Exam Choice

2005 Chemistry Trial HSC examination. Marking Guidelines and model Answers.

Section I A Multiple Choice

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	C	B	D	A	C	A	A	B	D	B	C	D	C	D

Section I B

Q16

a)

Criteria	Marks
Correct response	1

Starch

(b)

Criteria	Marks
Correct balanced equation for fermentation	1

$C_6H_{12}O_{6(aq)} \rightarrow 2\ C_2H_5OH_{(aq)} + 2\ CO_{2(g)}$

(c

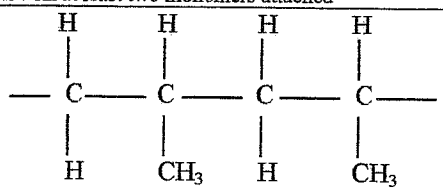
Criteria	Marks
Three correct conditions	2
Two or one correct condition	1

presence of yeast, water, suitable temp. 30-40°C, no air.

Q. 17

(a)

Criteria	Marks
Correct structure drawn with at least two monomers attached	1



(b)

Criteria	Marks
Correct similarity and difference stated	2
Correct similarity or difference stated	1

Both are insoluble (waterproof), both non-toxic. Differences include the fact that PPP is more rigid and holds its shape at higher temperatures when compared to polyethylene.

(c)

Criteria	Marks
Difference accounted for	1

Polypropylene is more rigid than polyethene because it has a heavier side chain therefore there will be greater dispersion forces holding the molecules together.

Q.18

(a)

Criteria	Marks
Evaluates both cell types in terms of chemistry, practicality and impact on society. Must include at least one correctly balanced half-equation from each cell.	5-6
Names one other cell type, describes some of its features including chemistry, practicality and impact on society. The answer must be illustrated with at least a word equation or formulas.	3-4
Names one other type of cell and describes at least one feature of it.	2
Names one other type of cell	1

The galvanic cell shown here produces a voltage which depends on the reduction potential of the reduction half cell and the oxidation potential of the oxidation half cell. In this cell Zn is oxidised. $Zn \rightleftharpoons Zn^{2+} + 2e^-$ and Cu^{2+} is reduced $Cu^{2+} + 2e^- \rightleftharpoons Cu$. The voltage (assuming molar solutions) would be 1.1 V.
This cell would not be very practical. The zinc electrode would rapidly oxidise and the concentrations of each solution would change, affecting the voltage.
This cell contains copper ions which are toxic and would present an environmental hazard.

A dry cell has a zinc anode like the cell above, but a carbon and manganese dioxide cathode. The zinc is oxidised $Zn \rightleftharpoons Zn^{2+} + 2e^-$ and the cathode reaction is as follows: $NH_4^+ + MnO_2 + H_2O + e^- \rightleftharpoons Mn(OH)_3 + NH_3$ They yield 1.5 V
These cells are very practical. They are portable and are ideal for low energy drain devices such as torches. However, voltage drops during use and they are not rechargeable.
The fact that they are not rechargeable means that they are disposed of to landfill in large quantities. The contents are toxic and corrosive and present an environmental hazard if they leech out.

Q.19

(a)

Criteria	Marks
Correct use given with a named medical isotope.	1

Technetium-99m – used to diagnose abnormalities in bone.

(b)

Criteria	Marks
The way it is used is correctly described AND explained in terms of its chemical properties.	3-4
The way it is used is correctly described OR explained in terms of its chemical properties	1-2

Technetium-99m is a medical isotope used to diagnose abnormalities to internal organs like bone, brain and liver. It is prepared in a solution and injected into the patient through a vein. The isotope collects in damaged tissue. This releases a concentrated dose of gamma rays which show up on the gamma camera and the doctor can determine the site and extent of damage. The isotope is ideal because it is non-toxic, it can be changed into a number of oxidation states which means it can combine with a number of biological molecules, eg with tin it is able to bind to red blood cells which carry it around the body. The fact that it has a short half-life and is easily excreted from the body make it safe to use.

