M13/4/CHEMI/SP3/ENG/TZ2/XX/M

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MARKSCHEME

MAY 2013

CHEMISTRY

Standard Level

Paper 3

21 pages

Subject Details: Chemistry SL Paper 3 Markscheme

Mark Allocation

Candidates are required to answer questions from **TWO** of the options **[2 x 20 marks]**. Maximum total = **[40 marks]**.

1. A markscheme often has more marking points than the total allows. This is intentional.

2. Each marking point has a separate line and the end is shown by means of a semicolon (;).

3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.

4. Words in brackets ( ) in the markscheme are not necessary to gain the mark.

5. Words that are underlined are essential for the mark.

6. The order of marking points does not have to be as in the markscheme, unless stated otherwise.

7. If the candidate's answer has the same "meaning" or can be clearly interpreted as being of equivalent significance, detail and validity as that in the markscheme then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by ***OWTTE*** (or words to that effect).

8. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.

9. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script.

10. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

11. If a question specifically asks for the name of a substance, do not award a mark for a correct formula unless directed otherwise in the markscheme. Similarly if the formula is specifically asked for, unless directed otherwise in the markscheme, do not award a mark for a correct name.

12. If a question asks for an equation for a reaction, a balanced symbol equation is usually expected, do not award a mark for a word equation or an unbalanced equation unless directed otherwise in the markscheme.

13. Ignore missing or incorrect state symbols in an equation unless directed otherwise in the markscheme.

Option A — Modern analytical chemistry

A1. (a) The ratio between the distance moved by the spot and the distance moved by the solvent front / *OWTTE*; ***[1]***
Accept this expressed as a correct equation.

(b) R_f value depends on the intermolecular forces that the component has with the mobile phase compared to the stationary phase / relative attraction of the component to mobile phase compared to the stationary phase / partition of the component between the mobile phase and the stationary phase / *OWTTE*;
if polarity of the solvents is different the intermolecular forces/attraction to mobile phase/partition will be different / *OWTTE*; ***[2]***
Accept "Components have different solubilities in different solvents" / OWTTE.

(c) (viewing under) ultraviolet/UV light;
(staining with) a dye/ninhydrin/potassium manganate(VII);
(exposing to) iodine (vapour); ***[2 max]***
Accept "staining with a developing (re)agent".
Do not accept just staining.

A2. (a) (i) ensures that only light with a single/particular/narrow range of wavelength/ frequency is passed through; ***[1]***
Accept "light of only one colour".

(ii) ensures that the beam of (monochromatic) radiation is (alternatively) passed through the sample **and** the reference; ***[1]***
Accept "splits/deflects the beam into two beams".

(iii) converts light/radiation into an electrical current/signal; ***[1]***
Accept "detects the radiation".

(b) (i) (C=C) bond vibrates;
Accept stretch/bend.

(vibration) must involve a change in dipole moment/polarity; ***[2]***

(ii) (energy/frequency of the C=C bond vibration) would depend on groups attached/rest of the molecule / *OWTTE*; ***[1]***

(c) *Wavelength*: increases/longer;
Frequency: decreases/lower;
Energy: decreases/lower; ***[3]***
Accept "weaker".

A3. (a) methyl ethanoate;
peak at 44 corresponds to loss of two methyl/ CH_3 groups (and peak at 59 the loss of the first) / the only isomer with two methyl groups / *OWTTE*; ***[2]***

