AQA GCSE CHEMISTRY (HIGHER) · 8462

CHEMISTRY



MARK SCHEME

4.1.2 THE PERIODIC TABLE (PACK 4)

SCORE	PERCENTAGE
/124	%

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Q1.

(a) 2 and 3

both needed

1

(b) (i) atomic number / proton number

electrons neutral

1

(ii) argon has more neutrons

accept more particles in nucleus

1

(iii) increases

1

by one with each element

1

[5]

Q2.

(a) conducts electricity

1

density low

1

(b) any **two** from:

unreactive (with water)

forms compounds with covalent bonds

high melting point

2

[4]

Q3.

(a) He

1

(b) carbon / silicon / germanium / tin / lead

accept correctly written symbols
C / Si / Ge / Sn / Pb

1

(c) copper

accept Cu

1

(d) iodine

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accept I or I_2

1

[4]

Q4.

(a) (i) same number of electrons

allow all have 7 electrons

1

in outermost shell

1

(ii) fluorine has fewer shells than iodine / less shielding

1

gains electrons more easily / more pull

1

(b) outermost shell full

1

no tendency to lose / gain electrons

1

[6]

Q5.

(a) C

1

(b) (i) C1 immediately below F

do not credit C below F

1

(ii) iodine or I **or** I_2

do not credit iodide

1

(c) K **or** accept word potassium

do not credit word potassium

1

(d) Li **or** K **or** Rb **or** Cs **or** Fr

*do not credit lithium **or** potassium **or** rubidium **or** caesium **or** francium*

1

[5]

Q6.

(a) (i) sodium

do not credit Na

1

(ii) chlorine

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do not credit Cl

1

(iii) helium

do not credit He

1

(b) (i) any **one** from

react with water

do not credit just 'very reactive'

*accept a recognised general reaction for a Group I metal such as reacts with oxygen **or** chlorine **or** acids*

form alkalis with water

give off hydrogen with water

It must specify a named chemical reaction

1

(ii) any **one** from

low melting

accept solid

low density

accept float on water

malleable

soft

accept easily cut with a knife

ductile

shiny

(good) conductors

1

[5]

Q7.

(a) (i) Cl

only

1

(ii) Na

only

1

(b) (i) Mg

only

1

(ii) halogens

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do not credit halide

1

(c) (i) 2.8

*ignore commas **or** fullstops*

1

(ii) 2.8.3

1

(d) the number of protons

*accept the number of electrons in an atom **or** 'number of protons or electrons'*

do not credit just the number of electrons

1

(e) neutron

1

[8]

Q8.

(a) gas

1

(b) (i) acid

ignore any reference to a particular kind of acid

1

(ii) 7

1

(c) 1

*credit potassium **or** K written into Group 1*

1

(d) (i) reacts rapidly **or** quickly **or** fast

*credit melts **or** fizzes **or** dissolves **or** violently **or** less violently (than K)*

1

sodium hydroxide **or** hydrogen

*credit NAOH **or** H2*

1

(ii) add universal indicator

*credit add indicator **or** litmus **or** use pH paper*

1

turns blue **or** purple

credit 'it goes purple' providing something has been added to the water

1

(e) any two from

heat **or** warm

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cut it up **or** have smaller pieces or larger surface area

*do not accept more lithium **or** less water*

stir

2

[10]

Q9.

(a) (i) any **one** from

noble gases inert gases

*accept group O **or** group 8 do not accept rare gases*

1

(ii) any **pair** from

an appropriate reason gains the second mark

balloons lighter than air
airships lighter than air **or** non-flammable

do not accept light
*do not accept they go up **or** rise in the air **or** unreactive*

for divers (air supply) insoluble in blood **or** to stop the bends

2

(iii) neon **or** argon

accept krypton, xenon, radon

1

(iv) Ne **or** Ar

accept Kr, Xe, Rn
*do not accept NE **or** AR **or** ne **or** ar etc*

1

(b) any **two** from

oxygen
nitrogen
hydrogen
chlorine
fluorine

2

(c) any **pair** from

the first mark for the name and the second mark for the correct symbol

sodium Na
potassium K
lithium Li

accept rubidium, caesium, francium Rb, Cs, Fr

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do not accept NA or na etc

2

(d) any **one** from

low density

accept floats on water

soft

*accept malleable **or** ductile*

grey

shiny when cut

conducts electricity **or** heat

1

[10]

Q10.

