## 國立嘉義大學 101 學年度基礎學科學力競賽試題卷

	科目:化學 題型:選擇題 配分:10	12. How many of the following salts are expected to be insoluble in water?
		Sodium sulfide barium nitrate ammonium sulfate potassium phosphate
1.	The density of lead is 11.35 g/mL. The experimental values obtained for the density of leading of leading of the density of leading of leading of the density of leading of	
	11.5, and 11.8 g/mL. Which one of the best describes this collection of data?	13. In accordance with the solubility rules, which of the following will occur when solutions containing
	(A) accurate (B) precise (C) both A and B (D) not enough information	about 0.1 g of Pb(NO <sub>3</sub> ) <sub>2</sub> (aq) and KI(aq) /100 mL are mixed?
2.	Which of the following numbers has the fewest number of significant figures?	(A) KNO <sub>3</sub> will precipitate; Pb <sup>2+</sup> and $\Gamma$ will be spectator ions. (B) No precipitate will form
	1235 0.30001 12000 0.00800	(C) $Pb(NO_3)_2$ will precipitate; $K^+$ and $\Gamma^-$ will be spectator ions. (D) $PbI_2$ will precipitate; $K^+$ and
	(A) 1235 (B) 0.30001 (C) 12000 (D) 0.00800	NO <sub>3</sub> will be spectator ions.
3.	Consider the numbers 23.68 and 4.12. The sum of these numbers has significant fig	res, and 14. All of the following are weak acids except
	the product of these numbers has significant figures.	(A) HCNO (B) HBr (C) HF (D) $HNO_2$
	(A) 3, 3 (B) 4, 4 (C) 3, 4 (D) 4, 3	15. As the volume of a gas decreases, the pressure increases due to
4.	The melting point for aspirin is 275°F. What is its melting point in °C?	(A) an increase in temperature of the gas molecules.
	(A) $135^{\circ}$ C (B) $333^{\circ}$ C (C) $257^{\circ}$ C (D) $121^{\circ}$ C	(B) a decrease in the density of the gas system.
5.	Which of the following is the greatest mass?	(C) an increase in the number of collisions occurring per unit time.
	(A) $2.0 \times 10^2 \text{ mg}$ (B) $10.0 \text{ dg}$ (C) $1.0 \times 10^5 \mu\text{g}$ (D) $2.0 \times 10^2 \text{ cg}$	(D) a decrease in the kinetic energy of the gas molecules.
6.	Which one of the following statements about atomic structure is false?	16. Two metals of equal mass with different heat capacities are subjected to the same amount of heat.
	(A) An atom is mostly empty space.	Which undergoes the smallest change in temperature?
	(B) Almost all of the mass of the atom is concentrated in the nucleus.	(A) The metal with the higher heat capacity.
	(C) The protons and neutrons in the nucleus are very tightly packed.	(B) The metal with the lower heat capacity.
	(D) The number of protons and neutrons is always the same in neutral atom.	(C) Both undergo the same change in temperature.
7.	$^{40}_{20}$ Ca <sup>2+</sup> has	(D) You need to know the initial temperatures of the metals.
	(A) 20 protons, 20 neutrons, and 18 electrons	17. Of energy, work, enthalpy, and heat, how many are state functions?
	(B) 20 protons, 20 neutrons, and 20 electrons	(A) 1 (B) 2 (C) 3 (D) 4
	(C) 20 protons, 22 neutrons, and 18 electrons	18. When an hydrogen electron makes transition from $n = 3$ to $n = 1$ , which of the following statement is
	(D) 22 protons, 18 neutrons, and 18 electrons	true?
8.	Which of the following pairs is incorrect?	I. Energy is emitted.
	(A) NH <sub>4</sub> Br, ammonium bromide (B) K <sub>2</sub> CO <sub>3</sub> , potassium carbonate (C) BaPO <sub>4</sub> , barium	
	(D) CuCl, copper (I) chloride	III. The electron loses energy.