Q. 20

(a)

Criteria	Marks
Correct reason given	1

CO_2 dissolving in rain water . $CO_2 + H_2O \rightarrow H_2CO_3$

(b)

Criteria	Marks
Correct explanation in terms of polluting gases like nitrogen and sulfur oxides from burning fossil fuels and industry. Correct equation must be given for one of the oxides.	3
Explanation given in terms of more polluting gases from burning fossil fuels, and their reaction with rain water. (at least one of those gases must be named)	2
Explanation given in terms of more polluting gases dissolving in rainwater.	1

Polluting gases such as oxides of nitrogen and sulfur (from burning fossil fuels and industry) dissolve in rain water to produce acid rain. The Blue Mts has much less pollution therefore less acid rain. Eg $SO_{2(g)} + H_2O \rightarrow H_2SO_{3(aq)}$

(c)

Criteria	Marks
Estimate should be between pH 5.4 and pH 6	1

PH 5.5

Q. 21

(a)

Criteria	Marks
Correct equation given and correct calculations based on average of 2nd and 3rd titres. Correct concentration of the sulfuric acid = 0.25 M	3 marks
Incorrect equation but calculations correct based on that error. OR Correct equation but error made in calculations	2 marks
Correct equation only	1 mark

$2\ NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2\ H_2O$
$n_{(OH^-)} = cV = 0.1 \times .025 = 0.0025$ mol.
Since H_2SO_4 is diprotic NaOH reacts in a ratio of 2 : 1 with H_2SO_4 n (H_2SO_4) = 0.0025/2 = 0.00125mol.
Average V of H_2SO_4 = (5.2 +4.8) /2 = 5.0 ml.

$c = n/V = 0.00125/.005 = \underline{0.25\ mol\ L^{-1}}$

(b)

Criteria	Marks
Both reliability and validity assessed. One with two reasons.	3-4 marks
Some attempt made to assess either validity or reliability.	1-2 marks

The task is valid in that the acid and base will react and the chosen indicator will change colour in the range required – she is reacting a strong acid with a strong base. However the student has chosen a poor primary standard in NaOH- this will absorb moisture during weighing and result in a standard solution of lower concentration than expected. The volumes at the end point will then be incorrect. The results also appear to be unreliable as the 2nd and 3rd titres are somewhat discrepant especially with such a small volume coming through. She should have repeated the titration several more times or even better, diluted the acid before hand so as to obtain lager volume for each titration.

Q. 22

(a

Criteria	Marks
Correct base named	1

ammonia or bicarbonate ion

(b

Criteria	Marks
Correct ionic equation given (net or full)	1

$NH_{3(aq)} + H_2O_{(l)} \rightarrow NH_4^+{}_{(aq)} + OH^-{}_{(aq)}$

(c

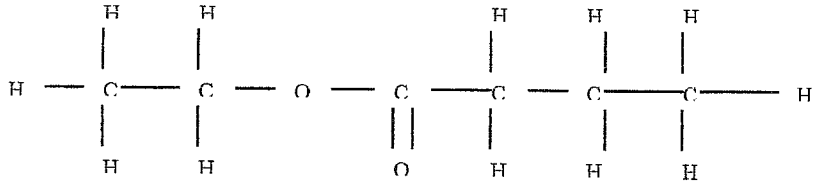
Criteria	Marks
Reference must be made to a specific natural system eg human blood and the fact that natural buffers in blood will resist changes in pH brought about by the addition of that base. That natural buffer must be mentioned by name or formula . eg H_2CO_3/ HCO_3^-	2
Reference is made to a specific natural system and a statement that implies it contains a buffer that will resist changes in the pH bought about by the addition of that base.	1

Human blood is buffered. It resists changes in pH brought about by the addition of acid or base. This is achieved by an equilibrium between H_2CO_3 and $HCO_3^- + H^+$. This is a complex system but essentially addition of a base will favour production of acid to counteract it and vice versa.

