| Question number | Answer | Notes | Marks |
|-----------------|---|---|-------|
| 1 (a) | D (filtration) | | 1 |
| (b) (i) | (chromatography) paper (original) position (of spot) solvent | award one mark for each correct label solvent: ALLOW label line to any point under the solvent level paper: ALLOW label line to paper, including under solvent level original spot: has to be in the centre of the baseline i.e. below the visible spots | 3 |
| (ii) | Four because there are four spots/dots (above the baseline in the chromatogram) | ALLOW blobs / marks / colours IGNORE refs to different heights | 1 |

| Question number | Answer Notes | Marks |
|-----------------|-----------------------------|-------|
| 2 a | D / simple distillation | 1 |
| b | C / fractional distillation | 1 |
| С | B / filtration | 1 |
| d | A / crystallisation | 1 |

| Question number | Answer | Notes | Marks |
|-----------------|--|---|-------|
| 3 a i | to prevent spots/them dissolving/mixing (in the solvent) / OWTTE | Accept substance(s)/pigment(s)/dy e(s) for spots Ignore references to diffusion/absorption Ignore references to spots smudging/running Accept spots would be washed off/away Ignore water for solvent | 1 |
| ii | Any two from: | | |
| | M1 evaporation /loss of solvent / OWTTE | Accept water for solvent Ignore gas escaping | |
| | M2 risk of fire | Ignore it is flammable only | |
| | M3 fumes may be toxic/poisonous | Ignore harmful/dangerous | 2 |
| | | Ignore references to substances entering tank/spillage Ignore references to reaction with air | |
| | | | |
| | | | |

| b | M1 cross in box A (chlorophyll is not present in carrots, sweet potatoes or tomatoes) M2 cross in box C (both beta-carotene and lycopene are present in sweet potatoes) M3 cross in box E (Both carrots and tomatoes contain a pigment other than beta-carotene, chlorophyll and lycopene) | If more than three answers given mark on list principle: eg four answers given with 3 correct and 1 incorrect scores 2 marks eg all five answers given so 3 correct and 2 incorrect scores 1 mark | 3 |
|---|--|---|---|
| C | M1 (distance between start line and solvent front) = $6(.0)$ M2 correct evaluation of R_f value $1.3/6.0 = 0.22$ | Accept answer to 1 or more dp, eg 0.2, 0.217, Accept 0.216recurring Reject 0.216 correct answer with no working scores 2 M2 CQ on M1 | 2 |
| d | (there is a substance in sweet potatoes that) does not dissolve/is insoluble (in the solvent) | Ignore mix Ignore water for solvent Reject not very soluble/partially soluble | 1 |

| Question Answer Answer | | Answer | Notes | Marks |
|------------------------|-----|--|---|-------|
| 4 8 | а | $CaCl_2(aq) + H_2SO_4(aq) \rightarrow CaSO_4(s) + 2HCl(aq)$ | All four must be correct to score Do not penalise upper case letters | 1 |
| k | b | | M1 filter paper in filter funnel Do not penalise inappropriate size M2 everything else correct Not essential that funnel touches flask Reject beaker/tube for M2 Ignore labels Ignore relative sizes | 2 |
| (| C İ | ${\rm Ca^{2+}}$ / calcium (ion) calcium sulfate/CaSO ₄ is partially/slightly soluble OR contains unreacted/excess calcium chloride/CaCl ₂ (solution) | Reject Ca with incorrect or missing charge Mark (i) and (ii) independently Accept <u>unreacted/excess</u> calcium ions | 1 |

| Question number | Answer | Notes | Marks |
|--------------------|---|---|---------|
| 4 d i | white precipitate | Accept solid / ppt / ppte / suspension in place of precipitate Reject other colours Reject other observations eg fizzing Ignore cloudy/milky/grey | 1 |
| ii | silver chloride | Accept correct formula Ignore incorrect formula Award both marks if both answers in either (i) or (ii) | 1 |
| iii | (hydrochloric/sulfuric) acid / H ⁺ there OR solution acidic | Accept because there are no other ions that could form a precipitate Accept no carbonate/hydroxide (ions) | 1 |
| е | M1 wash/rinse (with water) M2 leave it (to dry) / leave in a warm place / place in an oven / place in desiccator / heat it / dry with absorbent paper (eg kitchen/filter/blotting) | Reject methods that refer to filtrate /solution /crystallisation Ignore other named solvents Accept leave on a window ledge Ignore evaporate it / boil it Award 1 mark for both M1 and M2 correct but | 2 |
| | | in wrong order Total 10 |) marks |