9.		<b>.</b>
	(A) acetylene, $C_2H_2$ (B) benzene, $C_6H_6$ (C) cyclobutadiene, $C_4H_4$ (D) all o	
10.	What is the coefficient for water when the following equation is balanced?	(A) II, III (B) V (C) I, III (D) II, III
	$As(OH)3(s) + H2SO4(aq) \rightarrow As2(SO4)3(aq) + H2O(l)$	19. How many electrons in an atom can have the quantum numbers n = 4, 1 = 2? 《背面尚有試題
	(A) 12 (B) 6 (C) 4 (D) 2	(A) 14 (B) 12 (C) 5 (D) 10

11. Consider the following reaction:  $2A + B \rightarrow 3C + D$ 

(A) 67% (B) 75% (C) 89% (D) 100%

3.0 mol A and 2.0 mol B react to form 4.0 mol C. What is the percent yield of this reaction?

(A) The energy and position of an electron cannot be determined simultaneously. (B) Lower energy orbitals are filled with electrons before filigher energy orbitals. (C) When filling orbitals of electrons will occup the same orbital before filling a new orbital. (D) No two electrons can have the same four quantum numbers. (A) The energy and position of an electron cannot be determined simultaneously. (B) Lower energy orbitals are filled with electrons before filigher energy orbitals. (C) When filling orbitals of electrons will accup the same orbital before filling a new orbital. (D) No two electrons can have the same four quantum numbers. (A) The (B) R. (R) C (C) NaCl (D) (SCl (D) NaCl (D) SCl (D) NaCl (D) NaBl (D	20.	Order the elements, S, Cl, and F in the terms of increasing ionization energy.		III. temperature IV. intermolecular forces
		(A) S, Cl, F (B) Cl, F, S (C) F, S, Cl (D) F, Cl, S		(A) I, III (B) II, III, IV (C) I, III, IV (D) III, IV
(B) Lower earry yothtals are filled with electrons before higher energy orbitals are companied as every energy orbitals are filled with electrons will occupy the same orbital before filling as a new energy. (we electrons can have the same four quantum numbers.   (A) Fill   (B) Fill	21.	Which of the following statements about quantum theory is incorrect?	34.	A solution of hydrogen peroxide is 23.3% $H_2O_2$ by mass and has a density of 1.11 g/cm <sup>3</sup> . The
C) When filling orbitals of equal energy, two electrons will occupy the same orbital before filling a leave orbital.   D) No two electrons can have the same four quantum numbers.   D) No two electrons can have the same four quantum numbers.   D) No two electrons can have the same four quantum numbers.   D) No two electrons can have the same four quantum numbers.   D) No two electrons can have the same four quantum numbers.   D) No two electrons can have the same four quantum numbers.   D) No two electrons can have the same four quantum numbers.   D) No two for the following share, which of the following diatomic molecules would be the most polar?   D) No two for the following share is smallest radius?   D) No two for the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No two following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the following solutions would have the highest osmotic pressure?   D) No the		(A) The energy and position of an electron cannot be determined simultaneously.		molarity of the solution is:
		(B) Lower energy orbitals are filled with electrons before higher energy orbitals.		(A) 7.14 M (B) 0.259 M (C) 7.60 M (D) 7.93 M
(D) No two electrons can base the same four quantum numbers.   II. CH <sub>2</sub> -CH <sub>2</sub> -O-CH <sub>2</sub> -CH <sub>3</sub>   CH <sub>3</sub>		(C) When filling orbitals of equal energy, two electrons will occupy the same orbital before filling a	35.	Rank the following compounds according to increasing solubility in water.
2.		new orbital.		I. $CH_3-CH_2-CH_2-CH_3$
		(D) No two electrons can have the same four quantum numbers.		II. $CH_3$ - $CH_2$ - $O$ - $CH_2$ - $CH_3$
	22.	In the gaseous phase, which of the following diatomic molecules would be the most polar?		III. CH <sub>3</sub> -CH <sub>2</sub> -OH
4. Which of the following soute compounds has the largest lattice energy?  4. Which of the following soute compounds has the largest lattice energy?  4. Which of the following soute compounds has the largest lattice energy?  4. A) Bod		(A)LiF (B) CsF (C) NaCl (D) GCl		IV. CH <sub>3</sub> –OH
24. Which of the following ionic compounds has the largest lattice energy?  (A) 0.2 M NaBr, soft in bronked (B) 0.2 M CaCl2, calcium chloride (C) 0.3 M CaBr, 20 R, glucose  (C) 0.3 M CaB	23.	Which of the following has the smallest radius?		$(A) I < III < IV < II \qquad (B) \ I < II < IV < III \qquad (C) \ I < II < III < IV \qquad (D) \ III < IV < II < II < III < III$
Characteria		(A) $F^{-}$ (B) Ne (C) $O^{2-}$ (D) $Mg^{2+}$	36.	Which of the following solutions would have the highest osmotic pressure?