Q.23

(a)

Criteria	Marks
Correct structure of ester drawn	1



(b)

Criteria	Marks
At least three risks are identified and assessed.	3
Two or more risks are identified but only one is assessed.	2
One risk is identified and assessed	1

Preparing an ester by reflux involves several risks. They come from the chemicals and the hardware. Concentrated sulfuric acid which is the catalyst, poses a significant risk while pouring into the boiling flask. It is extremely corrosive to skin, eyes and clothing and protection from safety goggles, gloves and an apron is essential. Ethanol and other volatile alkanols pose a risk if there is a naked flame nearby. They must be poured into the boiling flask in a fume cupboard way from Bunsen burners and the flask should be sealed. Many alkanoic acids such as ethanoic and butanoic release toxic or irritating odours and should be poured into the flask in a fume cupboard.
Heating the flask with the condenser attached poses the risk of falling and breaking so it must be supported carefully with a clamp. The Bunsen flame will heat the flask considerably and it could break or burn you. Care should be taken to wear safety goggles and wait for the flask to cool before touching.

Q. 24

(a)

Criteria	Marks
Balanced eqn given Explanation of effect of pressure on reaction in terms of Le Chatelliers principle Outline of importance of preventing pressure getting too high.	3-4
The above less well done	1-2

$N_{2(g)} + 3\ H_{2(g)} \rightleftharpoons 2\ NH_{3(g)}$ According to Le Chatelier's principle the system will act to restore the balance. The reverse reaction would create more moles of gas and hence more pressure, so increasing pressure will favour the forward reaction as it will reduce the number of moles of gas and hence the pressure.
It is also important to monitor pressure to ensure that it doesn't get too high as this could impose an unacceptable risk of the reaction vessel exploding.

(b)

Criteria	Marks
Reference made to mole ratios of reactants and products in the equation. Correct answer	2
One of the above	1

Looking at mole ratio in equation 150 L of H_2 will react with just 50 L of N_2 (because of 3:1 mole ratio) to give 100L of NH_3

Q.25

(a)

Criteria	Marks
Correct structure of the ammonium ion (NH_4^+) drawn, Two electrons clearly belonging to the nitrogen are linked to a hydrogen and labelled as coordinate covalent bond.	2
One of the above	1

(b)

Criteria	Marks
Higher boiling point of ozone accounted for in terms of being a bigger molecule with stronger intermolecular forces. Higher solubility of ozone accounted for in terms of it being bent and slightly polar. This creates stronger attraction to water molecules. Higher reactivity can be accounted for in terms of one atom being held by a weak coordinate covalent bond.	3
Two of the above	2
One of the above	1

Q.26

Criteria	Marks
Students must identify at least four steps in preparing the samples and the equipment. This could also include collection of the samples. AND Students must justify those steps.	4-5
Three steps are identified and justified	3
Two steps are identified and at least one is justified	2
Two steps are identified OR one is identified and justified	1

Preparing the farmer's soil for analysis should involve the following steps:

- Taking equal samples of soil from several different areas on the farm thus increasing reliability.
- Taking samples with similar amounts of soil as opposed to some soil mixed with rocks or lots of water thus ensuring even spreads of cobalt.
- Preparing suitable standard solutions of known concentrations of cobalt so as to prepare a calibration curve.
- Using distilled water for those solutions to avoid possible contamination with cobalt from other sources outside the farm.
- Using a lamp of the cobalt element so as to generate the wavelength of light specific to the element being tested for.
- Preparing the soil samples so they can be sprayed in to the AAS flame and be vaporised.

Q.27

Criteria	Marks
The effectiveness of two methods of purifying and sanitising mass water supplies is assessed.	4-5
The effectiveness of two methods is mentioned BUT only one is assessed in depth.	3
Two methods of purifying and sanitising mass water supplies are described without any assessment of their effectiveness.	1-2

The most commonly used method of purifying water is:

- Flocculation which is the addition of chemicals like $FeCl_3$ or $Al_2(SO_4)_3$ which cause finely suspended particles in the water to stick together and form a precipitate. This settles out in large tanks. The method is very effective and cheap and also helps to remove some bacteria. Cl^- ions which remain are non-toxic.
- Filtration then follows through large filters made of sand and gravel. This removes any remaining particles and is efficient and cheap to run.
- Chlorination is used to kill any remaining micro-organisms. The levels of chlorine are sufficiently low so as to not harm people. Very few cases of infection resulting from water contamination are reported in Australia especially when compared to other countries.