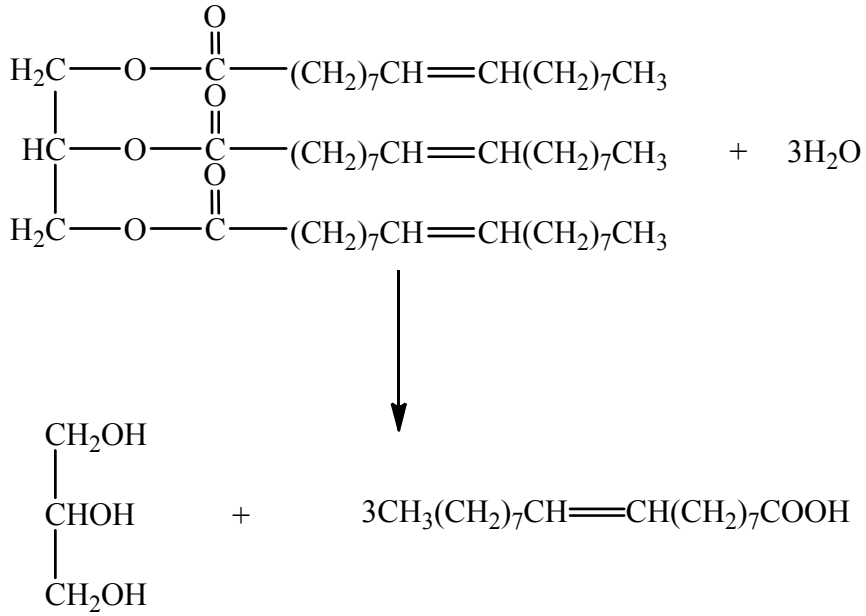
(b) propanoic acid;
only one with OH which accounts for (broad) absorption between 2500–3300 cm^{-1} region / *OWTTE*; ***[2]***

(c) methyl ethanoate;
the only one with (the six H atoms in) two different chemical environments / the two CH_3 groups give equal areas / *OWTTE*; ***[2]***

*Award **[1]** for correct second marking point in (a)–(c) even if compound is wrongly identified.*

Option B — Human biochemistry

B1. (a) (i)



correct structure for triglyceride;
correct structures for products;
correct balancing; ***[3]***
Mark for balancing can only be awarded if reactants and products are correct.
Accept more condensed structural formula, but ester group must be the correct way round (glycerol–OOC–R or glycerol–O–CO–R, ***not*** *glycerol–COO–R).*
Do not penalize minor errors in the hydrocarbon chain or in the use of R.

(ii) 100 g of oleic acid reacts with $\frac{253.8\times100}{282.52}$ (g) of I_2 ;
Do not penalize use of integer values for M_r.

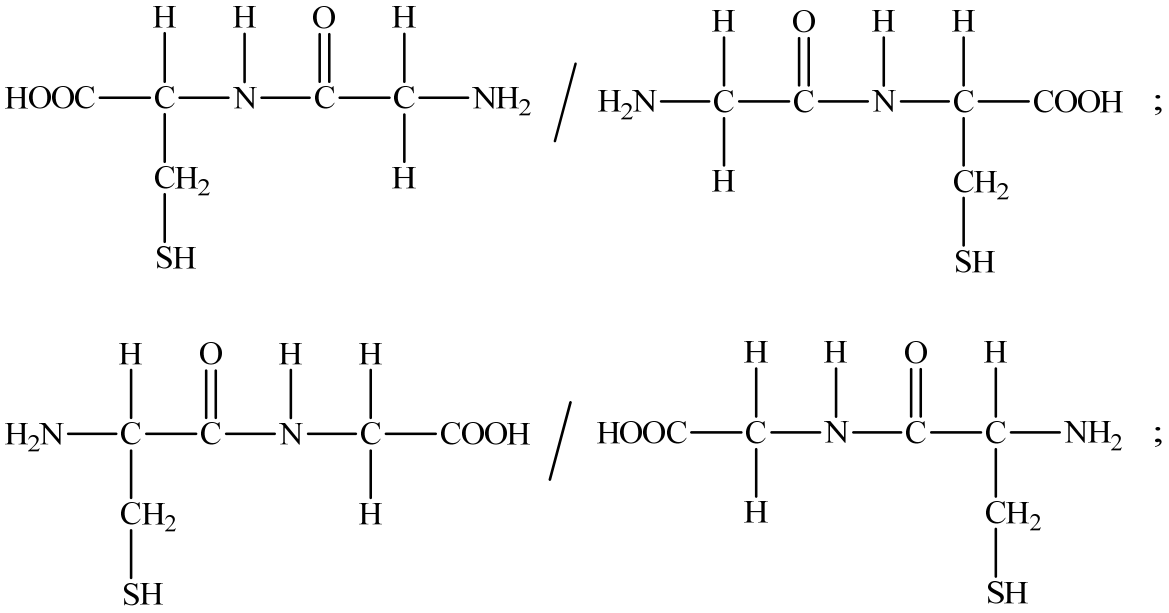
hence iodine number is 89.9; ***[2]***
Accept answers between 89.7 and 90.
Award ***[2]*** *for for correct answer.*
Award ***[1]*** *for an iodine number between 44.8 and 45.0 if monatomic iodine is assumed.*
Award ***[1]*** *for an iodine number between 0.897 and 0.900 if 1 g of oleic acid assumed.*
Award ***[1]*** *for an iodine number between 111 and 112 – mass of I_2 reacting with 100 g of oleic acid.*

