**Section I - Core**

Q1. A

Q2. A

Q3. B

Q4. B

Q5. C

Q6. D

Q7. D

Q8. D

Q9. A

Q10. C

As Δ H is negative, this means the reaction is exothermic, which means heat is given off. So +heat can be added to the right hand side of the equation. Now using Le Chatelier's Principle, to get more yield of phosgene, use **low temperatures** for the reaction to shift to the right to produce more heat. Also them total moles on the LHS is 1+1 = 2, and 1 on the RHS. So **high pressures** are used so that the equilibrium shifts to the side with less moles to reduce the pressure.

Q11. A

* C1 - Meth
* C2 - Eth
* C3 - Prop
* C4 - Bute
* C5 - Pent
* C6 - Hex
* C7 - Hept
* C8 - Oct

Therefore the order of molar masses of the substances from lowest to highest is 1-pentanol, 1-hexanol, 1-heptanol, 1-octanol.

It is given in the question that lower molecular weights are detected quicker so the first spike is 1-pentanol, the second is 1-hexanol, etc. Therefore X is 1-hexanol, A.

Q12. C

Q13. C

200 \times 4.18 \times 10^{-3} \times \left ( T_f - 21 \right )kJ per \frac {0.6}{12.01 \times 3 + 1.008 \times 8 +16.00}(moles of 1-propanol, C3H7OH)

equals

2021 kJ per 1 mol *utf* − 8

Equating this ratio,

2021 \times \frac {0.6}{12.01 \times 3 + 1.008 \times 8 +16.00} = 1 \times 200 \times 4.18 \times 10^{-3} \times \left ( T_f - 21 \right )

T_f - 21 = \frac {2021 \times \frac {0.6}{12.01 \times 3 + 1.008 \times 8 +16.00}}{200 \times 4.18 \times 10^{-3}}

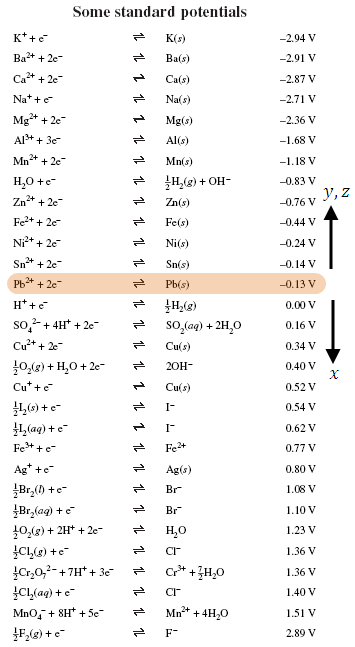
T_f = \frac {2021 \times \frac {0.6}{12.01 \times 3 + 1.008 \times 8 +16.00}}{200 \times 4.18 \times 10^{-3}} + 21

T_f = 45.14 ^\circ C

(I don't know why its different to the given options, but it closest to C (45.2))

Q14. D

The anode is the negative terminal. The anode is the more reactive metal of the two and is above the other metal on the relative activity series of metals. Therefore *x* must be below Pb on the relative activity series and *y* and *z* must be above Pb.

[](http://www.boredofstudies.org/wiki/Image:Sci_chem_pastpapers_2004hsc_14.png)

The higher the metal is on the series the greater the ease of oxidation. Therefore, going from the bottom of the series to the top we will have *x*, Pb, *z*, *y* OR *x*, Pb, *y*, *z*. Only one of these options is on the list of choices so it must be *x*, Pb, *y*, *z*.

Q15. B

(Here is how I would solve this question (there are probably better methods)):

Looking at Diagram A we can see that it is a dry cell. On a standard battery we know that the end with the part raised is positive and the flat part is negative. So 3 must be negative terminal. So the answer is either A or B. Now we know that electricity flows from cathode to anode, positive to negative, therefore 1 must be the cathode. Hence the answer is B.

