

IB Chemistry SL Practice Test

S1.1 and S1.2 - Revised Version

Name: _____

Paper 1A - Multiple choice [10 marks]

1. A small amount of ammonium chloride is heated in a test tube. A white solid deposits on the cooler part of the tube without any liquid forming. Which change is occurring?

- A. melting followed by freezing
- B. sublimation followed by deposition
- C. evaporation followed by condensation
- D. dissolving followed by crystallization

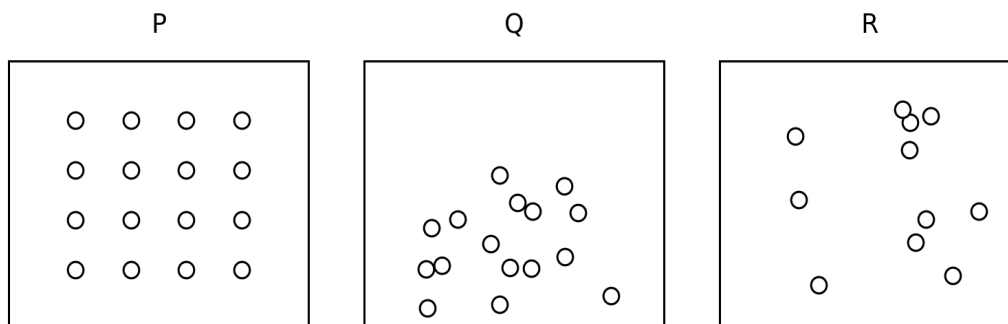
2. Which species contains 18 electrons, 17 protons and 20 neutrons?

- A. $^{37}_{17}\text{Cl}$
- B. $^{37}_{17}\text{Cl}^-$
- C. $^{38}_{18}\text{Ar}$
- D. $^{37}_{18}\text{Ar}^+$

3. A pure substance melts at 42 °C and boils at 118 °C. Which observation is correct?

- A. At 25 °C it is a liquid.
- B. At 60 °C it is a liquid.
- C. At 105 °C it is a gas.
- D. At 130 °C it is a liquid.

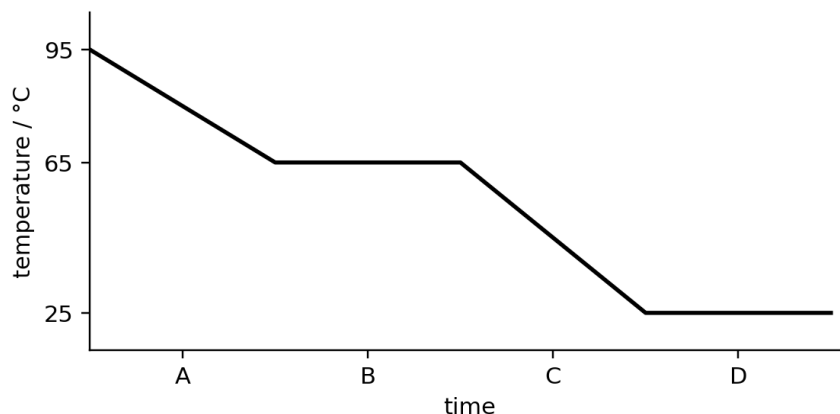
4. The particle diagrams P, Q and R represent three states of the same substance.



Which statement is correct?

- A. P is a gas and R is a solid.
- B. Q has a fixed shape and a fixed volume.
- C. R is most easily compressed.
- D. Particles in P move freely throughout the container.

5. A pure substance is cooled at a constant rate. The cooling curve is shown.



During which labelled interval does the average kinetic energy of the particles decrease while the substance remains in a single phase?

- A. A only
- B. B only
- C. A and C
- D. B and D

6. A mixture contains insoluble calcium carbonate and soluble sodium nitrate. Which sequence will best separate both solids?

- A. add water, filter, evaporate the filtrate
- B. heat strongly, then filter
- C. add ethanol, decant, crystallize
- D. distil the dry mixture

7. Two neutral atoms are isotopes of the same element. Which statement must be correct?

- A. They have the same number of neutrons.
- B. They have the same mass number.
- C. They have the same number of protons and electrons.
- D. They have different chemical symbols.