(b) (i) in linoleic acid, presence of C=C/double bond/unsaturation prevents close packing/leads to kinks/bends in chain;
Do ***not*** *allow mark without reference to C=C/double bond/unsaturation.*

hence weaker van der Waals'/London/dispersion forces between molecules; ***[2]***
Accept opposite statements for stearic acid but must point out that this is because it does not have a C=C/double bond/unsaturation.

(ii) cannot be synthesized by body; ***[1]***
Accept specific uses such as lowers LDL cholesterol level, increases HDL cholesterol level or lowers risk of heart disease.
Do ***not*** *accept just "lowers cholesterol level".*

B2. (a)



Accept condensed versions of structures such as –NH–CO–CH_2– / –HN–CO–CH_2–
Penalise repeated minor errors, such as incorrect representation of peptide bond (–COHN–/–NHOC–) once only.
*Award **[1]** for a correct peptide link if the rest of the structure is incorrect.*

[2]

(b) (i) sample of amino acids/mixture placed/spotted on gel/ polyacrylamide/ PAGE/paper;
buffer solution / solution of known pH;
(high) potential (difference)/electric field/voltage applied / + and – electrodes/ anode and cathode connected;
Accept current/electricity passed through.

different amino acids move different rates/distances according to their charge/isoelectric point / amino acids move towards oppositely charged electrode / *OWTTE*;
spray/develop with ninhydrin/organic dye/ detect by staining/fluorescence under UV light;
measure distance travelled and compare with standards/isoelectric points; ***[3 max]***
*Award **[1 max]** for the statement "different amino-acids move to different extents".*

(ii) cysteine; ***[1]***

(c) (i) folding of <u>secondary</u> structure / produces 3D shape of the protein; ***[1]***
*Do **not** accept "folding of the protein chain" / OWTTE.*

(ii) hydrogen/H bonds
ionic bonds/attraction
van der Waals'/London/dispersion forces
disulfide bridges
hydrophobic interactions ***[1]***
*Award **[1]** for any two of the above.*

B3.

Micronutrient	Fat-soluble / water-soluble	Medical condition
Vitamin A (retinol)	fat-soluble;	blindness / night blindness / xerophthalmia / dry eye syndrome;
Vitamin C (ascorbic acid)	water-soluble	scurvy/scorbutus;
Vitamin D (calciferol)	fat-soluble;	rickets

[4]

Option C — Chemistry in industry and technology.

C1. (a) (i) (bauxite) is reacted with (concentrated) sodium hydroxide/NaOH (solution at high temperature);
forms sodium aluminate / $Al(OH)_3 + OH^- \rightarrow Al(OH)_4^-$;
Accept both ionic and non-ionic equations and different, correct representations of the aluminate ion ($Al(OH)_4^-$, AlO_2^-).

solution is filtered / insoluble impurities removed (by filtration);
reaction reversed by cooling / diluting solution / adding water;
Accept passing CO_2 through the solution.

mixture seeded with alumina crystals;
pure hydroxide precipitated / $Al(OH)_4^- \rightarrow Al(OH)_3 + OH^-$;
Accept both ionic and non-ionic equations and different, correct representations of the aluminate ion ($Al(OH)_4^-$, AlO_2^-).
(pure) $Al(OH)_3$ heated / $2Al(OH)_3 \rightarrow Al_2O_3 + 3H_2O$; ***[3 max]***
*Award **[1 max]** for "Alumina is soluble in alkali, but impurities are not" / OWTTE.*
Ignore state symbols.

