

# Test 1

# Factors affecting rate

Decide whether each of the following statements is

**A.** TRUE

**B.** FALSE.

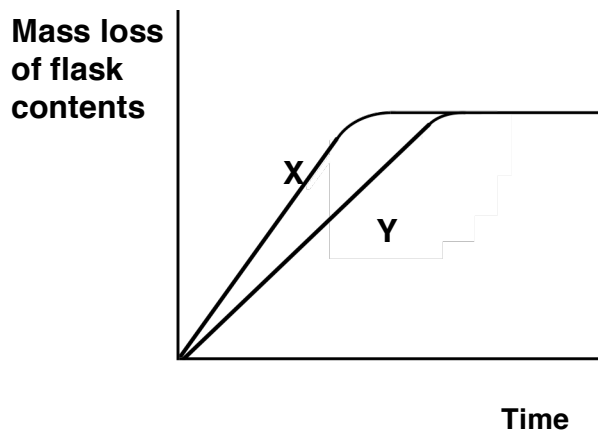
1. Increasing the temperature increases the rate of reaction.
2. Lumps of calcium carbonate react faster with acid than calcium carbonate powder.
3. A dilute acid usually reacts faster than a concentrated acid.
4. Milk is more likely to turn sour at 0 °C than at 10 °C.
5. Small potatoes take longer to cook than large potatoes.
6. Plants grow faster in warm weather than in cold weather.
7. Compared with coal dust, lumps of coal burn very rapidly.
8. Acetylene burns less rapidly in pure oxygen than in air.
9. Chips cook faster in oil at 300 °C than in oil at 200 °C.
10. Reactions involving gases go faster when the pressure is increased.

## Test 2

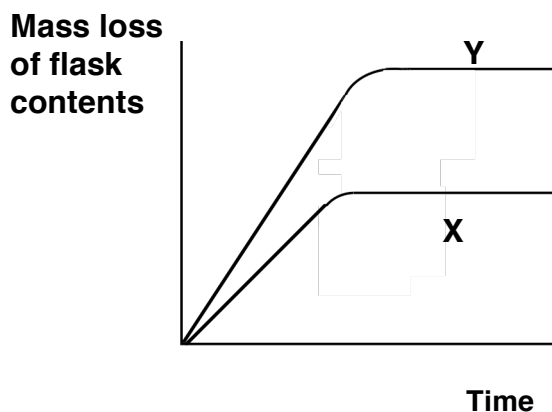
## Rate graphs

Questions 1 to 5 refer to graphs which show data obtained from reactions of hydrochloric acid.

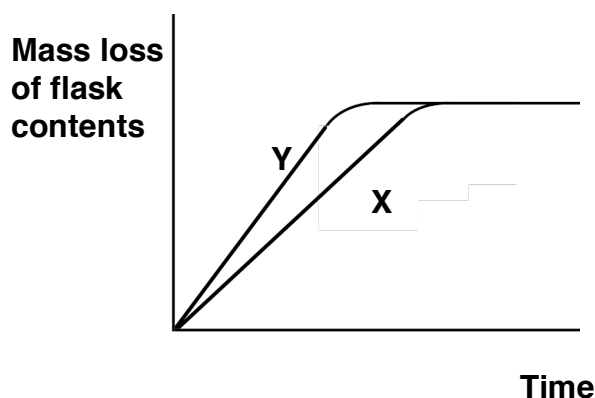
A.



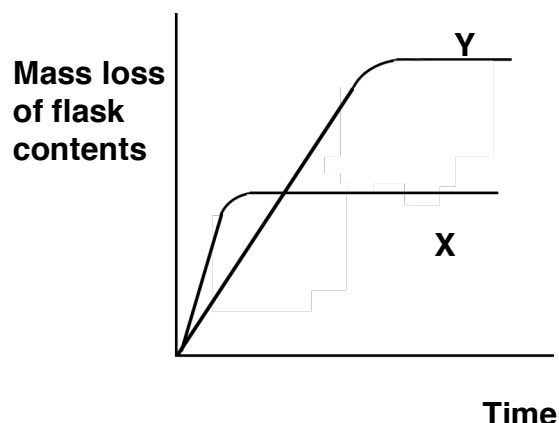
B.



C.



D.



Which graph shows the data likely to be obtained from each of the following pairs of reactions?

