

**Section A** (Answer ALL questions)

1. Each of the tasks listed in the table below can be accomplished by using material *A* or *B*. In each case, state an advantage of

Task	Materials	
	<i>A</i>	<i>B</i>
(a) As an analgesics	acetylsalicylate	morphine
(b) As a bleach	hypochlorite	sulphur dioxide
(c) As a fuel	gasoline	gasohol

- (i) using *A* over *B* to accomplish the task.  
(ii) using *B* over *A* to accomplish the task.

(You are *not* required to consider the price of the materials.)

(6 marks)

2. For each of the following experiments, state an expected observation and write a chemical equation for the reaction involved.

- (a) adding concentrated sulphuric acid to a beaker containing sodium bromide.  
(b) adding ammonia solution to copper(II) sulphate solution.  
(c) an propene gas is bubbled into an acidified potassium permanganate solution.

(6 marks)

3. Consider the substances listed below :

sulphur dioxide, concentrated sulphuric acid, ammonium sulphate,  
calcium oxide, , nitrogen dioxide, concentrated hydrochloric acid

- (a) Which substance is the pollutant of vehicles using petrol to cause acid rain? Write the chemical equation of the formation of acid rain.  
(b) Which substance is used in esterification of alkanolic acid and alkanol? State its function.  
(c) Which substance is used by farmers to increase crop yield? State its function.

(6 marks)

For questions 4 and 5, candidates are required to give paragraph-length answers. For each of these two questions, 3 of the marks will be awarded for effective communication of knowledge in chemistry.

4. Using flame test is an important method to identify an unknown compound. Describe how you can conduct a flame test in laboratory. Hence or otherwise, state **TWO** methods to distinguish sodium carbonate and calcium carbonate.

(9 marks)

5. Write an essay on the manufacture of concentrated sulphuric acid in industry.

(9 marks)

**END of Section A**

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**Section B** (Answer any **THREE** questions)

6.(a) (i) What is the basicity of acid?

(ii) What are the meanings of weak acid and concentrated acid respectively?

(iii) Comment the following TWO statements

statement I : "An acid with a higher basicity is a stronger acid."

statement II : "An acid with a high concentration is a strong acid."

Give an appropriate example to explain.

(iv) 25 cm<sup>3</sup> of a 0.30 M solution of an acid requires 15 cm<sup>3</sup> of 0.75 M sodium carbonate solution for complete reaction. What is the basicity of the acid ?

(8 marks)

(b) A student was conducted an experiment to determine the number of water of crystallization per formula unit of CaSO<sub>4</sub> in a sample of blackboard chalk. He tried to dissolve a sample of chalk into water and take the solution to be titrated with standard hydrochloric acid with methyl orange as indicator. Unfortunately, an unsatisfactory result was obtained.

(i) Explain why the result was unsatisfactory.

(ii) Devise an experiment, using chemicals and apparatus commonly available in a school laboratory, to determine the number of water of crystallization of CaSO<sub>4</sub>.

(iii) Assume the results obtained in a successful experiment are listed below:

mass of chalk sample = 10.09 g

mass of anhydrous chalk sample = 7.98 g

(1) Calculate the number of water of crystallization of CaSO<sub>4</sub>.

(2) State ONE assumption in the calculation

(Relative atomic masses : Ca= 40.0, S = 32.0, O = 16.0, H = 1.0)

(7 marks)

(c) Nitrogen can be prepared by the thermal decomposition of ammonium nitrite. The word equation below represents the decomposition of ammonium nitrite.

ammonium nitrite  $\xrightarrow{\Delta}$  nitrogen + steam

(i) Transcribe the word equation into a chemical equation.

(ii) Whether the above reaction is a redox reaction? Explain briefly.

(iii) What hazard warning labels label should be displayed on a bottle of ammonium nitrite? Explain briefly.

