

Subject knowledge tests: pre-16 chemistry

Test 1: questions

For each question, select the correct answer – A, B, C or D.

- 1 Which statement best explains why solid A melts at a lower temperature than solid B?
- A The attractions between particles in solid A are stronger than those between particles in solid B.
 - B The particles in solid A are larger than the particles in solid B.
 - C The mass of particles in solid A is greater than the mass of particles in solid B.
 - D The attractions between particles in solid A are weaker than those between particles in solid B.
- 2 1 kg of charcoal (pure carbon) is fully burned in oxygen. What is the mass of carbon dioxide produced?
- $C + O_2 \rightarrow CO_2$
- A_r values: C = 12; O = 16
- A 2.600 kg
 - B 1.571 kg
 - C 1.000 kg
 - D 3.667 kg
- 3 When calcium carbonate (marble chips) is added to dilute hydrochloric acid, a reaction occurs:
- $2HCl(aq) + CaCO_3(s) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$
- Which is the best method of measuring the rate of reaction?
- A Record the change in temperature over time.
 - B Record the volume of carbon dioxide gas produced over time.
 - C Change the concentration of the acid.
 - D Change the size, or surface area of the marble chips.



- 4 The mouth of a bottle full of air is closed off with a cork.
What is in between the particles in the bottle?
- A Air
 - B Bacteria
 - C Dust
 - D Nothing
- 5 50 g sugar (sucrose) is added to 200 g water in a beaker. The sugar is stirred until it has dissolved completely and cannot be seen. What is the mass of the sugar solution?
- A Less than 250 g because the sugar disappears when it dissolves.
 - B Less than 250 g because a gas is given off.
 - C 250 g because the sugar melts into the water, but is still there.
 - D 250 g because the sugar mass is spread through the solution.
- 6 A piece of solid phosphorus is put in a flask and covered with water. The flask is sealed with a bung and left on a sunny windowsill. The mass of the flask, bung, phosphorus and water is 600 g. The sun shines on the flask. The contents get hot. The water evaporates. The phosphorus catches fire, making white smoke.
- Which statement best explains what happens to the mass of the flask and its contents after the changes?
- A The mass goes down because the solid changes to a gas.
 - B The mass stays the same because the flask is sealed.
 - C The mass goes up because phosphorus burned in oxygen in the flask.
 - D The mass goes down because phosphorus is destroyed.



- 7 When methane gas burns with a yellow flame, energy is released.
Why is energy released when methane burns?
- A Energy comes from the flame.
 - B Energy stored in the methane is released on burning.
 - C Burning any fuel releases energy.
 - D Energy is released when carbon dioxide and water are made as products.
- 8 When a car is driven, the pressure in the car's tyres increases during the journey. Why does the pressure increase?
- A The tyres warm up as the car moves.
 - B The air particles move around more in a hot tyre.
 - C The air particles expand as the tyre gets hot.
 - D The people in the car put pressure on the tyres.
- 9 Here is an equation for the reaction between solid silver and iron(III) ions:
- $$\text{Ag(s)} + \text{Fe}^{3+}(\text{aq}) \rightleftharpoons \text{Ag}^+(\text{aq}) + \text{Fe}^{2+}(\text{aq})$$
- What does the \rightleftharpoons symbol mean?
- A The reaction goes forwards then backwards.
 - B The amounts of chemicals either side are equal.
 - C The reaction reaches equilibrium
 - D The reaction is balanced overall.
- 10 What is meant by an "empirical" formula for a substance?
- A A formula measured by experiment.
 - B The simplest numerical ratio of the types of atom present.
 - C Another term for the molecular formula.
 - D A formula indicating which elements are present.



