國立臺北科技大學

九十六學年度四年制二、三年級轉學生招生考試

系所組別：四技二年級專業科目（二）

第三節　普通化學 試題

02-1

注意事項：

1. 本試題共 40 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

Please choose a correct answer for each question (2.5 points each)

1. Which state of matter has atomic spacing that is close together and indefinite shape?
   A) liquid　B) solid　C) gas　D) plasma　E) none of the above

2. Which of the following is a homogeneous mixture?
   A) trail mix　B) stainless steel　C) water　D) molten iron　E) none of the above

3. Which of the following items is a chemical property?
   A) the paint color on a new red corvette
   B) the odor of spearmint gum
   C) the melting and boiling point
   D) the tarnishing of a copper statue
   E) none of the above

4. When methane is burned with oxygen the products are carbon dioxide and water. If you produce 36 grams of water and 44 grams of carbon dioxide from 16 grams of methane, how many grams of oxygen were needed for the reaction?
   A) 32　B) 80　C) 96　D) 64　E) none of the above

5. A 15.0 gram lead ball at 25.0°C was heated with 40.5 joules of heat. Given the specific heat of lead is 0.128 J/g·°C, what is the final temperature of the lead?
   A) 21.1°C　B) 46.1°C　C) 77.8°C　D) 0.844°C　E) none of the above

6. The atomic mass unit is defined as:
   A) the mass of the hydrogen atom containing only one proton
   B) the mass of electrons found in a carbon atom containing six protons and neutrons
   C) 1/12 the mass of a carbon atom containing six protons and six neutrons
   D) 1/14 the mass of a nitrogen atom containing 7 protons and 7 neutrons
   E) none of the above

7. When an atom loses an electron, the resulting particle is called
   A) a proton　B) an anion　C) a cation　D) an isotope　E) none of the above

8. You have 10.0 g each of Na, C, Pb, Cu and Ne. Which contains the largest number of moles?
   A) Na　B) C　C) Pb　D) Cu　E) Ne

9. A 42.7 gram sample of potassium nitrate contains how many grams of potassium?
   A) 39.1　B) 16.5　C) 21.4　D) 8.54　E) none of the above

10. What would the empirical formula be for the molecular compound $C_6H_9O_4$?
    A) $C_2H_3O_2$　B) CH_3O_2　C) $C_3H_6O_2$　D) $C_3H_9O_4$　E) none of the above

11. An unknown acid has a molar mass of 60.05 g/mol. Given the following percent composition, what is the molecular formula? 40% C, 6.7% H, 53.3% O
    A) $C_3H_4O_3$　B) CH_2O　C) $C_2H_4O_2$　D) $C_6H_{12}O_6$　E) none of the above

12. What are the coefficients for the following reaction when it is properly balanced?
    ___nitrogen monoxide + ___carbon monoxide → ___nitrogen + ___carbon dioxide
    A) 2, 1, 1, 2　B) 2, 2, 1, 2　C) 2, 2, 2, 1　D) 1, 1, 2, 2　E) none of the above

13. The primary cause of increasing greenhouse gases is:
    A) the burning of vast amounts of rainforests
    B) the production of CO_2 by respiration
    C) the increased use of natural gas, petroleum and coal
    D) the release of CO_2 by decreasing solubility in the ocean
    E) none of the above

14. How many moles of lithium nitrate are theoretically produced if we start with 3.4 moles of $Ca(NO_3)_2$ and 2.4 moles of Li_3PO_4?
    Reaction: $3Ca(NO_3)_2 + 2Li_3PO_4 \rightarrow 6LiNO_3 + Ca_3(PO_4)_2$
    A) 7.2　B) 6.8　C) 1.2　D) 1.1　E) not enough information

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15. The number of cycles of a wave that passes a stationary point in one second is called its
    A) wavelength　B) frequency　C) crest　D) trough　E) none of the above

16. Which color of the visible spectrum has photons with the most energy?
A) red B) orange C) green D) violet E) yellow

17. Which form of electromagnetic radiation has the shortest wavelength?
A) Radio Waves B) Microwaves C) X-rays D) Gamma Rays E) Infrared Radiation

18. The n = _____ principal shell is the lowest that may contain a d-subshell.
A) 1 B) 2 C) 3 D) 4 E) not enough information

19. Which of the following compounds have resonance structures?
A) CH_4 B) H_2O C) NH_3 D) O_3 E) None of the compounds have resonance structures

20. What is the electron geometry if you have 4 electron groups around the center atom?
A) linear B) trigonal planar C) tetrahedral D) trigonal bipyramidal E) not enough information

21. Which term matches the definition: The ability of an element to attract electrons within a covalent bond.
A) coulombic attraction B) dipole moment C) polar covalent D) nonpolar covalent E) electronegativity

22. A balloon filled with 0.500 L of air at sea level is submerged in the water to a depth that produces a pressure of 3.25 atm. What is the volume of the balloon at this depth?
A) 1.63 L B) 0.154 L C) 6.50 L D) 0.615 L E) none of the above

