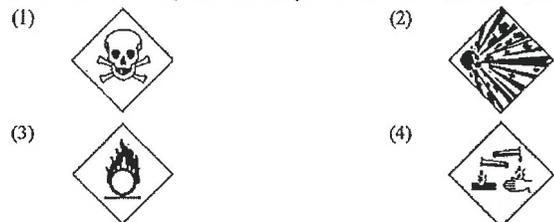


SECTION O Laboratory Safety and Precautions

Multiple-Choice Questions

CE88\_39

Which of the following hazard warning labels should be attached to a bottle of liquid bromine?



- A. (1) and (2) only  
 B. (1) and (4) only  
 C. (1), (3) and (4) only  
 D. (2), (3) and (4) only

CE89\_27

Which of the following combinations would cause "striking back" in a Bunsen flame?

|    | <u>Air hole</u> | <u>Gas supply</u> |
|----|-----------------|-------------------|
| A. | Fully closed    | Too weak          |
| B. | Fully closed    | Too strong        |
| C. | Fully open      | Too weak          |
| D. | Fully open      | Too strong        |

CE91\_05

Tetrachloromethane is a common solvent in the chemistry laboratory. Which of the following hazard warning labels should be displayed on a bottle of tetrachloromethane?



- A. (1) only  
 B. (2) only  
 C. (1) and (3) only  
 D. (2) and (3) only

CE94\_32

Which of the following label(s) should be placed on a bottle containing tetrachloromethane



- A. (1) only  
 B. (2) only  
 C. (1) and (3) only  
 D. (2) and (3) only

CE97\_10

Which of the following combinations is INCORRECT?

|    | <u>Chemical</u> | <u>Method of storage</u> |
|----|-----------------|--------------------------|
| A. | Calcium         | Under water              |
| B. | Potassium       | Under paraffin oil       |
| C. | Ethanol         | In a cool place          |
| D. | Solution        | In a brown bottle        |

CE99\_35

The label below is displayed on a container for chemical X:



Which of the following chemicals may X be?

- (1) Bromochlorodifluoromethane  
 (2) Ethanol  
 (3) Potassium
- A. (1) only  
 B. (2) only  
 C. (1) and (3) only  
 D. (2) and (3) only

CE01\_02

The hazard warning label shown below is found on a compressed gas cylinder.

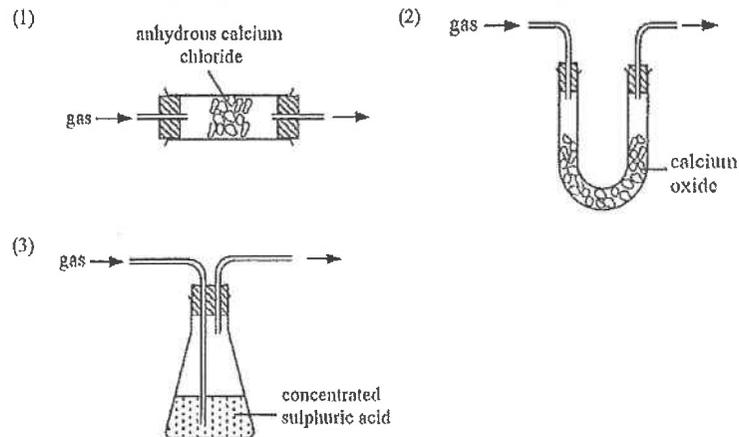


Which of the following gases may be contained in the cylinder?

- A. hydrogen  
 B. oxygen  
 C. chlorine  
 D. argon

CE02\_38

Which of the following set-ups can be used to dry moist sulphur dioxide gas?



- A. (1) and (2) only  
 B. (1) and (3) only  
 C. (2) and (3) only  
 D. (1), (2) and (3)

CE04\_05

Which of the following statements concerning nitric acid is correct?

- A. Nitric acid can be used as fertilizer.  
 B. Nitrogen monoxide is a raw material in the manufacture of nitric acid.  
 C. In the laboratory, concentrated nitric acid is commonly stored in brown bottles.  
 D. The following hazard warning label should be displayed on a bottle of concentrated nitric acid.