Draw the Lewis structures of the molecules below and use them to answer the questions from 25 to 27.  I. BH₃ II. NO₂ III. SF₄ IV. O₃ V. PCI₃  Which of the molecules obeys the octet rule?  26. How many of the molecules have molecules below and use them not answer the questions from 25 to 27.  (A) I B) I C) I D) I D(D(I) I D(I) I	24.	Which of the following ionic compounds has the largest lattice energy?		(A) 0.2 M NaBr, sodium bromide (B) 0.2 M CaCl <sub>2</sub> , calcium chloride (C) 0.3 M
		(A) BaO (B) BeO (C) CsI (D) NaBr		CH <sub>3</sub> COOH, acetic acid (D) 0.3 M C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> , glucose
25. Which of the molecules obeys the octet rule?  (A) IV (B) III (C) II (D) I  (B) What is the order of increasing base strength?  (A) CN, F, OAc, CIO <sub>4</sub> (B) CN, OAc, F, CIO <sub>4</sub> (C) CIO <sub>4</sub> , OAc, ACc, CIO <sub>4</sub> (C) CIO <sub>4</sub> , OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, F (D) CIO <sub>4</sub> , F, OAcc, CN, CN, The molecules show resonance?  (A) IN IN (B) III, IV (C) III, V (D) III, IV (D) II	Dra	w the Lewis structures of the molecules below and use them to answer the questions from 25 to 27.	37.	Given the following acids and $K_a$ values:
What is the order of increasing base strength?   What is the order of increasing base strength?		I. $BH_3$ II. $NO_2$ III. $SF_6$ IV. $O_3$ V. $PCl_5$		HClO <sub>4</sub> HOAc HCN HF
26. How many of the molecules have no dipole moment?  (A) CN, F, OAc, CIO <sub>4</sub> (B) CN, OAc, F, CIO <sub>4</sub> (C) CIO <sub>4</sub> , OAc,  (A) the concentration of each acid solution (B) the pH of each acid solution (C) the equilibrium constant of each acid solution (B) the pH of each acid solution (C) the equilibrium constant of each acid acid solution (B) the pH of each acid solution (C) the equilibrium constant of each acid (D) all of the above  (A) 120° (B) 60° (C) 109° (D) 90°  (A) 120° (B) 60° (C) 109° (D) 90°  (A) 120° (B) 60° (C) 109° (D) 90°  (A) 130° (B) 8p² (C) sp³ (D) sp  30. The hybridization of the central atom in NO <sub>3</sub> is  (A) 140° (B) 143PO <sub>4</sub> , PO <sub>4</sub> <sup>3</sup> - (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2</sup> - (C) H <sub>2</sub> PO <sub>4</sub> <sup>3</sup> - (D) HPO <sub>4</sub> <sup>2</sup> -, PO <sub>4</sub> <sup>3</sup> -  (A) Abuffer solution is prepared by dissolving 0.3 mol of NaC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> and 0.6 mol of HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> in water.  (A) Na (B) C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (C) HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (D) H <sub>3</sub> O <sup>5</sup> (A) Nicreases, increases (B) decreases, decreases (C) increases, decreases (D) decreases, decreases (D) decreases	25.	Which of the molecules obeys the octet rule?		$1 \times 10^{7}$ $1.76 \times 10^{-5}$ $4.93 \times 10^{-10}$ $3.53 \times 10^{-4}$
CN, F (D) ClO <sub>4</sub> , F, OAC, CN  Which of these molecules show resonance?  38. In deciding which of two acids is the stronger, one must know:  (A) I, II (B) II, IV (C) II, V (D) III, IV  (A) pyramidal (B) bent (C) Octahedral (D) trigonal plannar  39. The bond angles about the carbon atom in the formaldehyde molecule, H <sub>2</sub> C=O, are about:  (A) 120° (B) 60° (C) 109° (D) 90°  (B) 80° (C) 80° (D) 80° (D) 90°  (B) 80° (C) 80° (D) 80° (D) 90°  (B) 80° (D) 80° (D) 90°  (B) 80° (D) 80° (D) 80° (D) 90°  (B) 80° (D) 80° (D) 80° (D) 90°  (B) 80° (D) 90°		$(A) IV \qquad \qquad (B) III \qquad (C) II \qquad (D) I$		What is the order of increasing base strength?