### Contents of flask X

- 10 g chalk lumps (excess)  
50 cm<sup>3</sup> of 1 mol l<sup>-1</sup> HCl (aq)  
20 °C
- 4 cm magnesium ribbon  
50 cm<sup>3</sup> of 2 mol l<sup>-1</sup> HCl (aq) (excess)  
20 °C

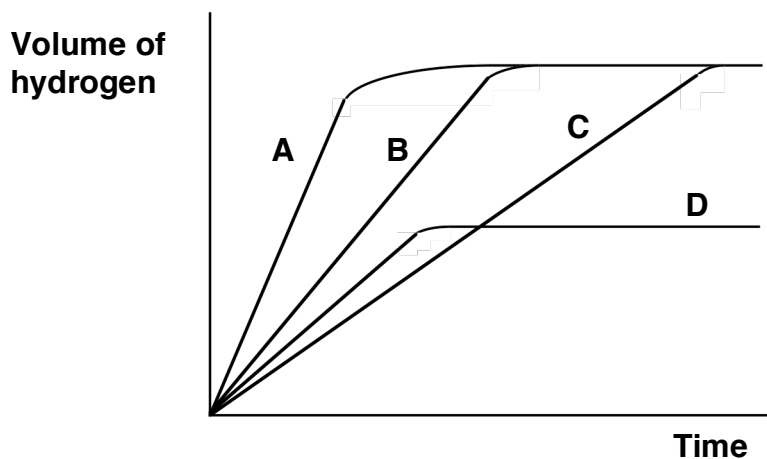
### Contents of flask Y

- 10 g chalk powder (excess)  
50 cm<sup>3</sup> of 1 mol l<sup>-1</sup> HCl (aq)  
20 °C
- 4 cm magnesium ribbon  
50 cm<sup>3</sup> of 1 mol l<sup>-1</sup> HCl (aq) (excess)  
20 °C

- |  |   |
|--|---|
| 3. 10 g chalk (excess)<br>50 cm <sup>3</sup> of 0.1 mol l <sup>-1</sup> HCl (aq)<br>20 °C          | 10 g chalk (excess)<br>50 cm <sup>3</sup> of 0.2 mol l <sup>-1</sup> HCl (aq)<br>20 °C          |
| 4. 4 cm magnesium ribbon<br>50 cm <sup>3</sup> of 2 mol l <sup>-1</sup> HCl (aq) (excess)<br>20 °C | 8 cm magnesium ribbon<br>50 cm <sup>3</sup> of 1 mol l <sup>-1</sup> HCl (aq) (excess)<br>20 °C |
| 5. 2 g zinc (excess)<br>50 cm <sup>3</sup> of 1 mol l <sup>-1</sup> HCl (aq)<br>20 °C              | 2 g zinc (excess)<br>50 cm <sup>3</sup> of 1 mol l <sup>-1</sup> HCl (aq)<br>40 °C              |

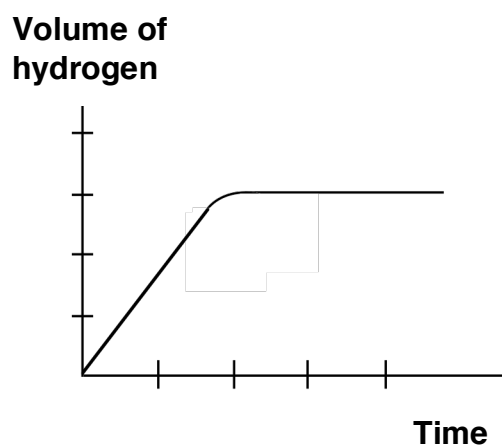
Questions 6 to 9 refer to four reactions of zinc with excess hydrochloric acid.

Curve **B** was obtained using 1 g zinc powder and 1 mol l<sup>-1</sup> acid at 20 °C.