CE05\_18

The following hazard warning labels are displayed on the reagent bottle of an acid.



What information about this acid can be obtained from the labels?

- A. It is very concentrated and flammable.  
 B. It is very concentrated and oxidizing.  
 C. It is flammable and corrosive,  
 D. It is corrosive and oxidizing.

CE06\_11

Which of the following statements about acids is correct?

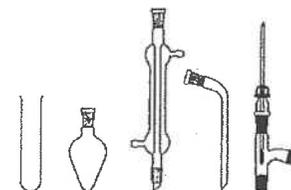
- A. Nitric acid is used in car batteries.  
 B. Hydrochloric acid is produced in human stomach.  
 C. Ethanoic acid is strong oxidizing agent.  
 D. The following hazard warning label should be displayed on a bottle of concentrated sulphuric acid.



CE08\_26

Consider the following pieces of apparatus:

Which of the following process can be performed by normal use of some or all of the above apparatus?



- (1) Refluxing a reacting mixture  
 (2) Separating two immiscible liquids  
 (3) Performing a simple distillation

- A. (1) and (2) only  
 B. (1) and (3) only  
 C. (2) and (3) only  
 D. (1), (2) and (3)

CE09\_25

Which of the following hazard warning labels should be displayed on the reagent bottle of methanol?



(1)



(2)

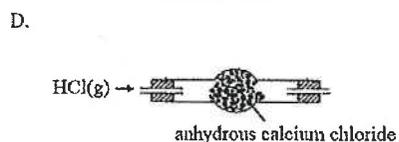
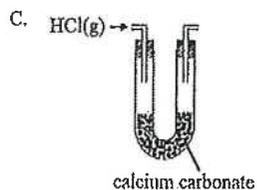
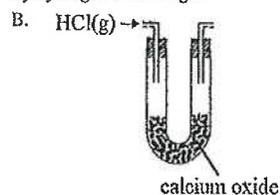
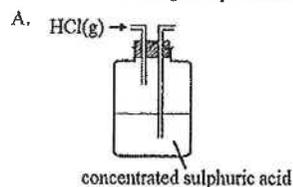


(3)

- A. (1) and (2) only  
 B. (1) and (3) only  
 C. (2) and (3) only  
 D. (1), (2) and (3)

CE10\_05

Which of the following set-ups can be used to dry hydrogen chloride gas?



CE10\_26

Which of the following safety measures should be taken when investigating the reaction between sodium and water?

- (1) Use forceps to pick sodium.
- (2) Use a small piece of sodium.
- (3) Use a small amount of water.

- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)

CE10\_42

Which of the following hazard warning labels should be displayed on a bottle of concentrated hydrochloric acid?



(1)



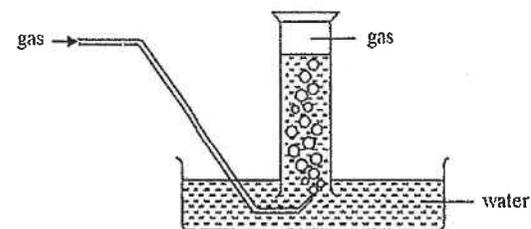
(2)



(3)

- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only

CE11\_10



The set-up shown in the above diagram can be used to collect

- A. ethene.  
B. ammonia.  
C. sulphur dioxide.  
D. hydrogen chloride.

CE11\_19

What is / are the potential hazard(s) of mixing an acidic toilet cleaner with chlorine bleach?

- (1) A toxic gas is liberated.
- (2) A large amount of heat is given.
- (3) A flammable substance is produced.

- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only

CE11\_20

Which of the following gases can be dried by using concentrated sulphuric acid?

- (1) Ammonia
- (2) Sulphur dioxide
- (3) Hydrogen chloride

- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only

DSE11SP\_08

The following hazard warning labels are displayed on the reagent bottle of an acid.



What information about this acid can be obtained from the labels?

- A. It is very concentrated and flammable.  
B. It is very concentrated and oxidizing.  
C. It is flammable and corrosive,  
D. It is corrosive and oxidizing.

