Practice Question Set For A-Level
**Subject : Chemistry**
**Paper-1 Topic: Inorganic 1**

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**Name of the Student**:_____
**Max. Marks : 27 Marks** **Time : 27 Minutes**

Q1.

(a) A solution of barium hydroxide is often used for the titration of organic acids. A suitable indicator for the titration is thymol blue. Thymol blue is yellow in acid and blue in alkali. In a titration a solution of an organic acid was added from a burette to a conical flask containing 25.0 $cm^3$ of a barium hydroxide solution and a few drops of thymol blue.

(i) Describe in full the colour change at the end-point of this titration.

_____

**(1)**

(ii) Thymol blue is an acid. State how the average titre would change if a few $cm^3$, rather than a few drops, of the indicator were used by mistake in this titration.

_____

**(1)**

(iii) Barium hydroxide is toxic. Suggest **one** safety precaution you would take to minimise this hazard when wiping up a spillage of barium hydroxide solution.

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_____

**(1)**

(iv) Suggest **one** reason why a 250 $cm^3$ conical flask is preferred to a 250$cm^3$ beaker for a titration.

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_____

**(1)**

(v) Suggest **one** reason why repeating a titration can improve its reliability

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**(1)**

(b) Solubility data for barium hydroxide and calcium hydroxide are given in the table below.

| Compound | Solubility at 20 °C / g $dm^{-3}$ |
|---|---|

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| | |
|---|---|
| barium hydroxide | 38.9 |
| calcium hydroxide | 1.73 |

(i) Use the data given in the table to calculate the concentration, in mol $dm^{-3}$, of a saturated solution of calcium hydroxide ($M_r$ = 74.1) at 20°C.

_____

_____

**(1)**

(ii) Suggest **one** reason why calcium hydroxide solution is **not** used in the titration of a 0.200 mol $dm^{-3}$ solution of an acid.

_____

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**(1)**

**(Total 7 marks)**

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Q2.

In an experiment to determine its solubility in water, solid barium hydroxide was added to 100cm$^3$ of water until there was an excess of the solid. The mixture was filtered and an excess of sulfuric acid was added to the filtrate. The barium sulfate produced was obtained from the reaction mixture, washed with cold water and dried. The mass of barium sulfate was then recorded.

(a) Explain why the mixture was filtered before the addition of sulfuric acid.

_____

_____

**(1)**

(b) State how the barium sulfate produced was obtained from the reaction mixture.

_____

_____

**(1)**

(c) Explain why the barium sulfate was washed before it was dried.

_____

_____

**(1)**

(d) Write an equation for the reaction between barium hydroxide and sulfuric acid.

_____

**(1)**

(e) In an experiment, 4.25 g of barium sulfate were formed when an excess of sulfuric acid was added to 100 cm$^3$ of a saturated solution of barium hydroxide.

(i) Use data from the Periodic Table to calculate the $M_r$ of barium sulfate.
Give your answer to one decimal place.

_____

**(1)**

(ii) Calculate the amount, in moles, of $BaSO_4$ in 4.25 g of barium sulfate.

_____

_____

**(1)**

(iii) Use your answer from part (ii) to calculate the mass of barium hydroxide ($M_r$ = 171.3) present in 1 dm$^3$ of saturated solution. Show your working.

_____

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**(2)**

(f) Barium sulfate is taken by mouth by patients so that an outline of a human digestive system can be viewed using X-rays. Explain why patients do **not** suffer any adverse effects from barium sulfate when it is known that solutions containing barium ions are toxic.

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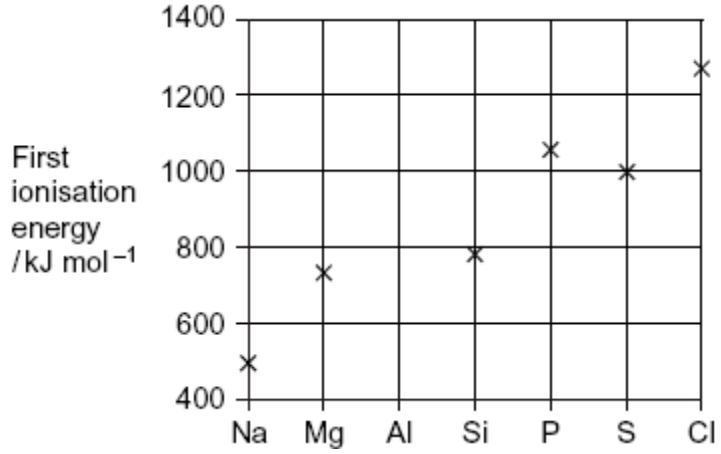
**(1)**

**(Total 9 marks)**

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Q3.

The following diagram shows the first ionisation energies of some Period 3 elements.




(a) Draw a cross on the diagram to show the first ionisation energy of aluminium.

**(1)**

(b) Write an equation to show the process that occurs when the first ionisation energy of aluminium is measured.

_____

**(2)**

(c) State which of the first, second or third ionisations of aluminium would produce an ion with the electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^1$

_____

**(1)**

(d) Explain why the value of the first ionisation energy of sulfur is less than the value of the first ionisation energy of phosphorus.

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_____

_____

**(2)**

(e) Identify the element in Period 2 that has the highest first ionisation energy and give its electron configuration.

Element _____

Electron configuration _____

**(2)**

(f) State the trend in first ionisation energies in Group 2 from beryllium to barium.
Explain your answer in terms of a suitable model of atomic structure.

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Trend _____

Explanation _____

_____

_____

_____

**(3)**

**(Total 11 marks)**

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