國立中山大學九十四學年度轉學生招生考試試題

科目：普通生物【海資系二年級】

1. 繪圖說明有髓鞘之神經細胞的型態（10 分）

2. 請寫出 ATP 之英文全名 （3 分）及其在生物體之功能 （7 分）

3. 繪圖比較並說明魚和人的心血管系統的循環差異 （20 分）

4. 請寫出 (1) DNA 之四種 nucleotide 之英文全名（8 分）

   (2) 繪圖說明四種 nucleotide 之化學構造（4 分）

   (3) 繪圖說明 DNA 之立體構造（4 分），並比較 DNA 與 RNA 之 nucleotide 種類的差異（4 分）

5. 繪圖說明細胞膜的構造（10 分）

6. 繪圖概述太陽能在生物體內轉變爲生物能的過程（15 分）

7. 請解釋 Endocrine（2 分）、Exocrine（2 分）、Neuroendocrine（2 分）、Paracrine（3 分）、Autocrine（3 分）、Bohr effect（3 分）

國立中山大學九十四學年度轉學生招生考試試題

科目：普通化學【海資系二年級、海工系二年級】

共 25 題選擇題（單選），每題 4 分，不做答以 0 分計，答錯倒扣 1 分。

1. The pOH of a 0.1M solution of HCl is:
   (A)1 (B) 13 (C) 14 (D) 0 (E) 15

2. The compound CH_3-O-CH_3 is best described as being a(n)
   (A) alcohol (B) alkene (C)ether (D)ester (E) carboxylic acid

3. Which one of the following compounds contains chlorine in a positive oxidation state?
   (A) HCl (B) KCl (C) $HClO_3$ (D) PCl_3 (E) NH_4Cl

4. Which of the following is a superoxide?
   (A) $KClO_3$ (B) RbO_2 (C) FeO (D) H_2O_2 (E) Na_2O_2

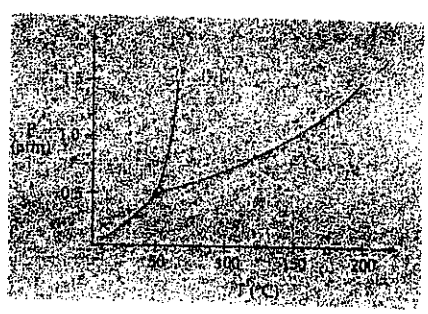
5. Which one of the following is paramagnetic ?
   (A) He (B) Be (C) Cl^- (D) F^- (E) Li

6. Which gas has a rate of diffusion 0.25 times that of hydrogen at the same temperature and pressure ?
   (A) CH_4 (B) PH_3 (C) Ar (D) N_2 (E) O_2

7. Which of the following aqueous solutions has the highest boiling point?
   (A)0.5 m NaCl (B) 0.5 m KBr (C) 0.5 m $CaCl_2$ (D) 0.5 m $C_6H_{12}O_6$ (E) 0.5 m $NaNO_3$

8. Which of the following assumptions is (are) valid based on kinetic molecular theory?
   I. Gas molecules have negligible volume.
   II. Gas molecules exert no attractive forces on each other.
   III. The temperature of a gas is directly proportional to its kinetic energy.
   (A) I only (B) III only (C) I and III only (D) II and III only. (E) I, II, and III

9. If the pressure of the substance shown in the diagram is decreased from 1.0 atmosphere to 0.5 tmosphere at a constant temperature of 100℃, which phase change will occur?



   (A)Freezing (B) Vaporization (C) Condensation (D) Sublimation (E) Deposition

10. The temperature above which gas molecules become too energetic to form a true liquid, no matter what the pressure, is called the
(A) melting point (B) critical point (C) boiling point (D) triple point (E) freezing point

11. $H_2O_{(s)} \rightarrow H_2O_{(l)}$
Which of the following is true of the reaction shown above at room temperature?
I. ΔG is greater than zero II. ΔH is greater than zero III. ΔS is greater than zero
(A) II only (B) III only (C) I and II only (D) I and III only (E) II and III only

12. Citric acid, $H_3C_6H_5O_7$, can give up three hydrogen ions in solution. The three dissociation reactions are as follows:
$H_3C_6H_5O_7 \rightleftharpoons H^+ + H_2C_6H_5O_7^-$ $K_1 = x$
$H_2C_6H_5O_7^- \rightleftharpoons H^+ + HC_6H_5O_7^{2-}$ $K_2 = y$
$HC_6H_5O_7^{2-} \rightleftharpoons H^+ + C_6H_5O_7^{3-}$ $K_3 = z$
Which of the following expressions gives the equilibrium constant for the reaction shown below?
$H_3C_6H_5O_7 \rightleftharpoons 3H^+ + C_6H_5O_7^{3-}$
(A) xyz (B) xy/z (C) x/yz (D) z/xy (E) $1/xyz$

13. When solid copper shavings are placed in a solution of dilute HNO_3, Cu^{2+} ions appear and NO gas bubbles form. Which of the following has occurred?
(A) Cu has been oxidized by H^+. (B) Cu has been oxidized by NO_3^-. (C) Cu has been reduced by NO_3^-.
(D) NO_3^- has been oxidized by H^+. (E) NO_3^- has been reduced by H^+.