DSE14\_15

Which of the following hazard warning labels should be displayed on both the reagent bottle storing concentrated sulphuric acid and the reagent bottle storing concentrated hydrochloric acid?

(1)



(2)



(3)



A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

DSE15\_01

Which of the following statements is correct?

A. All aqueous solutions contain  $H^+(aq)$  ions.

B. The pH of all acid solutions is greater than zero.

C. All acidic compounds contain hydrogen as their constituent elements.

D. A 'corrosive' hazard warning label must be displayed on all reagent bottles containing acid solution.

DSE16\_19

The hazard warning label below is displayed on a bottle containing chemical Z:



Which of the following chemicals may Z be?

(1) Sodium

(2) Trichloromethane

(3) Concentrated aqueous ammonia

A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

DSE18\_20

Which of the following hazard warning labels should be displayed on a bottle containing propan-2-ol?



(1)



(2)



(3)

A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

Structural Questions

AL99(I)\_08a(ii)

Suggest how to extinguish

(I) Burning cyclohexane in a conical flask, and

(1 mark)

(II) Burning sodium

(1 mark)

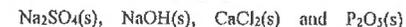
AL00(I)\_07c(ii)

What hazard warning label should be displayed on a bottle of ammonium nitrate(V) solid?

(1 mark)

AL03(I)\_08b

The following compounds can be used as drying agents:



Choose, from the above, one compound which is most suitable and effective

(i) for drying a solution of  $C_6H_5CO_2H$  in  $CHCl_3$ .

(1 mark)

(ii) for drying a moist solid sample of  $C_6H_5CO_2H$ .

(1 mark)

AL04(I)\_07

A student proposed a method to determine the concentration of citric acid in a sample of lemon juice by titration with standard sodium hydroxide solution. The method proposed consists of the following experimental procedures:

1. Prepare a standard sodium hydroxide solution by dissolving a known mass of sodium hydroxide pellets in deionized water and then make it up to  $250.0 \text{ cm}^3$ .
2. Transfer a known volume of the sample of lemon juice to a clean conical flask.
3. Fill a burette, which has been well rinsed with deionized water beforehand, with the standard sodium hydroxide solution.
4. Titrate the lemon juice in the flask with the sodium hydroxide solution using methyl orange as the indicator.
5. Using this titration result, calculate the concentration of citric acid in the sample.

Point out four inappropriate practices in the method. Explain why they are inappropriate and suggest corrections for them.

(6 marks)

AL04(I)\_08c

The following passage about an explosion involving hydrogen-oxygen balloons was adapted from a chemical journal.

#### Hydrogen-Oxygen Balloon Hazards

An accident occurred prior to the performance of a hydrogen-oxygen balloon demonstration, seriously injuring a demonstrator, who suffered painful second-degree burns.

To prepare for the demonstration, 15 balloons (pre-filled with a hydrogen-oxygen gas mixture) in a large, black polyethene garbage bag were transported to the site and kept there for a few hours. While setting up the demonstration, the demonstrator opened the bag and removed a single balloon for stringing and floating. Suddenly, the entire bag of balloons exploded violently...

(Source: Journal of Chemical Education, July 2003)

Using your knowledge of science, suggest why the explosion occurred.

(3 marks)

AL04(I)\_08d

(i) Explain why carbon dioxide extinguishers must not be used to put out a piece of burning sodium.

(1 mark)

(ii) Suggest a proper way to put out a piece of burning sodium in the laboratory.

(1 mark)

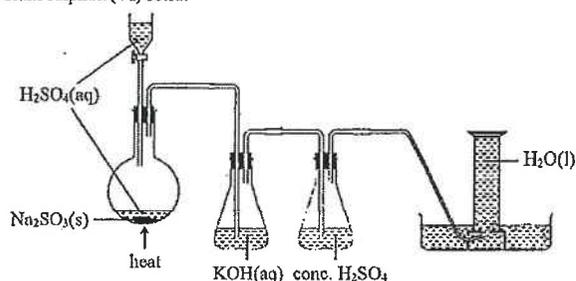
AL04(I)\_07a

(ii) Suggest one hazard warning label which should be displayed on a bottle of propan-2-ol.

