

**MARK SCHEME for the October/November 2011 question paper  
for the guidance of teachers**

**0620 CHEMISTRY**

**0620/22**

Paper 2 (Core Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

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- 1 (a) (i) C [1]
- (ii) A [1]
- (iii) E [1]
- (iv) D [1]
- (v) C [1]
- (b) (i) limestone / chalk / marble [1]  
**ignore:** lime / formulae
- (ii) 3<sup>rd</sup> box down ticked (heavier than air) [1]
- (iii) H<sub>2</sub>O on right [1]  
2(HCl) [1]  
second mark dependent on correct formula for water

**[Total: 9]**

| Page 3 | Mark Scheme: Teachers' version | Syllabus | Paper |
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- 2 (a) copper → any common use e.g. electrical wiring / pipes jewellery [1]  
**ignore:** for alloys / for brass / for wires (unqualified)
- platinum → any common use e.g. inert electrode / jewellery [1]  
**allow:** for catalyst (as long as not incorrect catalyst)
- aluminium → any common use e.g. food containers / car (bodies) / aircraft (bodies) / kitchen utensils / pots and pans [1]  
**allow:** for roofing / for high voltage electrical cables  
**ignore:** for wires / for knives
- (b) (i) poisonous / harms nervous system or brain [1]  
**ignore:** harmful (without qualification)
- (ii) protons → 82 [1]  
neutrons → 125 [1]
- (c) (i) Any three of: [3]  
sodium goes into a ball /  
gets smaller / disappears  
**allow:** dissolves **ignore:** reacts  
moves (over surface)  
bubbles / effervescence /  
**ignore:** hydrogen given off  
floats on the water (as it reacts) /  
fizzes / hissing / crackling  
**ignore:** sound  
litmus turns blue /  
**ignore:** changes colour
- (ii) sodium hydroxide [1]  
hydrogen [1]
- (iii) electron [1]  
lon [1]  
gains [1]  
negative [1]

[Total: 15]

|        |                                |          |       |
|--------|--------------------------------|----------|-------|
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- 3 (a) Any two of: [2]  
temperature  
mass / amount of manganese(IV) oxide / volume of manganese(IV) oxide  
size of manganese dioxide particles  
**allow:** pressure  
**ignore:** concentration
- (b) (i) the greater the concentration the greater the speed / rate increases with concentration [1]  
**ignore:** concentration increases speed / more oxygen the grater the concentration
- (ii) less hydrogen peroxide present (in B) / more hydrogen peroxide (in A) [1]  
**allow:** hydrogen peroxide less concentrated (in B)
- (iii) time taken → 27 (s) [1]  
**allow:** 26 (s)  
volume → 37 (cm<sup>3</sup>) [1]
- (c) magnesium → copper → manganese → lead [1]  
**ignore:** oxide / oxidation numbers
- [Total: 7]**
- 4 (a) methane [1]
- (b) arrangement → random / irregularly arranged / no fixed position [1]  
proximity → close together / touching [1]  
motion → random/ sliding over each other / movement not entirely free [1]  
**allow:** move slightly
- (c) (i) arrow at tube at bottom left [1]  
**ignore:** direction of arrow
- (ii) group of (different) molecules / group of (different) hydrocarbons [1]  
implication of different molecules  
with similar / (particular) range of boiling points / molecules with similar molecular masses or small range of molecular masses [1]
- (iii) X → naphtha [1]  
Y → diesel (oil) [1]
- (iv) structure of ethane showing all atoms and all bonds [1]
- (v) 2<sup>nd</sup> box down ticked (saturated hydrocarbon) [1]
- [Total: 11]**

| Page 5 | Mark Scheme: Teachers' version | Syllabus | Paper |
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- 5 (a) molecule → two or more atoms [1]  
atom → the smallest part [1]  
ion → an atom that has become [1]
- (b) (i) pH 13 [1]  
(ii) 40 [1]  
(iii) neutralisation [1]  
(iv) pH decreases / pH goes from higher to lower pH / suitable reference to pH values e.g. from pH 12 to pH 8 [1]  
final pH below 7 / stated value below 7 [1]  
**ignore:** gets more acidic
- (c) Any six of: [6]  
bubbles (from the electrodes)  
solution goes yellow(ish) / solution goes green(ish)  
hydrogen at cathode  
chlorine at anode  
(hydrogen and chlorine gases produced at wrong electrodes = 1)  
electrodes are graphite / electrodes are carbon  
electrodes conducts electricity / electrons move in electrodes  
hydrogen (ions) go to cathode  
chloride (ions) go to the anode  
smell of chlorine  
electrolyte conducts electricity  
**ignore:** hydroxide ions

[Total: 14]

|               |                                       |                 |              |
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- 6 (a) as a reducing agent / in the blast furnace / for extracting iron or zinc or other suitable metal / to extract metals / in making lime [1]
- (b) (i) layers can slide over each other [1]  
**both** ideas of layers and sliding needed  
strong bonding in all directions / covalent bonding in all directions /  
strong bonding in macromolecules in giant structure [1]  
**both** ideas of type of bonding and giant structure needed
- (ii) for cutting / drill bits / for drills [1]
- (c) (i) ammonium sulfate [1]  
**ignore:** water / hydrogen
- (ii) nitrogen [1]
- (d) one pair of electrons in each overlap area [1]
- (e) 1<sup>st</sup> box ticked [1]  
last box ticked [1]

**[Total: 9]**

| Page 7 | Mark Scheme: Teachers' version | Syllabus | Paper |
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- 7 (a) (i) Any two of: [2]  
 have same general formula / have same pattern of formula / members differ by CH<sub>2</sub> group  
 have same functional group  
 have similar chemical properties / prepared by similar methods  
**allow:** same chemical properties  
**not:** similar properties  
 show gradual change in physical properties / show trend in boiling points
- (ii)
- $$\begin{array}{c}
 \text{H} \quad \text{H} \\
 | \quad | \\
 \text{H} - \text{C} - \text{C} - \text{O} - \text{H} \\
 | \quad | \\
 \text{H} \quad \text{H}
 \end{array}$$
- allow:** OH in place of O – H [1]
- (b) (i) exothermic and temperature increases / goes from 18 to 37 [1]  
**both:** exothermic and temperature increase needed for the mark  
**allow:** exothermic because heat is given off
- (ii) grey / black / grey-black [1]  
**not:** brown / purple
- (c) filter (off zinc); [1]  
**note:** second mark dependent on filtration for first mark  
 (let alcohol) evaporate / evaporate (off the alcohol) [1]  
**allow:** warm gently (to remove some alcohol)  
**allow:** use drying agent  
**ignore:** heat unqualified / crystallise  
**reject:** residue left to dry
- (d) (i) ZnI<sub>2</sub> [1]  
**allow:** 5ZnI<sub>2</sub>
- (ii) 2<sup>nd</sup> answer ringed (giant ionic) [1]  
**allow:** underlined or ticked
- (e) 1 mark for each product [3]  
 zinc nitrate  
 ammonium nitrate **not:** ammonia nitrate  
 water
- (f) add (aqueous) sodium hydroxide (and warm) [1]  
 test gas evolved with red litmus paper/ universal indicator paper [1]  
 litmus paper/ universal indicator paper turns blue [1]  
**note:** the 2<sup>nd</sup> and 3<sup>rd</sup> marks are dependent on the first mark being correct

[Total: 15]