

MARK SCHEME

GCSE

CHEMISTRY

AQA - COMBINED SCIENCE

C1 - TEST 4

ATOMIC STRUCTURE AND THE PERIODIC TABLE

Intermediate

Mark schemes

- 1.** (a) + (1) 1
- neutron 1
- answers must be in the order shown*
- (b) because there is one / same number of electron(s) in outer energy level / shell 1
- (c) (i) unreactive **or** full outer energy level / shell 1
- (ii) helium has only two electrons in outer energy level
accept helium is less dense than air 1
- [5]**
- 2.** (a) contains only one sort of atom 1
- (b) platinum is not a compound / mixture / alloy
- or**
- platinum is an element so should have own (unique) symbol
- or**
- symbol shown represents 2 different sorts of atom
allow platinum is (an element so) not made of gold and silver 1
- (c) it contains two silver ions **and** one oxide ion
maximum of 1 mark if mention of being mixed together / covalently bonded
allow silver atoms for silver ions
allow oxygen atom / ion for oxide ion
allow for 1 mark:
it is silver oxide
- or**
- it is made of silver and oxygen*
- or**
- it is a compound*
- or**
- correct ratio of 2:1 atoms / ions for incorrect element(s)*
- 2
- [4]**

3.

- (a) hydrogen has one proton whereas helium has two protons

accept numbers for words

accept hydrogen only has one proton

ignore references to groups

1

hydrogen has one electron whereas helium has two electrons

accept hydrogen only has one electron

allow helium has a full outer shell (of electrons)

1

hydrogen has no neutrons **or** helium has two neutrons

if no other mark awarded, allow helium has more electrons / protons / neutrons for 1 mark

1

- (b) (i) 2 electrons on first shell **and**

8 electrons on outer shell

1

- (ii) they have a stable arrangement of electrons

accept they have full outer energy level / shell of electrons

*do **not** accept they have the same number of electrons in their outer energy level / shell*

allow they are noble gases

ignore they are in group 0

1

[5]

4.

- (a) (iron) is a metal

accept transition element

allow (iron) had different properties (to oxygen and sulfur)

ignore electrons

1

- (b) so that elements with similar properties could be placed together

allow to make the pattern fit

ignore undiscovered elements

1

- (c) atomic number(s)

allow proton number(s)

1

- (d) all have one electron in the outer shell (highest energy level)

allow same number of electrons in the outer shell (highest energy level)

1

(so they) have similar properties

or

react in the same way

allow specific reactions e.g. with water

1

[5]

5.

(a) Li **and** K

either order

*allow lithium **and** potassium*

1

(b) Fe

allow iron

1

(c) N **and** As

either order

*allow nitrogen **and** arsenic*

1

(d) Cu

allow copper

1

[4]

6.

(a) electron

1

atom

1

nucleus

1

orbit

1

(b) positive charge is provided by protons

1

(every atom of the same element contain the) same number of protons

*do **not** accept same number of protons and neutrons*

ignore reference to electrons

1

(c) $v = 300\,000\,000 \times \left(\frac{7}{100}\right)$

allow any correct method of determining 7% of 300 000 000

1

$v = 21\,000\,000$ (m/s)

allow 2.1×10^7 (m/s)

1

an answer of 21 000 000 scores 2 marks

(d) $r = 6 \times 2.5 \times 10^{-11}$

allow a ratio in the range of 5.7–6.3 or measurements that would give this range, correctly substituted

1

$r = 1.5 \times 10^{-10}$ (m)

allow 1.4×10^{-10} to 1.6×10^{-10}

their ratio $\times 2.5 \times 10^{-11}$ correctly calculated scores 1 mark

1

an answer in the range 1.4×10^{-10} to 1.6×10^{-10} scores 2 marks

[10]

7.

(a) (i) protons

allow "protons or electrons", but do not allow "protons and electrons"

1

(ii) protons plus / and neutrons

1

(b) (because the relative electrical charges are) $-(1)$ for an electron and $+(1)$ for a proton

allow electrons are negative and protons are positive

1

and the number of electrons is equal to the number of protons

if no other mark awarded, allow 1 mark for the charges cancel out

1

(c) (the electronic structure of) fluorine is 2,7 and chlorine is 2,8,7

allow diagrams for the first marking point

1

(so fluorine and chlorine are in the same group) because they have the same number of or 7 electrons in their highest energy level or outer shell

if no other mark awarded, allow 1 mark for have the same / similar properties

1

(d) S

1

(e) (i) ions

1

(ii) molecules

1

[9]

8.

(a) group 0

1

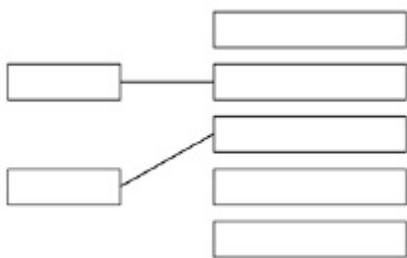
(b) left gaps

1

in some places changed the order based on atomic weights

1

(c)



1

1

(d) (electron) **A**

(neutron) **B**

(proton) **C**

3 correct answers scores 2 marks

1/2 correct answers scores 1 mark

2

(e) $\frac{23}{6.02 \times 10^{23}}$

1

$3.820598... \times 10^{-23}$

1

3.8×10^{-23}

an answer of 3.8×10^{-23} scores 3 marks

1

(f) $227 \times 10^{-12} \times \frac{1}{10\ 000} \text{ m}$

1

[11]

9.

- (a) (i) electronic structure 2,3 drawn
allow any representation of electrons, such as, dots, crosses, or numbers (2,3) 1
- (ii) nucleus 1
- (iii) protons and neutrons
do not allow electrons in nucleus 1
- (relative charge of proton) +1
allow positive 1
- (relative charge of neutron) 0
allow no charge/neutral 1
- ignore number of particles* 1
- (b) too many electrons in the first energy level or inner shell
allow inner shell can only have a maximum of 2 electrons 1
- too few electrons in the second energy level or outer shell
allow neon has 8 electrons in its outer shell or neon does not have 1 electron in its outer shell
allow neon has a stable arrangement of electrons or a full outer shell 1
- neon does not have 9 electrons or neon has 10 electrons
allow one electron missing
allow fluorine has 9 electrons 1
- ignore second shell can hold (maximum) 8 electrons or 2,8,8 rule or is a noble gas or in Group 0*
max 2 marks if the wrong particle, such as atoms instead of electrons
if no other mark awarded allow 1 mark for the electronic structure of neon is 2,8

[8]