(1 mark)

AL04(I)\_07b

(ii) A student suggested to use the set-up shown below to prepare a dry sample of sulphur dioxide from sodium sulphate(VI) solid.



Point out two mistakes in the above set-up, and suggest the corresponding rectifications.

(4 marks)

AL05(I)\_08

The photograph below shows a person conducting a test in a laboratory to detect the presence of ammonium ions in a solid sample. He is holding a test tube containing a hot mixture of the sample and sodium hydroxide solution, and is trying to smell.



State three inappropriate laboratory practices of the person and suggest the proper actions that should be taken.

(3 marks)

AL06(I)\_07b

(i) Circle the hazard warning label(s) below that should be displayed on a bottle of liquid bromine.



(1 mark)

(ii) A few drops of liquid bromine are spilled on a laboratory bench. Suggest a chemical method to treat the spilled liquid bromine.

(1 mark)

AL06(I)\_08b

State a possible consequence from each of the following poor laboratory techniques:

(i) Draining the lower layer from a separating funnel without removing the stopper.

(ii) Determining the melting point of a compound without completely removing the solvent after recrystallization.

AL07(I)\_07

In a chemistry laboratory, students are required to wear laboratory coat, plastic gloves and safety spectacles. Which of these safety measures do you consider the most important? Explain.

(2 marks)

AL08(I)\_07b

- (ii) Suggest why the following hazard warning labels should be displayed on a bottle of  $\text{LiAlH}_4(\text{s})$ .



EXPLOSIVE 爆炸性



CORROSIVE 腐蝕性

AL08(II)\_04

Suggest ONE safety precaution when shaking the liquid mixture in the separating funnel.

(1 mark)

AL09(I)\_07c

Explain why water should NOT be added to concentrated  $\text{H}_2\text{SO}_4$  in order to dilute the acid.

(1 mark)

AL09(I)\_07d

Suggest the most appropriate hazard warning label that should be displayed on a bottle of  $\text{NaClO}_3(\text{s})$ .

(1 mark)

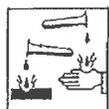
AL10(I)\_07b

State under what circumstances each of the following practices would be adopted and explain your answer.

- (i) The use of an air condenser instead of a water condenser in reflux. (2 marks)
- (ii) The use of concentrated  $\text{H}_3\text{PO}_4$  instead of concentrated  $\text{H}_2\text{SO}_4$  in the preparation of hydrogen halides from the corresponding sodium halides. (2 marks)

DSE12PP\_08

- (b) A concentrated aqueous methanol solution is used as the fuel in DMFC.
- (ii) Circle TWO of the following hazard warning labels that should be displayed on the container of a concentrated aqueous methanol solution.



CORROSIVE 腐蝕性



TOXIC 有毒



FLAMMABLE 易燃



OXIDISING 氧化性

(1 mark)

DSE12\_07

A fertilizer only contains ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ) and potassium chloride (KCl). An experiment was performed to determine the percentage by mass of  $\text{NH}_4\text{NO}_3$  in this fertilizer.

The  $\text{KOH}(\text{aq})$  was added slowly to the fertilizer and the mixture formed was heated gently. The ammonia liberated from the reaction between  $\text{NH}_4\text{NO}_3$  and  $\text{KOH}$  was first cooled in a condenser, and then passed through an inverted funnel to a solution containing 0.0485 mol of  $\text{HCl}$ . The solution was finally made up to  $100.00 \text{ cm}^3$  and labelled as 'S'.

- (b) Suggest the potential hazard of one of the chemicals used.

(1 mark)

DSE13\_04

- (c) Solid sodium hydroxide is available in school laboratories. However, a standard  $\text{NaOH}(\text{aq})$  CANNOT be directly prepared by weighing  $\text{NaOH}(\text{s})$  and then dissolving it in water. Explain why.

