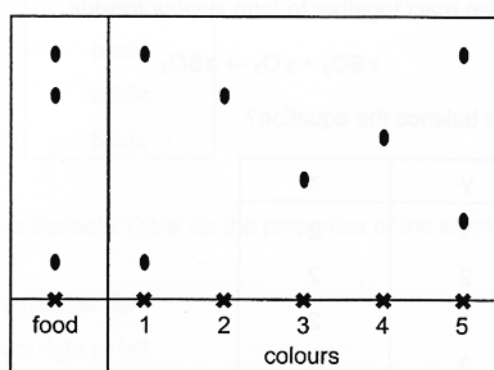


- 21 Which pair of apparatus must be used in obtaining dry samples of both a soluble salt and an insoluble salt from a mixture of the two salts in water?
- A evaporating dish and measuring cylinder
- B evaporating dish and filter funnel
- C filter funnel and measuring cylinder
- D filter funnel and stopwatch
- 22 The diagram shows a chromatogram of a food colouring.

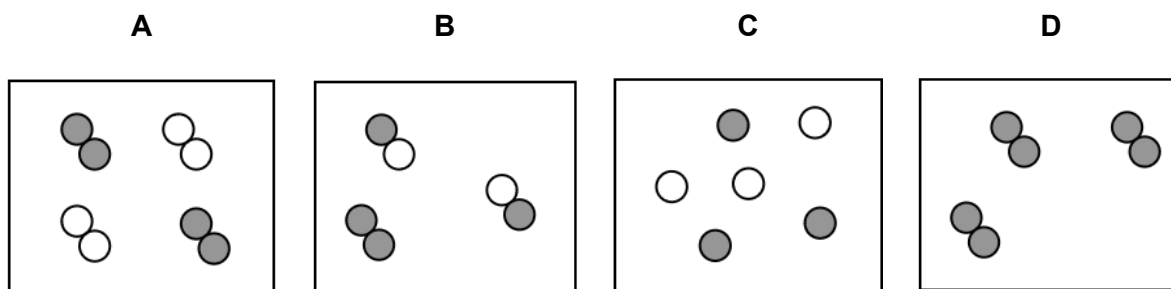


Which two colours does the food colouring contain?

- A 1 and 2
- B 2 and 3
- C 3 and 4
- D 4 and 5
- 23 Which row correctly describes the particles of sugar molecules and water molecules in a dilute sugar solution at room temperature?

|   | sugar molecules                  | water molecules                  |
|---|----------------------------------|----------------------------------|
| A | closely packed, moving at random | closely packed, moving at random |
| B | closely packed, not moving       | far apart, moving at random      |
| C | far apart, moving at random      | closely packed, moving at random |
| D | far apart, moving at random      | far apart, moving at random      |

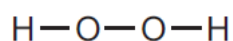
- 24 Which diagram represents a mixture of diatomic elements?



- 25 Carbon has three naturally occurring isotopes: carbon-12, carbon-13 and carbon-14.

Which statement about carbon-14 is correct?

- A** It has the same number of neutrons as protons.
- B** It has the same number of protons than carbon-13.
- C** It has the same relative atomic mass as carbon-13.
- D** It is formed by the addition of 2 electrons to carbon-12.
- 26 The diagram shows the structure of hydrogen peroxide.



What is the total number of electrons used for bonding in this molecule?

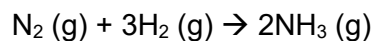
- A** 3                                      **B** 4
- C** 6                                      **D** 8
- 27 The proton and nucleon numbers of P and Q are shown.

| element | proton number | nucleon number |
|---------|---------------|----------------|
| P       | 3             | 7              |
| Q       | 8             | 16             |

What is the relative formula mass of the compound formed by the elements P and Q?

- A** 23                                      **B** 30
- C** 39                                      **D** 46

- 28** The equation for the production of ammonia is given below:



2 moles of nitrogen gas is mixed with 7 moles of hydrogen.

What will be present after the reaction?

