## 高雄醫學大學111學年度學生轉系考試【普通化學】試題第 頁，共 3 頁

說明：一，請一律以「答案卷」作答，作答時不得使用鉛筆，違者該科答案卷不予計分；限用黑色或藍色墨水的筆書寫。
二，考生應在答案卷上規定範圍内作答，且不得書寫任何與答案無關之文字，符號，違者該科不予計分。
三，答案卷以每人一張為限，不得要求增補；試題與答案卷必須缴回，不得攜出試場。

1．How many significant figures does the difference $218.7201-218.61$ contain？
［A］ 1
［B］ 2
［C］ 3
［D］ 4
［E］ 5

2．Which one of the following elements is most likely to form a $1+$ ion？
［A］aluminum
［B］indium
［C］thallium
［D］boron
［E］gallium

3．Name the compound $\mathrm{CuSO}_{4}$
［A］Copper（I）sulfate［B］Copper（II）sulfate［C］Copper（II）sulfite［D］Cobalt（II）sulfate［E］Cobalt（II） sulfite

4．A mass spectrometer works by ionizing atoms or molecules，and then accelerating them through oppositely charged plates．The mass is obtained by
［A］measuring the force of impact on a detecting screen，and then calculating the mass using force $=$ mass $\times$ acceleration．
［B］suspending the ions in an applied electric field，and then calculating mass by the setting the downward gravitational force equal to the upward electrostatic force．
［C］measuring the magnitude of deflection as the ions pass through a magnetic field to obtain the charge－to－volume ratio，and then calculating the mass from that ratio．
［D］measuring the time it takes for the ions to hit the detector at a known distance to calculate the acceleration，and then calculating mass from force $=$ mass $\times$ acceleration．
［E］all are not correct．

5．Which of the following compounds is a strong acid？
［A］ HF
［B］ HI
［C］ $\mathrm{HClO}_{2}$
［D］ $\mathrm{H}_{2} \mathrm{SO}_{3}$
［E］ $\mathrm{HNO}_{2}$

6．How many total electrons are transferred in the following reaction？
$\mathrm{B}_{2} \mathrm{H}_{6(\mathrm{~g})}+3 \mathrm{O}_{2(\mathrm{~g})} \rightarrow \mathrm{B}_{2} \mathrm{O}_{3(\mathrm{~s})}+3 \mathrm{H}_{2} \mathrm{O}_{(\mathrm{l})}$
［A］ 2
［B］ 3
［C］ 4 ［D］ 6
［E］ 12

7．A 45 mL sample of nitrogen gas is cooled from $135^{\circ} \mathrm{C}$ to $15^{\circ} \mathrm{C}$ in a container that can contract or expand at constant pressure，what is the new volume of the nitrogen gas？
［A］ 64 mL
［B］ 5.0 mL
［C］ 410 mL
［D］ 32 mL
［E］ 41 mL

