

AQA Combined Science GCSE Trilogy

Chemistry Paper 1 AO1 Questions

Atomic Structure & The Periodic Table

1. What is an atom?
2. What does the periodic table show?
3. What is a compound?
4. What is a mixture?
5. State the various processes by which mixtures can be separated. (i.e. separation techniques)
6. How did the old plum pudding model describe the structure of the atom?
7. Which experiment led to the discovery of the nucleus?
8. How did the nuclear model of the atom differ to the plum pudding model?
9. What detail about electrons did Niels Bohr add to the nuclear model?
10. Who discovered the neutron in the nucleus?
11. What are the relative electrical charges of a proton, neutron and electron?
12. What is the overall electrical charge of an atom?
13. What is the radius of a typical atom?
14. How much smaller than an atom is its nucleus?
15. What are the relative masses of a proton, neutron and electron?
16. What is the mass number of an atom?
17. What is an isotope?
18. What does the atomic number of an element tell you?
19. Why are some elements' relative atomic masses not whole numbers? (i.e. Cl 35.5)
20. Electrons occupy different energy levels around an atom. What are these energy levels also known as?
21. How many electrons can occupy each energy level?
22. How are the elements in the periodic table ordered?
23. How are the elements in the periodic table grouped?
24. How many electrons are in the outer shell of all group 2 elements?
25. What is an ion?
26. Do metals form positive or negative ions?
27. Are metals found on the left or right side of the periodic table?
28. In which group of the periodic table are the elements all unreactive?
29. Why are the elements in that group unreactive?
30. What are the elements in group 1 known as?
31. Why are they so reactive?
32. How does the reactivity of the elements in group 1 change as you travel down the group?
33. Which group contains the halogens?
34. How does the reactivity of the halogens change as you travel down the group?
35. How does the melting point of the halogens change as you travel down the group?

Bonding, Structure & Properties

1. What are the 3 types of bonding?
2. Which type of bond is formed between metals and non-metals?
3. Which type of bond is formed between non-metals?
4. Which type of bonding is formed between metals?
5. What are swapped or shared between atoms making a chemical bond?

6. When a metal atom reacts with a non-metal atom to form an ionic bond, does the metal atom gain, lose or share electrons?
7. When a metal atom reacts with a non-metal atom to form an ionic bond, does the non-metal atom gain, lose or share electrons?
8. Which force holds the ions together in an ionic bond?
9. Draw a dot and cross diagram to show the ionic bond between sodium (Na) and chlorine (Cl).
10. How many electrons does an atom of magnesium lose to become an ion?
11. What is the name given to the regular arrangement of ions in an ionic compound?
12. When a covalent bond is formed, are electrons swapped or shared between atoms?
13. Are covalent bonds between atoms strong or weak?
14. Draw a dot and cross diagram to show the bonding in an ammonia (NH₃) molecule.
15. What is a polymer?
16. Metallic bonds are formed due to which property of the outer shell electrons in a metal atom?
17. What are the 3 states of matter?
18. How is the arrangement of particles in a substance different in each of the 3 states of matter?
19. What is the freezing point of a substance?
20. What is the melting point of a substance?
21. What is the boiling point of a substance?
22. What do the symbols (s), (l), (g) and (aq) mean when they follow an element symbol in a chemical equation? (e.g. NaCl(aq))
23. Do ionic compounds have high or low melting points?
24. Do ionic compounds conduct electricity when dissolved in water?
25. Do substances made of small molecules have high or low melting points?
26. Do substances made of small molecules conduct electricity when dissolved in water?
27. Do giant covalent structures have high or low melting points?
28. Do giant covalent structures conduct electricity when dissolved in water?
29. Why do some compounds have higher melting points than others?
30. What are the common properties of metals?
31. Why do we make alloys out of pure metals?
32. Why do metals conduct electricity?
33. What are the properties of diamond?
34. Why is diamond hard?
35. Why does graphite conduct electricity?
36. Why is graphite slippery?
37. What is a fullerene?
38. Give examples of the uses of carbon nanotubes.

Quantitative Chemistry

1. How do you calculate the relative formula mass of a molecule?
2. What is the law of conservation of mass?
3. Why would the mass of reacting chemicals appear to change if one of the products of the reaction is a gas?
4. If a set of repeat readings has a large range about the mean of that set of readings, do the readings have a large or small uncertainty?
5. What are the units of concentration?

Chemical Changes

1. What is gained in an oxidation reaction?
2. What do metals react with to form metal oxides?

3. What is lost in a reduction reaction?
4. What is the reactivity series of metal?
5. What happens in a displacement reaction?
6. Name 3 unreactive metals.
7. Name 3 more reactive metals.
8. What is an acid?
9. What happens when zinc reacts with hydrochloric acid?
10. How can metals less reactive than carbon be extracted from their oxides?
11. What are the products of reactions between acids and metals?
12. Which salt is produced when magnesium reacts with sulfuric acid?
13. Which salt is produced when iron reacts with hydrochloric acid?
14. What happens during a neutralisation reaction?
15. What are the products when an acid is neutralised by a metal carbonate?
16. What are the products when an acid is neutralised by a metal hydroxide?
17. What is a base?
18. What is an alkali?
19. Use an ionic equation to show what happens during a neutralisation reaction.
20. What is the range of the pH scale?
21. What is electrolysis?
22. What is the difference between a cathode and an anode?
23. What will be produced at the electrodes when molten zinc chloride is electrolysed?
24. What is mixed with molten aluminium oxide when aluminium is extracted by electrolysis?
25. Why does the carbon anode continuously need replacing in this process?
26. When an aqueous salt solution is electrolysed, which gas is produced at the cathode (assuming the metal in the salt is more reactive than hydrogen)
27. Which 2 ions does the water in the aqueous solution break down into during electrolysis?

Energy Changes

1. What is an exothermic reaction?
2. Give examples of types of reactions that are exothermic.
3. What is an endothermic reaction?
4. Give examples of types of reactions that are endothermic.
5. What is the activation energy for a reaction?
6. What needs to happen between the particles of reactants for a chemical reaction to occur?
7. Sketch a reaction profile for an exothermic reaction.
8. Sketch a reaction profile for an endothermic reaction.

Practical Knowledge Needed:

- How could you separate a mixture of sand and salt?
- What equipment would you need to filter excess powder from a solution?
- How could you measure the change in mass when magnesium reacts with acid?
- How could you investigate the order of reactivity of a set of different metals (i.e. magnesium, zinc, iron and copper)?
- How could you test to find out which gas is produced in a reaction between a metal and an acid?
- How can a pure, dry sample of a soluble salt be prepared from a base and an acid?
- Why is it dangerous to directly heat an acid with a Bunsen burner?
- How could you test to find out if a metal chloride salt solution produces oxygen or chlorine at the anode during electrolysis?

- How could you investigate how the concentration of acid affects the temperature change in reactions between metals and acids?

Maths Skills Needed:

- Can you write 1560000 in standard form?
- Can you write 0.0000000156 in standard form?
- What does a number in front of a chemical symbol mean in an equation? (i.e. **2**Mg)
- What does a subscript number after a chemical symbol mean? (i.e. CO₂)
- Can you balance a chemical equation? (i.e. balance H₂O → O₂ + H₂)
- Do the following set of repeat readings have a high or low uncertainty: 3.0, 6.4, 5.8, 2.9, 4.2, 4.4, 8.1
- Can you use ratios?
- Can you calculate the mass of a solute in a given volume of a known concentration using concentration = mass / volume?