(ii) melting point of the cryolite solution is much lower than the melting point of alumina/Al_2O_3 / it lowers the melting point (of the mixture); ***[1]***
*Do **not** allow lowers melting point of aluminium.*
*Do **not** allow lowers required/operating temperature.*
Accept improves conductivity of the electrolyte/aluminium oxide.

(iii) *Positive electrode (anode)*:
$2O^{2-} \rightarrow O_2 + 4e^-$ / $O^{2-} \rightarrow \frac{1}{2}O_2 + 2e^-$ / $C + 2O^{2-} \rightarrow CO_2 + 4e^-$;

Negative electrode (cathode):
$Al^{3+} + 3e^- \rightarrow Al$; ***[2]***
Allow e instead of e^-.
Accept multiples of the correct equations, such as $2Al^{3+} + 6e^- \rightarrow 2Al$.
*Award **[1 max]** if correct equations but at wrong electrodes.*
Ignore state symbols.

(b) by reduction with a more reactive metal/metal above Al in electrochemical series/ECS/reactivity series / *OWTTE*; ***[1]***
Accept equations for displacement reactions of Al_2O_3 with more reactive metals.

(c) graphite/carbon electrodes converted/oxidized (into CO_2);
the fossil fuels used to provide energy/transport (produce CO_2); ***[2]***

C2. (a) homogeneous catalyst is in the same phase/state as the reactants **and** heterogeneous is in a different phase/state to the reactants; ***[1]***

(b) *Advantage*:
all catalyst exposed to reactants / does not depend on surface area / react more rapidly / *OWTTE*;

Disadvantage:
difficult to remove from products; ***[2]***
Accept "Cannot always be used at high temperature".
Apply ECF if C2. (a) the wrong way round.

(c) amount of reactant converted to product per amount of catalyst;
Accept efficiency / conversion rate.

ability to work under different/a range of conditions;
toxicity / environmental/health impact;
catalytic poisoning / active sites become blocked;
lifetime of catalyst;
ease of removal; ***[3 max]***

C3. (a) (i) HDPE/high density polyethene has little/no branching/side chains **and** low density has (many) branches/side chains; ***[1]***

(ii) branching in LDPE/ low density polyethene prevents chains fitting closely together;
weaker intermolecular/van der Waals'/London/dispersion forces so more flexible; ***[2]***
*Accept opposite statements for HDPE/*high density polyethene.

(b) (i) vaporizes causing it to expand/form expanded polystyrene */ OWTTE*; ***[1]***

(ii) (thermal) insulator / packaging material / absorb shock; ***[1]***
Do not accept just cups.

Option D — Medicines and drugs

D1. (a) ester; ***[1]***
Accept ethanoate/acetate.
*Do **not** accept formula.*

(b) *Aspirin*:
Intercepts pain stimulus at source / blocks/interferes with production of substances/ prostaglandins that cause pain/swelling/fever / *OWTTE*;

Diamorphine:
(temporarily) bonds to/blocks/interferes with receptor sites/synapses in the brain / prevent transmission of pain impulses (without depressing central nervous system/CNS) / *OWTTE*; ***[2]***
*Award **[1 max]** if answer states that mild analgesic acts at source and strong analgesics act in the brain/CNS.*

(c) prevent stroke/heart attack/disease / thin blood / reduces risk of blood clots / anti-inflammatory; ***[1]***

(d) *Advantage*:
stronger pain killer / lower dose required / quicker acting;

Disadvantage:
more addictive / easier to build up tolerance and exceed lethal dose / smaller therapeutic window/index / *OWTTE*; ***[2]***

D2. (a) *Moderate doses*:
induce sedation / slow down mental activity / reduce anxiety / lower heart rate / relax muscles / vasodilation;
Accept euphoria / reduced inhibitions.