8. A drop of liquid ethanol is left on a watch glass at room temperature and gradually disappears. Which statement best explains this observation?

- A. The ethanol molecules decompose into smaller particles.
- B. Some molecules at the surface have enough kinetic energy to escape into the gas phase.
- C. The entire sample reaches its boiling point.
- D. The spaces inside individual ethanol molecules become larger.

9. Which observation from Rutherford's alpha-particle scattering experiment gives the strongest evidence that the nucleus occupies only a very small fraction of an atom?

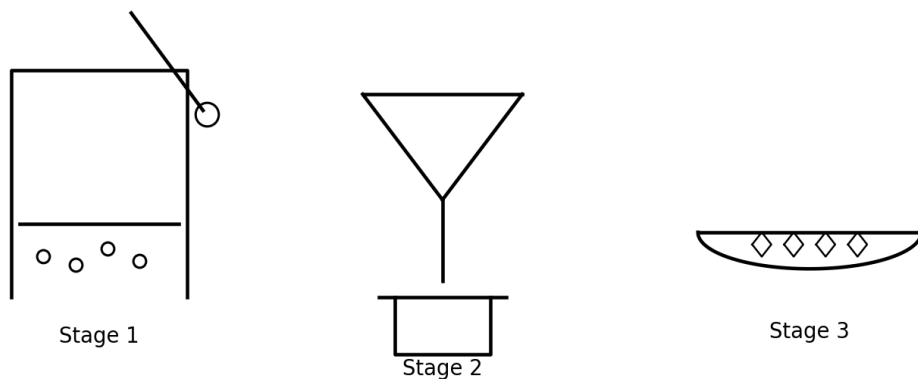
- A. Most alpha particles pass straight through the foil.
- B. A few alpha particles are deflected through large angles.
- C. Alpha particles have a positive charge.
- D. Gold is a metal.

10. A sample contains particles of the same element with mass numbers 63 and 65. Which property is different between these particles?

- A. number of protons
- B. nuclear charge
- C. number of neutrons
- D. number of occupied electron shells

Paper 1B - Answer all questions completely

1. A student wants to prepare pure crystals of magnesium sulfate from magnesium carbonate and dilute sulfuric acid.



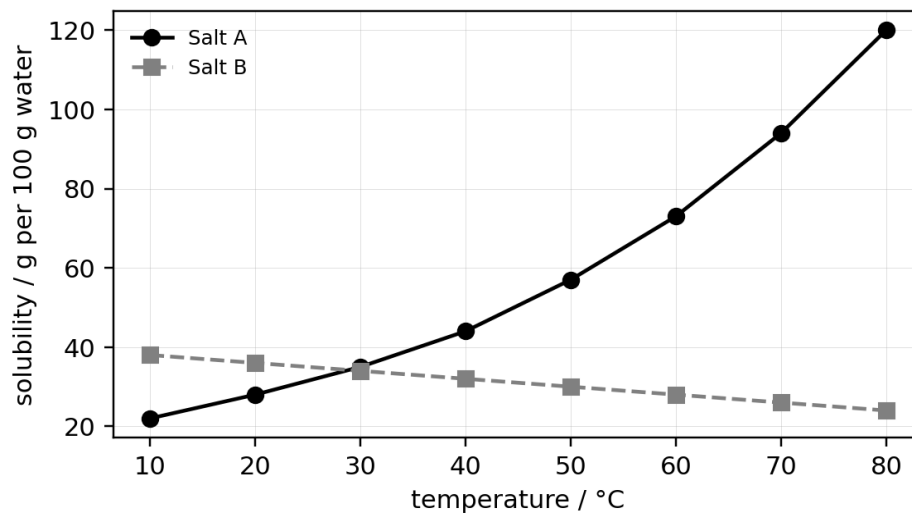
(a) Describe what the student should do in Stage 1 and state one observation that shows a reaction is occurring. [2]

(b) Explain why excess magnesium carbonate is added before Stage 2. [1]

(c) State the purpose of Stage 2. [1]

(d) Describe how the solution collected in Stage 2 can be used to obtain dry crystals of magnesium sulfate. [2]

2. The graph shows how the solubility of two salts changes with temperature.



(a) Deduce which salt is more suitable for purification by recrystallization. Give a reason using the graph. [2]

(b) A saturated solution of Salt A is prepared at 70 °C using 100 g of water and then cooled to 20 °C. Estimate the maximum mass of Salt A that can crystallize. [2]

(c) Suggest why the crystals should be washed with a small amount of cold water rather than warm water. [1]

3. A student was given a mixture to separate and collect the individual components.

The mixture contained sand, $\text{SiO}_2(\text{s})$, sodium chloride, $\text{NaCl}(\text{s})$, and iron filings, $\text{Fe}(\text{s})$.

