

**WRITE YOUR NAME IN BLOCK CAPITALS ON THE TOP OF EACH SHEET
NO CALCULATORS ARE ALLOWED**

In taking this examination you are expected to adhere to the GT academic honor code. At a minimum this requires that you utilize only the materials supplied to you, and that you do not give help to, or accept help from, others.

The maximum possible score on this test is only 37 points so please be careful. Check your answers on finishing the test to make sure that you have not made any careless mistakes.

- 1) When sodium is dissolved in anhydrous liquid ammonia a blue solution is formed. What chemical species is responsible for this blue color? Write a formula for it. **(2 points)**

The solvated electron, $e^-(am)$

- 2) Sodium metal is produced industrially by the electrolysis of molten sodium chloride. Using your knowledge of sodium chemistry explain why sodium is not produced by the electrolysis of a sodium chloride solution in water. **(2 points)**

Any sodium formed would react with the water.

- 3) Which of the following compounds can be regarded as salt like hydrides containing H^- **(2 points)**

BaH₂, SiH₄, B₂H₆, PdH_x, H₂Se, HCl, SbH₃, **RbH**

- 4) Which of the following compound(s) can be regarded as electron deficient hydride(s) **(1 point)**

BaH₂, SiH₄, **B₂H₆**, H₂Se, HCl, SbH₃, RbH

- 5) Which of the following compounds can be regarded as molecular hydrides? **(2 points)**

BaH₂, **SiH₄**, **B₂H₆**, PdH_x, **H₂Se**, **SbH₃**, RbH

- 6) Which of the following compounds are likely to react with water to form a basic solution? **(2 points)**

NO₂, **Rb₂O**, P₂O₃, SeO₂, CO₂, **SrO**

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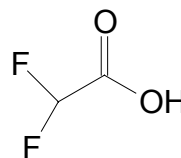
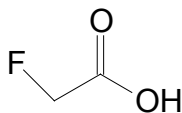
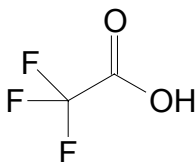
- 7) Which of the following compounds are likely to react with water to form an acidic solution? (2 points)

NO_2 , Rb_2O , P_2O_3 , SeO_2 , CO_2 , SrO

- 8) Pick from each of the following groups of Bronsted acids the one with the smallest pK_a . (3 points)

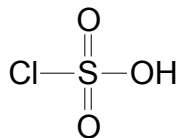
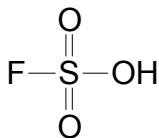
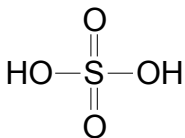
a. HOBr , HOCl , **HOF** , HOH

b.



First one

c)



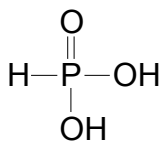
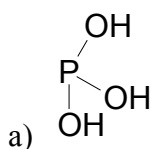
Second one

- 9) Which of the species in each of the following groups is most basic? (2 points)

a. H_2SeO_4 , **SeO_4^{2-}** , HSeO_4^-

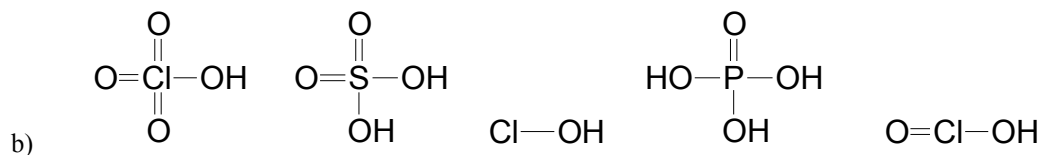
b. H_2AsO_4^- , H_3AsO_4 , **AsO_4^{3-}** , HAsO_4^{2-}

- 10) For each of the following groups of oxoacids indicate which is likely to have the lowest pK_a . (2 points)



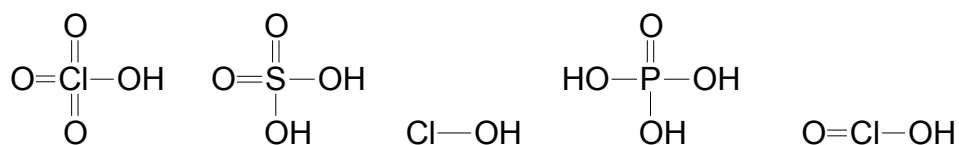
Second one

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First one

- 11) Which of the following Bronsted acids is likely to be the weakest? (1 point)

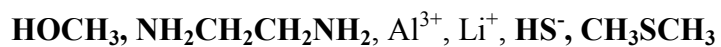


Third one

- 12) For each of the following groups of compounds identify which salt would give the most acidic solution when dissolved in water to give a 1M solution. (3 points)

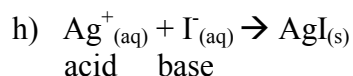
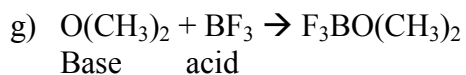
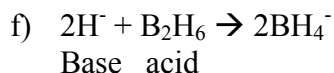
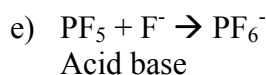
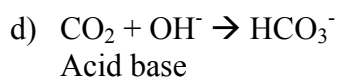
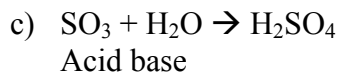
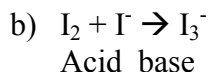
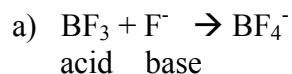
- a. RbNO_3 , **$\text{Fe}(\text{NO}_3)_3$** , $\text{Sr}(\text{NO}_3)_2$
- b. $\text{Ba}(\text{NO}_3)_2$, **$\text{Cr}(\text{NO}_3)_3$** , $\text{Cr}(\text{NO}_3)_2$,
- c. CsNO_3 , **AgNO_3** , RbNO_3

- 13) Identify all the species in the following list that are capable of acting as Lewis bases. (2 points)

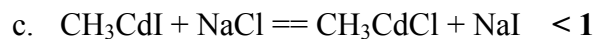


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- 14) For each of the following Lewis acid - Lewis base reactions identify which reactant is the acid and which is the base. **(8 points)**



- 15) Using hard-soft acid base principles determine if the equilibrium constants for the following reactions will be greater than or less than 1. Assume that all the reactions are done in water. **(3 points)**



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