Higher doses:
induce sleep / loss of consciousness / induce coma / cause death; ***[2]***
Accept alters perception / slurred speech / staggering / loss of balance / intoxication.

(b) (i) from orange to green; ***[1]***

(ii) ethanal/acetaldehyde/CH_3CHO / ethanoic acid/acetic acid/CH_3COOH; ***[1]***
*Do **not** accept aldehyde / carboxylic acid.*

(c) *Blood sample*:
gas(-liquid) chromatography/GLC/GC / high pressure/performance liquid chromatography/HPLC;
No credit for just "chromatography".

column separates the alcohol/ethanol from the other components in the blood / retention time identifies alcohol/ethanol / (the amount of alcohol/ethanol in the blood is) compared with a known sample / by measuring the area under the eluted peaks / *OWTTE*;

Intoximeter:
infrared spectroscopy/infrared light passed through;
the absorption of the C–H/C–O bond is measured (and compared with a calibrated sample) / *OWTTE;*

OR

fuel cell;
an electric current/voltage is generated (proportional to the concentration of alcohol/ethanol in the breath) / *OWTTE*; ***[4]***

(d) enhances the effect/causes a stronger/different effect of another drug (present in the body at the same time); ***[1]***

D3. (a) prevents the growth/ multiplication of bacteria (causing disease);
Accept "kills bacteria".
interferes with the enzymes that bacteria need to make normal cell walls / prevents normal cell wall formation;
*Do **not** accept "Destroys cell walls".*
cells absorbs water (by osmosis) and ruptures/bursts; ***[2 max]***

(b) does not need to be injected / not broken down by stomach acid / resistant to penicillinase; ***[1]***
Accept "overcomes resistance of bacteria" / OWTTE;
*Do **not** accept "immune" rather than "resistant".*

(c) some bacteria may be resistant to just one antibiotic / can make β-lactamase/penicillinase (which can degrade penicillin);
few bacteria resistant to all the antibiotics / prevents the risk of further resistance developing; ***[2]***
*Unless penalised in D3 (b), do **not** accept "immune" rather than "resistant".*

Option E — Environmental chemistry

E1. (a) (i) acidic/acid-forming pollutants deposited on the Earth's surface/leave the atmosphere / rain/precipitation/deposition that is acidic/with a $pH < 5.6$; ***[1]***
Award mark if two specific examples are given.
Accept acid rain.

(ii) $SO_2/SO_3/NO_2$;
Allow names of oxides. Do not allow NO_x.
Accept NO, but for second mark $2NO + O_2 \rightarrow 2NO_2$ must also be included.

$SO_2 + H_2O \rightarrow H_2SO_3$ / $SO_3 + H_2O \rightarrow H_2SO_4$ /
$2SO_2 + O_2 + 2H_2O \rightarrow 2H_2SO_4$ / $2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$ /
$4NO_2 + O_2 + 2H_2O \rightarrow 4HNO_3$; ***[2]***
Do not allow ECF for equation.

(iii) addition of lime/$Ca(OH)_2$/limestone/$CaCO_3$; ***[1]***
Accept "adding alkali/base" or "neutralizing acidity".

(b) *For SO_2/SO_3*:
remove S from fossil fuels;
alkaline scrubbing;
(limestone-based) fluidized bed combustion;
flue gas desulfurization in coal-burning power stations;
use oxide ores rather than sulphide ores;

For NO_2:
control of fuel/air ratio;
recirculation of exhaust fumes;
catalytic converter;
thermal exhaust reactor; ***[2 max]***

For either:
Allow ECF for incorrect (a) (ii).
Accept "reducing energy consumption/use of powered transport" / OWTTE for either
Accept "use renewable energy sources/hydro/solar/tidal/wind" / OWTTE for either.

