edexcel

Edexcel GCE

Chemistry

6241/01

June 2006

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Results Mark Scheme

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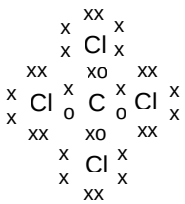
Chemistry
6241/01

1 (a) $..2s^2 2p^2$ *OR* $1s^2 2s^2 2p^2$ *OR* $(1s^2)2s^2 2p_x^{\ 1} 2p_y^{\ 1}$
ALLOW capitals and subscripts **(1 mark)**

(b) large gap/jump between 4th and 5th ionisation energies (so fifth in inner shell) **(1 mark)**

(c) 4 pairs of electrons around C atom **(1)**
all lone pairs shown **(1)**
Mark independently



ALLOW all dots/crosses **(2 marks)**
Any attempt at an ionic diagram **(0)**

(d) (i) High energy/fast/gun electrons hit/strike
OR bombarded by electrons **(1)**

Removes/knocks out electron **(1)**
OR equation e.g. $X \rightarrow X^+ + e^{(-)}$ *IGNORE state symbols*
If knock out is mentioned, hit/strike is not required in 1st mark **(2 marks)**

(ii) magnetic field/magnet/electromagnet/magnetic plates **(1 mark)**

(e) (i) mass of one **atom** (of the isotope) **(1)**
relative to 1/12th of the mass of **(1)**
a carbon -12 **atom (1)**

OR 2nd and 3rd marks can be awarded as follows:
On a scale where a ^{12}C atom **(1)**
has a mass of 12 (*NOT* grams) **(1)**

Word "atom" need only be mentioned once
Word "mass" need only be mentioned once
If define R.A.M……**max1** **(3 marks)**

(ii) 162 *IGNORE* units **(1 mark)**

(iii) (atoms with) same no. of protons **(1)**
NOT same atomic number
"different number of electrons" loses 1st mark but IGNORE "same number of electrons"

different number of neutrons **(1)**
NOT different mass number
Penalise incorrect reference to number of electrons **(2 marks)**

(iv) same number of electrons *IGNORE* "same number of protons"

OR same electronic configuration/pattern/structure
NOT same number in outer orbit **(1 mark)**

Total 14 marks

2 (a) (i) Covalent **(1 mark)**

(ii) Induced-dipole(-induced dipole)/dispersion/London/v der Waals/vdw
Temporary or instantaneous can be used instead of induced

NOT "dipole" forces
NOT permanent dipole
NOT dipole-dipole **(1 mark)**

(iii) polymer has stronger/more vdw/intermolecular forces **(1)**
ALLOW dipole forces

because it has more electrons/larger electron cloud/more contact area **(1)**
NOT larger molecules/surface area

so more energy/heat needed to overcome/break these forces
OR so more energy/heat needed to separate these molecules **(1)**
NOT breaking **bonds**
3rd mark is NOT stand alone **(3 marks)**

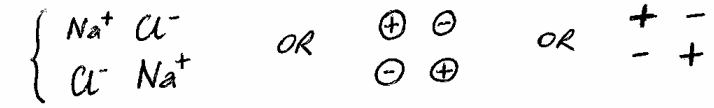
(b) **strong** attraction between Mg **ions**/Mg^{2+}/cations/metal ions **(1)**
NOT electrostatic forces/metallic bonds

and **delocalised**/**sea** of electrons **(1)**
Mark independently **(2 marks)**

(c) Ionic/electrovalent **(1)**

diagram shows alternating cations and anions in planar arrangement **(1)**

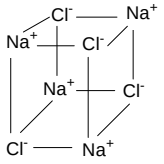
2nd mark



OR labelled "blobs" – minimum labelling is "Na/sodium ion" and "chloride ion"

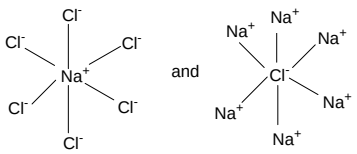
in 3-D structure/at least 2 (part) layers shown **(1)**

2nd and 3rd marks



(2)