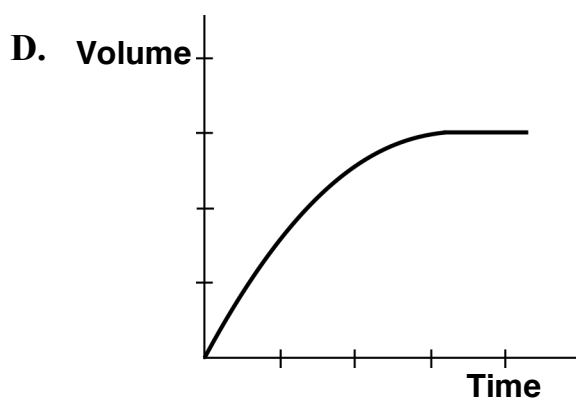
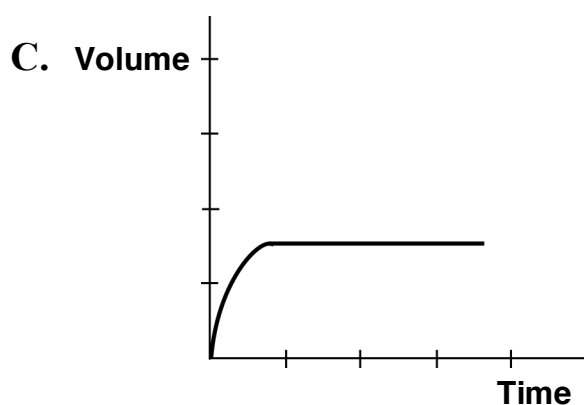
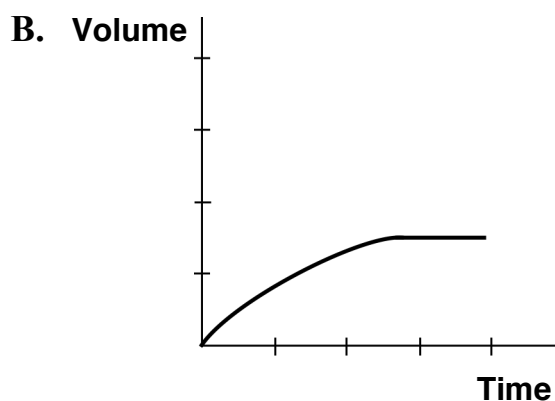
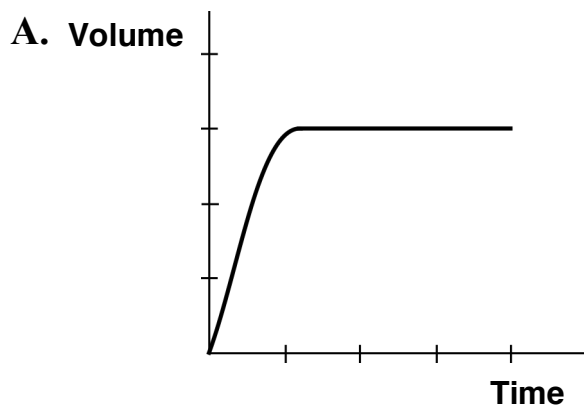


- Which curve could have been obtained using 1 g zinc powder and 1 mol l<sup>-1</sup> acid at 10 °C.
- Which curve could have been obtained using 0.5 g zinc powder and 1 mol l<sup>-1</sup> acid at 20 °C.
- Which curve could have been obtained using 1 g zinc powder and 1 mol l<sup>-1</sup> acid at 30 °C.
- Which curve could have been obtained using 1 g zinc lumps and 1 mol l<sup>-1</sup> acid at 20 °C.

10. The graph opposite shows the volume of hydrogen given off against time when an excess of magnesium ribbon is added to 100 cm<sup>3</sup> of hydrochloric acid, concentration 1 mol l<sup>-1</sup>, at 30 °C.



Which graph would show the volume of hydrogen given off when an excess of magnesium ribbon is added to 50 cm<sup>3</sup> of hydrochloric acid of the same concentration at 20 °C?