(a) 2.8.2. magnesium or 2.8.8.2. calcium
inner shell (2)
outer shell (2)
intermediate shell/s correct
element named to match structure

each for 1 mark
(Structure correct for element name but not in group 2, award 2 marks)

4

(b) Similar hydrogen and/or an alkali/hydroxide produced

for 1 mark

Reasons: chemical reaction involves loss of an electron
Na + Li have the same number of electrons in the outer shell
(*do not allow* same group of p.table)

each for 1 mark

Different rate of reaction faster for sodium*

for 1 mark

Reason: outer electron more easily lost from the sodium atom
[* allow sodium hydroxide produced]

for 1 mark

5

[9]

Q11.

(a) (i) 9

(ii) 2.8.7 gas

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(iii) liquid

each for 1 mark

4

(b) increase as go down the table/F → I/down group/
as more protons/as atoms get bigger

for 1 mark

1

(c) (i) reactions depend on taking/sharing electrons
same number of electrons in outer shell/highest energy level

(ii) F → I electrons in a higher energy level/further from nucleus
so less easy to gain/hold electrons

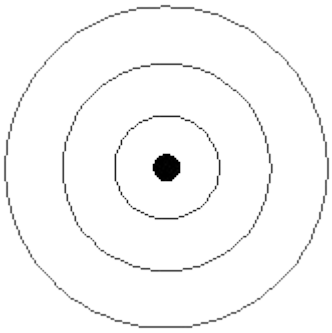
each for 1 mark

4

[9]

Q12.

(a)



each shell completed correctly
[*for written 2.8.2 award 1 mark*]

for 1 mark each

3

(b) idea that

- chemical reactions of metals, involves losing electrons

  for 1 mark

- these three elements have the same number
  of electrons in the outer shell/highest energy level

  gains 1 mark

but

- these three elements all have two electrons in
  the outer shell/highest energy level

  gains 2 marks

All form ions with a 2+ charge gains all 3 of these marks

- reactivity depends on how easily the electrons are lost

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for 1 mark

- the further the electrons are from the nucleus/the higher the energy level they are in, the more <u>shells</u> the atom has* then the more easily they are lost

  for 1 mark

- in calcium the electrons are further from the nucleus than in magnesium than in beryllium

  for 1 mark

or as you go down the group .....
(*not just "the more electrons"....)

6

[9]

Q13.

(a) (i) W and Z (allow oxygen and sulphur)

for 1 mark

(ii) Group 6

for 1 mark

2

(b) W and Y (allow oxygen and nitrogen or correct symbol for any 2 gaseous elements)

for 1 mark

1

(c) (i) (S)
- produce an alkali/hydroxide *each*
- produce hydrogen <u>or</u> idea of effervescence

(D)
- (alkali is) <u>sodium</u> hydroxide
- the reaction is faster/more vigorous

any 3 • for 1 mark

3

(ii) *ideas that*

potassium is further down the group <u>or</u> more electron shells

gains 1 mark

but because the electrons in potassium are further from the nucleus/in a more outer shell / in a higher energy level

gains 2 marks

so they are most easily lost **or** less strongly pulled/held by nucleus

for 1 mark

3

[9]

Q14.

(a) sodium / magnesium / aluminium *(Allow correct symbols)*

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for 1 mark

1

(b) argon (Allow correct symbols)

for 1 mark

1

(c) chlorine (Allow correct symbols)

for 1 mark

1

[3]

Q15.