- A** 2 moles of ammonia
  - B** 2 moles of ammonia and 1 mole of nitrogen
  - C** 4 moles of ammonia
  - D** 4 moles of ammonia and 1 mole of hydrogen
- 29** Which statement is correct for 22 g of carbon dioxide?
- A** It contains  $1.51 \times 10^{23}$  carbon atoms.
  - B** It contains  $1.51 \times 10^{23}$  oxygen atoms.
  - C** It contains  $6.02 \times 10^{23}$  oxygen atoms.
  - D** It contains  $6.02 \times 10^{23}$  carbon dioxide molecules.
- 30** One mole of compound X gives 3 moles of ions in aqueous solution.  
X reacts with ammonium carbonate to give an acidic gas.  
What is compound X?
- |                            |                            |
|----------------------------|----------------------------|
| <b>A</b> calcium hydroxide | <b>B</b> hydrochloric acid |
| <b>C</b> sodium hydroxide  | <b>D</b> sulfuric acid     |

**31** Which equation does not represent a redox reaction?

- A**  $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$
- B**  $\text{Br}_2(\text{g}) + 2\text{I}^{-}(\text{aq}) \rightarrow 2\text{Br}^{-}(\text{aq}) + \text{I}_2(\text{s})$
- C**  $\text{Cl}_2(\text{g}) + \text{S}^{2-}(\text{aq}) \rightarrow \text{S}(\text{s}) + 2\text{Cl}^{-}(\text{aq})$
- D**  $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$

**32** Aqueous ammonium sulfate is tested with aqueous sodium hydroxide and then warmed gently.

Which observation can be made?

- A** A gas is produced that bleaches damp red litmus paper.
- B** A gas is produced that turns damp red litmus paper blue.
- C** A white precipitate is formed that dissolves in excess sodium hydroxide.
- D** A white precipitate is formed that is insoluble in excess sodium hydroxide.

**33** Astatine is an element in Group 17, located below iodine in the Periodic Table.

Which statement about astatine is correct?

- A** Astatine displaces iodine from aqueous potassium iodide.
- B** Astatine forms an ionic compound with sodium with the formula  $\text{Na}_2\text{At}$ .
- C** Astatine is a black solid at room temperature and pressure.
- D** Astatine is a molecule that conducts electricity in all states.

**34** Nickel is between iron and lead in the Reactivity Series.

Which statements can be deduced from its position in the Reactivity Series?

1. Nickel forms effervescence with cold water.
2. Nickel forms an oxide when heated in air.
3. Nickel reacts with dilute hydrochloric acid to produce hydrogen gas.
4. Nickel can displace potassium from potassium nitrate solution.

**A** 1 and 2

**B** 2 and 3

**C** 2 and 4

**D** 3 and 4

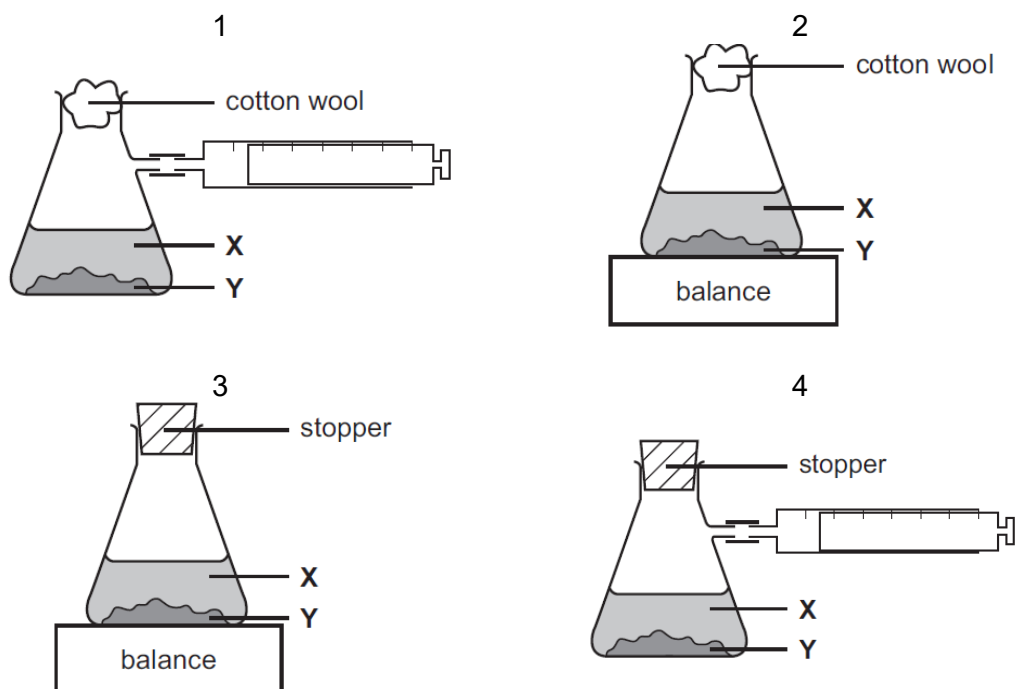
**35** The temperature of a beaker of water is measured to be 37 °C.