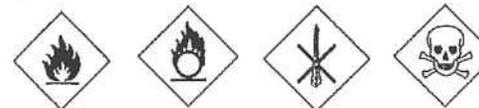
(1 mark)

- (e) The following were considered as INAPPROPRIATE practices when carrying out the titration experiment. For each of them, explain why it would lead to inaccurate titration results:

- (i) Rinsing the conical flask with the standard  $\text{H}_2\text{C}_2\text{O}_4(\text{aq})$  before transferring  $25.00 \text{ cm}^3$  of the acid solution to it. (1 mark)
- (ii) Carrying out the titration with the filter funnel remained on top of the burette after using it to fill the burette with the  $\text{NaOH}(\text{aq})$ . (1 mark)

DSE13\_10

- (a) An oxygen cylinder can be used to provide oxygen for the fuel cell. From the hazard warning labels shown below, circle the label that should be displayed on the oxygen cylinder.



(1 mark)

DSE14\_05

Concentrated acids are common reagents found in laboratories.

- (a) State a safety measure in handling concentrated acids in laboratories.

(1 mark)

DSE14\_07 (modified)

- (c) Suggest a possible reason why the concentration of the concentrated hydrochloric acid in the bottle obtained from volumetric analysis would be smaller than that actual value.

(1 mark)

DSE15\_03

- (b) A compound contains iron and oxygen only. In an experiment for determining the empirical formula of this compound, 2.31 g of the compound was heated with carbon monoxide. Upon complete reaction, carbon dioxide and 1.67 g of iron were formed.
- (iii) As carbon monoxide is poisonous, suggest one necessary safety precaution in carrying out the experiment.

(1 mark)

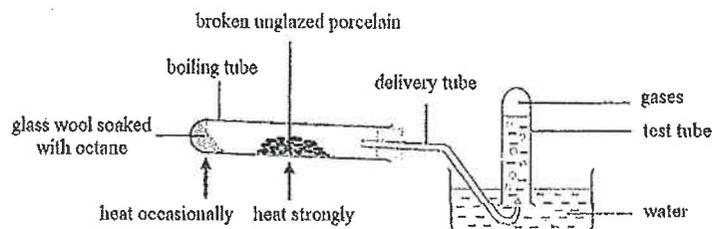
DSE15\_04

- (d) A student diluted a sample of concentrated sulphuric acid for making a lead-acid accumulator.
- (i) Describe how concentrated sulphuric acid can be diluted in a laboratory. State a safety precaution needed during the dilution process.

(3 marks)

DSE16\_03

The diagram below shows an experimental set-up in which the glass wool soaked with octane is heated occasionally and the broken unglazed porcelain is heated strongly. Some gases are collected in the test tube over water.



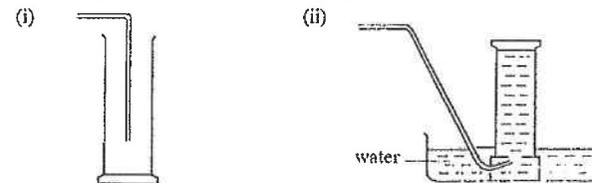
- (d) When no more gas can be collected, what should be done to end the experiment for safety consideration? Explain your answer.

(2 marks)

DSE17\_01

Barium (Ba) is an element in Group II of the Periodic Table. Its chemical properties are similar to those of calcium.

- (b) A gas with a pungent smell is formed when  $\text{Ba}(\text{OH})_2(\text{s})$  is heated with  $\text{NH}_4\text{Cl}(\text{s})$ . State the reason why the gas CANNOT be collected by each of the following methods.



Reason: (1 mark)

Reason: (1 mark)

DSE17\_06

Concentrated sulphuric acid is a reagent commonly found in laboratories.

- (a) Circle TWO hazard warning labels that should be displayed on a bottle of concentrated sulphuric acid:



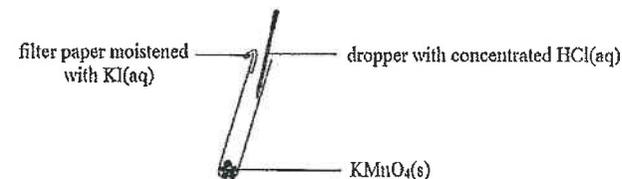
(1 mark)

- (b) (i) Explain why concentrated sulphuric acid should NOT be titrated directly with  $\text{NaOH}(\text{aq})$ .