27. Which of these molecules show resonance? (A) I, II (B) II, IV (C) II, V (D) III, IV  28. The molecular structure of OF <sub>2</sub> is (A) pyramidal (B) bent (C) Octahedral (D) trigonal plannar  29. The bond angles about the carbon atom in the formaldehyde molecule, H <sub>2</sub> C=O, are about: (A) 120° (B) 60° (C) 109° (D) 90°  30. The hybridization of the central atom in NO <sub>3</sub> is (A) phase bond order of a bond increases, the bond energy and the bond length (A) increases, increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases  32. Which of the following is the correct order of boiling points for KNO <sub>3</sub> , CH <sub>3</sub> OH, C <sub>2</sub> H <sub>6</sub> , Ne? (A) Ne < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < KNO <sub>3</sub> (B) KNO <sub>3</sub> < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < Ne (C)  38. In deciding which of two acids is the stronger, one must know: (A) the concentration of each acid solution (B) the pH of each acid solution (C) the equilibrium constant of each acid solution (B) the pH of each acid solution (C) the equilibrium constant of each acid solution (B) the pH of each acid solution (C) the equilibrium constant of each acid solution (B) the pH of each acid solution (C) the equilibrium constant of each acid solution (B) the above  39. The dihydrogenphosphate ion, H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , has both a conjugate acid and a conjugate base. These are, respectively:  (A) H <sub>3</sub> PO <sub>4</sub> , PO <sub>4</sub> <sup>3-</sup> (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2-</sup> (C) H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , HPO <sub>4</sub> <sup>2-</sup> (D) HPO <sub>4</sub> <sup>2-</sup> , PO <sub>4</sub> <sup>3-</sup> 40. A buffer solution is prepared by dissolving 0.3 mol of NaC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> and 0.6 mol of HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> in water. Which substance will show a decrease in concentration when a strong base is added?  (A) Na <sup>+</sup> (B) C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (C) HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (D) H <sub>3</sub> O <sup>+</sup> (A) Na <sup>+</sup> (B) C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (C) HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (D) H <sub>3</sub> O <sup>+</sup> 41. Consider a solution consisting of the following two buffer systems:  (A) PO <sub>4</sub> = HPO <sub>4</sub> =	26.	How many of the molecules have no dipole moment?		(A) $CN^-, F^-, OAc^-, ClO_4^-$ (B) $CN^-, OAc^-, F^-, ClO_4^-$ (C) $ClO_4^-, OAc^-,$
(A) I, II (B) II, IV (C) II, V (D) III, IV (C) II, V (D) II, IV (D) III, IV (C) II, V (D) II, IV (D) II, IV (D) II, IV (D) II, IV (D		(A) 1 (B) 2 (C) 3 (D) 4		$CN^-, F^-$ (D) $ClO_4^-, F^-, OAc^-, CN^-$
28. The molecular structure of OF2 is  (A) pyramidal (B) bent (C) Octahedral (D) trigonal plannar  29. The bond angles about the carbon atom in the formaldehyde molecule, H <sub>2</sub> C=O, are about:  (A) 120° (B) 60° (C) 109° (D) 90°  30. The hybridization of the central atom in NO <sub>3</sub> is  (A) ps <sup>2</sup> (C) sp <sup>3</sup> (D) sp  31. As the bond order of a bond increases, the bond energy and the bond length  (A) increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases  32. Which of the following is the correct order of boiling points for KNO <sub>3</sub> , CH <sub>3</sub> OH, C <sub>2</sub> H <sub>6</sub> , Ne?  (A) Ne < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < KNO <sub>3</sub> (B) KNO <sub>3</sub> < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < Ne (C)  (A) 120° (B) 60° (C) 109° (D) 90°  (A) 120° (B) 120° (C) 120° (D) 120° (	27.	Which of these molecules show resonance?	38.	In deciding which of two acids is the stronger, one must know:
(A) pyramidal (B) bent (C) Octahedral (D) trigonal plannar  39. The dihydrogenphosphate ion, H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , has both a conjugate acid and a conjugate base. These are, respectively:  (A) 120° (B) 60° (C) 109° (D) 90°  30. The hybridization of the central atom in NO <sub>3</sub> <sup>-</sup> is  (A) p <sup>3</sup> (B) sp <sup>2</sup> (C) sp <sup>3</sup> (D) sp  31. As the bond order of a bond increases, the bond energy and the bond length  (A) increases, increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases  32. Which of the following is the correct order of boiling points for KNO <sub>3</sub> , CH <sub>3</sub> OH, C <sub>2</sub> H <sub>6</sub> , Ne?  (A) Ne < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < KNO <sub>3</sub> (B) KNO <sub>3</sub> < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < Ne (C)  39. The dihydrogenphosphate ion, H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , has both a conjugate base. These are, respectively:  (A) H <sub>3</sub> PO <sub>4</sub> , PO <sub>4</sub> <sup>3</sup> - (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2</sup> - (C) H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - PO <sub>4</sub> <sup>3</sup> -  (A) H <sub>3</sub> PO <sub>4</sub> , PO <sub>4</sub> <sup>3</sup> - (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2</sup> - (C) H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - PO <sub>4</sub> <sup>3</sup> -  (A) H <sub>3</sub> PO <sub>4</sub> , PO <sub>4</sub> <sup>3</sup> - (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2</sup> - (C) H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - PO <sub>4</sub> <sup>3</sup> -  (A) H <sub>3</sub> PO <sub>4</sub> , PO <sub>4</sub> <sup>3</sup> - (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2</sup> - (C) H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - PO <sub>4</sub> <sup>3</sup> -  (A) H <sub>3</sub> PO <sub>4</sub> , PO <sub>4</sub> <sup>3</sup> - (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2</sup> - (C) H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - (D) HPO <sub>4</sub> <sup>2</sup> - PO <sub>4</sub> <sup>3</sup> -  (A) H <sub>3</sub> PO <sub>4</sub> , PO <sub>4</sub> <sup>3</sup> - (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2</sup> - (C) H <sub>2</sub> PO <sub>4</sub> - (D) H <sub>2</sub> PO <sub>4</sub> - (D) HPO <sub>4</sub> <sup>2</sup> - (D) HP		$(A) I, II  (B) II, IV \qquad (C) II, V \qquad (D) III, IV$		(A) the concentration of each acid solution (B) the pH of each acid solution (C) the equilibrium
29. The bond angles about the carbon atom in the formaldehyde molecule, H₂C=O, are about:  (A) 120° (B) 60° (C) 109° (D) 90°  30. The hybridization of the central atom in NO₃ is  (A) p³ (B) sp² (C) sp³ (D) sp  31. As the bond order of a bond increases, the bond energyand the bond length  (A) increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases  32. Which of the following is the correct order of boiling points for KNO₃, CH₃OH, C₂H₆, Ne?  (A) Ne < CH₃OH < C₂H₆ < KNO₃ (B) KNO₃ < CH₃OH < C₂H₆ < Ne (C)  (A) H₃PO₄, PO₄³ (B) H₃PO₄, HPO₄² (C) H₂PO₄ , HPO₄² (D) HPO₄² , PO₄³ (D) HPO₄² , PO₄₃ (D) HPO₄₃ (D) HPO₄ (D) HPO₄₃ (D) HPO₄	28.	The molecular structure of OF <sub>2</sub> is		constant of each acid (D) all of the above