(3 marks)

7. (a) Milk of magnesia is a weak alkaline substance. It is used as a drug to reduce stomach disturbance.
- (i) What type of drug is milk of magnesia? What is the active ingredient in milk of magnesia?
- (ii) Write a chemical equation for the reaction of milk of magnesia in stomach.
- (iii) In the previous days, calcium carbonate was used as an active ingredient to reduce stomach disturbance. Suggest **ONE** reason why it is replaced by milk of magnesia.
- (iv) State **ONE** adverse side effect of taking milk of magnesia.

(5 marks)

- (b) The table below lists some information of two brands of tablets, both containing a substance called “*ACTIVE M*” which is the active ingredient in milk of magnesia to reduce stomach disturbance.

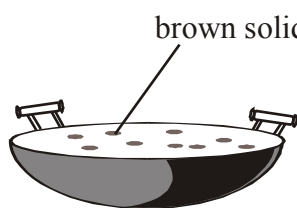
Brand	Price per packet	Number of tablets per packet	Mass of “ <i>ACTIVE M</i> ” per tablet
<i>X</i>	\$10	10	?
<i>Y</i>	\$25	20	350 mg

A student performs an experiment to determine the mass of “*ACTIVE M*” in one tablet of brand *X*. It is found that 20.0 cm<sup>3</sup> of 0.400 M hydrochloric acid are required for neutralization.

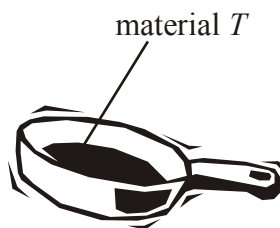
- (i) Name the apparatus that should be used to transfer 20.0 cm<sup>3</sup> of the hydrochloric acid for neutralization. Moreover, state the liquid that should be used to rinse this apparatus.
- (ii) Suggest an indicator used in the reaction and state the color change at the end of reaction.
- (iii) Calculate the mass of “*ACTIVE M*” in one tablet of *X*.  
(you may assume that “*ACTIVE M*” is the only substance in the tablet that reacts with hydrochloric acid.)
- (iv) Decide which brand of tablets gives better value for money.  
molar mass of “*ACTIVE M*” 58.0 g mol<sup>-1</sup>.

(7 marks)

7. (c) Some brown solid deposits found on an iron wok if woks are not thoroughly dried after washing. However, this phenomenon was not found on a non-stick frying pan.