- 11 Which of these procedures could a chemist use to separate the components of the compound lead bromide?
- A Dissolving, then filtering.
 - B Dissolving, then chromatography.
 - C Melting, then electrolysis.
 - D None, because a compound cannot be split up.
- 12 Iron and sulfur react according to the equation:
- $$\text{Fe(s)} + \text{S(s)} \rightarrow \text{FeS(s)}$$
- What is left in the reaction vessel when 112 g iron and 80 g sulfur react?
- A_r values: Fe = 56; S = 32
- A 192 g FeS
 - B 176 g FeS and 16 g sulfur
 - C 176 g FeS only
 - D 192 g FeS₂
- 13 What are the units for relative atomic mass, A_r ?
- A Atomic mass units
 - B g⁻⁹
 - C kg⁻¹²
 - D There are no units for relative atomic mass.
- 14 Which of these substances could be a “chemical element”?
- A A colourless liquid that can be split into two liquids by distillation.
 - B A silver solid that changes to a white solid on heating.
 - C A dark blue liquid that gives three lines in a chromatography test.
 - D A white solid that gives off carbon dioxide gas when heated.



- 15 Here are the colours of Universal Indicator solution at different pH values but the same concentration:



- Which response gives the correct order for the numbers on the pH scale?
- A Strong alkali – weak alkali – distilled water – weak acid – strong acid
- B Weak acid – strong acid – neutral – strong alkali – weak alkali
- C Strong acid – weak acid – neutral – weak alkali – strong alkali
- D Weak alkali – strong alkali – distilled water – strong acid – weak acid
- 16 Which statement is the best definition for *rate of reaction*?
- A Amount of product produced in a unit of time.
- B Volume of gas produced in a unit of time.
- C Amount of product produced until a reagent runs out.
- D Amount of product produced in the first minute.
- 17 Which of the following solutions is likely to have the highest pH?
- A A weak dilute acid.
- B A strong dilute acid.
- C A weak concentrated acid.
- D A strong concentrated acid.

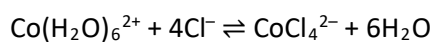
- 18 When calcium carbonate (marble chips) is added to dilute hydrochloric acid, a reaction occurs:



Eventually the reaction stops. A colourless solution remains.

Why does the reaction stop?

- A All the calcium carbonate has reacted.
 - B The reaction has reached equilibrium.
 - C The amounts of reagents and products have equalised.
 - D No more gas can be produced.
- 19 Here is the equation for the reaction between two complex ions:



PINK	BLUE
(cobalt(II)	(cobalt(II)
hexahydrate	tetrachloro
complex ion)	complex ion)

What will happen if a lot of water is added when the reaction is at equilibrium?

- A A pink colour would be produced.
 - B A blue colour would be produced.
 - C A purple colour would be produced.
 - D It's impossible to tell without knowing the original colour.
- 20 Which of the following lists include compounds only?
- A Methane, carbon dioxide, air
 - B Water, iron, crude oil
 - C Air, crude oil, iron
 - D Carbon dioxide, water, methane



- 21 Which of these properties apply to a single atom of copper?
- Colour: red – orange
- Malleable: can be shaped
- Ductile: can be pulled into wires
- Melting point: melts at 1083 °C
- A All of them
- B None of them
- C Colour and melting point only
- D Colour only
- 22 When a candle burns the wax disappears and eventually the flame goes out. What is happening?
- A The wax melts then evaporates with the heat of the flame.
- B The wick burns creating heat to evaporate the wax.
- C The wax melts then burns in oxygen in the air.
- D The wax stores energy which is given off when the candle burns.
- 23 The equation for the reaction between solid silver and iron(III) ions is:
- $$\text{Ag(s)} + \text{Fe}^{3+}(\text{aq}) \rightleftharpoons \text{Ag}^{+}(\text{aq}) + \text{Fe}^{2+}(\text{aq})$$
- Which is the best explanation for what would happen when an aqueous solution of iron(II) ions is added to an aqueous solution of silver ions?
- A No change because the reaction is at equilibrium.
- B Silver appears in the test tube and the reaction stops.
- C Silver appears, then reacts to form silver ions, then silver re-appears.
- D Silver appears in the test tube.

