

國立嘉義大學 95 學年度  
【日間學制】轉學生招生考試試題

科目：普通化學

〈請將答案寫在答案卷上〉

Single choice questions (單一選擇題，每題 2 分，共 100 分)

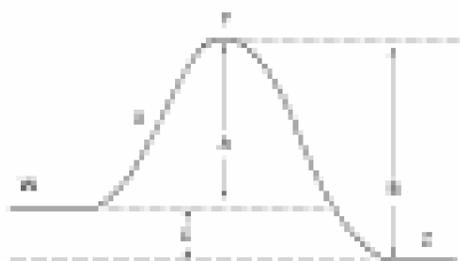
- Which number has the greatest uncertainty?  
(A)  $1.01 \pm 0.01$  (B)  $4.60 \pm 0.01$  (C)  $100.0 \pm 10.00$  (D)  $20.00 \pm 0.01$  (E)  $200.0 \pm 10.0$
- Which of the following is a pure substance? (A) An egg (B) Steel (C) Sea water (D) Silver (E) The air
- Every atom contains  
(A) As many neutrons as electrons (B) As many neutrons as protons (C) As many nuclei as neutrons  
(D) As many electrons as protons (E) As many nuclei as protons
- What is the charge of an ion with 35 protons, 38 neutrons and 38 electrons? (A) 0 (B) +3 (C) +38 (D) -3 (E) -38
- Which of the following is the formula of barium fluoride? (A) BaF (B) Ba<sub>2</sub>F (C) BaF<sub>2</sub> (D) BaF<sub>3</sub> (E) Ba<sub>2</sub>F<sub>2</sub>
- Which one of the following is **not** a polyatomic anion? (A) Hydride (B) Nitrite (C) Carbonate (D) Sulfate (E) Chlorate
- The atomic mass of rhenium is 186.2. Given that 37.1% of natural rhenium-185, what is the other stable isotope?  
(A)  ${}_{75}^{183}\text{Re}$  (B)  ${}_{75}^{187}\text{Re}$  (C)  ${}_{75}^{189}\text{Re}$  (D)  ${}_{75}^{181}\text{Re}$  (E)  ${}_{75}^{190}\text{Re}$
- What is the approximate molar mass of ethanol (C<sub>2</sub>H<sub>5</sub>OH)? (A) 43 (B) 39 (C) 46 (D) 37 (E) 50
- Which compound contains the highest percent by mass of hydrogen? (A) HCl (B) HF (C) HI (D) H<sub>2</sub>O (E) H<sub>2</sub>S
- A compound is composed of element X and hydrogen. Analysis shows the compound to be 80 % X by mass, with three times as many hydrogen atoms as X per molecule. Which element is element X? (A) He (B) F (C) O (D) C (E) N
- When the following equation is balanced, what is the sum of the coefficients?  
$$\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$$
  
(A) 6 (B) 8 (C) 9 (D) 10 (E) 12
- The limit reactant in a reaction  
(A) is the reactant for which there is the least amount in grams.  
(B) is the reactant which has the lowest coefficient in a balanced equation.  
(C) is the reactant for which there is the most amount in grams.  
(D) is the reactant for which there is the fewest number of moles.  
(E) none of these.
- Which of the following is **not** a weak acid? (A) H<sub>2</sub>CO<sub>3</sub> (B) CH<sub>3</sub>COOH (C) HI (D) HNO<sub>2</sub> (E) NH<sub>4</sub>Cl
- Which of the following salts is insoluble in water? (A) BaSO<sub>4</sub> (B) K<sub>3</sub>PO<sub>4</sub> (C) Na<sub>2</sub>S (D) Pb(NO<sub>3</sub>)<sub>2</sub> (E) CaCl<sub>2</sub>
- In which of the following does nitrogen have an oxidation state of +4?  
(A) NH<sub>3</sub> (B) HNO<sub>3</sub> (C) N<sub>2</sub>O (D) NO (E) N<sub>2</sub>O<sub>4</sub>
- In the reaction shown below, what species is oxidized?  
$$2\text{NaI} + \text{Br}_2 \rightarrow 2\text{NaBr} + \text{I}_2$$
  