National guidelines are adhered to in maintaining the water quality and regular testing occurs at all parts of the treatment process. Apart from a scare in the late 1990's when above average counts of Giardia were found, water quality in Australia is excellent. The odd person may be allergic to the low levels of fluoride or chlorine in the water but overall it is very effective and fairly cheap.
An alternative method of water treatment is to use microscopic membrane filters. These are extremely effective at removing harmful micro-organisms and some can even remove large organic molecules. However they have the disadvantage of being more expensive than the other method and the filters need regular cleaning. The membranes also need replacing.

Section 2
OPTIONS:

Q. 28

(a) i)

Criteria	Marks
One shrinking resource identified eg. whale oil, rubber, etc.	1

ii)

Criteria	Marks
Student evaluates the progress being made to develop a replacement material for a named shrinking natural resource.	3
Evaluation made but poorly attempted	1-2

(b) i)

Criteria	Marks
Student correctly predicts that the reaction will favour products.	1

ii)

Criteria	Marks
Student correctly writes the equilibrium constant expression AND calculates the equilibrium constant to be 2.25 AND realises it is not equal to the value of K as originally stated in the question therefore not at equilibrium yet.	2
Student correctly writes the expression AND/OR calculates K in the early stages of the reaction to be 2.25 but does not make a connection with the value of K given in the initial data.	1

iii)

Criteria	Marks
Student describes a model for equilibrium and analyses at least two of its limitations	4
Student describes a model but only one limitation is analysed	3
Student describes a model with poor or no analysis	1-2

(c) i)

Criteria	Marks
1. Student gives correct equation: $2H^+_{(aq)} + Mg_{(s)} \rightarrow Mg^{2+}_{(aq)} + H_{2(g)}$	1
2. Student gives correct equation: $C_6H_{12}O_6 \xrightarrow{\text{conc } H^+} 6C + 6H_2O$	1

ii)

Criteria	Marks
Student correctly explains that concentrated sulfuric acid can be stored in iron containers because it is molecular and it is not until it is ionised by water that it can attack that metal AND The transport is also carried out in iron tankers with great care being taken to keep out moisture AND Diluted sulfuric acid must be stored in glass which is inert and will not be attacked by the hydronium ion.	3
Student refers to two of the above.	2
Students refers to only one aspect mentioned above	1

(d) (i)

Criteria	Marks
Student correctly describes the properties of an emulsion and relates these to its uses. Eg Mayonnaise is an emulsion of water in oil with lecithin as the emulsifier. It is very viscous and homogeneous – not separating on standing. These properties enable it combine all flavours in every serving and being viscous means it does not soak into bread.	2-3
Student correctly describes the use of an emulsion	1

(ii)

Criteria	Marks
Student correctly states that hard water contains higher levels of Ca or Mg ions and these form insoluble salts with the negative head of the fatty acid molecules of soap thus preventing lathering. Cationic detergents have a positive head and so are unaffected by positive ions in the water.	2
Student correctly describes the effect of hard water on soaps in terms of forming insoluble salts thus preventing lathering. OR gives a sound reason why some detergents do not form an insoluble salt.	1

(e) (i)

Criteria	Marks
Student correctly identifies a step and outlines the procedure	2-3
Student correctly identifies a step eg sodium carbonate formation from sodium bicarbonate.	1

(ii)

Criteria	Marks
Student correctly identifies one difficulty	1

Sample answer:
In the conversion of sodium bicarbonate to Na_2CO_3, a sample of the $NaHCO_3$ was weighed and heated but it was difficult to know when all the $NaHCO_3$ had been decomposed and how we could remove all the CO_2 from the flask.