(A) 120° (B) 60° (C) 109° (D) 90°  (A) H <sub>3</sub> PO <sub>4</sub> , PO <sub>4</sub> <sup>3-</sup> (B) H <sub>3</sub> PO <sub>4</sub> , HPO <sub>4</sub> <sup>2-</sup> (C) H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , HPO <sub>4</sub> <sup>2-</sup> (D) HPO <sub>4</sub> <sup>2-</sup> , PO <sub>4</sub> <sup>3-</sup> 30. The hybridization of the central atom in NO <sub>3</sub> <sup>-</sup> is  (A) p <sup>3</sup> (B) sp <sup>2</sup> (C) sp <sup>3</sup> (D) sp  31. As the bond order of a bond increases, the bond energy and the bond length  (A) increases (B) decreases (C) increases, decreases (D) decreases, increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases (B) decreases, decreases (D) decreases,		(A) pyramidal (B) bent (C) Octahedral (D) trigonal plannar	39.	The dihydrogenphosphate ion, $H_2PO_4^-$ , has both a conjugate acid and a conjugate base. These are,
30. The hybridization of the central atom in NO₃⁻ is  (A) p³ (B) sp² (C) sp³ (D) sp  31. As the bond order of a bond increases, the bond energy and the bond length  (A) increases, increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases  32. Which of the following is the correct order of boiling points for KNO₃, CH₃OH, C₂H₆, Ne?  (A) Ne < CH₃OH < C₂H₆ < KNO₃ (B) KNO₃ < CH₃OH < C₂H₆ < Ne (C)  40. A buffer solution is prepared by dissolving 0.3 mol of NaC₂H₃O₂ and 0.6 mol of HC₂H₃O₂ in water. Which substance will show a decrease in concentration when a strong base is added?  (A) Na⁺ (B) C₂H₃O₂⁻ (C) HC₂H₃O₂ (D) H₃O⁺  (A) Na⁺ (B) C₂H₃O₂⁻ (C) HC₂H₃O₂ (D) H₃O⁺  41. Consider a solution consisting of the following two buffer systems:  H₂CO₃ = HCO₃⁻ + H⁺ pK₄ = 6.4  H₂PO₄⁻ = HPO₄²⁻ + H⁺ pK₄ = 7.2  At pH 6.4, which one of the following is true of the relative amounts of acid and conjugate base	29.	The bond angles about the carbon atom in the formaldehyde molecule, H <sub>2</sub> C=O, are about:		respectively:
(A) p³ (B) sp² (C) sp³ (D) sp  Which substance will show a decrease in concentration when a strong base is added?  (A) Na⁺ (B) C₂H₃O₂⁻ (C) HC₂H₃O₂ (D) H₃O⁺  (A) increases, increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases  increases  H₂CO₃ = HCO₃⁻ + H⁺ pK₃ = 6.4  H₂PO₃⁻ = HPO₃⁻ + H⁺ pK₃ = 7.2  (A) Ne < CH₃OH < C₂H₆ < KNO₃ (B) KNO₃ < CH₃OH < C₂H₆ < Ne (C)  At pH 6.4, which one of the following is true of the relative amounts of acid and conjugate base		(A) $120^{\circ}$ (B) $60^{\circ}$ (C) $109^{\circ}$ (D) $90^{\circ}$		(A) $H_3PO_4$ , $PO_4^{3-}$ (B) $H_3PO_4$ , $HPO_4^{2-}$ (C) $H_2PO_4^{-}$ , $HPO_4^{2-}$ (D) $HPO_4^{2-}$ , $PO_4^{3-}$
31. As the bond order of a bond increases, the bond energy and the bond length  (A) increases, increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases  increases  H <sub>2</sub> CO <sub>3</sub> = HCO <sub>3</sub> <sup>-</sup> + H <sup>+</sup> pK <sub>a</sub> = 6.4  Which of the following is the correct order of boiling points for KNO <sub>3</sub> , CH <sub>3</sub> OH, C <sub>2</sub> H <sub>6</sub> , Ne?  (A) Na <sup>+</sup> (B) C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup> (C) HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (D) H <sub>3</sub> O <sup>+</sup> 41. Consider a solution consisting of the following two buffer systems:  H <sub>2</sub> CO <sub>3</sub> = HCO <sub>3</sub> <sup>-</sup> + H <sup>+</sup> pK <sub>a</sub> = 6.4  H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> = HPO <sub>4</sub> <sup>2</sup> + H <sup>+</sup> pK <sub>a</sub> = 7.2  (A) Na <sup>+</sup> (B) C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (C) HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (D) H <sub>3</sub> O <sup>+</sup> 42. Consider a solution consisting of the following two buffer systems:  H <sub>2</sub> PO <sub>3</sub> = HCO <sub>3</sub> <sup>-</sup> + H <sup>+</sup> pK <sub>a</sub> = 6.4  H <sub>2</sub> PO <sub>4</sub> = HPO <sub>4</sub> <sup>2</sup> + H <sup>+</sup> pK <sub>a</sub> = 7.2  At pH 6.4, which one of the following is true of the relative amounts of acid and conjugate base	30.	The hybridization of the central atom in NO <sub>3</sub> is	40.	A buffer solution is prepared by dissolving 0.3 mol of $NaC_2H_3O_2$ and 0.6 mol of $HC_2H_3O_2$ in water.