E2. (a) *Formation*:
$O_2 \rightarrow 2O\bullet$ **and** $O\bullet + O_2 \rightarrow O_3$;

Depletion:
$O_3 \rightarrow O_2 + O\bullet$ **and** $O\bullet + O_3 \rightarrow 2O_2$; ***[2]***

Do not accept $O\bullet + O\bullet \rightarrow O_2$.
No penalty for missing radical symbols.
*Award **[1 max]** for one correct formation and one correct depletion equation.*
*Do **not** penalise failure to mention UV light.*

(b) (i) CFCs have a low reactivity/strong bonds/are highly stable;
CFCs/radicals they produce/ $Cl\bullet$ have high residual time in atmosphere;
some (developing) countries still producing/consuming CFCs / slower phase-out of CFCs;
harmful CFCs are still present in expanded polystyrene and old refrigerators and have yet to leak into the atmosphere;
slow mixing between lower atmosphere/troposphere and upper atmosphere/stratosphere; ***[1 max]***

(ii) *Advantage*: ***[1 max]***
do not damage the ozone layer;
decompose less readily (than CFCs);
cheaper than CFCs;

Disadvantages:
flammable;
both contribute to global warming/greenhouse gases/absorb IR radiation; ***[3 max]***

E3. *Nutrient depletion*: ***[2 max]***
over-grazing/harvesting removes nutrients/minerals from soil / intensive farming/ monoculture/repeatedly growing same crop/heavy tillage leads to leaching/less nutrient replacement;
restoring nutrients with the use of fertilizers could lead to (further) environmental pollution / plants will not grow (well);

Soil pollution: ***[2 max]***
arises from use of fertilizers / pesticides;
disrupts food chain / reduces biodiversity / contaminates surface/ground water;
heavy metal pollution (from mining);

E4. (a) $Hg^{2+}(aq) + S^{2-}(aq) \rightarrow HgS(s)$ / $H_2S(g) + Hg^{2+}(aq) \rightarrow HgS(s) + 2H^+(aq)$ /
$H_2S(aq) + Hg^{2+}(aq) \rightarrow HgS(s) + 2H^+(aq)$;
correctly balanced equation;
correct state symbols; ***[2]***
Neither mark can be awarded for an incorrect equation.

(b) increased growth of plants/algae;
(anaerobic) <u>decay</u> consumes dissolved oxygen; ***[2]***
Accept "aquatic life killed" OWTTE.

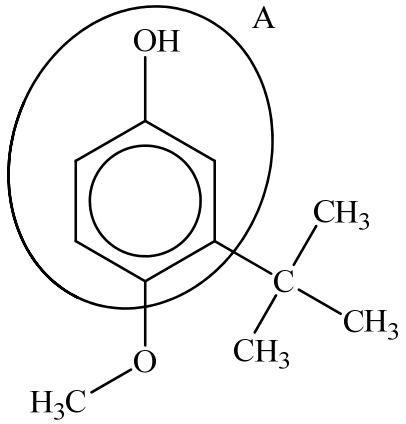
Option F — Food chemistry

F1. (a) a substance which slows/delays/prevents the onset of oxidation (of food); ***[1]***

(b) *β-carotene*:
Any green/orange vegetable or fruit, such as carrots/squash/broccoli/sweet potatoes/tomatoes/kale/cantaloupe melon/peaches/apricots;

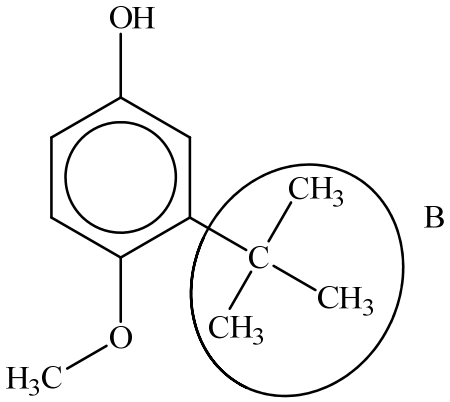
selenium:
fish/shellfish/eggs/cheese/chicken/poultry/grains/legumes/cereals/nuts/garlic/red meat/liver; ***[2]***

(c) (i)



correct circle around the phenolic group; ***[1]***
Accept a circle around –OH alone or around –COH.

