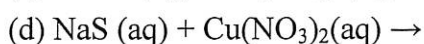明志科技大學 106 學年度研究所碩士班一般考試暨在職專班招生命題用紙

所別： 材料工程研究所 組別： 不分組 科目： 普化
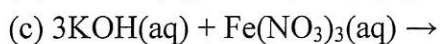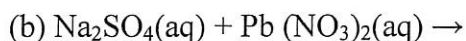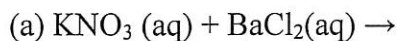
注意□不准□一般計算器■工程用計算器，考試時間總計：100 分鐘。試題共 2 頁，第 1 頁

1. Explain the meaning of the following: **(10 %)**
   (a) hydrogen bonding;   (b) London dispersion force;   (c)Ionic bonding
   (d) Standard Temperature and Pressure (S.T.P.)

2. Suppose 25.0 kg (2.5×10^4 g) of nitrogen gas and 5.00kg (5.0×10^3 g) of hydrogen gas are mixed and reacted to form ammonia . Calculate the mass of ammonia produced when this reaction is run to completion. **(10%)**

3. Which substance in each pair would be expected to show the largest vapor pressure at a given temperature? Explain your reasoning. **(10%)**
   (a) $CH_3OH(l)$, $CH_3CH_2CH_2CH_2OH(l)$ (b) H_2O or CH_3OH

4. How many protons and neutrons are contained in the nucleus of each of following atoms? Assuming each atom is uncharged, how many electrons are present? **(10 %)**

   (a) $^{39}_{19}K$ ； (b) $^{53}_{24}Cr$ ；(c) $^{84}_{34}Se$ ； (d) $^{76}_{33}As$ ；(e) $^{91}_{36}K$

5.For the following ions, indicate whether electrons must be *gained* or *lost* from the parent neutral atom, and *how many* electrons must be gained or lost. **(10 %)**
   (a) Ca^{2+} ； (b) N^{3-} ；(c) Br^{-} ； (d)Fe^{3+} ；(e) Al^{3+}

6. For the following pairs of ions, use the concept that a chemical compound must have a charge of zero to predict the formula of the simplest compound that the ions are most likely to form. **(10 %)**
   (a) Mg^{2+} and N^{3-} ； (b) Ca^{2+} and P^{3-} ；(c) Na^+ and S^{2-} ； (d). Al^{3+} and O^{2-} ；(e) Li^+ and N^{3-}

7. Classify each of the following reactions in as many ways as possible. **(10 %)**
   (a) $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$
   (b) $2Al(s) + 3Cl_2(g) \rightarrow 2AlCl_3(s)$
   (c) $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$
   (d) $2Cs(s) + Br_2(l) \rightarrow 2CsBr(s)$
   (e) $KOH(aq) + HCl(aq) \rightarrow H_2O(l) + KCl(aq)$

背面尚有試題

明志科技大學 106 學年度研究所碩士班一般考試暨在職專班招生命題用紙

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8. For each of the following reactions, complete and balance the equation, indicating clearly which product is the precipitate. **(20%)**

   (a) KNO_3 (aq) + $BaCl_2$(aq) →

   (b) Na_2SO_4(aq) + $Pb(NO_3)_2$(aq) →

   (c) $3KOH$(aq) + $Fe(NO_3)_3$(aq) →

   (d) NaS (aq) + $Cu(NO_3)_2$(aq) →

9. Calculate the energy (in KJ) required to heat 25g of liquid water from 25 ^{o}C to 100 ^{o}C. The specific heat capacity of liquid water is 4.18 J/g ^{o}C, and the molar heat of vaporization of water is 40.6 KJ/ mole.   **(10%)**