butene is true?

- (I) 此分子有兩個雙鍵。The molecule has two double bonds.  
 (II) 分子中所有的鍵結可自由轉動 There is free rotation around every bond.  
 (III) 二號碳存在  $sp^2$  混成軌域 Carbon #2 exhibits  $sp^2$  hybridization.  
 (IV) *Cis*-2-butene 是它的結構異構物 *Cis*-2-butene is its structural isomer.

- (A) I,II,III (B) I, III (C) II,IV  
 (D) IV (E) 其他的組合 Other combination.

9. 对价电子來說，下列哪个原子具有最大的有效核电荷？Which of the following atoms has the largest effective nuclear charge for the valence electron?  
 (A) P (B) C (C) Mg (D) O (E) S
10. 下列哪一个分子或离子的电离能最低？Which of the following atom or ions has the smallest ionization energy?  
 (A)  $O^{2-}$  (B)  $F^-$  (C)  $S^{2-}$  (D) S (E)  $S^{2+}$
11. 下列分子或离子中，其中心原子的混成轨域为  $dsp^3$  的有几个？How many of the following molecules or ions have a hybridization of  $dsp^3$  on the central atom?  
 $IO_2F_2^-$ ,  $SiF_4$ ,  $TeF_4$ ,  $ICl_3$ ,  $IF_4^+$ ,  $XeF_4$ ,  $ClO_4^-$   
 (A) 2 (B) 3 (C) 4 (D) 5 (E) 6
12. 反应  $A \rightarrow B + C$  中以  $1/[A]_t$  对时间作图为一斜率为正的直线，请问此反应的級数为多少？  
 When the reaction  $A \rightarrow B + C$  is studied, a plot  $1/[A]_t$  vs. time gives a straight line with a positive slope. What is the order of the reaction?  
 (A) 0 級 zero (B) 1 級 first (C) 2 級 second (D) 3 級 third  
 (E) 原文资料不足无法判断 More information is needed to determine the order.
13. 下述何者影响平衡常数？Which of the following has an effect on the equilibrium constant?  
 (A) 正反应活化能 activation energy of the forward reaction  
 (B) 反应物及生成物的浓度 concentrations of the reactants and products  
 (C) 有无催化剂 presence of a catalyst  
 (D) 容器体极大小的改变 change in volume of container  
 (E) 温度变化 change in temperature
14. 下列哪組并非共轭酸碱对 Which one of the following pairs is NOT a conjugate acid-base pair?  
 (A)  $H_2O$ ,  $OH^-$  (B)  $H_2O_2$ ,  $HO_2^-$  (C)  $OH^-/O_2^-$   
 (D)  $H_2PO_4^-$ ,  $HPO_4^{2-}$  (E)  $HCl$ ,  $H^+$
15. 下列何者为 0.45 M  $CH_3COOH$  and 0.35 M  $CH_3COONa$  缓冲溶液的 pH 值？What is the pH of a buffer that consists of 0.45 M  $CH_3COOH$  and 0.35 M  $CH_3COONa$ ?  
 $[K_a(CH_3COOH) = 1.8 \times 10^{-5}]$   
 (A) 4.49 (B) 4.64 (C) 4.85 (D) 5.00 (E) 5.52
16. 下列哪个单位用於 3 級反应的速率常数？Which of the following is the units for a third-order rate constant?  
 (A)  $s^{-1}$  (B)  $mol\ L^{-1}\ s^{-1}$  (C)  $L\ mol^{-1}\ s^{-1}$   
 (D)  $L^2\ mol^{-2}\ s^{-1}$  (E)  $L^3\ mol^{-3}\ s^{-1}$



在何种条件下可以得到大量的氧气? Which reaction conditions would produce the largest amount of oxygen?

- (A) 高温高压 high temperature, high pressure
- (B) 低温高压 low temperature, high pressure
- (C) 高温低压 high temperature, low pressure
- (D) 低温低压 low temperature, low pressure
- (E) 以上皆非，除非添加催化剂 none of these, unless a catalyst is added.