(ii)



correct circle around the tertiary butyl group; ***[1]***

(d)

Advantages: [2 max]	***Disadvantages: [1 max]***
increase shelf life / prevent foods deteriorating;	
natural antioxidants have other health benefits; *Accept specific examples:* • *vitamin C/E/carotenoids reduce the risk of cancer/heart disease.* • *vitamin C prevents scurvy/is vital in hormone / collagen production.* • *β-carotene is a precursor for vitamin A.*	synthetic antioxidants do not have (proven) additional health advantages (at the levels used);
natural antioxidants are considered safer than synthetic ones;	health worries regarding safety of some synthetic antioxidants (used in the past);
natural antioxidants are normally present in foodstuffs / require less regulation;	synthetic antioxidants needs to be regulated to ensure safe use / synthetic antioxidants policies can be difficult to implement/vary between countries;
synthetic antioxidants are more effective than synthetic ones;	natural antioxidants are less effective than synthetic ones;
synthetic antioxidants levels are more easily controlled;	levels of natural antioxidants are less easily controlled;
synthetic antioxidants have no colour, taste or odour (at the levels used);	natural antioxidants add unwanted colour / taste / smell to food;

[3 max]

A factor in a given row may ***not*** *be used as both an advantage and a disadvantage.*

F2. (a) temperature (changes);
light;
pH (change);
presence of metal ions;
oxidation/reduction; ***[2 max]***

(b) (i) HCO_3^- produces a (slightly) alkaline/basic pH / pH range 7.5–9 / *OWTTE*; ***[1]***
Accept "buffers the solution".

(ii) Mg^{2+}/magnesium (ion) displaced by (two) H^+/hydrogen (ions); ***[1]***
Accept Mg^{2+}/magnesium (ion) is released.

(iii) pheophytin (complex); ***[1]***

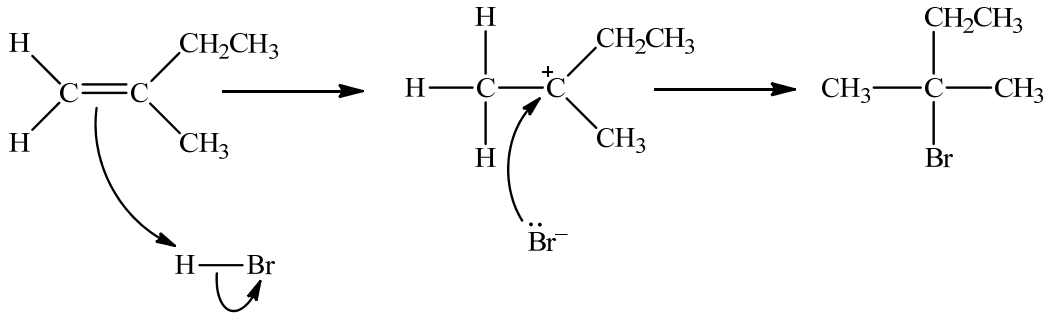
(c) (NH_2 /amino group of) amino acid/peptide/protein;
(carbonyl group of) reducing sugar/glucose;
react by condensation;
lysine in particular causes browning colour; ***[3 max]***

F3. *Benefits*: ***[2 max]***
enhanced taste/quality/appearance;
longer shelf life;
reduced maturation time;
improved tolerance of drought / marginal conditions / rainfall/temperature/nutrient levels;
increase in yield/productivity/feed efficiency;
development of crops with greater amounts of nutrients/micronutrients;
more resistant to herbicides and insecticides / permit the use of more environmentally friendly herbicides and insecticides;
increased resistance to pests/disease / improved animal health;

Concerns: ***[2 max]***
links to increased allergies (for people involved in GM food processing);
risk of changing the composition of a balanced diet/altered nutritional quality of food;
pollen from GM crops may contaminate normal crops with unknown effects;
uncertainties about long-term health effects of genetic modification of food; ***[4 max]***

