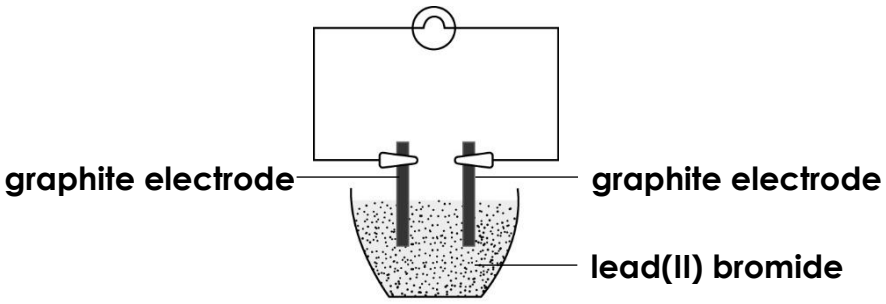
Quiz (Electrolysis)

Section A: Multiple Choice

1. During electrolysis, the electrolyte conducts electricity by the movement of
   A. delocalized electrons.
   B. mobile cations and anions.
   C. electrolyte particles.
   D. solvent particles.

2. A student used the following set-up to investigate the electrolysis of lead(II) bromide. However, the bulb does not light up.



   Which of the following modifications can make the bulb light up?
   (1) Heat lead(II) bromide strongly until it melts
   (2) Replace the graphite electrodes with platinum electrodes
   (3) Add water to the solid
   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

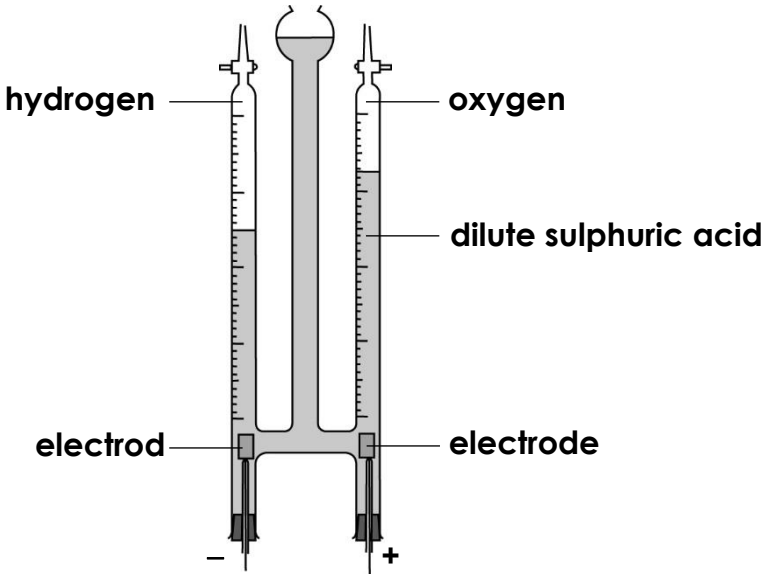
3. Which of the following statements about the electrolysis of concentrated potassium iodide solution using graphite electrodes is correct?
   A. A brown colour appears around the cathode.
   B. The mass of the graphite electrodes increases.
   C. The amount of potassium ions decreases.
   D. The pH value of the resultant solution increases.

4. The following table shows the results of the electrolysis of a blue solution using graphite electrodes.

Electrode	Result
Cathode	Some reddish brown solids form. The solid does not react with dilute hydrochloric acid.
Anode	A gas with a choking smell evolves. The gas can turn moist blue litmus paper red and then white.

   The solution is probably
   A. concentrated copper(II) chloride solution.
   B. concentrated copper(II) sulphate solution.
   C. concentrated sodium iodide solution.
   D. concentrated sodium chloride solution.

Questions 5 and 6 refer to the electrolysis of dilute sulphuric acid using a Hofmann voltameter.