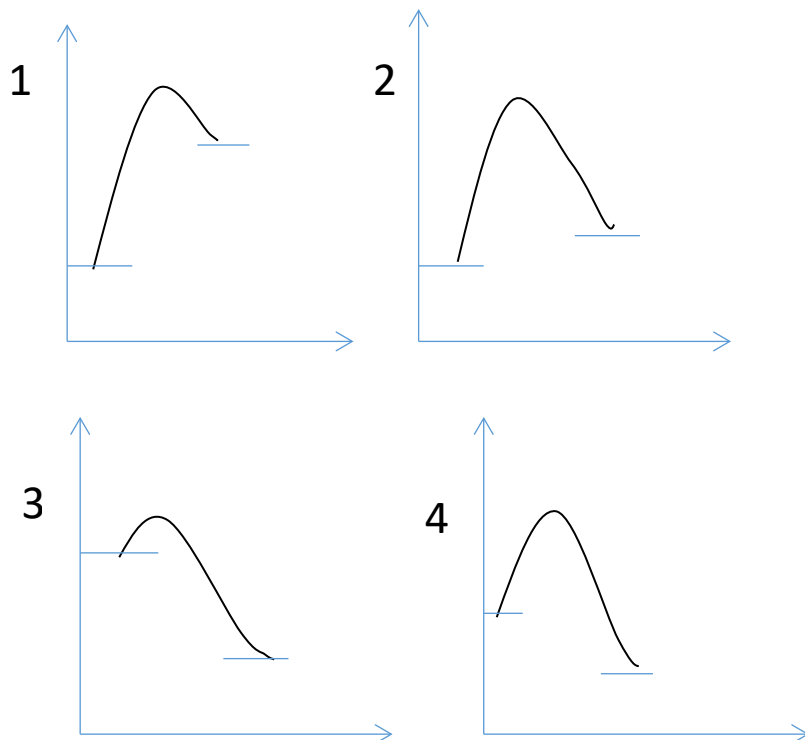


- 24 What is an “exothermic” reaction?
- A A reaction that is instantaneous.
 - B A reaction that absorbs energy from the environment.
 - C A reaction that transfers energy to the environment.
 - D A reaction that has a very fast rate.
- 25 In which list are these chemical elements in the correct order of increasing particle movement?
- A Oxygen, mercury, gold
 - B Mercury, gold, oxygen
 - C Gold, mercury, oxygen
 - D The particles move the same amount in all three.
- 26 Which statement is the best description of the properties of an ACID?
- A An acid eats material away.
 - B An acid burns skin and/or materials.
 - C An acid reacts with metals to produce hydrogen gas.
 - D An acid reacts with alkalis to produce carbon dioxide.



27 Which two energy profiles represent exothermic reactions?

(vertical axis: energy, horizontal axis: course of reaction)

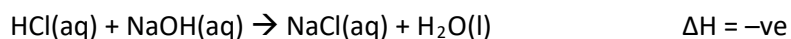


- A 1,2
- B 2,3
- C 1,4
- D 3,4

28 A vitamin C tablet is put in water. A gas is produced as the tablet dissolves. Where did the gas come from?

- A It was formed in a chemical reaction.
- B It was in the tablet already in solid form.
- C It was hydrogen or oxygen from the water.
- D It was gaseous vitamin C from the tablet.

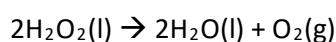
29 Hydrochloric acid and aqueous sodium hydroxide react together releasing energy



Which is the best explanation for energy being released?

- A Bonds between hydrogen and chlorine break.
- B Bonds between sodium and hydroxide ions break.
- C Sodium and chloride ions bond together forming sodium chloride.
- D Hydrogen and hydroxide ions bond together forming water molecules.

30 Hydrogen peroxide decomposes to produce water and oxygen gas:



The reaction occurs slowly at room temperature. Changing which two factors would increase decomposition rate?

- A Volume of oxygen, temperature
- B Concentration of hydrogen peroxide, volume of oxygen
- C Temperature, volume of water
- D Concentration of hydrogen peroxide, adding a catalyst

31 Which statement is the best definition for “freezing point”?

- A The temperature at which liquid water becomes solid ice, 0 °C.
- B The temperature at which any liquid becomes solid.
- C Any temperature below 0 °C
- D The temperature at which particle movement stops.

32 Which list names only everyday substances which are alkaline?

- A Baking soda, toothpaste, oven cleaner
- B Fizzy drink, orange juice, vinegar
- C Baking soda, fizzy drink, oven cleaner
- D Toothpaste, orange juice, vinegar