## Test 3

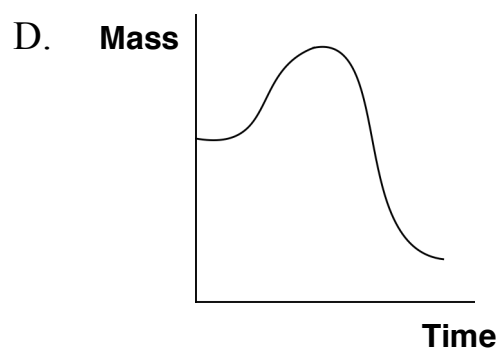
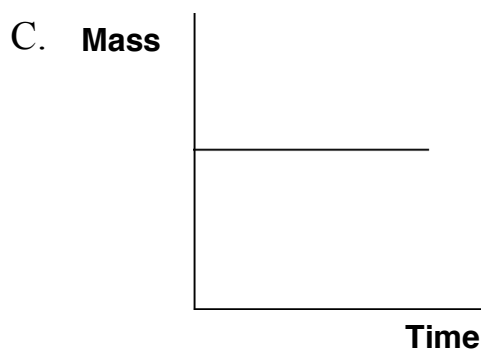
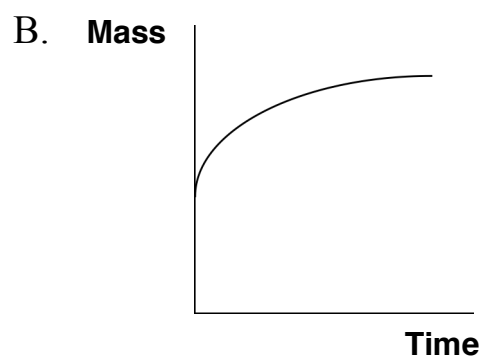
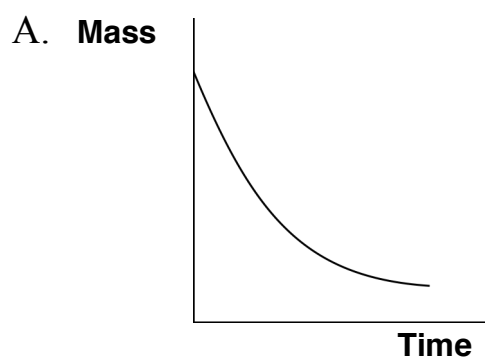
## Catalysts

In questions 1 to 8, decide whether each of the following statements is

**A.** TRUE

**B.** FALSE.

1. A catalyst can increase the rate of a reaction.
2. A catalyst can be recovered chemically unchanged at the end of reaction.
3. A catalyst plays no part in a chemical reaction.
4. Catalytic convertors are fitted to cars to catalyse the conversion of harmful gases to harmless gases.
5. A catalyst is neither a reactant nor a product in a chemical reaction.
6. A catalyst is used up in a chemical reaction.
7. Enzymes can be used in industrial processes.
8. Enzymes catalyse the chemical reactions that take place in living cells.
9. Which graph would best show what happens to the mass of the catalyst as the reaction proceeds?



## Test 4

## Following the course of a reaction

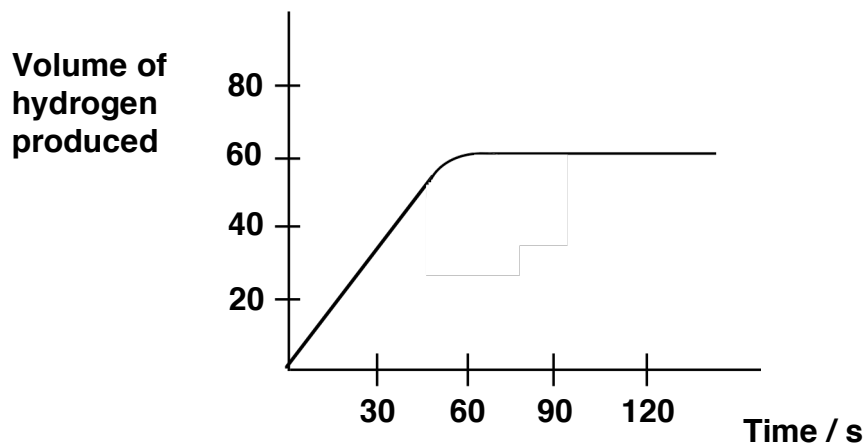
In questions 1 to 8, decide whether each of the following statements is

