GCE AS LEVEL CHEMISTRY

S21- B410

Assessment Resource A

Structure of Matter and Simple Reactions

1. Complete the electronic structure of a bromine atom, Br. [1]

$1s^2\ 2s^2\ 2p^6$ .....

2. Give the oxidation state of chromium in the dichromate ion, $Cr_2O_7^{2-}$. [1]

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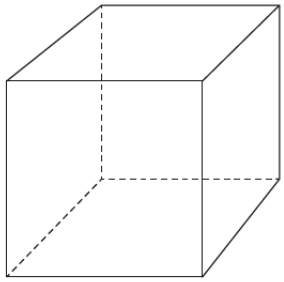
3. Complete the diagram to show the structure of caesium chloride, CsCl. [1]



4. Using the formula of calcium sulfate, calculate the number of **oxygen** atoms present in 0.1 mol of calcium sulfate. [2]

Number of oxygen atoms = ...

5. *(a)* A student was studying the boiling temperatures of different substances including those listed in the table.

Substance	Boiling temperature / °C
hydrogen, H_2	–253
bromine, Br_2	59
hydrogen bromide, HBr	–66

The student suggested that the boiling temperature could be predicted by considering the strength of the covalent bonds in the molecules.

State why the student is **incorrect**. Explain your reasoning and the factors that govern the boiling temperatures of these substances. [6 QER]

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(b) (i) Silicon and hydrogen can form a series of compounds called silanes.

Draw a dot and cross diagram to show the electron arrangement in the silane, Si_2H_6. Show outer electrons only. [2]

(ii) Predict the H—Si—H bond angle in Si_2H_6. Explain your answer. [2]

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6. Cerrusite is a naturally-occurring crystalline ore that contains a high percentage of insoluble lead(II) carbonate, $PbCO_3$.

(a) One method of finding the percentage of lead in the ore is by forming lead ions in solution and then precipitating them as lead(II) sulfate.

(i) Suggest how the ore could be treated to form lead(II) ions in solution. [1]

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(ii) Name a solution which could be added to the lead(II) solution to form lead(II) sulfate [1]

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(iii) Write an **ionic** equation for the reaction used to form lead(II) sulfate. Include state symbols. [2]

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(iv) Describe how the lead(II) sulfate precipitate should be treated to obtain results for quantitative analysis. Explain your answer. [3]

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(b) (i) 4.52 g of cerrusite were investigated by the method outlined in part *(a)* and the following results were obtained.

	Mass / g
Empty container	21.47
Container + lead(II) sulfate	25.03

Calculate the percentage by mass of **lead** in the cerrusite. [3]

Percentage = ... %

(ii) The balance used in the experiment could be read to 2 decimal places. **Two** weighings were made to find the mass of lead(II) sulfate. Calculate the maximum percentage error in the mass of lead(II) sulfate. Show your working. [1]

Maximum percentage error = ... %

(c) Some samples of cerrusite are thought to contain other carbonates in addition to the lead(II) carbonate. Suggest how this hypothesis could be investigated in a school or college laboratory. [2]

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7. Compound **X** contains **only** carbon, hydrogen and oxygen. 6.57 g of **X** was burned in excess oxygen to form carbon dioxide and water. 12.57 g of carbon dioxide and 7.74 g of water were collected.

(a) Suggest how the mass of carbon dioxide and the mass of water could be measured in this experiment. [2]

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(b) Find the percentage by mass of each element in **X**. [3]

Percentage carbon = ... %

Percentage hydrogen = ... %

Percentage oxygen = ... %

(c) Calculate the empirical formula of **X**. [2]

Empirical formula .....

(d) 9.20 g of **X**, measured at a pressure of 103 kPa and a temperature of 100 °C, had a volume of 6.02×10^3 cm^3. Calculate the relative molecular mass, M_r, of **X**. [4]

Relative molecular mass = ...

(e) Use your answers to parts *(c)* and *(d)* to deduce the molecular formula of **X**. [1]

Molecular formula .....