[[edit](http://www.boredofstudies.org/wiki/index.php?title=2004_HSC_Chemistry_Solutions&action=edit&section=2)]

**Q16.**

(a)

A mass of solid sodium hydrogen carbonate must be accurately weighted. This solid sodium hydrogen carbonate must be transferred into a volumetric flask, which is then filled with water to the calibration line. *The moles of solid sodium hydrogen carbonate can be calculated (mass / molar mass), and the volume of solution is known from the volumetric flask used. So concentration can be calculated (concentration = number of moles of sodium hydrogen carbonate / total volume). As the concentration is known accurately it is a standard solution.* (The italics may not be required as it is not part of outlining the procedure.)

(b)

c= \frac {n}{v}

0.12 = \frac {n}{250 \times 10^{-3}}

*n* = 0.03 moles

n = \frac {m}{MM}

m = 0.03 \times \left ( 22.99 + 1.008 + 12.01 + 16.00 \times 3 \right )(NB: this assumes the equation is NaHCO3, which I am not sure of. Please check it.)

*m* = 2.52 g

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**Q17.**

(a) The left one is "vinyl chloride" and the right is "styrene".

(b)

Polyvinylchloride (PVC) (made from the vinyl chloride monomer):

Used in electrical wire coating because it is an electrical insulator, tough and flexible. Also used in water pipes as it is a non-metal it does not corrode or rust.

OR

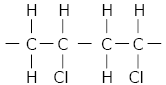
Polystyrene (made from the styrene monomer):

Used for foam cups as it is a good insulator of heat. Also used for packaging as it is easy to mould to various complex shapes.

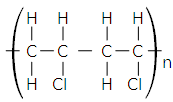
For full marks you need 2 uses and 2 properties.

(c)

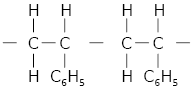
Polymer made from the vinyl chloride monomer:

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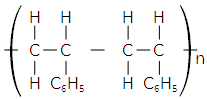
OR sometimes drawn as, (The above method is better though. See 2004 HSC Notes from the Examination Centre – Chemistry, p7.)

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Polymer made from the styrene monomer:

[](http://www.boredofstudies.org/wiki/Image:Sci_chem_pastpapers_2004hsc_17c_3.png)

OR sometimes drawn as, (The above method is better though. See 2004 HSC Notes from the Examination Centre – Chemistry, p7.)

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**Q18.**

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**Q19.**

(a)

(b) Number of moles of Copper Sulfate originally in beaker:

n = c x v

= 0.05 x 0.250

= 0.0125 moles

Mass of Copper Sulfate originally in beaker:

n= \frac {m}{M}

m = n x M (M = molar mass)

= 0.0125 x 159.62

= 1.99525 g

Weight of Copper Sulfate remaining in beaker:

1.99525 - 0.325 = 1.67 g

Moles of Copper Sulfate remaining in beaker:

n= \frac {m}{M}

= 1.67/159.62

= 0.01 moles

Concentration of Copper Sulfate remaining in beaker:

c= \frac {n}{v}

= 0.01/0.250

= 0.04 mol/L

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**Q20.**

(a)

(b)

[[edit](http://www.boredofstudies.org/wiki/index.php?title=2004_HSC_Chemistry_Solutions&action=edit&section=7)]

**Q21.**

(a) Qualitative analysis refers to observing qualities, properties or observations and making a judgement based on these observations. Quantitative analysis refers to preforming numerical calculations based on data from experiment or other to make a judgement.

(b)

(c)

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**Q22.**

(a) Amphiprotic substances are able to act as both proton donors and proton acceptors.

(b)

H2PO4– + H2O → H3O+ + HPO42-

H2PO4– + H3O+ → H2O + H3PO4

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**Q23.**

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**Q24.**

(a)

*n* = *cv*

n = 0.01 \times 10 = 0.1

c = \frac {n}{v} = \frac {0.1}{10 + 90} = 0.001mol L-1

*pH* = − *log*100.001 = 3.00

(b) They are used as food additives as they

(c)

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**Q25.**

[[edit](http://www.boredofstudies.org/wiki/index.php?title=2004_HSC_Chemistry_Solutions&action=edit&section=12)]