OR



(2)
If only one of them given **(1)** **(3 marks)**

Total 10 marks

3 (a) (i) Red/brick-red/orange-red **(1)**
NOT 'Orange' *on its own*

Yellow **(1)** *ALLOW* orange **(2 marks)**

(ii) electrons promoted (by heat/flame to a higher level) **(1)**
NOT electrons excited

fall back down/return **(1)**

emit light **(1)** **(3 marks)**

(b) (i) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
OR ½ this OR multiples of this
IGNORE state symbols **(1 mark)**

(ii) $Na_2O + H_2O \rightarrow 2NaOH$ **(1 mark)**
OR ½ this OR multiples of this
IGNORE state symbols

(c) Bubbles/fizz/effervescence **(1)**
float/move about (on surface) **(1)**
melts/forms sphere **(1)**
gets smaller/disappears **(1)**
burns with yellow flame **(1)**
IGNORE dissolves OR gets hot
IGNORE explodes/ignites

IGNORE gas/fumes

Any two

(2 marks)

(d) KO_2
OR O_2K **(1 mark)**

Total 10 marks

4 (a) (i) -1/-I, 0 -1/-I, 0
minus can be either side, sub or superscript

iodine no's correct **(1)**
chlorine no's correct **(1)** **(2 marks)**

(ii) chlorine oxidation number goes down/goes from 0 to -1, so reduced **(1)**

iodine oxidation number goes up/goes from -1 to 0, so oxidised **(1)**
Mark consequentially on (a)(i) **(2 marks)**

(iii) moles NaI= $\frac{30.0}{150}$ = 0.2 **(1)**

moles I_2 = 0.1 **(1)**

mass of I_2 = 0.1 x 254 = 25.4 (g) **(1)**

OR
300g NaI **(1)** => 254g I_2 **(1)**

30.0 x $\frac{254}{300}$ = 25.4(g) **(1)**

Correct answer with some working **(3)**
Use of atomic numbers **2 max**
Penalise wrong units **(3 marks)**

(iv) vol = 0.1 x 24 = 2.4 (dm^3)
If not 2.4, check for consequential on (a)(iii) **(1 mark)**

(b) (i) black/grey/grey-black **(1)**
NOT blue-black
NOT purple
IGNORE shiny/silvery

Solid **(1)** **(2 marks)**

(ii) $I(g) \rightarrow I^+(g) + e^{(-)}$ *OR* $I(g) - e^{(-)} \rightarrow I^+(g)$

species **(1)**
state symbols **(1)** – *award state symbols mark only if species correct and in correct place, or if wrong halogen used*
If I_2 *OR* $\frac{1}{2}I_2$ **(0)** **(2 marks)**

(iii) nuclear charge increases/more protons **(1)**

(but) **more** shielding/screening
OR extra shells between outer shell/valence/electrons and nucleus **(1)**

outer electron further from nucleus/iodine's **outer** electron in higher energy level/shell (therefore less energy). **(1)**
ACCEPT "electron being removed" instead of "outer"
(3 marks)

Total 15 marks

5 (a) (i) 4 pairs of electrons /2 lone pairs and 2 bond pairs **(1)**

so electron pairs arranged tetrahedrally
OR
Arranged to give maximum separation/minimum repulsion **(1)** **(2 marks)**

(ii) 103 – 105 (°) **(1)**

lone pair repulsion> bond pair repulsion **(1)** **(2 marks)**

(b) (i) trigonal planar diagram **(1)**
e.g two opposite wedges gets **(1)**
three wedges of two types gets **(1)**
one wedge only gets **(0)**
IGNORE name

120 (°) marked on diagram **(1)** – *stand alone* **(2 marks)**

(ii) B and Cl have different electronegativities / Cl more electronegative than B
OR different electronegativities explained **(1 mark)**

(iii) Dipoles (or vectors) cancel/symmetrical molecule/centres of positive and negative charges coincide
IGNORE polarity cancels **(1 mark)**

(iv) Induced-dipole(-induced dipole)/dispersion/London/v der Waals/vdw
Temporary or instantaneous can be used instead of induced

NOT "dipole" forces
NOT permanent dipole
NOT dipole-dipole **(1 mark)**

(c) $\frac{14.9}{31} = (0.481)$ $\frac{85.1}{35.5} = (2.40)$ **(1)**

$\frac{0.481}{0.481} = 1$ $\frac{2.40}{0.481} = 5$, so **PCl_5** **(1)**

Use of atomic number **max 1** **(2 marks)**

Total 11 marks

Paper Total: 60 Marks