

國立高雄師範大學九十八學年度轉學生招生考試試題

系所別：化學系、生科系二年級

(以鉛筆作答者不予計分)

科 目：普通化學（第一頁，共六頁）

※注意：不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上，於本試題上作答者，不予計分。

I. Multiple choice questions (2% each)

- The elements in a column of the periodic table are known as
 - metalloids.
 - a period.
 - noble gases.
 - a group.
 - nonmetals.
- Complete the following sentence. A *scientific law* is:
 - a tentative explanation for a set of observations that can be tested by further experimentation.
 - a statement describing a relationship between phenomena that is always the same under the same conditions.
 - a unifying principle that explains a body of facts and relations.
 - a model used to visualize the invisible.
- An atom of bromine has a mass about four times greater than that of an atom of neon. Which choice makes the correct comparison of the relative numbers of bromine and neon atoms in 1,000 g of each element?
 - The number of bromine and neon atoms is the same.
 - There are one thousand times as many bromine atoms as neon atoms.
 - There are one thousand times as many neon atoms as bromine atoms.
 - There are four times as many neon atoms as bromine atoms.
 - There are four times as many bromine atoms as neon atoms.
- Which of these compounds is a *strong electrolyte*?
 - H₂O
 - O₂
 - H₂SO₄
 - C₆H₁₂O₆ (glucose)
 - CH₃COOH (acetic acid)

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第一頁、共六頁

科 目：普通化學（第二頁，共六頁）

5. A pressure that will support a column of Hg to a height of 256 mm would support a column of water to what height? The density of mercury is 13.6 g/cm^3 ; the density of water is 1.00 g/cm^3 .
- (A) 348 cm (D) 33.8 ft
(B) $1.00 \times 10^2 \text{ ft}$ (E) 76.0 cm
(C) 18.8 mm
6. An endothermic reaction causes the surroundings to
- (A) warm up. (D) decrease in temperature.
(B) become acidic. (E) release CO_2 .
(C) condense.
7. What is the wavelength of radiation that has a frequency of $6.912 \times 10^{14} \text{ s}^{-1}$?
- (A) $1.447 \times 10^{-15} \text{ nm}$ (D) $2.074 \times 10^{23} \text{ nm}$
(B) $4.337 \times 10^2 \text{ nm}$ (E) $4.337 \times 10^{-7} \text{ nm}$
(C) $2.304 \times 10^6 \text{ nm}$
8. The nineteenth century chemists arranged elements in the periodic table according to increasing
- (A) atomic number. (D) number of neutrons.
(B) number of electrons. (E) nuclear binding energy.
(C) atomic mass.
9. Which of these compounds is most likely to be ionic?
- (A) KF (D) CO_2
(B) CCl_4 (E) ICl
(C) CS_2
10. According to the VSEPR theory, the shape of the SO_3 molecule is
- (A) pyramidal. (D) distorted tetrahedron (seesaw).
(B) tetrahedral. (E) square planar.
(C) trigonal planar.
11. The general formula for *alkenes* is
- (A) $\text{C}_n\text{H}_{2n+2}$ (D) C_nH_{2n}
(B) $\text{C}_{2n}\text{H}_{2n}$ (E) $\text{C}_n\text{H}_{2n-2}$
(C) C_nH_{n+2}

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12. Helium atoms do not combine to form He₂ molecules, yet He atoms do attract one another weakly through

- (A) dipole-dipole forces. (D) dipole-induced dipole forces.
 (B) ion-dipole forces. (E) hydrogen bonding.
 (C) dispersion forces.

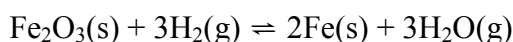
13. Which one of the following would be immiscible with water?

- (A) $\begin{array}{c} \text{H}_2\text{C} - \text{CH}_2 \\ / \quad \backslash \\ \text{O} \quad \text{O} \\ \backslash \quad / \\ \text{H}_2\text{C} - \text{CH}_2 \end{array}$ (C) $\begin{array}{c} \text{O} \\ || \\ \text{CH}_3 - \text{S} - \text{CH}_3 \end{array}$
 (B) C₂H₅—OH (D) S=C=S
 (E) NH₃

14. The units of "reaction rate" are

- (A) L mol⁻¹ s⁻¹. (D) s⁻².
 (B) L² mol⁻² s⁻¹. (E) mol L⁻¹ s⁻¹.
 (C) s⁻¹.