Chinese Iron Wok

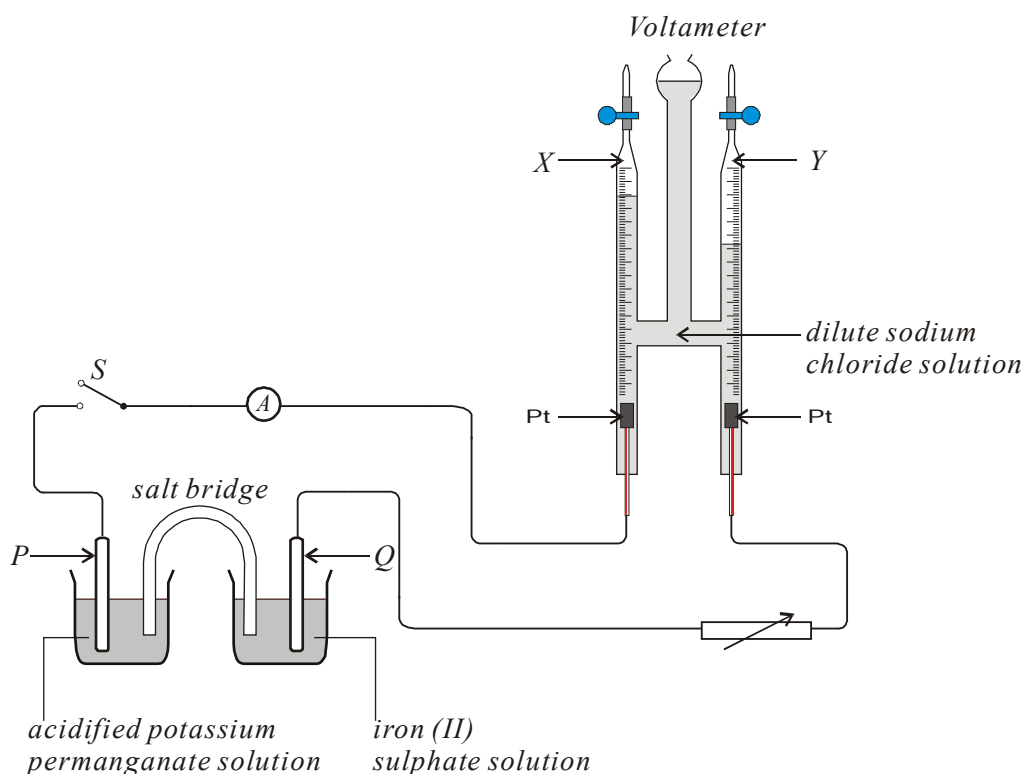


non-stick frying pan

- (i) What is the brown deposits? Under what conditions it is formed.
- (ii) Explain why there is no such brown substance appeared on a non-stick frying pan.
- (iii) Draw the structure of the material *T*.
- (iv) Suggest how to remove the brown substance on wok effectively. State the underlying principle briefly.

(6 marks)

8. (a) When the circuit in the set-up shown below is closed, the iron(II) sulphate solution changes its colour from green to yellow.



- (i) Write a half equation for the reaction that occurs in the iron(II) sulphate solution. Explain whether the electrode *Q* is anode or cathode.
- (ii) What would be observed in the acidified potassium permanganate solution after some time? Write a half equation for the reaction that would occur.
- (iii) Identify the direction of *electron* flow in the external circuit.
- (iv) What is the function of the salt bridge in the set-up?
- (v) Using the concepts of preferentially discharged, name the products obtained at *X* and *Y* and explain why they formed.
- (vi) Write the overall equation occurred in voltameter (electrolytic cell).
- (vi) Deduce the ratio of the theoretical volumes of gases produced at *X* and *Y*.
- (vii) After electrolysis, what is change of the following properties in sodium chloride solution? Explain briefly.
  - (1) concentration
  - (2) pH value
- (viii) In order to obtain a gas with bleaching power in the electrolysis, **TWO** modifications must be taken in the above set-up. Please specify and explain briefly.

(14 marks)

(b) Write a balanced ionic equation for each of the reactions which would be expected to occur if the following sets of substances were mixed in aqueous solution. If no reaction would occur, write 'no reaction' and explain briefly.

(i) Cu and dilute HCl(aq)

(ii) Cu and NaNO<sub>3</sub>.

(iii) NaNO<sub>3</sub>, and dilute HCl(aq)

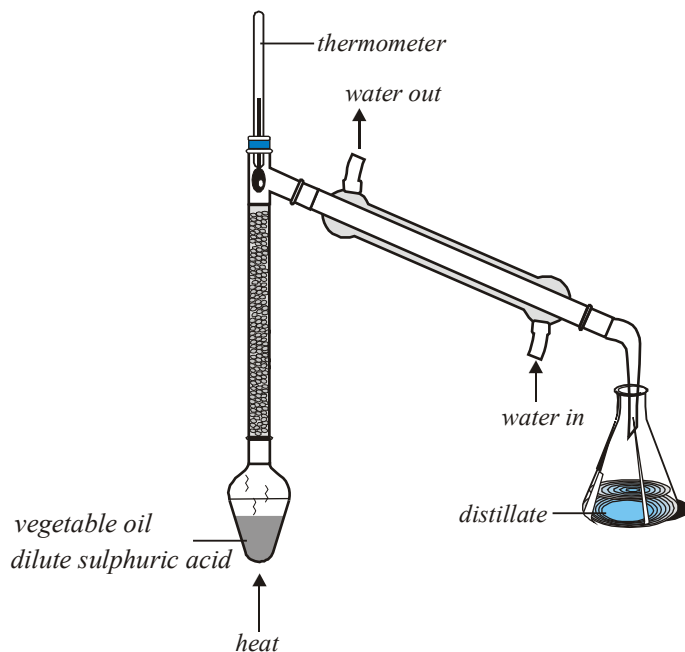
(iv) NaNO<sub>3</sub>, dilute HCl(aq) and Cu