23. A sample of helium gas initially at 37.0°C, 785 torr and 2.00 L was heated to 58.0°C while the volume expanded to 3.24 L. What is the final pressure in atm?
A) 517 B) 0.681 C) 1.79 D) 3.21 E) none of the above

24. Ammonia gas decomposes according to the equation: $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$
If 15.0 L of nitrogen is formed at STP, how many liters of hydrogen will be produced (also measured at STP)?
A) 15.0 L B) 30.0 L C) 45.0 L D) 90.0 L E) not enough information

25. Intermolecular forces are responsible for:
A) the taste sensations B) the shape of protein molecules C) the function of DNA D) the existence of liquids and solids E) all of the above

26. Liquids that have high vapor pressure and low boiling points are called
A) abnormal liquids B) volatile liquids C) non-volatile liquids D) viscous liquids E) none of the above

27. How many kilojoules of heat are needed to completely vaporize 42.8 grams of $C_4H_{10}C$ at its boiling point? Given ΔH_{vap} = 26.5kJ/mol
A) 74.12 B) 9.49 C) 15.3 D) 16.3 E) none of the above

28. Which intermolecular force is common to all polar molecules but not nonpolar molecules?
A) dispersion forces B) dipole-dipole forces C) hydrogen bonding D) X-forces E) none of the above

29. You need to prepare 2.00 L of 0.100 M Na_2CO_3 solution. The best procedure is to weigh out
A) 10.6 g Na_2CO_3 and add 2.00 L of water to it
B) 21.2 g Na_2CO_3 and add 2.00 L of water to it
C) 10.6 g Na_2CO_3 and add water until the final solution has a volume of 2.00 L
D) 21.2 g Na_2CO_3 and add water until the final solution has a volume of 2.00 L
E) none of the above

30. What volume of 9.00 M nitric acid is needed to make 6.50 L of 1.25 M solution?
A) 903 mL B) 1.73 L C) 1.10 L D) 748 mL E) none of the above

31. How many grams of barium sulfate are produced if 25.34 mL of 0.113 M $BaCl_2$ completely react given the reaction: $BaCl_2$ (aq) + Na_2SO_4 (aq) → $BaSO_4$ (s) + 2NaCl (aq)
A) 5.90 B) 26.3 C) 1039 D) 0.668 E) none of the above

32. What is the change in the boiling point of a solution made by dissolving 14.7 g of $C_6H_{12}O_6$ into 150.0 mL of water? The density of water is 1.00 g/mL and K_b = 0.512°C/m.
A) 0.502°C B) 5.22°C C) 0.0418°C D) 0.279°C E) none of the above

33. How many mL of 0.112 M $Pb(NO_3)_2$ are needed to completely react with 25.0 mL of 0.105 M KI? Given: $Pb(NO_3)_2$ (aq) + 2KI(aq) → PbI_2 (s) + $2KNO_3$ (aq)
A) 11.7 B) 23.4 C) 0.147 D) 5.85 E) none of the above

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34. The Arrhenius definition of an acid is:
A) a proton donor B) a proton acceptor C) produces H^+ in solution D) produces OH^- in solution E) none of the above

35. A 35.0 ml sample of 0.225 M HBr was titrated with 42.3 ml of KOH. What is the concentration of the KOH?

A) 0.157 M　B) 0.303 M　C) 0.272 M　D) 0.186 M　E) none of the above

36. A chemical equilibrium exists when

A) reactants are completely changed to products

B) there are equal amounts of reactants and products

C) the rate at which reactants form products becomes zero

D) the sum of reactant and product concentrations equals one mole

E) the rate at which reactants form products is the same as the rate at which products form reactants

37. Identify the equation for which $K_{eq} = [Cu^{+}]2[S^{2-}]$.

A) $Cu_2S(s) \rightleftharpoons Cu^{+}(aq) + 2S^{2-}(aq)$　B) $CuS(s) \rightleftharpoons Cu^{2+}(aq) + S^{2-}(aq)$　C) $\frac{1}{2}Cu_2S(s) \rightleftharpoons Cu^{+}(aq) + \frac{1}{2}S^{2-}(aq)$　D) $Cu_2S(s) \rightleftharpoons 2Cu^{+}(aq) + S^{2-}(aq)$　E) none of the above

38. What is the $[Cu^{2+}]$ at equilibrium, given CuS, $K_{sp} = 1.27 \times 10^{-36}$?

A) 1.27×10^{-36} M　B) 6.35×10^{-37} M　C) 1.13×10^{-18} M　D) 1.61×10^{-72} M　E) not enough information

39. The reducing agent

A) gains electrons　B) loses oxygen　C) is the oxidized substance　D) is itself reduced

E) none of the above

40. In the following reaction, $Mg(s) + Cu^{2+}(aq) \rightarrow Mg^{2+}(aq) + Cu(s)$

A) Mg is the reducing agent and Cu is the oxidizing agent

B) Mg^{2+} is the reducing agent and Cu is the oxidizing agent

C) Cu is the reducing agent and Mg^{2+} is the oxidizing agent

D) Cu^{2+} is the reducing agent and Mg is the oxidizing agent.

E) Mg is the reducing agent and Cu^{2+} is the oxidizing agent