(A) NaI (B) Br<sub>2</sub> (C) Br<sup>-</sup> (D) Na<sup>+</sup> (E) I<sup>-</sup>
- When the equation  $\text{Cl}_2 \rightarrow \text{Cl}^- + \text{ClO}_3^-$  (basic solution) is balanced using the smallest whole-number coefficient of OH<sup>-</sup> is  
(A) 2 (B) 4 (C) 6 (D) 8 (E) 10
- A balloon has a volume of 1.2 liters at 24°C. The balloon is heated to 48°C. Calculate the new volume of the balloon.  
(A) 1.20 L (B) 1.30 L (C) 1.60 L (D) 2.10 L (E) 2.40 L
- Which conditions of *P*, *T*, and *n*, respectively, are most ideal?  
(A) high *P*, high *T*, high *n*. (B) low *P*, low *T*, low *n*. (C) high *P*, low *T*, high *n*. (D) low *P*, high *T*, low *n*. (E) none of these.
- At STP, Which gas has the highest density? (A) H<sub>2</sub> (B) O<sub>2</sub> (C) N<sub>2</sub> (D) He (E) CH<sub>4</sub>
- At STP, Which gas has the slowest average speed? (A) H<sub>2</sub> (B) O<sub>2</sub> (C) N<sub>2</sub> (D) He (E) CH<sub>4</sub>
- At STP, Which gas has the largest average kinetic energy? (A) H<sub>2</sub> (B) O<sub>2</sub> (C) He (D) CH<sub>4</sub> (E) all gases the same

23. What is the approximate root mean square speed for  $O_2$  molecules at  $25^\circ C$  ?  
 (A) 4.8 m/s (B) 48 m/s (C) 480 m/s (D) 4,800 m/s (E) 48,000 m/s
24. Of work, heat, enthalpy, and entropy, how many are state functions? (A) 0 (B) 1 (C) 2 (D) 3 (E) 4
25.  $2CO(g) + C(s) \rightarrow C_3O_2(g)$   $\Delta H^\circ = 127.3$  kJ/mol. The heat of formation for  $C_3O_2$  is -93.7 kJ/mol. What is the heat of formation of carbon monoxide? (A) 116.8 kJ/mol (B) -348.3 kJ/mol (C) 221.0 kJ/mol (D) -110.5 kJ/mol (E) 33.6 kJ/mol
26. The frequency of an electromagnetic wave is  $6 \times 10^{14}$  Hertz ( $s^{-1}$ ). What is its wavelength in meters?  
 (A)  $1.8 \times 10^{23}$  m (B)  $1.8 \times 10^{-7}$  m (C)  $2 \times 10^6$  m (D)  $5 \times 10^2$  m (E)  $5 \times 10^{-7}$  m
27. Which form of electromagnetic radiation has the longest wavelengths?  
 (A) gamma rays (B) microwaves (C) x-rays (D) infrared radiation (E) visible light
28. In the hydrogen atom spectrum, for which of the following transitions does the light emitted have the shortest wavelength?  
 (A)  $n = 6$  to  $n = 5$  (B)  $n = 3$  to  $n = 2$  (C)  $n = 5$  to  $n = 3$  (D)  $n = 6$  to  $n = 4$  (E)  $n = 6$  to  $n = 3$
29. How many orbitals have the principal quantum number  $n = 3$ ? (A) 1 (B) 3 (C) 5 (D) 7 (E) 9
30. An element with the electron configuration  $[Xe]4f^{14}5d^56s^2$  would belong to which class on the periodic table?  
 (A) transition metal (B) alkaline earth elements (C) halogens (D) rare earth element (E) none of these
31. Which statements about hydrogen are true?  
 I. H has a lower ionization energy than He.      II.  $H^-$  is larger than H.  
 III. H bonds with the halogens to form polar covalent compounds.  
 IV. H does not have a second ionization energy.  
 (A) I, III (B) I, II (C) II, III (D) I, III, IV (E) I, II, III, IV
32. Lithium losing an electron is an \_\_\_\_\_ process and oxygen losing an electron is an \_\_\_\_\_ process.  
 (A) endothermic, exothermic (B) exothermic, endothermic (C) endothermic, endothermic (D) exothermic, exothermic  
 (E) more information is needed
33. Which of the following statements is incorrect?  
 (A) Ionic bonding results from the transfer of electrons from one atom to another.  
 (B) Linear molecules can not have a net dipole moment.  
 (C) Dipole moments result from the unequal distribution of electrons in a molecule.  
 (D) A molecule with very dipole bonds can be nonpolar.  
 (E) The electrons in a polar bonds are found nearer to the more electronegative element.
34. Choose the compound with the most ionic bond. (A) LiCl (B) KF (C) NaCl (D) LiF (E) KCl
35. Which of the following molecules has a dipole moment? (A)  $SO_3$  (B)  $CO_2$  (C)  $CO_3^{2-}$  (D)  $NO_3^-$  (E) none of these
36. Which of the following molecules has a nonlinear structure? (A)  $XeF_2$  (B)  $BeF_2$  (C)  $NO_2^+$  (D)  $O_3$  (E)  $I_3^-$
37. Which of the following molecules contains a pi bond? (A)  $H_2CO$  (B)  $C_2H_6$  (C)  $CH_3OCH_3$  (D)  $CH_3NH_2$  (E)  $C_2H_5OH$
38. The hybridization of Br in  $BrF_3$  is (A) sp (B)  $sp^2$  (C)  $sp^3$  (D)  $dsp^3$  (E)  $d^2sp^3$
39. Which of the following would you expect to have the highest boiling point?  
 (A)  $F_2$  (B)  $Cl_2$  (C)  $Br_2$  (D)  $I_2$  (E) All of these have the same boiling point
40. The vapor pressure of pure water at  $100^\circ C$  is (A) 100 torr (B) 250 torr (C) 500 torr (D) 760 torr (E) 1000 torr
41. The equilibrium constant for the reaction  $HA \rightleftharpoons H^+ + A^-$  is called:  
 (A)  $K_a$  (B)  $K_b$  (C)  $K_w$  (D)  $K_p$  (E)  $1/K_a$
42. Which of the following is a conjugate acid/base pair?  
 (A)  $HCl/OCl^-$  (B)  $H_2SO_4/SO_4^{2-}$  (C)  $NH_4^+/NH_3$  (D)  $H_3O^+/OH^-$  (E) none of these
43. As water is heated, its pH decreases. This means that  
 (A) the water is no longer neutral (B)  $[H^+] > [OH^-]$  (C)  $[OH^-] > [H^+]$  (D) statements A and B are correct  
 (E) none of these