Q. 29

(a) i)

Criteria	Marks
Student correctly identifies the chloride anion	1

ii)

Criteria	Marks
Student correctly identifies the beakers with molten sodium iodide and dissolved sodium iodide as the beakers in which a redox reaction occurs and explains why in terms of them both having mobile ions that can move to the electrodes.	2
Student correctly identifies both beakers	1

iii)

Criteria	Marks
Cathode reaction in middle beaker is $Na^+_{(l)} + e^- \rightarrow Na_{(l)}$ OR in first beaker $H_2O_{(l)} + e^- \rightarrow 1/2H_{2(g)} + OH^-_{(aq)}$	1

(b)i)

Criteria	Marks
Student outlines a suitable procedure with iron and a named form of steel. It should include a description of the identical conditions for both, a time frame and a method of measuring the degree of rusting.	3
A suitable procedure is given but no result OR a poor procedure with a result.	2
A poor procedure is given	1

ii

Criteria	Marks
Results are explained in terms of the presence of named passivating metals within the stainless steel and description of the chemistry involved	2
Results are explained in terms of the presence of passivating metals but not the chemistry involved in the protection.	1

(c)i

Criteria	Marks
Student explains the rapid corrosion of the steel as being due to the less reactive metal, copper, providing the cathodic surface for the reduction of oxygen.	2
Student explains that the iron in steel is in touch with a less reactive metal.	1

ii)

Criteria	Marks
Student correctly identifies a suitable metal that would protect the steel and explains the process thoroughly with an equation	3
A suitable metal is identified and an explanation given without an equation.	2
A suitable metal is identified.	1

(d) ii)

Criteria	Marks
Student explains the difference in terms of CO_2 being more soluble and states that the increase in solubility is due to it reacting with water and forming a series of equilibrium reactions.	2
Student states that CO_2 is more soluble than O_2.	1

ii)

Criteria	Marks
Student explains the drop in O_2 concentration as being due to less mixing with the air as you go deeper and greater consumption by animals without plants in the environment. The CO_2 increase is due to less consumption by plants compared to the surface and a continuation of respiration by animals which live deeper.	3
Student correctly describes the change in concentration of the two gases and gives a good explanation for one gas.	2
Student correctly describes the changes in concentration of the two gases.	1

(e)

Criteria	Marks
Student correctly describes the use of electrolysis as a method of removing salt and cleaning and stabilising artefacts. AND Assesses the method	4-5
Student describes one method with some assessment OR Describes two methods	2-3
Student describes one method	1

Q.30

(a)i)

Criteria	Marks
Student correctly identifies the structure as glycerol	1

ii)

Criteria	Marks
Student correctly predicts that it is soluble in water AND explains why in terms of the three hydroxyl groups allowing for the formation of hydrogen bonds with water OR explains in terms of polarity.	2
Student correctly predicts that it is soluble in water with the reason "like dissolves like".	1

(b) i)

Criteria	Marks
Student names an enzyme and outlines a suitable procedure that could be used to investigate the effect of changing the temperature. The procedure should include a description of controlled variables and a means of measuring enzyme activity.	3
Student names a suitable enzyme but gives a poor outline of the procedure	1-2

ii)

Criteria	Marks
Student draws the axes with suitable labels and sketches a curve which peaks in the 30^0-40^0 C range, and drops off towards zero and 100^0C	1

iii)

Criteria	Marks
Student accounts for the enzyme's activity at very low temperatures by saying the molecules have restricted mobility and cannot reach their substrate AND accounts for the absence of activity at very high temperatures by saying the enzyme is denatured (or its shape is permanently changed) so it cannot fit its substrate. This is due to the breaking of bonds such as disulfide, hydrogen, etc which maintain the tertiary structure.	3
As above but little detail in student's reasons for the drop in activity.	1-2

(c)i)

Criteria	Marks
Student explains the significance in terms of the terminal PO_4 group of the three as being able to be removed or added and thus release energy for various metabolic activities or absorb energy during respiration.	2
The student describes the bond to the third phosphate as being able to store energy	1

ii)

Criteria	Marks
Student describes the role of ATP as being hydrolysed to release mechanical energy to actively move the actin filaments past the myosin filaments. The myosin catalyses the breakdown of ATP as it binds to actin.	2
Student describes the role in general terms as providing the energy to slide the filaments past each other OR that energy allows the myosin head to bend.	1

(d)ii)