(A) increases, increases (B) decreases, decreases (C) increases, decreases (D) decreases, increases increases (B) decreases, decreases (D) decreases, dec		(A) $p^3$ (B) $sp^2$ (C) $sp^3$ (D) $sp$		Which substance will show a decrease in concentration when a strong base is added?
increases $H_2CO_3 \rightleftharpoons HCO_3^- + H^+  pK_a = 6.4$ 32. Which of the following is the correct order of boiling points for KNO <sub>3</sub> , CH <sub>3</sub> OH, C <sub>2</sub> H <sub>6</sub> , Ne? $H_2PO_4^- \rightleftharpoons HPO_4^{2-} + H^+  pK_a = 7.2$ (A) Ne < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < KNO <sub>3</sub> (B) KNO <sub>3</sub> < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < Ne (C) At pH 6.4, which one of the following is true of the relative amounts of acid and conjugate base	31.	As the bond order of a bond increases, the bond energyand the bond length		(A) $Na^+$ (B) $C_2H_3O_2^-$ (C) $HC_2H_3O_2$ (D) $H_3O^+$
32. Which of the following is the correct order of boiling points for KNO <sub>3</sub> , CH <sub>3</sub> OH, C <sub>2</sub> H <sub>6</sub> , Ne? $H_2PO_4^- \rightleftharpoons HPO_4^{2-} + H^+ pK_a = 7.2$ (A) Ne < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < KNO <sub>3</sub> (B) KNO <sub>3</sub> < CH <sub>3</sub> OH < C <sub>2</sub> H <sub>6</sub> < Ne (C) At pH 6.4, which one of the following is true of the relative amounts of acid and conjugate base		(A) increases, increases (B) decreases, decreases (C) increases, decreases (D) decreases,	41.	Consider a solution consisting of the following two buffer systems:
(A) Ne $<$ CH $_3$ OH $<$ C $_2$ H $_6$ $<$ KNO $_3$ (B) KNO $_3$ $<$ CH $_3$ OH $<$ C $_2$ H $_6$ $<$ Ne (C) At pH 6.4, which one of the following is true of the relative amounts of acid and conjugate base		increases		$H_2CO_3 \rightleftharpoons HCO_3^- + H^+ \qquad pK_a = 6.4$
	32.	Which of the following is the correct order of boiling points for KNO <sub>3</sub> , CH <sub>3</sub> OH, C <sub>2</sub> H <sub>6</sub> , Ne?		$H_2PO_4^- \iff HPO_4^{2-} + H^+ \qquad pK_a = 7.2$
N O H WINO OH OH OH OH OH OH WINO		(A) $Ne < CH_3OH < C_2H_6 < KNO_3$ (B) $KNO_3 < CH_3OH < C_2H_6 < Ne$ (C)		At pH 6.4, which one of the following is true of the relative amounts of acid and conjugate base
$Ne < C_2H_6 < KNO_3 < CH_3OH \qquad (D) Ne < C_2H_6 < CH_3OH < KNO_3 \qquad present?$	N	$Ne < C_2H_6 < KNO_3 < CH_3OH$ (D) $Ne < C_2H_6 < CH_3OH < KNO_3$		present?