- correct reactants (i.e. sodium + water either way round)
- correct products (i.e. sodium hydroxide + hydrogen, either way round)
- arrow → / = [do <u>not</u> allow produce/makes or similar]

[do <u>not</u> allow symbols or formulae]

each for 1 mark

[3]

Q16.

(a) *ideas that*

- hydrogen is in a group / is with the halogens
- only seven groups / no group O / no noble gases / fewer elements
- halogens are in the first group / Group 1
- other elements are in one group higher / **<u>one</u>** example
- modern table only has two elements in the top row/period
- metals and non-metals are not separated
- arranged in increasing mass number *[Credit converse answers]*

any three for 1 mark each

3

(b) *ideas that*

- all rows / periods are the same length / have seven elements
- all elements had to be in one of the groups
- **<u>he didn't know</u>** about the noble gases / not all the elements **<u>had been discovered</u>**
- he didn't know about atomic number / proton number / atomic structure / electron structure

any one for 1 mark

1

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[4]

Q17.

(a) ideas that

- hydrogen is in a group / is with the halogens
- only seven groups / no group O / no noble gases / fewer elements
- halogens are in the first group / Group 1
- other elements are in one group higher *(or example)*
- modern table only has two elements in the top row / period
- modern table not in order of atomic weight/mass
- metals and non-metals not at opposite ends

(NB allow converse answers throughout)

any three for 1 mark each

3

(b) ideas that

- all rows / periods are the same length / have seven elements
- all elements had to be in one of the groups
- he didn't know about the noble gases / not all the elements had been discovered
- he didn't know about atomic/proton number/electron structure
- he arranged elements in order of atomic weight/mass

any one for 1 mark

1

(c) (i) *ideas that*
tellurium and iodine are in reverse order

for 1 mark

1

(ii) elements are arranged in order of proton (atomic) number
or based on electron structure/outer shell electrons
(so tellurium is correctly placed before iodine)
[tellurium = 'dead mark']

each for 1 mark

2

[7]

Q18.

(a) A is sodium/Na*
B is argon/Ar*

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each for 1 mark
*(*case of letters must be correct)*

2

(b) (i) *ideas that*

- outer electron (in element C / 2.8.8.1 / potassium) is at a higher energy level / in a more outer shell/further away from nucleus / shielded by more full electron shells
- electron is more easily lost/less strongly held / attracted

each for 1 mark

2

(ii) *ideas that*

- (element B / 2.8.8 / argon) has an outer shell that is complete/has 8 electrons
- no tendency to gain or lose electrons / has a stable configuration
- *(not 'is stable' / 'in group O' / 'a noble gas')*

each for 1 mark

2

[6]

Q19.

(a)
- water

(allow *acid**)

- (metal) hydroxide (solution)/alkali

(allow metal salt / compound)

- hydrogen

(allow hydrogen)
for 1 mark each

(*if named acid then matching salt)

or

- oxygen / chlorine / halogen
- for *1 mark*
- oxide / chloride / halide

gains 1 mark

but

- named oxide(s) *gains 2 marks*

(accept fully correct formulae throughout)

3

(b) *idea that*

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- hydrogen and iodine would only react if heated to > 200°C / a high temperature (*ignore* reference to light / dark)

- reactivity decreases down the Group / iodine is lower in the Group than bromine / iodine is the lowest in the Group

(**or** converse N.B. credit this idea here even if given in (d))

for 1 mark each

2

(c) $H_2 + Cl_2 \rightleftharpoons 2HCl$ or $\frac{1}{2}H_2 + \frac{1}{2} Cl_2 \rightarrow HCl$

for 1 m*ark*

1

(d) idea that (or converse)

- in atoms lower down the Group the electrons in the outer shell / highest energy level (of electrons) are further from the nucleus **or** shielded by more (inner) shells / electrons

[but not simply "more electrons"]

or are less strongly attracted to the nucleus

- so an electron is less easily gained

for 1 mark each

2

[8]

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