C3.2 Mastery Quiz: Introduction to Quantitative Chemistry

Section A - You should use a periodic table where necessary

1. Below shows a chemical formula of a compound.

$$CaCO_3$$

Choose the correct number of atoms in one molecule. [1]

Tick (✓) **one** box.

A. 1 calcium atom, 1 carbon atom, 3 oxygen atoms ☐

B. 1 calcium atom, 3 carbonate atoms ☐

C. 3 calcium atoms, 3 carbon atoms, 3 oxygen atoms ☐

2. Choose the correct state symbol for an aqueous solution. [1]

Tick (✓) **one** box.

A. (l) ☐

B. (s) ☐

C. (aq) ☐

3. Below shows a symbol equation of a chemical reaction.

$$CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$$

When this reaction was carried out in a beaker on a balance, the mass decreased.

Choose the best explanation for why. [1]

Tick (✓) **one** box.

A. Carbon dioxide gas is produced which has no mass ☐

B. Carbon dioxide gas left the beaker ☐

C. Reactants always have a greater mass than the products formed ☐

4. Below shows an incomplete word equation for a chemical reaction.

Calcium carbonate + hydrochloric acid → carbon dioxide + _____ + water

Choose the missing substance. [1]

Tick (✓) **one** box.

A. Chlorine carbonate ☐

B. Calcium chloride ☐

C. Hydrocarbonate ☐

5. 200 g sodium hydroxide was dissolved in water to make 1 dm^3 solution.

Choose the concentration of this sodium hydroxide solution. [1]

Tick (✓) **one** box.

A. 0.2 g/dm^3 ☐

B. 0.005 g/dm^3 ☐

C. 200 g/dm^3 ☐

6. Choose the relative formula mass of CO_2.

(Ar: C = 12; O = 16) [1]

A. $M_r = 44$ ☐

B. $M_r = 28$ ☐

C. $M_r = 56$ ☐

7. Choose the most appropriate equipment for accurately measuring 10 cm^3 water. [1]

Tick (✓) **one** box.

A. 10 cm^3 measuring cylinder ☐

B. 10 cm^3 beaker ☐

C. 10 cm^3 evaporating dish ☐

8. A student investigated how heating calcium carbonate affected its mass.

Calcium carbonate was heated in a test tube for 1 minute.

The mass was measured before and after heating, then the change in mass recorded.

This was repeated four times and the results are shown below.

Repeat number	Change in mass (g)
1	12
2	13
3	10
4	9

Choose the correct analysis of these results. [1]

Tick (✓) **one** box.

A. The change of mass of 9 g is an anomaly ☐

B. The change in mass is 11 g +/- 2 g ☐

C. The results are very precise ☐

9. Choose the technique that would separate insoluble copper carbonate from a copper sulfate solution. [1]

Tick (✓) **one** box.

A. Filtration ☐

B. Evaporation ☐

C. Crystallisation ☐

10. Choose the correct hazard for using dilute hydrochloric acid. [1]

Tick (✓) **one** box.

A. It is an irritant and could irritate skin ☐

B. Wear safety goggles so acid cannot get into eyes ☐

C. It is quite likely that the acid splashes onto skin and it must be rinsed off immediately ☐

11. Convert 12 dm^3 to cm^3. [1]

Tick (✓) **one** box.

A. 1200 cm^3 ☐

B. 0.012 cm^3 ☐

C. 12000 cm^3 ☐

12. Choose the relative formula mass of $(NH_4)_3PO_4$.

(Ar: N = 14; H = 1; P = 31; O = 16) [1]

Tick (✓) **one** box.

A. $M_r = 123$ ☐

B. $M_r = 121$ ☐

C. $M_r = 149$ ☐

D. $M_r = 144$

13. 300 g of H_2SO_4 is dissolved in water to make 500 cm^3 of solution.

Choose the concentration of this solution. [1]

Tick (✓) **one** box.

A. 600 g/cm^3 ☐

B. 0.6 g/cm^3 ☐

C. 1.66 g/cm^3 ☐

14. Choose the correct compounds that react to make copper sulfate crystals. [1]

Tick (✓) **one** box.

A. Copper and sulfate ☐

B. Copper oxide and sulfuric acid ☐

C. Copper sulfide and oxygen ☐

15. Choose which of the symbol equations below is balanced. [1]

Tick (✓) **one** box.

A. $N_2 + H_2 \rightarrow NH_3$ ☐

B. $3\ N_2 + 3\ H_2 \rightarrow NH_3$ ☐

C. $N_2 + 3\ H_2 \rightarrow 2\ NH_3$ ☐

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Section B

1. Complete the word equation below.

   Hydrochloric acid + sodium hydroxide → _____ + water

2. State the 'Law of Conservation of Mass'.

   _____

   _____

3. There is usually uncertainty in the measurements done in an experiment.

   Define 'uncertainty'.

   _____

   _____

4. Describe a method to make pure, dry crystals of magnesium sulfate from a metal oxide and a dilute acid. You may draw labelled diagrams to support your method.

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