**A.** TRUE

**B.** FALSE.

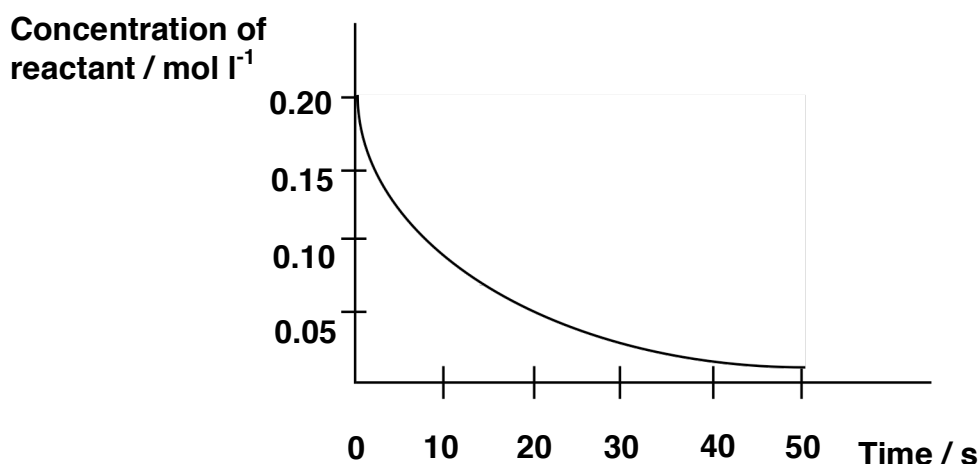
1. The unit for average rate of reaction could be  $\text{mol l}^{-1} \text{s}^{-1}$ .
2. The unit for average rate of reaction could be  $\text{cm}^3 \text{s}^{-1}$ .
3. The unit for average rate of reaction could be  $\text{mol l}^{-1}$ .
4. The unit for average rate of reaction could be  $\text{g s}^{-1}$ .
5. The unit for average rate of reaction could be  $\text{g l}^{-1}$ .
6. For a fixed change in concentration of a reactant, the shorter the time taken, the faster the rate of reaction.
7. The rate of a reaction is likely to be fastest nearer the end of the reaction.
8. For some reactions, the reaction rate can double for every temperature rise of  $10^\circ\text{C}$ .

Questions 9 to 11 refer to the graph which shows data obtained from the reaction of zinc with hydrochloric acid.



9. What was the total volume of hydrogen produced in the reaction?
- A.  $20 \text{ cm}^3$       B.  $40 \text{ cm}^3$       C.  $60 \text{ cm}^3$       D.  $80 \text{ cm}^3$
10. How long did it take for the reaction to go to completion?
- A. 30 s      B. 60 s      C. 90 s      D. 120 s
11. What was the average rate at which hydrogen was produced, in  $\text{cm}^3 \text{ s}^{-1}$ , in the first 30 s?
- A. 1.2      B. 2.4      C. 3.6      D. 4.8

Questions 12 to 14 refer to the graph which shows how the concentration of a reactant in a reaction varied with time.



12. What was the initial concentration, in  $\text{mol l}^{-1}$ , of the reactant?
- A. 0.05      B. 0.10      C. 0.15      D. 0.20
13. What was the average rate at which the reactant was used up, in  $\text{mol l}^{-1} \text{ s}^{-1}$ , in the first 20 s?
- A. 0.0025      B. 0.0050      C. 0.0075      D. 0.0150
14. What was the average rate at which the reactant was used up, in  $\text{mol l}^{-1} \text{ s}^{-1}$ , in the period 20 s to 40 s?
- A. 0.00050      B. 0.00150      C. 0.00250      D. 0.0125

## Test 5

## About elements

In questions 1 to 12, decide whether each of the following elements is

**A.** a metal

**B.** a non-metal.

**(You may wish to use the Data Booklet.)**

- |              |              |
|--------------|--------------|
| 1. silver    | 7. arsenic   |
| 2. sulphur   | 8. cobalt    |
| 3. magnesium | 9. mercury   |
| 4. iodine    | 10. platinum |
| 5. aluminium | 11. astatine |
| 6. sodium    | 12. rhodium  |

In questions 13 to 24, decide whether each of the following elements, at room temperature (20 °C), is

**A.** a solid

**B.** a liquid

**C.** a gas.

**(You may wish to use the Data Booklet.)**

- |                |              |
|----------------|--------------|
| 13. oxygen     | 19. chlorine |
| 14. iodine     | 20. bromine  |
| 15. phosphorus | 21. silicon  |
| 16. hydrogen   | 22. mercury  |
| 17. calcium    | 23. argon    |
| 18. potassium  | 24. fluorine |