The student observed the original mixture and made the following hypothesis.

The iron would have the lowest percent by mass because it appeared to be present in the smallest quantity.

(a) Suggest a set of experimental steps required to obtain pure samples of each component of the mixture. [4]

(b) The following data were collected.

Substance	Mass in g $\pm$ 0.01 g	Percent Composition
Mixture before separation	5.62	N/A
Iron after separation	2.17	
Sand after separation	1.98	
Salt after separation	1.80	32.0%

Calculate the percent composition of the iron and sand in the mixture. [1]

(c) The percentages in (b) add up to more than 100. Suggest a reason that would explain these results and how to reduce or eliminate it. [2]

Error:

Reduce or Eliminate:

(d) The results did not support the original hypothesis. Suggest why the hypothesis was incorrect. [1]

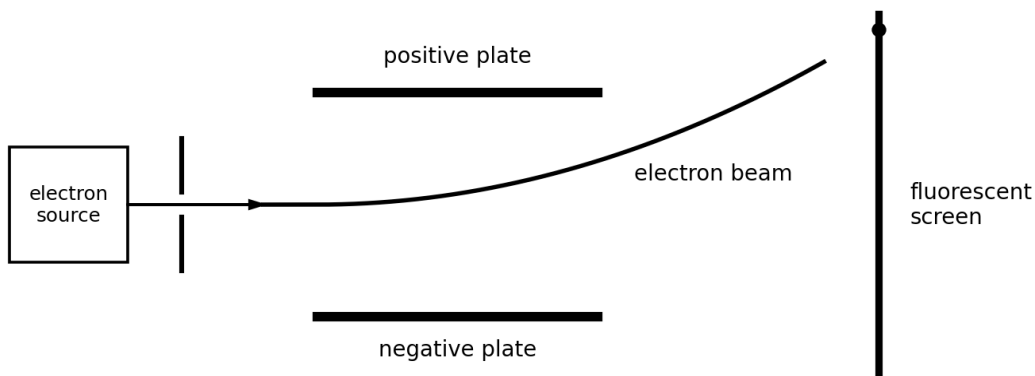
(e) In a different experiment, the students needed to separate a mixture of methanol and butan-1-ol. State the best method to separate this mixture and the physical property used for the separation. [2]

Separation method:

Physical property:

Paper 2 - Short response

1. An electron beam travels through a narrow slit and then passes between two charged plates before striking a fluorescent screen.



(a) Deduce the sign of the charge carried by the particles in the beam from the direction of deflection. [1]

(b) Explain why the beam curves toward the positive plate. [1]

(c) A beam of protons moving at the same speed enters the same electric field. Predict how its path would differ in *direction* and *amount of deflection*. Explain your answer. [2]

(d) Explain how the discovery of electrons provided evidence that atoms are not indivisible particles. [1]

2. A sealed syringe contains air at room temperature.

(a) Use the particle model to explain why the gas can be compressed. [2]

(b) The syringe is heated while its volume is kept constant. Describe what happens to the motion of the gas particles. [1]

(c) A liquid has the same volume as the gas sample but is much more difficult to compress. Explain this difference in terms of particle spacing. [2]

3. Bromine occurs as two isotopes, bromine-79 and bromine-81.

(a) Complete the table. [3]

Species	protons	neutrons	electrons
$^{79}_{35}\text{Br}$	35		35
$^{81}_{35}\text{Br}^-$		46	
$^{79}_{35}\text{Br}^+$	35		34

(b) State one similarity and one difference in the chemical behavior of bromine-79 and bromine-81 atoms. [2]

(c) Explain why bromine-79 and bromine-81 have different masses. [1]