

**JOINT INTERSCHOOLS EVALUATION TESTS  
JISSET 2009**

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CHEMISTRY  
PAPER 3

This paper consists of 8 printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

1. You are provided with:

- Solution S, made by dissolving 4.9g of  $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$  in 250.0cm<sup>3</sup> of solution.
- Solution R, a solution of Potassium Manganate VII),  $\text{KMnO}_4$  containing 0.002 moles in 100cm<sup>3</sup> of solution.

You are required to determine the mole ratio of R to S and write a balanced ionic equation for the reaction that occur.

Procedure

Fill the burette with solution R. Pipette 25.0cm<sup>3</sup> of solution S into a clean 250ml conical flask. Add about 5cm<sup>3</sup> of 2M Sulphuric (VI) acid and titrate with solution R from the burette till the permanent pink colour appears. Repeat the procedure two more times and record your results in the table below.

**Table I**

	I	II	III
Final burette reading (cm <sup>3</sup> )			
Initial burette reading (cm <sup>3</sup> )			
Titre (cm <sup>3</sup> )			

(4mks)

(a) **Calculate the:**

- Average of solution R used (1mk)
  - Concentration of R in moles per litre. (2mks)
  - Number of moles of R used. (1mk)
  - Concentration of S in moles per litre. (2mks)
  - Number of moles of S in 25.0 cm<sup>3</sup> (1mk)
- (b) **Determine** the mole ratio of R to S (1mk)

(c) **Write** a balanced ionic equation for the reaction between solution R and solution S in the presence of 2M Sulphuric (VI) acid (K=19, Mn=55, O=16, Fe=56, S=32, N=14, H=1)

(2mks)

2. You are provided with:

- Magnesium ribbon labeled
- 2.0M Sulphuric(IV) acid, solution.
- You are required to determine the rate of reaction between Magnesium and Sulphuric(IV) acid at different concentrations.

Procedure

Place six test tubes on a test-tube rack and label them 1,2,3,4,5 and 6. Using a 10cm<sup>3</sup> measuring cylinder, measure out volumes of 2.0M Sulphuric (VI) acid, solution N as shown in the table II below and pour them into the corresponding test tubes. Wash the measuring cylinder and use it to measure the volumes of distilled water as indicated in the table II and pour into corresponding test-tubes.

Cut out six pieces each of 1cm length of Magnesium ribbon. Transfer all of the solution in the test-tube 1 into a clean 100ml beaker. Place one piece of Magnesium into the beaker and start a stop watch immediately. Swirl the beaker continuously ensuring that magnesium is always inside the solution. Record in the table II the time taken for Magnesium ribbon to disappear. Wash the beaker each time and repeat the procedure for each of the solutions in the test-tubes 2,3,4,5 and 6

**Table II**

Test-tube number	1	2	3	4	5	6
Volume of solution N. (cm <sup>3</sup> )	10	9	8	7	6	5
Volume of distilled water (cm <sup>3</sup> )	0	1	2	3	4	5
Time taken (sec)						
Rate of reaction, 1/time						
Number of moles of N used						

(7mks)

(i) Plot a graph of rate of reaction, 1/time (Y-axis) against the volume of N used. (3mks)

## GRAPH PAPER

(ii) Using the graph, determine the time that would be taken for a 1cm length of magnesium ribbon to disappear if the number of moles of N used was 0.015

(2mks)

(iii) **State** and **explain** the shape of your graph.

(2mks)

3. You are provided with solid M. carry out the tests below. Write your observations and inferences in the spaces provide.

(a) Place about half of solid M in a clean dry test-tube. Heat the solid gently and strongly. Test any gases produced with both blue and red litmus papers.

Observations	Inference
(1mk)	(1mk)

- (b) Put the remaining of solid M in a test-tube. Add about 5cm<sup>3</sup> of distilled water and shake the mixture well. (retain the mixture for use in test (c))

Observations	Inference
(1mk)	(1mk)

- (c) (i) To about 2cm<sup>3</sup> of the mixture in a test-tube add aqueous Ammonia dropwise until in excess.

Observations	Inference
(1mk)	(1mk)

- (ii) To about 1cm<sup>3</sup> of the mixture in a test-tube add about 1cm<sup>3</sup> of Hydrogen peroxide followed by aqueous Ammonia dropwise until in excess.

Observations	Inference
(1 ½ mks)	(1mk)

- (iii) To about 1cm<sup>3</sup> of the mixture in a test-tube, add three drops of Barium Nitrate solution.

Observations	Inference
(1mk)	(1 ½ mks)

- (iv) To a mixture obtained in (iii) above, add about 4cm<sup>3</sup> of 2M aqueous Hydrochloric acid (c)

Observations	Inference
( ½ mk)	( ½ mk)