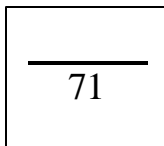


**Chemistry 12**  
**Worksheet 4-6**  
**Anhydrides, Acid Rain and Titrations**



Name \_\_\_\_\_

Date Due \_\_\_\_\_

Correct &amp; Hand In by \_\_\_\_\_

*This worksheet covers material from class notes and Student Workbook pages 154-158, and pages 186-188.*

1. State whether the following compounds will act as acids (A) or bases (B) when added to water. (10 marks)

a)  $\text{ClO}_2$  ..... \_\_\_\_\_ f)  $\text{CO}_2$  ..... \_\_\_\_\_b)  $\text{SrO}$ ..... \_\_\_\_\_ g)  $\text{Cs}_2\text{O}$  ... \_\_\_\_\_c)  $\text{Cr}_2\text{O}_3$  ... \_\_\_\_\_ h)  $\text{BaO}$  ..... \_\_\_\_\_d)  $\text{SeO}_2$  .... \_\_\_\_\_ i)  $\text{SO}_3$  ..... \_\_\_\_\_e)  $\text{NO}_2$  ..... \_\_\_\_\_ j)  $\text{Ag}_2\text{O}$  ..... \_\_\_\_\_

2. a) Define a **basic anhydride** (1 mark) -

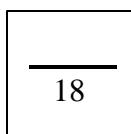
b) Give three examples of basic anhydrides (*make sure formulas are correct!*) (3 marks)

\_\_\_\_\_

3. a) Define an **acidic anhydride** (1 mark) -

b) Give three examples of acidic anhydrides (*make sure formulas are correct!*) (3 marks)

\_\_\_\_\_



4. Give three examples of *amphoteric* (or amphiprotic) anhydrides.(3 marks)

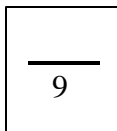
\_\_\_\_\_

The element other than oxygen in these is found near the \_\_\_\_\_  
of the periodic table.(1 mark)

5. Normal (unpolluted) rain water usually has a pH of about \_\_\_\_\_. This is  
less than 7 due to \_\_\_\_\_gas dissolving in the air.(2 marks)
6. “Acid rain” could be defined as rain having a pH below \_\_\_\_\_. (1 mark)
7. Fossil fuels containing the element \_\_\_\_\_ are a major cause of acid rain. (1 mark)
8. Give two formula equations which show how sulphurous acid can be produced  
starting with sulphur. (2 marks)
- 1.
- 2.
9. Give three formula equations which show how sulphuric acid can be produced  
starting with sulphur. (3 marks)
- 1.
- 2.
- 3.
10. The element \_\_\_\_\_ reacts with oxygen in the cylinders of automobile motors  
to produce various nitrogen oxides. (1 mark)
11. Give the balanced equation for the formation of NO from it’s elements. (1 mark)

12. Give the balanced equation for the formation of  $\text{NO}_2$  from its elements. (1 mark)
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13. Give the balanced equation for the formation of nitrous and nitric acid from  $\text{NO}_2$  dissolving in rain water. (1 mark)
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14. Other than cars and fossil fuel burning power plants, what are some other sources of acid rain? (2 marks)
- 
15. Explain why acid rain falling on one area may do less damage than the same acid rain falling in a different area. (1 mark)
16. Give four major unfavourable effects of acid rain. (4 marks)
- 1.
  - 2.
  - 3.
  - 4.
17. Give four ways in which acid rain and the problems associated with it could be solved or at least helped (4 marks)
- 1.
  - 2.
  - 3.
  - 4.

18. 13.45 mL of 0.200 M NaOH is required to titrate 25.0 mL of a solution which is known to have HCl. Calculate the original [HCl]. Show all your steps. (3 marks)
19. 13.45 mL of 0.200 M HCl is required to titrate 25.0 mL of a solution which is known to have Ba(OH)<sub>2</sub>. Calculate the original [Ba(OH)<sub>2</sub>]. Show all your steps. (3 marks)
20. 13.45 mL of 0.200 M Sr(OH)<sub>2</sub> is required to titrate 25.0 mL of a solution which is known to have HNO<sub>3</sub>. Calculate the original [HNO<sub>3</sub>]. Show all your steps. (3 marks)



21. What volume of 0.100 M NaOH would be required to titrate 35.0 mL of a 0.231M solution of  $\text{H}_2\text{C}_2\text{O}_4$ . Show all your steps. (3 marks)

22. Consider the following 0.100 M solutions:

I. HF    II. HBr    III.  $\text{H}_2\text{SO}_4$

The equivalence point is reached when 10.00 mL of 0.100 M NaOH has been added to 10.00 mL of solutions (1 mark)

A. II only    B. I and II only    C. II and III only    D. I, II and III

23. a) Write the *balanced formula equation* for the titration between sulphurous acid and potassium hydroxide. (1 mark)

\_\_\_\_\_

b) Write the *balanced net-ionic equation* for the titration between sulphurous acid and potassium hydroxide. (1 mark)

\_\_\_\_\_

24. Given the following data table:

<i>Beaker</i>	<i>Volume</i>	<i>Contents</i>
1	10.0 mL	0.1 M $\text{Ba}(\text{OH})_2$
2	15.0 mL	0.2 M $\text{NH}_3$
3	20.0 mL	0.05 M KOH
4	50.0 mL	0.2 M NaOH

- a) Which beaker would require the greatest volume of 0.1M HCl for complete neutralization? \_\_\_\_\_ (1 mark)

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- b) What volume of 0.1M HCl would be needed for the neutralization in (a)?  
(2 marks)

Answer \_\_\_\_\_ mL

- c) Which beaker would require the least volume of 0.1M HCl for complete neutralization? \_\_\_\_\_ (1 mark)

- d) What volume of 0.1M HCl would be needed for the neutralization in (c)?  
(2 marks)

Answer \_\_\_\_\_ mL

25. Calculate the mass of NaOH which is required to neutralize 15.00 mL of 0.350 M  $\text{H}_2\text{SO}_4$ ? (3 marks)

Answer \_\_\_\_\_ grams

26. When a 0.1 M strong base titrates a 0.1 M weak monoprotic acid, it takes

(*less/more/the same*) \_\_\_\_\_ volume of the base as it would to titrate a 0.1 M strong monoprotic acid. (1 mark)

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