Criteria	Marks
Student assesses the importance of anaerobic respiration during sprinting AND includes a chemical description of the process	5-6
Student gives a sound chemical description of anaerobic respiration but only a limited assessment of its importance in sprinting.	3-4
Student states that a sprinters demand for oxygen is greater than his supply and the only way to get enough is through anaerobic respiration and fewer ATP molecules are formed in anaerobic respiration.	1-2

Sample answer:

During a sprint, runners only have enough ATP to last for 5 seconds. It takes about 30 seconds of breathing to supply enough oxygen to help replace that lost ATP in oxidative phosphorylation. Little breathing is done during race and the only way a sprinter running 100 – 400 metres, can get enough ATP, is from anaerobic respiration. In this process muscle cells convert pyruvic acid to lactic acid in the cytoplasm and in the absence of oxygen and release 2 moles of ATP per mole of glucose. This is 18 times less than in aerobic respiration. This will provide enough ATP to finish the race but beyond those distances the lactic acid will build up in the blood and inhibit the sprinter. He can only remove the lactic acid by supplying lots of oxygen after the race.

(e) i)

Criteria	Marks
Student correctly predicts pathway D to be oxidation.	1

ii)

Criteria	Marks
Student correctly draws the structure of a fatty acid	1

iii)

Criteria	Marks
Student explains that in the TCA cycle, $NADH + H^+$ is oxidised to NAD^+ and $FADH_2$ is oxidised to FAD. This facilitates the transfer of energy via cytochromes to ADP which then forms ATP. Reduction occurs when electrons from the cytochrome chain combine with O_2 molecules and H^+ ions to form water.	3
Student explains the oxidation but ignores the reduction of oxygen OR explains the reduction but gives a partial explanation of the oxidation	2
Student gives a partial explanation of the oxidation process.	1

Q.31

(a) i)

Criteria	Marks
Student identifies a correct mineral eg haematite and Colour - red	2
Student identifies mineral	1

ii)

Criteria	Marks
Student makes the connection with a metal in a coloured pigment and its position in the transition block of elements on the Periodic Table. This metal eg iron in haematite, will have partially filled d sub-shells, and electrons in lower energy levels can absorb visible wave-lengths and move to higher d orbitals. This enables a colour change	2
Student makes the connection with those elements in the transition block.	1

(b) i)

Criteria	Marks
Student correctly identifies the element as strontium.	1

ii)

Criteria	Marks
Student explains the effect of UV and infra-red light on pigments containing zinc oxide and those containing copper	3-4
Student explains the effect of UV and infra-red on zinc oxide or copper pigment	2
Student explains the effect of UV or infra-red on zinc oxide or copper pigment	1

(c) i)

Criteria	Marks
Student predicts that it has two electrons in its outer shell and explains it in terms of the big jump in ionisation energy from removing the second electron to the third which is part of a full shell and requires a lot more energy	2
Student predicts that it is has two electrons because there is a bigger gap between ionisation energies.	1

ii)

Criteria	Marks
Student correctly describes the electron configuration as $1s^2 2s^2 2p^6 3s^2 3p^3$	1

iii)

Criteria	Marks
Student correctly predicts it to be fluorine because it has 7 electrons in its outer shell and only requires one more to complete that shell. Fluorine also has the most protons in its nucleus and therefore has the strongest attraction for electrons when compared to other elements with incomplete shells in Period 2.	2
Student predicts fluorine because it has seven electrons in it outer shell	1

(d) i)

Criteria	Marks
Student accurately predicts the oxidation state of manganese to be +7	1

ii)

Criteria	Marks
$KMnO_4$ is a powerful oxidising agent because it has four oxygen atoms most of which have only six electrons in their outer shell and they can readily accept electrons. Eg MnO_4^- can oxidise zinc atoms Oxidation half-eq'n $Zn_{(s)} \rightarrow Zn^{2+} + 2e^-$ Reduction half-eq'n $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$ (balancing would be good but not essential)	2
Student says that $KMnO_4$ is a powerful oxidising agent because it has four oxygen atoms which can accept electrons.	1

iii)