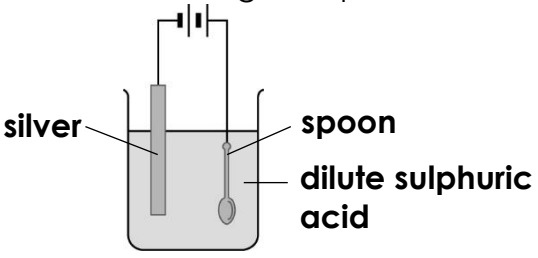
5. Which of the following statements about the electrolysis are correct?
   (1) Hydrogen ion is the only cation that moves towards the cathode.
   (2) Hydroxide ion is the only anion that moves towards the anode.
   (3) The concentration of sulphuric acid increases at the end of the experiment.

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

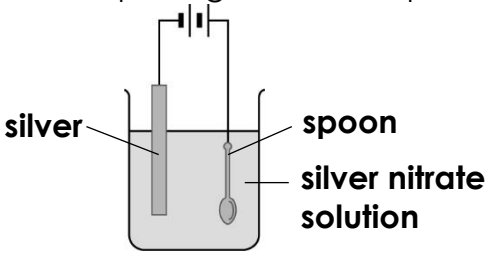
6. Which of the following explains why the volume ratio of hydrogen and oxygen collected is not 2:1?
   A. Some oxygen produced reacts with the electrode.
   B. Some sulphuric acid decomposes during the electrolysis.
   C. Oxygen is more soluble in water than hydrogen.
   D. The molar volume of hydrogen is higher than that of oxygen.

7. Which of the following set-ups can be used for electroplating silver on a spoon?

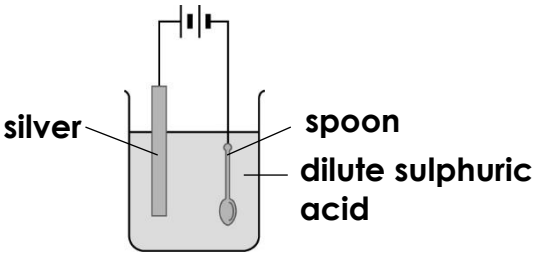
A.



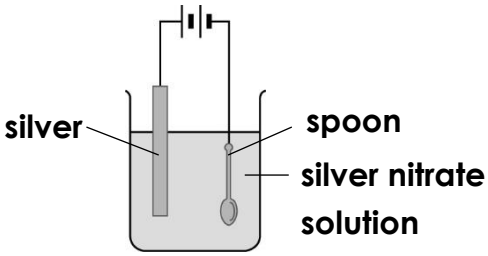
B.



C.



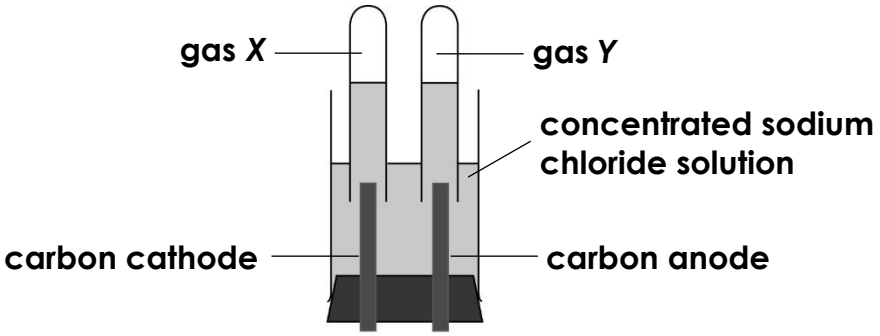
D.