Option G — Further organic chemistry

G1. (a) (i) electrophilic addition; ***[1]***

(ii) 

curly arrow from C=C to H of H–Br **and** curly arrow showing Br leaving;
correct carbocation representation;
curly arrow from lone pair/negative charge on Br^- to C^+; ***[3]***

(iii) 2-bromo-2-methylbutane involves the formation of an intermediate tertiary carbocation;
this is more stable than the primary carbocation intermediate that would be formed if the product was 1-bromo-2-methylbutane;
Accept argument based on low stability of primary carbocation.

the increased positive inductive effect of the extra –R groups increases the stability of the intermediate / *OWTTE*; ***[2 max]***
*Do **not** award marks for quoting Markovnikov's rule without any explanation.*

(b) react with (warm, aqueous) sodium hydroxide solution / OH^-(aq); ***[1]***
*Do **not** accept answers, such as NaOH, that do not refer to water/solution.*

(c) magnesium/Mg;
non-polar solvent/ether/diethyl ether/ethoxyethane / dry/absence of water; ***[2]***

G2. (a) all C–C bond lengths/strengths are the same/between the different lengths/strengths for C–C single bond and a C=C double bond / *OWTTE*;
Do not accept "bonds are the same" without any qualification.

only one 1,2-disubstituted isomer exists whereas there would be two if there were alternate double and single bonds / only three disubstituted benzene compounds rather than four / *OWTTE*;
benzene (mainly) undergoes (electrophilic) substitution reactions rather than addition reactions (which would be expected if it contains C=C double bonds) / *OWTTE*;
Accept does not undergo addition reactions / decolourize bromine water.

the enthalpy change of hydrogenation/combustion is less exothermic than would be expected if benzene contained three double bonds/not 3 times that of cyclohexene / the enthalpy change of formation is less endothermic / *OWTTE*; ***[3 max]***

(b) *Iodobenzene:*
does not (readily) react;
the C–I bond is stronger due to delocalization of (one of) the non-bonding pair of electrons on the I atom with the benzene pi electrons / the pi electrons on the benzene ring repel the OH^-/nucleophile making it less likely to react with the carbon atom attached to the I atom / the lone pair on the I atom in iodobenzene is delocalized into the ring, considerably reducing the polarity of the C–I bond / benzene ring prevents the nucleophile attacking from the opposite direction to the C–I bond;
Accept "steric hindrance".

(Iodomethyl)benzene:
reacts (readily);
the OH^-/nucleophile attacks the δ^+ C atom attached to the I atom as the benzene ring has little effect / *OWTTE*; ***[4]***
Accept "reacts by nucleophilic substitution/S_N2 mechanism".
Accept the opposite any of the reasons given above for lack of iodobenzene reactivity, ***other than*** *the one used in the answer to the first part.*

G3. (a) methyl/CH_3 group exerts a positive inductive effect / "pushes" electrons towards the (carboxyl) carbon atom (relative to the –H atom in methanoic acid);
negative charge of the ethanoate/acetate (an)ion is more localized/electron density on the (carboxyl) carbon atom/in O–H bond in the ethanoate/acetate (an)ion greater so attracts a proton more readily/O–H bond is stronger/less likely to break / increases charge on the oxygen atoms of the ethanoate/acetate (an)ion making it less stable / *OWTTE*; ***[2]***
Accept opposite statements for methanoate ion.

(b) (electronegative) Cl atom is electron withdrawing / "pulls" electrons away from the (carboxyl) carbon atom/O–H bond (relative to the positive inductive effect caused by the C_2H_5 group in propanoic acid) / *OWTTE*;
electron density on the (carboxyl) carbon atom of the chloropropanoate (an)ion lower so attracts a proton less readily/O–H bond is weaker/more likely to break / decreases charge on the oxygen atoms of the chloropropanoate (an)ion making it more stable / *OWTTE*; ***[2]***
Accept opposite statements for propanoate ion.