(1 mark)

DSE18\_08

Refer to the experimental set-up as shown below:

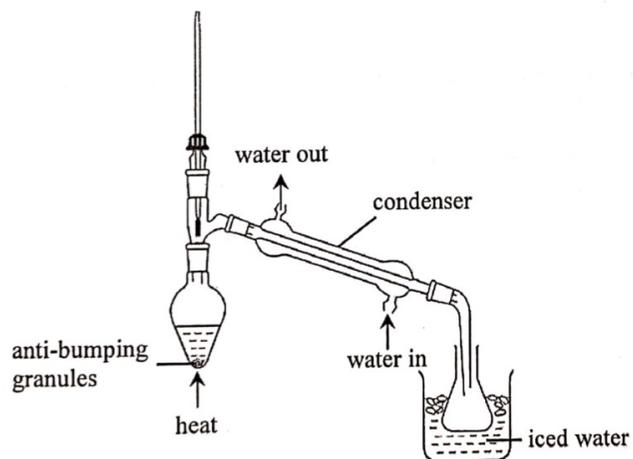


- (d) In consideration of laboratory safety, explain where the experiment should be performed.

(1 mark)

2022

17. Refer to the following set-up :

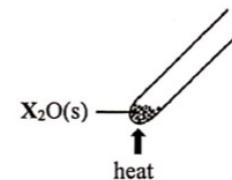


Which of the following processes can be performed by using the above set-up ?

- (1) obtaining pure water from sea water
- (2) obtaining propane from diesel oil
- (3) obtaining oxygen from liquefied air

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

2. The diagram below shows an experimental set-up in which a metal oxide  $X_2O(s)$  is decomposed upon strong heating. A silvery metal  $X$  and a colourless gas  $Z$  are formed.



(a) State what  $Z$  is and suggest a test for it.

(2 marks)

6 (e) From the hazard warning labels shown below, circle a label that should be displayed on a gas cylinder containing methane. (1 mark)



(1 mark)

### Marking Scheme

#### MCQ

|          |         |          |         |          |         |            |         |
|----------|---------|----------|---------|----------|---------|------------|---------|
| CE88_39  | C       | CE89_27  | C       | CE91_05  | B       | CE94_32    | A       |
| CE97_10  | A       | CE99_35  | D       | CE01_02  | A       | CE02_38    | B       |
| CE04_05  | C       | CE05_18  | D       | CE06_11  | B       | CE08_26    | B       |
| CE09_25  | A       | CE10_05  | D       | CE10_26  | A       | CE10_42    | A       |
| CE11_10  | A       | CE11_19  | A       | CE11_20  | D       | DSE11SP_08 | D       |
| DSB14_15 | B (70%) | DSB15_01 | A (46%) | DSB16_19 | C (27%) | DSB18_20   | A (63%) |

#### Structural Questions

##### AL99(I)\_08a(ii)

- (I) Cover the flask with wet towel / fire blanket [1]  
*OR,* use foam / carbon dioxide / BCF / BTM type extinguisher
- (II) Use powder type extinguisher / sand [1]

##### AL00(I)\_07c(ii)

Oxidizing / explosive [1]

##### AL03(I)\_08b

- (i)  $\text{Na}_2\text{SO}_4(\text{s})$  [1]
- (ii)  $\text{Na}_2\text{SO}_4(\text{s}) / \text{CaCl}_2(\text{s}) / \text{P}_2\text{O}_5(\text{s})$  [1]