In questions 25 to 36, decide whether each of the following elements is

**A.** found naturally as the element

**B.** found naturally in compounds but **NOT** as the element

**C.** made by scientists.

25. gold

26. americium

27. calcium

28. aluminium

29. fermium

30. silver

31. magnesium

32. sodium

33. zinc

34. californium

35. oxygen

36. chlorine

37. sulphur

38. nitrogen

39. carbon

40. bromine

## Test 6

## The Periodic Table

1. Approximately how many elements are in the Periodic Table?  
**A.** 58            **B.** 88            **C.** 118            **D.** 148
2. How many elements in the Periodic Table are noble (inert) gases?  
**A.** 3            **B.** 6            **C.** 9            **D.** 100
3. Approximately how many metals are in the Periodic Table?  
**A.** 55            **B.** 75            **C.** 95            **D.** 115
4. If a new element was to be discovered this year, it would most likely be  
**A.** found in the sea            **B.** found in a rock  
**C.** made in the laboratory            **D.** found in the atmosphere.

Questions 5 to 8 refer to ways of arranging elements in the Periodic Table.

Decide whether the elements in each of the following lists are in

- A.** the same group            **B.** the same period.
5. sodium, potassium, lithium
  6. carbon, nitrogen, oxygen
  7. phosphorus, aluminium, chlorine
  8. chlorine, iodine, fluorine



## Test 7

## Families of elements

The questions in this test refer to families of elements in the Periodic Table.

- A. the halogens.
- B. the alkali metals
- C. the noble (inert) gases
- D. the transition metals
- E. none of these

Use a Periodic Table to decide the family to which each of the following elements belongs.

- |               |                |
|---------------|----------------|
| 1. chlorine   | 11. platinum   |
| 2. oxygen     | 12. fluorine   |
| 3. iron       | 13. aluminium  |
| 4. argon      | 14. helium     |
| 5. sodium     | 15. rubidium   |
| 6. iodine     | 16. mercury    |
| 7. magnesium  | 17. phosphorus |
| 8. neon       | 18. zinc       |
| 9. copper     | 19. xenon      |
| 10. potassium | 20. lead       |

## Test 8

## Elements and compounds

In questions 1 to 18, decide whether each of the following substances is

**A.** an element

**B.** a compound.

- |                     |                      |
|---------------------|----------------------|
| 1. Na               | 7. bromine           |
| 2. H <sub>2</sub>   | 8. magnesium nitrate |
| 3. CO               | 9. sugar             |
| 4. HNO <sub>3</sub> | 10. salt             |
| 5. calcium sulphide | 11. iron             |
| 6. sodium           | 12. vinegar          |

In questions 13 to 18, decide whether each of the following lists of substances contains

**A.** only elements

**B.** only compounds

**C.** both elements and compounds.

13. copper sulphide, copper, zinc
14. nitrogen, oxygen, magnesium
15. sodium chloride, lead sulphide, carbon dioxide
16. O<sub>2</sub>, Mg, Br<sub>2</sub>
17. NaBr, KF, N<sub>2</sub>
18. Zn, H<sub>2</sub>O, H<sub>2</sub>

## Test 9

## Names of compounds

In questions 1 to 6, name the compounds formed from each of the following pairs of elements.

1. copper and chlorine
2. sodium and oxygen
3. iron and bromine
4. lead and sulphur
5. hydrogen and iodine
6. magnesium and nitrogen

In questions 7 to 18, name the elements in each of the following compounds.

7. hydrogen oxide
8. copper sulphate
9. calcium nitride
10. sodium carbonate
11. nitrogen hydride
12. carbon chloride
13. sodium sulphide
14. calcium sulphite
15. potassium nitrate
16. aluminium bromide
17. sodium phosphate
18. potassium chromate

## Test 10

## Particles in the atom

Questions 1 to 5 refer to the atomic particles.

A. proton                      B. neutron                      C. electron

1. Which particle has a positive charge ?
2. Which particle has a negative charge?
3. Which particle is neutral?
4. Which particle does **not** have a mass of 1 amu?
5. Which particle will pass through an electric field without being deflected?

Questions 6 and 7 refer to pairs of atomic particles.

A. neutrons and electrons                      B. neutrons and protons  
C. protons and electrons

6. What two particles are found in the nucleus?
7. What two particles are almost totally responsible for the mass of an atom?
8. An atom is neutral because it contains
  - A. a number of electrons equal to the sum of the numbers of protons and neutrons
  - B. a number of neutrons equal to the sum of the numbers of electrons and protons
  - C. a number of electrons equal to the number of protons
  - D. a number of protons equal to the number of neutrons.