When a substance is added to the water, an exothermic change occurs.

What is a possible new temperature of the solution and how is the heat transferred?

|          | temperature / °C | heat transfer                         |
|----------|------------------|---------------------------------------|
| <b>A</b> | 32               | from the solution to the surroundings |
| <b>B</b> | 32               | from the surroundings to the solution |
| <b>C</b> | 42               | from the solution to the surroundings |
| <b>D</b> | 42               | from the surroundings to the solution |

36 A liquid X reacts with solid Y to form a gas.



Which two diagrams show suitable methods for investigating the speed of the reaction?

**A** 1 and 3

**B** 1 and 4

**C** 2 and 3

**D** 2 and 4

37 What is the main constituent of natural gas?

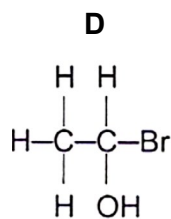
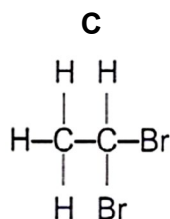
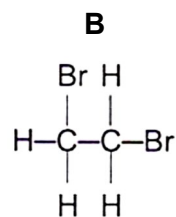
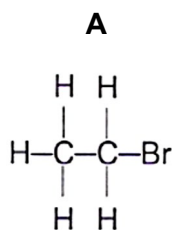
**A** argon

**B** ethene

**C** methane

**D** nitrogen

- 38 What is a possible structure of the product formed when ethene gas is passed through bromine water?



- 39 Which property remains unchanged when ethene undergoes addition polymerisation to form poly(ethene)?

- A** melting and boiling point  
**B** percentage composition of carbon  
**C** reactivity with bromine solution  
**D** relative molecular mass

- 40 Which row correctly shows one process that adds carbon dioxide to the atmosphere and one that removes it?

|          | adds carbon dioxide | removes carbon dioxide |
|----------|---------------------|------------------------|
| <b>A</b> | combustion          | respiration            |
| <b>B</b> | photosynthesis      | respiration            |
| <b>C</b> | respiration         | combustion             |
| <b>D</b> | respiration         | photosynthesis         |

**END OF PAPER**

**Colours of Some Common Metal Hydroxides**

|                      |            |
|----------------------|------------|
| calcium hydroxide    | white      |
| copper(II) hydroxide | light blue |
| iron(II) hydroxide   | green      |
| iron(III) hydroxide  | red-brown  |
| lead(II) hydroxide   | white      |
| zinc hydroxide       | white      |



The Periodic Table of Elements

| Group                |                       |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
|----------------------|-----------------------|-------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|----|----|----|----|----|----|
| 1                    | 2                     | 1<br>H<br>hydrogen<br>1                                                 |  |  |  |  |  |  |  |  |  |  |  | 13 | 14 | 15 | 16 | 17 | 18 |
|                      |                       | Key                                                                     |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| 3                    | 4                     | proton (atomic) number<br>atomic symbol<br>name<br>relative atomic mass |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| Li<br>lithium<br>7   | Be<br>beryllium<br>9  |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| 11                   | 12                    |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| Na<br>sodium<br>23   | Mg<br>magnesium<br>24 |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| 19                   | 20                    |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| K<br>potassium<br>39 | Ca<br>calcium<br>40   |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| 37                   | 38                    |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| Rb<br>rubidium<br>85 | Sr<br>strontium<br>88 |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| 55                   | 56                    |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| Cs<br>caesium<br>133 | Ba<br>barium<br>137   |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| 87                   | 88                    |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
| Fr<br>francium       | Ra<br>radium          |                                                                         |  |  |  |  |  |  |  |  |  |  |  |    |    |    |    |    |    |
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**2025 Sec 4E / 5E Science (Physics / Chemistry) Prelim Paper 1 Answers**

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| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| B | A | D | D | A | C | A | B | D | C  |

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| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| C  | D  | B  | B  | D  | C  | C  | C  | A  | A  |

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| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| B  | A  | C  | A  | B  | C  | B  | D  | C  | D  |

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| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| A  | B  | C  | B  | C  | D  | C  | B  | B  | D  |