##### AL04(I)\_07

- Step 1: A standard  $\text{NaOH}(\text{aq})$  should not be prepared using the method as described. [½]  
 Explanation:  $\text{NaOH}(\text{s})$  is not a primary standard / is hygroscopic /  $\text{NaOH}(\text{s})$  reacts with  $\text{CO}_2(\text{g})$  in air. [½]  
 Correction: it is necessary to standardize the  $\text{NaOH}(\text{aq})$  before use.
- Step 3: The burette should not be rinsed with water only. [½]  
 Explanation: Water that remains in the burette will cause a dilution of the  $\text{NaOH}(\text{aq})$ . [½]  
 Correction: The burette needs to be rinsed with deionized water and then with the  $\text{NaOH}(\text{aq})$  prepared. [½]
- Step 4: Methyl orange is not a suitable indicator. [½]  
 Explanation: The experiment involves a titration of a weak acid with a strong alkali, pH at the end point is about 8 to 9. [½]  
 Correction: Phenolphthalein should be used. [½]
- Step 5: Calculation should not be based on the result of one titration only. [½]  
 Explanation: There may be errors in the titration [½]  
 Correction: Repeat the titration at least 3 times. Use the mean titre for the calculation. (Ignore the result of the trial titration, if necessary). [½]

##### AL04(I)\_08c

- The garbage bag was filled with a hydrogen-oxygen mixture because  $\text{O}_2(\text{g})$  and  $\text{H}_2(\text{g})$  diffused out of the balloons. [1]
- The frictional force between balloons produces static electricity and hence sparks. [1]
- The electric spark cause the  $\text{H}_2(\text{g})$  and  $\text{O}_2(\text{g})$  mixture to explode. [1]
- (Accept other reasonable answers)

##### AL04(I)\_08d

- (i) The high temperature of the piece of burning sodium may cause decomposition of  $\text{CO}_2$ . The sodium will continue to burn. [1]
- (ii) Covering the piece of burning Na with sand / use dry powder extinguisher to put out the fire. [1]

##### AL04(I)\_07a

- (ii) Flammable [1]

##### AL04(I)\_07b

- (ii)  $\text{KOH}(\text{aq})$  should not be used as  $\text{SO}_2(\text{g})$  reacts vigorously with  $\text{KOH}(\text{aq})$ . An empty conical flask (as a trap) should be used instead. / It is not necessary to include the flask containing  $\text{KOH}(\text{aq})$  in the set-up. [1]
- $\text{SO}_2(\text{g})$  should not be collected over water as it is very soluble. Collect the  $\text{SO}_2(\text{g})$  produced by downward delivery / upward displacement of air / using a syringe. [1]

##### AL05(I)\_08

- The person did not wear laboratory coat. Should wear a laboratory coat. [1]
- The person did not have eye protection. Should wear safety spectacles / goggles. [1]
- Should not detect  $\text{NH}_3(\text{g})$  by smelling while heating the reaction mixture. The mixture may shoot his face. Should detect  $\text{NH}_3(\text{g})$  by the use of a piece of wet red litmus paper that can change it from red to blue [1]
- OR,* by  $\text{HCl}(\text{aq})$  that can form a white fumes with  $\text{HCl}(\text{aq})$ .
- OR,* should smell  $\text{NH}_3(\text{g})$  after turning off the Bunsen burner.

##### AL06(I)\_07b

- (i) Toxic; corrosive [1]
- (ii) Treat the spilt bromine with  $\text{NaOH}(\text{aq})$ . [1]

##### AL06(I)\_08b

- (i) Without releasing the pressure, the liquid in the separating funnel will not drain out of the funnel. [1]
- (ii) The melting point determined will be lowered than the expected value. [1]

AL07(I)\_07  
Safety spectacles [1]  
Eyes are the most delicate organs. Any harm on eyes cannot easily be recovered [1]

AL08(I)\_07b  
(ii)  $\text{LiAlH}_4(\text{s})$  reacts with water moisture in air to give  $\text{H}_2(\text{g})$ . [1]  
The reaction is highly exothermic. When  $\text{H}_2(\text{g})$  is mixed with air under this condition, an explosion may occur. [1]  
The reaction gives  $\text{LiOH}$  of high concentration. Presence of high  $[\text{OH}^-]$  is corrosive. [1]

AL08(II)\_04  
Release pressure in the separating funnel from time to time by inverting it and opening the tap. [1]

AL09(I)\_07c  
Dilution of conc.  $\text{H}_2\text{SO}_4$  is highly exothermic process. The heat evolved can vaporize the water and cause splashing out of the acid. [1]

AL09(I)\_07d  
Oxidizing [1]