9. An atom is made up of 6 protons, 6 electrons and 8 neutrons.

It will have a mass approximately equal to that of

**A.** 6 protons

**B.** 12 protons

**C.** 8 protons

**D.** 14 protons.

10. An atom is made up of 17 protons, 17 electrons and 18 neutrons.

It will have a mass approximately equal to that of

**A.** 17 neutrons

**B.** 34 neutrons

**C.** 18 neutrons

**D.** 35 neutrons.



## Test 11

## Electron arrangement and the Periodic Table

- Elements in the same group of the Periodic Table have the same
  - atomic number
  - number of electrons
  - number of shells (energy levels)
  - number of outer electrons.
- What is the electron arrangement in an atom of calcium?
  - 2,4
  - 2,8,8,2
  - 2,1
  - 2,8
- What is the electron arrangement in an atom with an atomic number of 16?
  - 2,8,8
  - 2,8,1
  - 2,8,6
  - 2,2

Questions 4 to 7 refer to numbers of outer electrons.

- 2
- 8
- 4
- 7

What is the number of outer electrons in an atom of each of the following elements?

- argon
- silicon
- magnesium
- chlorine

Questions 8 to 11 refer to numbers of outer electrons.

- 6
- 3
- 1
- 5

What is the number of outer electrons in an atom with each of the following atomic numbers?

- 8
- 7
- 10
- 13

Questions 12 to 15 refer to the following elements.

**A.** chlorine    **B.** lithium    **C.** magnesium    **D.** helium

Which element has similar chemical properties to each of the following atoms?

12. an atom with an electron arrangement of 2,8,1
13. an atom with an electron arrangement of 2,8
14. an atom with an atomic number of 9
15. an atom with an atomic number of 20

Question 16 to 19 refer to the electron arrangements shown below.

**A.** 2,8,7                      **B.** 2,8,8,2                      **C.** 2,8                      **D.** 2,8,1

Which is the electron arrangement in an atom with similar chemical properties to each of the following atoms?

16. an atom with an electron arrangement of 2,8,8,1
17. an atom with an electron arrangement of 2,7
18. an atom with an atomic number of 18
19. an atom with an atomic number of 4

## Test 12

## Atomic number and mass number

1. What is the atomic number of sodium?  
A. 2                      B. 11                      C. 19                      D. 26
2. All atoms of the one element must have the same  
A. mass number                      B. number of neutrons  
C. atomic number                      D. number of particles in the nucleus.
3. The number of protons in an atom is equal to the  
A. mass number                      B. number of neutrons  
C. number of electrons                      D. mass number less atomic number.
4. The atomic number of an atom gives the number of  
A. neutrons                      B. protons  
C. protons and neutrons                      D. electrons and neutrons.
5. The number of neutrons in an atom is equal to the  
A. number of protons                      B. number of electrons  
C. mass number less atomic number                      D. atomic number less mass number.
6. The mass number of an atom is calculated by adding together the number of  
A. protons and electrons                      B. protons and neutrons  
C. neutrons and electrons                      D. protons, neutrons and electrons.
7. The number of electrons in an atom is equal to the  
A. atomic number                      B. mass number  
C. number of neutrons                      D. mass number less atomic number.

8. An atom of an element has 10 electrons, 12 neutrons and 10 protons.  
What is its mass number?  
**A.** 12            **B.** 20            **C.** 22            **D.** 32
9. An atom of an element has 92 protons and 151 neutrons.  
What is its atomic number?  
**A.** 59            **B.** 92            **C.** 151            **D.** 243
10. The number of electrons in an atom is 34 and the mass number is 79.  
What is the number of neutrons in the atom?  
**A.** 11            **B.** 34            **C.** 45            **D.** 79
11. An atom has 26 protons, 26 electrons and 30 neutrons.  
The atom will have  
**A.** atomic number 26, mass number 56  
**B.** atomic number 56, mass number 30  
**C.** atomic number 30, mass number 26  
**D.** atomic number 52, mass number 56.
12. An atom has atomic number 20 and mass number of 40.  
The nucleus of this atom contains:
- |           | <b>Protons</b> | <b>Neutrons</b> |
|-----------|----------------|-----------------|
| <b>A.</b> | 10             | 10              |
| <b>B.</b> | 20             | 20              |
| <b>C.</b> | 20             | 40              |
| <b>D.</b> | 40             | 40              |