(4 marks)

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9. (a) A student used the following improper set-up to prepare soap:

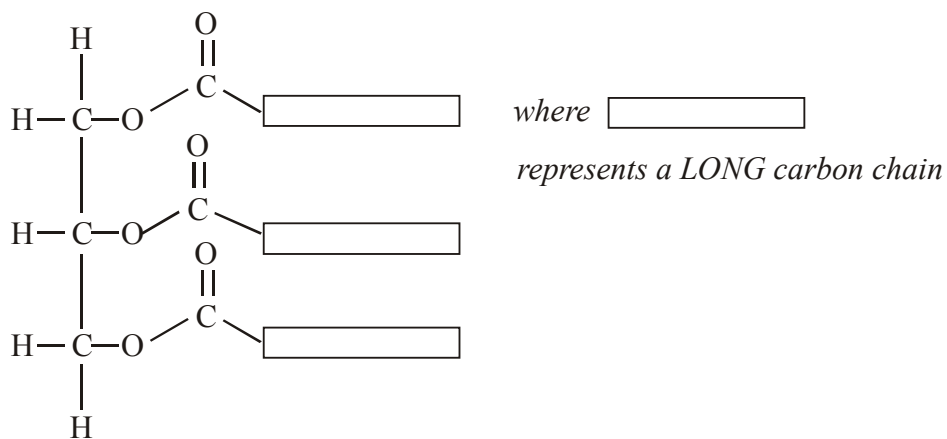


(i) Suggest TWO reasons why the above set-up is not suitable for the preparation of soap.

(ii) Draw a labelled diagram for the set-up of the preparation of soap.

(iii) Name the above reaction.

(iv) The following diagram is the structure of the vegetable oil.



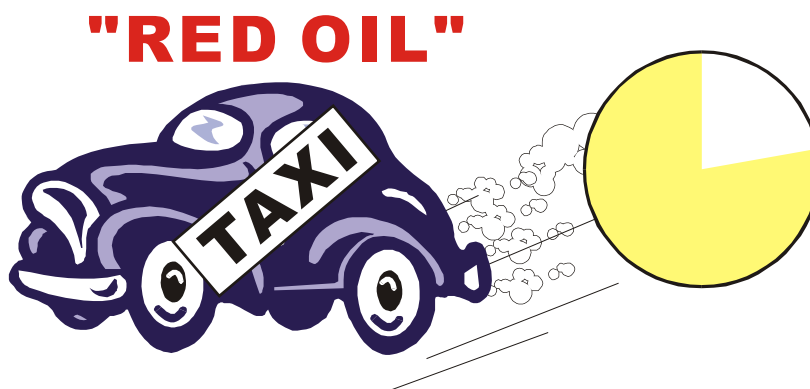
structure of vegetable fat

With reference to this structure, draw the structure of the soap prepared from this oil.

(v) Suggest a method and explain briefly how to obtain the soap from the reaction mixture.

(9 marks)

- (b) The illustration below shows the exhaust from a taxi using a “RED OIL” fuel



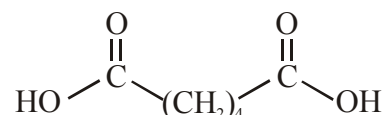
- (i) Name the fraction of oil that is commonly used as a fuel of a taxi.
- (ii) Name TWO the air pollutants commonly found in the exhaust gases of vehicles.
- (iii) List TWO disadvantages of using “RED OIL”.
- (iv) Suggest a test for monitoring vehicles using “RED OIL”.
- (v) In order to improve the quality of air in Hong Kong, what actions should be taken by the Government? Suggest ONE measure imposed on public transport vehicles.

(6 marks)

- (c) Nylon is a plastic which is formed by the following two monomers *A* and *B*.



*A*



*B*

- (i) Explain why these molecules are suitable for making condensation polymers.
- (ii) Draw the structure of the repeating unit of the nylon.
- (iii) Give ONE product made of nylon.

(3 marks)