**Q26.**

[[edit](http://www.boredofstudies.org/wiki/index.php?title=2004_HSC_Chemistry_Solutions&action=edit&section=13)]

**Q27.**

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**Section II - Options**

[[edit](http://www.boredofstudies.org/wiki/index.php?title=2004_HSC_Chemistry_Solutions&action=edit&section=15)]

**Q28. Industrial Chemistry**

(a) (i)

(ii)

(b) (i) (ii)

(c)

(d) (i) (ii) (iii)

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**Q29. Shipwrecks, Corrosion and Conservation**

(a) (i) (ii)

(b) (i) (ii)

(c)

(d) (i) (ii) (iii)

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**Q30. The Biochemistry of Movement**

(a) (i) (ii)

(b) (i) (ii)

(c)

(d) (i) (ii) (iii)

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**Q31. The Chemistry of Art**

(a)

(i)

(ii)

(b)

(i)

(ii)

(c)

(d)

(i)

(ii)

(iii)

[[edit](http://www.boredofstudies.org/wiki/index.php?title=2004_HSC_Chemistry_Solutions&action=edit&section=19)]

**Q32. Forensic Chemistry**

(a) (i) Gel electrophoresis (ii) A mass spectrometer tests samples in a vacuum. The sample is first atomised, then its molecules split (how?) in ways characteristic to each substance in the sample, creating charged particles. These particles are then accelerated with electrical plates with increasingly negative potentials and bent in an arc with a magnetic field. The radii of the arcs of the particles are determined by their mass, their charge, and the strength of the magnetic field. The spectrometer only allows particles of a specific radius of arc to pass into the detector. By adjusting the magnetic field, this allows particles to be sorted by their mass/charge ratio. By measuring the concentrations of the particles of different mass/charge ratios, a spectrum is produced which can be compared to standard spectra to identify component chemicals in the sample and their concentration.

This is very useful to forensic chemistry as it allows samples to be compared very accurately, to establish connections between artefacts, people and crime scenes or determine whether a specific substance has been consumed by an individual by analysing their blood or urine.

(b) (i) Whilst 6 amino acids are common to both samples, vasopressin contains 2 amino acids not present in oxytocin (glutamic acid, phenylalanine), and oxytocin also contains 2 amino acids not present in vasopressin (leucine, isoleucine) (ii)

(c) The vast majority of testing in the school laboratory is qualitative. For example, flame tests to identify metal cations only demonstrate the presence of such ions, and do not indicate their concentration. Similarly, tests for carbohydrates like using Benedict's solution for identifying sugars, only establish the presence of such sugars.

For forensic chemists, this is rarely sufficient. Forensic chemists need quantitative analysis because this gives the much broader distinction between samples necessary for establishing connections between samples. For testing metal ions, AAS is often used, which gives extreme accuracy and can detect very low concentrations which are not possible to detect in the school laboratory. For carbohydrates, they may use HPLC, which separates the carbohydrates to be measured using mass spectrometry.

The existence of these sophisticated quantitative technologies make the distinguishing tests used in the school laboratory have very little use to forensic chemists.

(d) (i) Chromatography is the separation of samples into their component substances, or groups of substances by subjecting them to mobile and stationary phases (gaseous, liquid or solid), with the differing attractions of the sample components to these phases determining their velocities, separating them.

(ii) We used ethanol and water with paper to produce chromatographs of pen inks. Strips of paper with dots of various inks were placed in solvents, the dots above the fluid. Care was taken to ensure that the pieces of paper did not fall into the solvents, such as attaching them to paddle pop sticks suspended above the fluid. The results revealed the different coloured components of the inks, and separations occurring in ethanol but not in water revealed the non-polar nature of some components.

(iii) Forensic samples are always labelled, only handled by trained persons and only when necessary, placed in plastic bags and handled only by special equipment. Prevention of contamination of samples is crucial because contamination invalidates results and if there is no remaining uncontaminated sample, the contamination is disastrous as the forensic analysis is no longer possible. This means that evidence has been lost forever, potentially causing the failure to convict a criminal or the realease of a wrongly convicted innocent person.