15. Which is the correct equilibrium constant expression for the following reaction?



- (A) $K_c = [\text{Fe}_2\text{O}_3] [\text{H}_2]^3 / [\text{Fe}]^2 [\text{H}_2\text{O}]^3$
 (B) $K_c = [\text{H}_2] / [\text{H}_2\text{O}]$
 (C) $K_c = [\text{H}_2\text{O}]^3 / [\text{H}_2]^3$
 (D) $K_c = [\text{Fe}]^2 [\text{H}_2\text{O}]^3 / [\text{Fe}_2\text{O}_3] [\text{H}_2]^3$
 (E) $K_c = [\text{Fe}] [\text{H}_2\text{O}] / [\text{Fe}_2\text{O}_3] [\text{H}_2]$

16. Which is *not* a characteristic property of acids?

- (A) tastes sour (D) neutralizes bases
 (B) turns litmus from blue to red (E) reacts with carbonates to yield CO₂ gas
 (C) reacts with metals to yield CO₂ gas

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科目：普通化學（第四頁，共六頁）

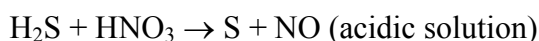
17. In which one of the following solutions will acetic acid have the greatest percent ionization?

- (A) 0.1 M CH_3COOH
(B) 0.1 M CH_3COOH dissolved in 1.0 M HCl
(C) 0.1 M CH_3COOH plus 0.1 M CH_3COONa
(D) 0.1 M CH_3COOH plus 0.2 M CH_3COONa

18. Which of these species has the highest entropy (S°) at 25°C ?

- (A) $\text{CH}_3\text{OH}(\text{l})$ (D) $\text{H}_2\text{O}(\text{l})$
(B) $\text{CO}(\text{g})$ (E) $\text{Ni}(\text{s})$
(C) $\text{MgCO}_3(\text{s})$

19. Complete and balance the following redox equation. When properly balanced using the smallest whole-number coefficients, the coefficient of S is



- (A) 1 (D) 5
(B) 2 (E) 6
(C) 3

20. The electron configuration of a Mn atom is

- (A) $[\text{Ar}]4s^23d^5$ (D) $[\text{Ar}]4s^13d^6$
(B) $1s^22s^22p^63s^23p^63d^7$ (E) $[\text{Ar}]4s^24d^5$
(C) $[\text{Ne}]3s^23d^7$

21. Alpha particles are identical to

- (A) protons. (D) helium nuclei.
(B) helium atoms. (E) electrons.
(C) hydrogen atoms.

22. Which one of these molecules could *not* serve as a monomer for an addition polymer?

- (A) $\text{ClCH}=\text{CH}_2$ (D) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_2=\text{C}-\text{CH}=\text{CH}_2 \end{array}$
(B) $\text{H}_2\text{C}=\text{CH}-\text{CN}$
(C) $\text{H}_2\text{C}=\text{CH}-\text{C}_6\text{H}_5$ (E) $\begin{array}{c} \text{O} \\ || \\ \text{CH}_3-\text{C}-\text{OH} \end{array}$

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23. Lead melts at 601.0°C. What temperature is this in °F ?

- (A) 302°F (D) 1,082°F
(B) 365°F (E) 1,114°F
(C) 1,050°F

24. What is the formula for the ionic compound formed by calcium and selenium?

- (A) CaSe (D) Ca₃Se
(B) Ca₂Se (E) CaSe₃
(C) CaSe₂

25. What is the molar mass of acetaminophen, C₈H₉NO₂?

- (A) 43 g/mol (D) 162 g/mol
(B) 76 g/mol (E) 125 g/mol
(C) 151 g/mol

II. Please give the “ English name “ for each of following elements: (10%)

- (1) Na, (2) K, (3) Fe, (4) Cu, (5) Au, (6) Hg, (7) Pb, (8) P, (9) Sn, (10) Sb.
For example: if the Question is “ H “, then the Answer is “ Hydrogen “.

III. Please give the “ English name “ for each of following compounds. (10%)

- (1) O₃, (2) HClO₃, (3) C₆H₆, (4) CH₃Cl, (5) [Ag(NH₃)₂]Cl

IV. Please give the “ full name “ for each of following abbreviations: (10%)

- (1) VSEPR, (2) LCAO-MO, (3) PVC, (4) FT-NMR, (5) DNA

For example: if the Question is “ FIA ”, then the Answer is “ Flow Injection Analysis, or
F = Flow, I = Injection, A = Analysis “

V. Please give a “ simple “ answer for each of following question: (10%)

- (1) Which of following species has the biggest bond order? (O₂⁺, O₂, or O₂⁻)
(2) Which of following species has higher positional entropy (per mole) at a given temperature? (solid CO₂ or gaseous CO₂)
(3) How many nanometer will equal to one meter?
(4) What is the chemical material for anode of lead storage battery?
(5) What is the rate constant for a first-order reaction with a half-life of 100 seconds.

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VI. Please write down the “ formula “ and specify all symbols in this formula for the following equations or laws: (10%)

- (1) Arrhenius equation,
- (2) Nernst equation,
- (3) Henry's law,
- (4) Graham's law of effusion,
- (5) Schrodinger equation (one-particle, one-dimensional and time-independent)

For example: if the Question is “ Ideal gas law “, then the Answer is “ $PV = nRT$;

P = pressure, V = volume, n = number of moles of gas, R = ideal gas constant,

T = absolute temperature “