14. A solution prepared by mixing equal volumes of 0.2-molar HCl and 0.2-molar NH_3, has a pH of
(A)1 (B) greater than 1 and less than 7 (C) 7 (D) greater than 7 and less than 13 (E) 13
(For NH_3, $K_b = 1.8 \times 10^{-5}$)

15. Which of the following sets of quantum numbers (n, l, m_l, m_s) best describes the highest energy valence electron in a ground-state aluminum atom?
(A)2, 0, 0, 1/2 (B) 2, 1, 0, 1/2 (C) 3, 0, 0, 1/2 (D) 3, 0, 1, 1/2 (E) 3, 1, 1, 1/2

16. The density of a sample of water decreases as it is heated above a temperature of 4℃. Which of the following will be true of an aqueous solution of $NaC_2H_3O_2$ when it is heated from 10℃ to 60℃?
(A) The molarity will increase. (B) The molarity will decrease. (C) The molality will increase.
(D) The molality will decrease. (E) The molarity and the molality will remain unchanged.

17. Which of the following salts will produce a colorless solution when added to water?
(A) $Cu(NO_3)_2$ (B) $NiCl_2$ (C) $KMnO_4$ (D) $ZnSO_4$ (E) $FeCl_3$

18. The first ionization energy for magnesium is 730 kJ/mol. The third ionization energy for magnesium is 7700 kJ/mol. What is the most likely value for magnesium's second ionization energy?
(A) 490 kJ/mol (B) 1400 kJ/mol (C) 4200 kJ/mol (D) 7100 kJ/mol (E) 8400 kJ/mol

19. A 100 gram sample of pure $^{37}_{18}Ar$ decays by electron capture with a half-life of 35 days. How long will it take for 90 grams of $^{37}_{17}Cl$ to accumulate?
(A) 31 days (B) 39 days (C) 78 days (D) 116 days (E) 315 days

20. $2\ Cu^{+}_{(aq)} + M_{(s)} \rightarrow 2\ Cu_{(s)} + M^{2+}_{(aq)}$ $E^{o} = +0.92$ V
$Cu^{+}_{(aq)} + e^{-} \rightarrow Cu_{(s)}$ $E^{0} = +0.52$ V
Based on the reduction potentials given above, what is the standard reduction potential for the following half-reaction?
$M^{2+}_{(aq)} + 2e^{-} \rightarrow M_{(s)}$
(A) +0.40 V (B) +0.12 V (C) -0.12 V (D) -0.40 V (E) -1.44 V

21. The reaction of elemental chlorine with ozone in the atmosphere occurs by the two-step process shown below
I. $Cl + O_3 \rightarrow ClO + O_2$
II. $ClO + O \rightarrow Cl + O_2$
Which of the statements below is true regarding this process?
(A) Cl is a catalyst. (B) O_3 is a catalyst. (C) ClO is a catalyst. (D) O_2 is an intermediate.
(E) O is an intermediate.

22. For which of the following reactions will the equilibrium constants K_C and K_P have the same value?
(A) $2\ N_2O_{5(g)} \rightleftharpoons 2\ NO_{2(g)} + O_{2(g)}$ (B) $2\ CO_{2(g)} \rightleftharpoons 2\ CO_{(g)} + O_{2(g)}$
(C) $H_2O_{(g)} + CO_{(g)} \rightleftharpoons H_{2(g)} + CO_{2(g)}$ (D) $3\ O_{2(g)} \rightleftharpoons 2\ O_{3(g)}$ (E) $CO_{(g)} + Cl_{2(g)} \rightleftharpoons COCl_{2(g)}$

23. A $^{222}_{86}Rn$ nuclide decays through the emission of two beta particles and two alpha particles. The resulting nuclide is (A) $^{214}_{84}Po$ (B) $^{210}_{84}Po$ (C) $^{214}_{83}Bi$ (D) $^{210}_{83}Bi$ (E) $^{214}_{82}Pb$

24. $N_{2(g)} + 3\ Cl_{2(g)} \rightarrow 2\ NCl_{3(g)}$ $\Delta H = 460$ kJ
Which of the following statements is true regarding the reaction shown above?
(A) It is not spontaneous at any temperature. (B) It is spontaneous only at very high temperature.
(C) It is spontaneous only at very low temperature. (D) It is spontaneous only at very high concentrations.
(E) It is spontaneous only at very low concentrations.

25. At 25℃, the vapor pressure of water is 24 mmHg. Which of the following expressions gives the vapor pressure of a solution created by adding 2.0 moles of glucose to 55 moles of water?
(A) $\frac{(24)(2.0)}{(55)}$ mmHg (B) $\frac{(2.0)}{(24)(55)}$ mmHg (C) $\frac{(24)(55)}{(57)}$ mmHg (D) $\frac{(55)}{(24)(57)}$ mmHg
(E) $\frac{(24)(57)}{(55)}$ mmHg