44.  $2\text{NOBr(g)} \rightleftharpoons 2\text{NO(g)} + \text{Br}_2\text{(g)}$ . After equilibrium was reached, the volume was increased to 2.0 liters, while the temperature was kept at 300 K. This will result in:
- (A) an increase in  $K_p$ .      (B) a decrease in  $K_p$ .      (C) a shift in the equilibrium position to the right.  
 (D) a shift in the equilibrium position to the left.      (E) none of these
45. For a solution equimolar in HCN and NaCN, which statement is false?
- (A) This is an example of the common ion effect.  
 (B) The  $[\text{H}^+]$  is larger than it would be if only the HCN was in solution.  
 (C) The  $[\text{H}^+]$  is equal to the  $K_a$ .  
 (D) Addition of more NaCN will shift the acid dissociation equilibrium of HCN to the left.  
 (E) Addition of NaOH will increase  $[\text{CN}^-]$  and decrease  $[\text{HCN}]$
46. Which of the following compounds has the smallest  $\text{p}K_a$  in the water? (A) NaOH (B) HCl (C)  $\text{H}_2\text{CO}_3$  (D)  $\text{NH}_4\text{Cl}$  (E)  $\text{H}_3\text{PO}_4$
47. Which of the following statements is typically true for a catalyst?
- (A) The concentration of the catalyst will go down as a reaction proceeds.  
 (B) The catalyst provides a new pathway in the reaction mechanism.  
 (C) The catalyst speeds up the reaction.  
 (D) Two of these.  
 (E) None of these.

Use the following to answer question 48-50:

The questions below refer to the following diagram.



48. Why is this reaction considered to be exothermic?
- (A) Because energy difference B is greater than energy difference C  
 (B) Because energy difference B is greater than energy difference A  
 (C) Because energy difference A is greater than energy difference C  
 (D) Because energy difference B is greater than energy difference C plus energy difference A  
 (E) Because energy difference A and energy difference C are about equal
49. At what point on the graph is the activated complex present?
- (A) point W (B) point X (C) point Y (D) point Z (E) none of these
50. If the reaction were reversible, would the forward or the reverse reaction have a higher activation energy?
- (A) The diagram shows no indication of any activation energy.  
 (B) The forward and reverse activation energies are equal.  
 (C) The forward activation energy  
 (D) The reverse activation energy  
 (E) none of these