AL10(I)\_07b  
(i) If the reactant(s) / solvent used in the experiment has a high boiling point ( $>130^\circ\text{C}$ ), the large temperature difference outside and inside the water jacket may cause cracking of the water condenser. [1]  
(ii)  $\text{HBr}$  and  $\text{HI}$  are reducing agents. They react with concentrated  $\text{H}_2\text{SO}_4$  to give the corresponding halogens. In such cases, the non-oxidizing and non-volatile acid  $\text{H}_3\text{PO}_4$  should be used. [1]  
Concentrated  $\text{H}_2\text{SO}_4$  can only be used to prepare  $\text{HCl}$  and  $\text{HF}$ . [1]

DSE12PP\_08  
(b) (ii) Toxic and flammable [1]

DSE12\_07  
(b) The  $\text{KOH}$  is (very) corrosive. /  $\text{NH}_4\text{NO}_3$  is explosive /  $\text{NH}_4\text{NO}_3$  is flammable /  $\text{HCl}$  is corrosive. [1]

DSE13\_04  
(c)  $\text{NaOH}(\text{aq})$  is deliquescent / hygroscopic / absorbs water from the atmosphere. [1]  
OR,  $\text{NaOH}(\text{s})$  reacts with  $\text{CO}_2(\text{g})$  in the atmosphere.  
 $\therefore$  The mass of  $\text{NaOH}(\text{s})$  cannot be accurately determined by weighing.

(e) (i) Rinsing the conical flask with  $\text{H}_2\text{C}_2\text{O}_4(\text{aq})$ : Some  $\text{H}^+(\text{aq})$  ions / acid /  $\text{H}_2\text{C}_2\text{O}_4(\text{aq})$  remain in the flask, and more alkali (as revealed from the burette reading) than actually required is used to reach the titration end-point. [1]  
(Do not accept the concentration of  $\text{H}^+(\text{aq})$  increase.)  
(ii)  $\text{NaOH}(\text{aq})$  clinging onto the stem of funnel may fall into the burette. The volume of alkali used (as revealed from the burette reading) is smaller than what is expected. [1]

DSE13\_10  
(a) [1]



DSE14\_05  
(a) Wearing protective gloves or plastic gloves or gown or safety goggles or any suitable PPE [1]  
OR, Adding concentrated acids into water when diluting the concentrated acids  
OR, Use a fume cupboard.  
Not accepted: maintain a good ventilation.

DSE14\_07 (modified)  
(c) Some  $\text{HCl}$  escaped / vaporized from the concentrated acid as  $\text{HCl}(\text{g})$  / Concentrated hydrochloric acid is volatile. [1]

DSE15\_03  
(b) (iii) Perform the experiment in a fume cupboard. [1]

DSE15\_04  
(d) (i) Pour a small amount of the concentrated sulphuric acid to a large amount of water. [2]  
Accept answers like "add concentrated sulphuric acid to a large amount of water."  
Constant stirring is required (if the amounts of water and acid are not mentioned) [1]  
Wear goggle / face shield / safety spectacles / safety glasses

DSE16\_03  
(d) The delivery tube should be taken out of the water level before removing the heating source, otherwise sucking back will happen / the boiling tube will be cracked. [1]

DSE17\_01

- (b) (i) The gas (ammonia) is less dense than air. [1]  
(Should be answered in terms of density. Not accept: The gas is lighter than air.)
- (ii) The gas (ammonia) is soluble (in water). [1]  
Accept: the gas will be absorbed by water / The gas will react with water.  
(Not accept: The gas is slightly soluble in water.)

DSE17\_06

- (a) Oxidizing and corrosive [1]
- (b) (i) The reaction between concentrated sulphuric acid and NaOH(aq) is highly exothermic. [1]  
*OR,* Concentrated NaOH / H<sub>2</sub>SO<sub>4</sub> is corrosive.  
*OR,* Avoid to fill the burette more than once.  
*OR,* Use less chemicals.  
(Do not accept answer like "splashed out" without mentioning of "highly exothermic.")

DSE18\_08

- (d) The experiment should be performed in a fume cupboard as chlorine gas is toxic / toxic gas is released. [1]  
(Do not accept well-ventilated benches, etc.)