13. An atom has atomic number 23 and mass number 51.  
What is the number of electrons in the atom?
- A. 23                  B. 28                  C. 51                  D. 74
14. The symbol  ${}^{238}_{92}\text{U}$  shows that this uranium atom contains
- A. 238 protons and 92 electrons  
B. 92 protons and 146 neutrons  
C. 92 protons and 238 neutrons  
D. 146 protons and 92 neutrons.
15. An atom contains 8 protons, 10 neutrons and 8 electrons.  
Which of the following represents the atom?
- A.  ${}^{16}_8\text{X}$                   B.  ${}^{18}_8\text{X}$                   C.  ${}^{18}_{10}\text{X}$                   D.  ${}^{26}_{10}\text{X}$

Question 16 and 17 refer to the information in the table.

| Element       | W  | X  | Y  | Z  |
|---------------|----|----|----|----|
| Atomic number | 9  | 19 | 18 | 20 |
| Mass number   | 19 | 39 | 40 | 40 |

16. Which elements have the same number of electrons?
- A. W and X                                  B. X and Z  
C. Y and Z                                  D. none of these
17. Which elements have the same number of neutrons?
- A. W and X                                  B. X and Z  
C. Y and Z                                  D. none of these

## Test 13

## Isotopes

- Isotopes of the same element must have
  - the same number of protons and neutrons, but different numbers of electrons
  - the same number of protons and electrons, but different numbers of neutrons
  - the same number of neutrons, but different numbers of protons and electrons
  - the same number of protons, but different numbers of electrons and neutrons.
- Some atoms of an element are heavier than other atoms of the same element.

This is because they have different numbers of

  - neutrons
  - protons
  - nuclei
  - electrons.
- Which of the following statements is **not** true about isotopes?
  - Their electron arrangements are the same.
  - The masses of their nuclei are different.
  - Their numbers of protons are different.
  - Their nuclear charges are the same.
- The two isotopes of carbon,  ${}^{12}_6\text{C}$  and  ${}^{14}_6\text{C}$ , differ from each other in
  - mass number
  - atomic number
  - chemical properties
  - electron arrangement.

5. An isotope of oxygen of mass number 18 differs from the most abundant form of oxygen in
- A. the number of atoms per molecule
  - B. the number of electrons in the outer shell (energy level)
  - C. the number of protons in each nucleus
  - D. the ratio of neutrons to protons in the nucleus.

In questions 6 to 11, decide whether each of the following pairs of atoms are

- A. isotopes of the same element
  - B. **NOT** isotopes of the same element.
6. an atom with 6 protons and 8 neutrons  
and  
an atom with 8 protons and 8 neutrons
7. an atom with 10 protons and 10 neutrons  
and  
an atom with 10 protons and 12 neutrons.
8. an atom with atomic number 17 and mass number 35  
and  
an atom with atomic number 17 and mass number 37
9. an atom with atomic number 1 and mass number 2  
and  
an atom with atomic number 2 and mass number 4
10.  ${}^{16}_8\text{W}$  and  ${}^{18}_8\text{X}$
11.  ${}^{40}_{19}\text{Y}$  and  ${}^{40}_{20}\text{Z}$

12. Which pair or pairs of the following atoms are isotopes of the same element?



- A. W, X only                      B. W, Y only  
C. W, X and Y, Z                D. no pair

- 13.

| Atom | Number of protons in nucleus | Nuclear charge |
|------|------------------------------|----------------|
| 1    | 50                           | 36             |
| 2    | 50                           | 37             |
| 3    | 49                           | 38             |
| 4    | 52                           | 38             |

From the information given in the table, which of the following pairs of atoms are isotopes?

- A. 1 and 2    B. 2 and 3    C. 2 and 4    D. 3 and 4
14. An isotope of an element can be represented  ${}_{24}^{50}\text{X}$ .

Which of the following is most likely to represent another isotope of the element?

- A.  ${}_{23}^{50}\text{X}$     B.  ${}_{24}^{52}\text{X}$     C.  ${}_{24}^{82}\text{X}$     D.  ${}_{25}^{50}\text{X}$