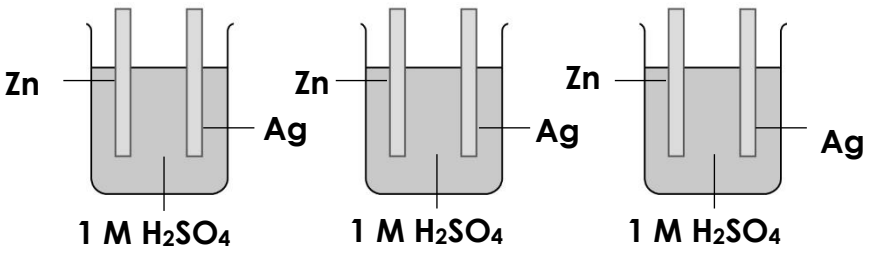


8. Which of the following methods CANNOT reduce the pollution from the electroplating industry?
   A. Recover the metal ions for direct reuse
   B. Precipitate out the heavy metal ions in the effluents
   C. Neutralize the alkaline effluents with excess sulphuric acid
   D. Neutralize the acidic effluents with slaked lime

Section B: Structural Question

A student carried out the electrolysis of concentrated sodium chloride solution. Three chemical cells are given as shown below. They should be connected in series.





(a) Connect the above set-up with conducting wires so that electrolysis can occur.

(b) Name gas *Y*.

(c) Suggest why it is necessary to use three chemical cells in series instead of a single chemical cell.

(d) (i) Write a half equation for the production of gas *X*.
(ii) Suggest a chemical test for gas *X*.

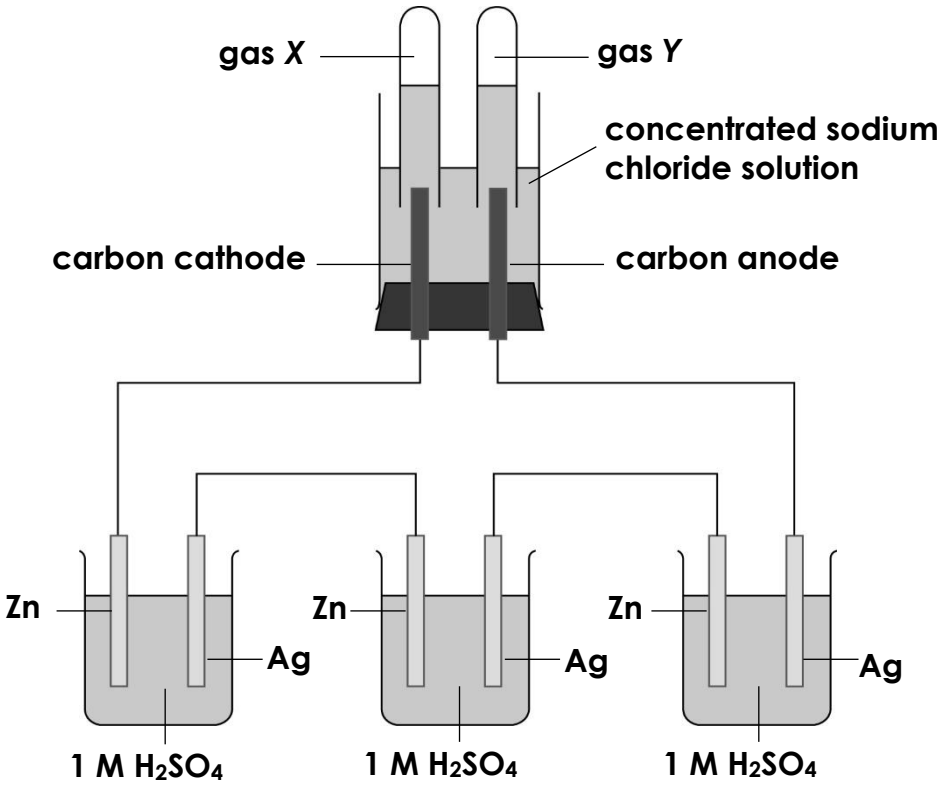
Suggested Answer

Section A

1.	B	5.	B
2.	A	6.	C
3.	D	7.	D
4.	A	8.	C

Section B

(a)



(b) Chlorine

(c) The voltage of a single cell might not be high enough for electrolysis to occur. Three chemical cells in series are used to provide a higher voltage.

(d) (i) $2H^+ + 2e^- \longrightarrow H_2$

(ii) Test the gas with a burning splint.
Hydrogen burns with a 'pop' sound.