8．Styrene， $\mathrm{C}_{8} \mathrm{H}_{8}$ ，is one of the substances used in the production of synthetic rubber．When styrene burns in oxygen to form carbon dioxide and liquid water under standard－state conditions at $25^{\circ} \mathrm{C}, 42.62 \mathrm{~kJ}$ are released per gram of styrene．Find the standard enthalpy（ $\mathrm{kJ} / \mathrm{mol}$ ）of formation of styrene at $25^{\circ} \mathrm{C}$ ．
（Given：$\quad \Delta \mathrm{H}^{\circ}\left[\mathrm{CO}_{2}(\mathrm{~g})\right]=-393.5 \mathrm{~kJ} / \mathrm{mol}, \Delta \mathrm{H}_{\mathrm{f}}^{\circ}\left[\mathrm{H}_{2} \mathrm{O}(\mathrm{l})\right]=-285.8 \mathrm{~kJ} / \mathrm{mol}, \Delta \mathrm{H}^{\circ}{ }_{\mathrm{f}}\left[\mathrm{H}_{2} \mathrm{O}(\mathrm{g})\right]=-241.8 \mathrm{~kJ} / \mathrm{mol}$ ）
［A］～141．28
［B］～317．28
［C］$\sim 36.7$
［D］～4249
［E］$\sim 8730$
9. What is the maximum number of electrons in an atom that can have the following quantum numbers?
$\mathrm{n}=3 \quad l=2$
[A] 18
[B] 10
[C] 5
[D] 2
[E] 1
10. Which of the following make an isoelectronic pair: $\mathrm{Cl}^{-}, \mathrm{O}^{2-}, \mathrm{F}_{,} \mathrm{Ca}^{2+}, \mathrm{Fe}^{3+}$ ?
[A] $\mathrm{Ca}^{2+}$ and $\mathrm{Fe}^{3+}$
[B] $\mathrm{O}^{2-}$ and F
$[\mathrm{C}] \mathrm{F}$ and $\mathrm{Cl}^{-}$
[D] $\mathrm{Cl}^{-}$and $\mathrm{Ca}^{2+}$
[E] None of the above.
11. The cobalt(III) complex, $\mathrm{Co}^{3+}$, has how many $3 d$ electrons?
[A] 0
[B] 7
[C] 6
[D] 5
[E] 4
12. Which of the atoms listed below has the smallest radius?
[A] Al
[B] P
[C] As
[D] Te
[E] Na
13. If the radius of atom $X$ is greater than the radius of atom $Y$, then it is also likely that
[A] X has a larger electron affinity than Y does. [B] X has a larger effective nuclear charge than Y does.
[C] X has greater metallic character than Y does. [D] X has a larger first ionization energy than Y does.
[E] X is a poorer conductor of electricity than Y when in the solid state.
14. Which one of the following ionic solids would have the largest lattice energy?
[A] NaCl
[B] NaF
[C] $\mathrm{CaBr}_{2}$
[D] CsI
[E] $\mathrm{CaCl}_{2}$
15. Which of the following substances is/are bent?
(i) $\mathrm{H}_{2} \mathrm{~S}$
(ii). $\mathrm{CO}_{2}$
(iii) $\mathrm{N}_{3}{ }^{-}$
(iv) $\mathrm{NH}_{2}^{-}$
(v) $\mathrm{O}_{3}$
[A] only (iii)
[B] (i) and (v)
[C] (i), (iii), and (v)
[D] (i), (ii), (iii), and (v)
[E] (i), (iv), and (v)
16. Which are the properties of ionic compounds?