18. 0.050 M 的三乙基氨,  $(\text{C}_2\text{H}_5)_3\text{N}$  水溶液的 pH 值为何? What is the pH of a 0.050 M triethylamine,  $(\text{C}_2\text{H}_5)_3\text{N}$  aqueous solution?

$$[K_b = 5.3 \times 10^{-4}]$$

- (A) 11.69
- (B) 8.68
- (C) 5.32
- (D) 2.31
- (E) < 2.0

19. 如果滴定过程中 25.0 mL 的 0.35 M HCOOH 已加入 25.0 mL 的 0.20 M KOH，会是什么 pH 值? During the titration of 25.0 mL sample of 0.35 M HCOOH, what is the pH of the solution after 25.0 mL of KOH has been added?

$$[K_a(\text{HCOOH}) = 1.77 \times 10^{-4}]$$

- (A) 4.00
- (B) 3.88
- (C) 3.63
- (D) 3.51
- (E) 3.47

20. 反应  $\text{A} \rightarrow \text{B}$  为一級反应，且对于反应物 A 而言也为一級。若使 A 浓度加倍，会产生什么后果? The reaction  $\text{A} \rightarrow \text{B}$  is first-order overall, and first-order with respect to the reactant A. What is the effect of doubling the initial concentration of A?

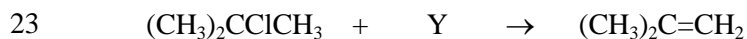
- (A) 縮短反应半生期 shorten the half-life of the reaction.
- (B) 增加反应速率常数 increase the rate constant of the reaction.
- (C) 降低反应速率常数 decrease the rate constant of the reaction.
- (D) 縮短达平衡时间 shorten the time taken to reach equilibrium.
- (E) 初始速率加倍 double the initial rate.

21. 下列何种水溶液有最高的 pH? Which of the following aqueous liquids will have the highest pH?

- (A) 0.1 M  $\text{CH}_3\text{COOH}$ ,  $\text{p}K_a = 4.7$
- (B) 0.1 M  $\text{HOOCCH}=\text{CHCOOH}$   $\text{p}K_{a1} = 1.9$ ,  $\text{p}K_{a2} = 6.3$
- (C) 0.1 M  $\text{H}_3\text{C}_6\text{H}_5\text{O}_7$ ,  $\text{p}K_a = 3.1$
- (D) 0.1 M  $\text{HOOC-COOH}$   $\text{p}K_{a1} = 1.27$ ,  $\text{p}K_{a2} = 4.3$
- (E) 纯水 pure water

22. 何者为  $\text{PCl}_3$  的分子结构? Which is the correct molecular structure for  $\text{PCl}_3$ ?

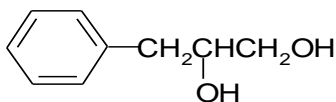
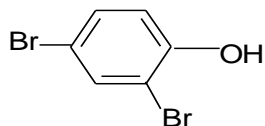
- (A) 三角双锥 trigonal bipyramidal
- (B) 平面三角形 trigonal planar
- (C) 四面体 tetrahedral
- (D) 八面体 octahedral
- (E) 以上皆非 none of the above.



Y 可能是... could be ...

- (A)  $\text{H}_2\text{SO}_4$                       (B)  $\text{NaOH}$                       (C)  $\text{CuO}$   
 (D)  $\text{LiAlH}_4$                       (E)  $\text{KMnO}_4$

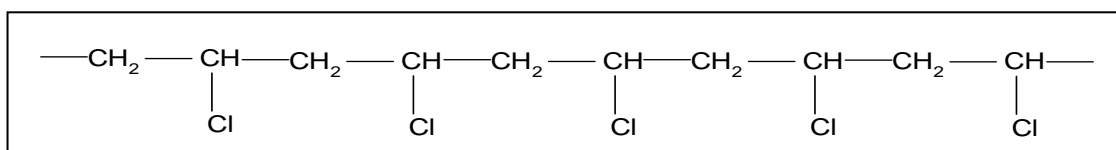
24. 以下两个化合物可以那一项试剂來区分？ Which reagent could be used to differentiate the following two compounds?



- (I)  $\text{KMnO}_4$                       (II)  $\text{FeCl}_3$   
 (III)  $\text{NaOH}$                       (IV) 溴水 Bromine water

- (A) I,II,III                      (B) I, III                      (C) II,IV  
 (D) IV                      (E) 其他的组合 Other combination.

25. 以下的构造代表某聚合物分子的一部分。以下那一些的说法正确？ The structure below represents part of the molecule of a polymer. Which of the following statements is correct?



- (I) 它是氯化聚乙烯 It is poly(vinyl chloride)  
 (II) 它的单体是  $\text{CH}_2$  和  $\text{CHCl}$  The monomer units are  $\text{CH}_2$  and  $\text{CHCl}$ .  
 (III) 它是一种热塑塑料 It is a thermoplastic.  
 (IV) 它是用在轮胎的制造 It is used in manufacturing of tyre.

- (A) I,II,III                      (B) I, III                      (C) II,IV  
 (D) IV                      (E) 其他的组合 Other combination.