Criteria	Marks
Student describes and justifies the procedure. It should include an initial set of colours of the various oxidation states of manganese. Eg with MnO_4^- the colour is purple, with MnO_4^{2-} the colour is green, etc This knowledge of colour indicates when the compound has actually oxidised something. Two other oxidising agents were chosen – $Pb^{2+}_{(aq)}$, and KCr_2O_7 - all being of different oxidising strengths so that a comparison could be made. Next some known species were chosen to be oxidised – Zn, $I^-_{(aq)}$ and $Cl^-_{(aq)}$ The same masses of solids or volumes and concentrations of solutions were used and an excess of the reducing agents were added to the three oxidising agents – this ensures that all the oxidising agents had reacted. Results in terms of colour changes or visible solids appearing were recorded.	3
Student two aspects of the procedure with one justification	2
Student describes one aspect of the with justification	1

(e)

Criteria	Marks
Student briefly describes the nature of a ligand and lists a variety of points indicating the value of models in understanding ligands eg. They show how they form, they help to explain the importance of certain geometrical shapes, why some like oxalate can chelate and how the geometry depends on the number and type of metal ion orbitals occupied by ligand lone pairs. More general answers like a model can be picked up and displayed at different angles can also be included. AND student should also indicate why they may not be of much use eg. Relative sizes of atoms are rarely shown exactly in atomic models so a true indication of shape may not be obvious. AND student refers to specific examples And student gives a final value judgement	4-5
Student briefly describes a ligand and gives a limited outline of the value of models and a drawback in their use.	2-3
Student briefly describes the nature of a ligand	1

Q.32

(a) i)

Criteria	Marks
Student correctly identifies glycogen as the polysaccharide in animals.	1

ii)

Criteria	Marks
Student accounts for the difference in terms of glucose existing in solution as an equilibrium between the ring molecule and an open chain form AND states that the open chain form has a carbonyl and hydroxy group on or near the end of the molecule and is thus able to be oxidised. The disaccharide, sucrose, does not form an equilibrium with an open chain form therefore none of those groups are in a position to be oxidised.	2
Student accounts for the difference in terms of glucose, existing in solution as an equilibrium between the ring molecule and an open chain form BUT no details of functional groups are mentioned.	1

(b) i)

Criteria	Marks
Student correctly draws a dipeptide molecule and labels the peptide bond	2
Student correctly draws a dipeptide but without a label OR an erroneous dipeptide with a correct peptide bond labelled	1

ii)

Criteria	Marks
Student correctly describes a procedure which includes a named mixture, a named suitable solvent (mobile phase) and a material over which the solvent can run (stationary phase). Use of a standard reference and a means of developing the dots made by the separated molecules should also be stated.	3-4
A procedure is described but it is does not refer to some of the above aspects of the investigation	1-2

iii)

Criteria	Marks
Student correctly compares the properties of two types of mixtures. ie chromatography uses the fact that different substances in the mixture have different solubilities in the solvent while in electrophoresis the separation is based on the different charges and sizes of the molecules in the mixture	2
Student describes one of the above	1

(c)

Criteria	Marks
Student refers to a recent case such as the Azaria Chamberlain case and discusses the technology involved in changing the conviction.	3-4
Students makes reference to a recent case but the discussion is limited	1-2

(d)

Criteria	Marks
Student briefly describes what a data bank is and then makes an assessment based on a series of arguments for and against their use by government agencies and private companies.	4-5
Student describes what a data bank is and gives a limited assessment of their use.	2-3
Student describes what a data bank and gives a reason to support or oppose their use.	1

(e) i)

Criteria	Marks
Student gives a correct definition of destructive testing.	1

(ii)

Criteria	Marks
Student explains that in mass spectroscopy, a sample is vaporised and ionised and then the positive ions are accelerated by an electric field and passed through a magnetic field. The ions are forced to move in a curved path which depends on their charge and mass. From this, the masses can be calculated and the molecules or their fragments identified. Mass spectroscopy could be used to identify a specific compound like hexanol or a mixture of compounds like crude from a particular location. All are organic molecules.	4
Student explains how mass spectroscopy works but neglects some aspects.	2-3
Student gives an example of a suitable sample.	1