| Question number | Answer | Notes | Marks |
|-----------------|--|---|---------|
| 5 (a) | M1 - C | | 1 |
| | M2 - (it) has a spot in line with/at the same height as (the spot produced by) bute/an illegal drug | Accept references to travelling same distance / having same $R_{\rm f}$ value | 1 |
| | | M2 dep on M1 | |
| (b) | a substance/liquid that dissolves a solute/solid/another substance | Accept it forms a solution with a solute/solid/substance | 1 |
| (c) | M1 correctly measured distance for lasix spot correctly measured distance of solvent front | Lasix spot 62-64 mm / 6.2-6.4 cm Solvent front 84 mm / 8.4 cm | 1 |
| | M2 - any value in range 0.73 - 0.77 | Minimum of 2 dp correct answer with no working scores 2 | 1 |
| | | M2 csq on M1 | |
| (d) | the more soluble the substance the further it will travel | Allow distance increases with (increasing) solubility ignore any reference to proportionality | 1 |
| | 1 | Total | 6 marks |

| Question number | Answer | Notes | Marks |
|-----------------|--|---|-------|
| 6 (a) (i) | green | ignore shades accept yellow-green | 1 |
| (ii) | to allow (excess/unreacted) gas to escape/to prevent pressure build up | accept to prevent (the risk of) an explosion/breaking the apparatus | 1 |
| (iii) | Chlorine/the gas is toxic/poisonous | ignore harmful, dangerous, etc. | 1 |
| (b) (i) | M1 - 2.8(000) and 5.325 56 35.5 OR 0.05(00) and 0.15(00) M2 - 1:3 M3 - FeCl ₃ | award 0/3 if division by atomic numbers / wrong way up / multiplication used do not penalise roundings or minor transcription errors (e.g. 5.235 for Cl) If 71 used for Cl ₂ , lose M1 but M2 and M3 can be awarded – consequential answer from this error is Fe ₂ Cl ₃ M2 subsumes M1 Accept symbols in any order | 1 1 |
| (ii) | iron(III) chloride | Award 3 marks for correct final answer with no working accept ferric chloride ignore iron chloride accept iron trichloride | 1 |

| 9 (c) | Cl ₂ + 2 NaOH → NaCl + NaClO + H ₂ O | 2 |
|-------|--|---|
| | M1 - all formulae correct | |
| | M2 - balanced using correct formulae | |

| Question number | Answer | Notes | Marks |
|-----------------|---|--|-------|
| 7 (a) (i) | $Zn(s) + 2 HCI(aq) \rightarrow ZnCI_2(aq) + H_2(g)$ | | 2 |
| | M1 - all formulae correct and equation balanced | | |
| | M2 - state symbols correct | M2 can be awarded for near misses on formulae, e.g. ZnCl and H accept upper case letters for state symbols | |
| (b) | M1 bubbles/fizzing/effervescence | accept gas given off ignore hydrogen given off | 2 |
| | M2 zinc/solid gets smaller/disappears | accept zinc/solid dissolves / (final) solution is <u>colourless</u> reject zinc melts and other Group 1 observations, eg floats / moves across surface | |
| | | Ignore references to heat and temperature change | |

| Question number | А | nswer | | | Notes | Marks |
|-----------------|--|--|---|------|---|-------|
| 7 (c) (i) | El I | Experiment 1 | Experiment 2 | | | |
| | Final burette breading in cm ³ | 10.40 | 22.70 | | | 3 |
| | Initial burette reading in cm ³ | 0.00 | 1.90 | | | |
| | Volume of acid added in cm ³ | 10.40 | 20.80 | | | |
| (ii) | M1 - all four burette reading M2 - subtractions correct M3 - all six values in table M1 - (because) the volume doubled M2 - the concentration is hor use of an express M2 for indicating how c₂ V₁, c₁, and V₂ are known dm⁻³) | given to 2 deeplamount of a malf / 0.37 (malf on such as V | acid required hacid dm ⁻³) $1C_1 = V_2C_2$ ated (e.g. bec | ause | Ignore trailing zeroes for M1 and M2 M2 CSQ on burette readings given in table Mark independently accept either a calculation or a description | 1 |