1. They are liquids or solid at room temperature. 2. They have high melting points.
2. Solids do not conduct electricity, but liquids do. 4. All of ionic compounds can dissolve in water.
[A] all
[B] 1, 2, and 3
[C] 1,3 , and 4
[D] 2,3 , and 4
[E] 2 and 4
3. Which of the following liquids would make a good solvent for iodine, $\mathrm{I}_{2}$ ?
[A] HCl
[B] $\mathrm{H}_{2} \mathrm{O}$
[C] $\mathrm{CH}_{3} \mathrm{OH}$
[D] $\mathrm{NH}_{3}$
[E] $\mathrm{CS}_{2}$
4. For the overall chemical reaction shown below, which one of the following statements can be rightly assumed? $\quad 2 \mathrm{H}_{2} \mathrm{~S}_{(\mathrm{g})}+\mathrm{O}_{2(\mathrm{~g})} \rightarrow 2 \mathrm{~S}_{(\mathrm{s})}+2 \mathrm{H}_{2} \mathrm{O}_{(\mathrm{l})}$
[A] The reaction is third-order overall. [B] The reaction is second-order overall.
[C] The rate law is, rate $=\mathrm{k}\left[\mathrm{H}_{2} \mathrm{~S}\right]^{2}\left[\mathrm{O}_{2}\right]$. [D] The rate law is, rate $=\mathrm{k}\left[\mathrm{H}_{2} \mathrm{~S}\right]\left[\mathrm{O}_{2}\right]$.
[E] The rate law cannot be determined from the information given.
5. Which one of these statements about strong acids is true?
[A] All strong acids have H atoms bonded to electronegative oxygen atoms.
[B] Strong acids are $100 \%$ ionized in water. [C] The conjugate base of a strong acid is itself a strong base.
[D] Strong acids are very concentrated acids.
[E] Strong acids produce solutions with a higher pH than weak acids.
6. You have 500.0 mL of a buffer solution containing 0.20 M acetic acid $\left(\mathrm{CH}_{3} \mathrm{COOH}\right)$ and 0.30 M sodium acetate $\left(\mathrm{CH}_{3} \mathrm{COONa}\right)$. What will the pH of this solution be after the addition of 20.0 mL of 1.00 M NaOH solution? $\quad\left[\mathrm{K}_{\mathrm{a}}=1.8 \times 10^{-5}\right]$
[A] 4.41
[B]
4.74
[C] 4.56
[D] 4.92
[E] 5.07
7. Which one of the following reactions would you expect to have the lowest $\Delta S^{\circ}$ ?
[A] $\mathrm{CH}_{4(g)}+2 \mathrm{O}_{2(g)} \rightarrow \mathrm{CO}_{2(g)}+2 \mathrm{H}_{2} \mathrm{O}_{(g)}$
[B] $\quad \mathrm{C}_{2} \mathrm{H}_{2(g)}+5 / 2 \mathrm{O}_{2(g)} \rightarrow 2 \mathrm{CO}_{2(g)}+\mathrm{H}_{2} \mathrm{O}_{(g)}$
$[\mathrm{C}] \quad \mathrm{C}_{2} \mathrm{H}_{4(g)}+\mathrm{O}_{2(g)} \rightarrow 2 \mathrm{CO}_{2(g)}+2 \mathrm{H}_{2} \mathrm{O}_{(g)}$
[D] $\quad \mathrm{C}_{2} \mathrm{H}_{6(g)}+7 / 2 \mathrm{O}_{2(g)} \rightarrow 2 \mathrm{CO}_{2(g)}+3 \mathrm{H}_{2} \mathrm{O}_{(g)}$
[E] All the above reactions have the same $\Delta \mathrm{S}^{\circ}$
8. The formula " $\mathrm{C}_{\mathrm{n}} \mathrm{H}_{2 \mathrm{n}}$ " should be
a. Alkanes; b. Alkenes; c. Alkynes; d. Cycloalkane
[A] a or b
[B] b or c
[C] c or d
[D] a ord
[E] b ord
9. Which of the following is most soluble in water
[A] ${ }^{\dagger} \mathrm{BuOH}$
[B] ${ }^{\dagger} \mathrm{Bu}-\mathrm{O}-{ }^{-} \mathrm{Bu}$
[C] ${ }^{\mathrm{t}} \mathrm{Bu}-\mathrm{C}(=\mathrm{O})-{ }^{\mathrm{t}} \mathrm{Bu}$
[D] ${ }^{\mathrm{B}} \mathrm{BuC}(=\mathrm{O}) \mathrm{OH}$
[E] ${ }^{t} \mathrm{BuC}(=\mathrm{O}) \mathrm{O}-{ }^{\mathrm{t}} \mathrm{Bu}$
10. In the complex ion $\left[\mathrm{Co}(\mathrm{en})_{2} \mathrm{Br}_{2}\right]^{+}$, the oxidation number of Co is
[A] +1
[B] +2
[C] +3
[D] -2
[E] -1
11. Which complex has the less unpaired electrons
$[\mathrm{A}]\left[\mathrm{Mn}(\mathrm{CN})_{6}\right]^{4-} ;[\mathrm{B}]\left[\mathrm{Pd}\left(\mathrm{PPh}_{3}\right)_{4}\right]^{2+} ;[\mathrm{C}] \mathrm{Na}_{3}\left[\mathrm{CoCl}_{6}\right] ;[\mathrm{D}]\left[\mathrm{Cr}\left(\mathrm{NH}_{3}\right)_{3}\left(\mathrm{H}_{2} \mathrm{O}\right) \mathrm{Cl}_{2}\right] \mathrm{Cl} ;[\mathrm{E}]\left[\mathrm{Cr}(\mathrm{en})_{3}\right]^{2+}$
