Chemistry A (1530)

Paper 3H

MARK SCHEME – Summer 2004

1. (a)

–1;
0 / neutral;
(+)1; in the nucleus; 4

(b) beryllium atom - outer shell = 2;
magnesium atom - outer shell = 2;
Be inner shell = 2 **and** Mg inner shell = 2.8; 3
[Reject mention of protons / neutrons]

(c) **both** have two outer electrons / same number of outer electrons; 1
[Ignore both group 2]

(d) (i) 9; 1

(ii) 10; 1

Total 10 marks

2. (a) transition metals; 1

(b) Any suitable use, for example, aircraft bodies / hip joint / making alloys; 1

(c) $Ti + O_2 \longrightarrow TiO_2$
reactants;
products; 2
[Two marks cannot be credited if incorrectly balanced]

(d) (i) Ti^{4+}; 1
[Allow Ti^{+4}]

(ii) O^{2-}; 1
[Allow O^{-2}]

(iii) 2. 8; 1

(iv) ionic; 1

Total 8 marks

3. (a) item - any suitable item;
property - any relevant property; [Ignore cost arguments] 2

(b) An explanation to include:
1. (long) chain / large molecule / high molecular mass;
2. of repeating small units / monomer; 2

plus one communication mark for using a suitable structure and style of writing 1

(c) (i) Any two from:
1. reduces waste / less landfill;
2. (makes monomers) to reuse / recycles plastic;
3. conserves oil; 2

(ii) energy used / expensive; 1

Total 8 marks

4. (a) (i) X **and** Z; 1

(ii) carbon and hydrogen **only** / no chlorine; 1

(b) X / methane / CH_4; 1

(c) butane; 1

Total 4 marks

5. (a) loss of oxygen / gain of electrons; 1
[Ignore gain of hydrogen]

(b) (i) limestone / calcium carbonate;
coke / carbon; [Reject coal]
(hot) air / oxygen; 3

(ii) carbon monoxide; 1

(iii) road (foundations) / building materials / fertilisers; 1
[Reject surfacing]

(c) (i) An explanation to include two from:
2. mixture has lower melting point /
bauxite has higher melting point / lowers temperature of process;
2. requires less electricity / energy / more economic /
aluminium would vaporise at higher temperature /
casing would melt;
3. improved conductivity; 2

(ii) An explanation to include:
1. oxygen (formed at anode);
2. reacts with carbon / anode;
3. to form carbon monoxide or dioxide / wears anode away (consequential); 3
[Equation could score any / all of these marks]

(d) An explanation to include three from:

1. aluminium more reactive (than iron);
2. compounds of aluminium more stable (than compounds of iron) / harder to extract from ore;
3. requires more energy / electricity / electrolysis;
4. electricity is expensive; 3

plus one communication mark for presenting relevant information in a form that suits its purpose 1

Total 15 marks

6. (a) A description to include three from:

1. hydrogen peroxide measured out;
2. use of appropriate apparatus;
3. heat hydrogen peroxide to 30°C;
4. time fixed volume gas / until gas stops / measure gas / weigh;
5. carry out repeats;

[Do not allow full marks if method / apparatus would not work] 3

plus one communication mark for ensuring that spelling, punctuation and grammar are accurate so that the meaning is clear 1

(b) A description to include three from:

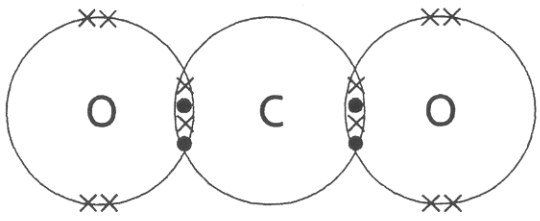
1. repeat same experiment with catalyst;
2. reaction faster;
3. weigh catalyst at beginning and at end;
4. filter and dry catalyst / catalyst remains unchanged / black powder remains;
5. product same in each case; 3

(c) (i) catalyst in biological system / OWTTE; 1

(ii) any suitable process; 1

Total 9 marks

7. (a)



a shared pair of electrons;
two double bonds;
remainder of electrons around the oxygen atoms; 3
[Any inner shells must be correct]

(b) covalent;
shared (pairs of) electrons; 2

(c) (i) $C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$
reactants;
products;
balanced; 3

(ii) An explanation to include:
1. carbon monoxide released;
2. poisonous / toxic; [Reject harmful etc]; 2

Total 10 marks

8. (a) (i) (percentage) increases; 1

(ii) increased cost / increased risk of **explosion**; 1

(b) (percentage) decreases; 1

(c) An explanation to include three from:
1. increase energy of particles;
2. move faster / moves about more;
3. more collisions;
4. more successful collisions; 3

(d) (i) 2(14 + 4) + 32 + (4 x 16);
or
132; 1

(ii) A calculation to include:
1. $2 \times 17 \longrightarrow 132$;
2. 100 tonnes $\longrightarrow \frac{132 \times 100}{2 \times 17}$ tonnes;
3. = 388 (tonnes); 3

(e) A suggestion to include two from:
1. **excess** fertilizer;
2. washed away (by rainfall);
3. causes pollution qualified / eutrophication / algae growth / distortion of plant growth;
4. avoids wastage / cost of excess fertilizer; 2

Total 12 marks

9. (a) boiling point **increases** as the atomic number **increases**; 1

(b) (i) (atoms of same element with) different number of neutrons; 1

(ii) A calculation to include:

1. $\frac{(20 \times 90.9) + (22 \times 9.1)}{100}$;

2. = 20.18 / 20.2; 2

(c) An explanation to include:

1. full / complete outer shell;
2. atoms do not share / lose / gain **electrons**; 2

(d) A calculation to include:

1. mass of fluorine = 49.0 – 26.2 = 22.8 g;

2. Xe = $\frac{26.2}{131}$ = 0.2 F = $\frac{22.8}{19.0}$ = 1.2;

3. ratio 1:6;

4. empirical formula = XeF_6; [Allow ecf] 4

(e) $Xe(g) + 2F_2(g) \rightleftharpoons XeF_4(s)$

reactants;
balanced;
equilibrium symbol;
state symbols; 4

Total 14 marks

TOTAL MARK 90