33. Generally the vapor pressure of a liquid is related to: $ (A)[H_2CO_3] > [HCO_3^-] \text{ and } [H_2PO_4^-] > [HPO_4^{2-}] $	33.	Generally the vapor pressure of a liquid is related to:		(A) $[H_2CO_3] > [HCO_3^-]$ and $[H_2PO_4^-] > [HPO_4^{2-}]$
I. the amount of liquid II. atmospheric pressure (B) $[H_2CO_3] = [HCO_3^-]$ and $[H_2PO_4^-] > [HPO_4^{2-}]$		I. the amount of liquid II. atmospheric pressure		(B) $[H_2CO_3] = [HCO_3^-]$ and $[H_2PO_4^-] > [HPO_4^{2-}]$

- (C) [H<sub>2</sub>CO<sub>3</sub>] = [HCO<sub>3</sub><sup>-</sup>] and [HPO<sub>4</sub><sup>2</sup><sup>-</sup>] > [H<sub>2</sub>PO<sub>4</sub><sup>-</sup>]
   (D) [HCO<sub>3</sub><sup>-</sup>] > [H<sub>2</sub>CO<sub>3</sub>] and [HPO<sub>4</sub><sup>2</sup><sup>-</sup>] > [H<sub>2</sub>PO<sub>4</sub><sup>-</sup>]
   42. In the reaction P<sub>4</sub>(s) + 10Cl<sub>2</sub>(g) → 4PCl<sub>5</sub>(s), the reducing agent is (A) Chlorine (B) PCl<sub>5</sub> (C) phosphorus (D) Cl<sup>-</sup>
   43. The evidation state of joding in IO<sub>2</sub><sup>-</sup> is
- 43. The oxidation state of iodine in  $IO_3$  is
  - (A)+3 (B)-3 (C)+5 (D)-5
- 44. The following reactions are examples of  $Pb^{2+} + 2\Gamma \rightarrow PbI_2$

$$2Ce^{4+} + 2\Gamma \rightarrow I_2 + 2Ce^{3+}$$

$$HOAc + NH_3 \rightarrow NH_4^+ + OAc^-$$

- (A) acid-base reactions (B) precipitation, acid-base, and redox reactions, respectively (C) redox, acid-base, and precipitation reactions, respectively(D) precipitation, redox, and acid-base reactions, respectively
- 45. How much heat is required to raise the temperature of a 4.48-g sample of iron (specific heat = 0.450 J/g°C) from 25.0°C to 79.8°C?
  - (A) 1.98 J (B) 246 J (C) 110 J (D) 546 J
- 46. Consider the following rate law: Rate =  $k[A]^n[B]^m$ , How are the exponents n and m determined?
  - (A) by using the balanced chemical equation (B) by using the subscripts for the chemical formulas (C) by using the coefficients of the chemical formulas (D) by experiment
- 47. The freezing point of helium is -270°C. The freezing point of xenon is -112°C. Both of these are in the noble gas family. Which of the following statements is supported by these data?
  - (A) Helium and xenon form highly polar molecules. (B) As the molecular weight of the noble gas increases, the freezing point decreases. (C) The London dispersion forces between the helium molecules are less than the London dispersion forces between the xenon molecules. (D) None of these.
- 48. Which of the following compounds has the lowest viscosity?
  - (A)  $CCl_4(l)$  (B)  $N_2(g)$  (C)  $H_2O(l)$  (D)  $CH_3$ - $(CH_2)_{25}$ - $CH_3(l)$
- 49. Which of the following best describes an orbital?
  - (A) space which may contain electrons, protons, and/or neutrons (B) the space in an atom where an electron is most likely to be found (C) small, walled spheres that contain electrons (D) a single space within an atom that contains all electrons of that atom
- 50. The most likely reason for colloidal dispersion is \_\_\_\_\_
  - (A) the Tyndall effect (B) coagulation (C) emulsion formation (D) electrostatic repulsion 《試題結束請將答案卡及試題卷一倂繳回》

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