Atomic structure, analysis and quantitative chemistry

1. (a) covalent 1

(b) (i) liquid 1

(ii) fluorine 1

*accept F / F_2; do **not** accept fluoride*

(c) (i) should fluoride ions be added to drinking water? 1

(ii) any **one** from: 1

- not enough reliable/valid evidence
- may be other factors involved
- it is an opinion / choice / belief / ethics issue
- it can't be scientifically investigated

allow can't do an experiment
ignore test
mark independently of (c) (i)

[5]

2. (a) (i) element 1
compound 1

(b) loses 1
electron 1

(c) (i) 8 electrons drawn on outer shell 1

accept dots or crosses or both.

(ii) oppositely charged ions attract each other. 1

Or because chloride ions are negative and sodium ions are positive

accept 'they are negative'

[6]

3. (a) (i) column 1

mass spectrometer 1

computer 1

(b) (i) 165 *if answer is not correct then evidence of correct working gains **one** mark. e.g. (10 × 12) + 15 + 14 + 16* 2

(ii) 10.37%

Accept 10 / 10.4 / 10.37

*if answer is not correct then evidence of correct working gains **one** mark. e.g. minimum evidence would be 14/135*

(c) any **two** from: 2

- faster
- more accurate
- detects smaller amounts

(d) **two** sensible ideas such as: 2
- avoid bias
- improve reliability
- check the result

[11]

4. (i) 23 to 59 *accept 36* 1

(ii) decolourise **or** (orange to) colourless 1
ignore discolours / fades
*do **not** allow oil decolourises*

(because bromine reacts with the) (carbon) double bond 1
*ignore alkenes **or** reference to unsaturation*

(iii) any **one** from: 1
- an anomalous result (11.2) / Test 2
  accept $\frac{23.2 + 24.0}{2}$ *(= 23.6)*
- 11.2 / Test 2 is ignored when averaging
  accept average of tests 1 and 3

(iv) unsaturation 67% 1
average was less than it should be / only 26.8 cm³

(this means there is) 33% saturated fat 1
it should have been 28.0 cm³ to give a percentage of 70%

[6]

5. (a) 40 + 12 + (3 × 16) = 100 *each for 1 mark* 2

(b) M_r of CaO = 56 *for 1 mark* 4
mass required = 60 × 100/56 *for 2 marks*
= 107.1 *for 1 mark*

(c) (i) calcium hydroxide 1

(ii) solid 1

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6. (a)

C	H	O	
$\frac{0.60}{12}$	$\frac{0.15}{1}$	$\frac{0.40}{16}$	1
= 0.05	= 0.15	= 0.025	1
2	6	1	1

C_2H_6O

***1** mark for dividing the correct amount or multiples of correct amount by A_r*
***1** mark for proportions*
***1** mark for whole number ratio – accept any multiple*
***1** mark for correctly written simplest formula*

*correct formula without working gets only **2** marks*
correct formula gains full marks provided steps 1 and 2 are correct.
*ecf can be allowed from step 2 to 3 **or** step 3 to 4*
formula can be in any order eg OH_6C_2 1

(b) intermolecular forces / bonds 1

are weak *(covalent) bonds are weak = 0*

or forces between molecules **or** bonds between molecules (1)
(attractive) forces are weak = 1

are weak (1) 1
*if no marks awarded, allow low boiling point **or** small M_r for **1** mark*

(c) (i) to check the safety of the perfume (owtte) 1
*accept references to possible harmful / dangerous effects of perfume **or** possible reactions on skin*
eg to show it does not damage skin / cause cancer etc.
allow to see what it smells like on the skin
allow so the company do not have to test on animals

(ii) any **two** from: 2

idea from text **linked with** an explanation

- the company claim to have tested the product: but we cannot be certain they have **or** how thorough they are **or** how accurately reported
- companies did not disclose how they did their tests: so they could not be checked **or** so they could not be shown to be reliable / valid **or** so they could not be repeated
  or converse eg companies should disclose how they did their tests so that results can be checked etc.
- companies may not have repeated their tests: so they may not be reliable
- companies do their own tests: so they may be biased **or** so they may not be truthful about their results **or** so they may not be reliable
  or converse eg independent tests should be done so as to ensure there is no bias etc.
- the companies are using different tests: so the results cannot be compared **or** so results will be different **or** so results will not be fair / valid / reliable
  or converse eg companies should do the same tests so that the results will be fair etc.
- companies would not give false information because of damage to reputation **or** it might lead to litigation

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7. (a) 130.4 accept 130 to 130.43478……. 2
correct answer gains two marks with or without working or even with incorrect working.
*an answer of 131 would gain **one** mark.*
if answer is not correct then: moles of salicylic acid = 0.7 ..... (1 mark)
***or** mass of aspirin = moles of salicylic acid x 180 (1 mark)*
allow alternate methods of calculation to gain working mark.
e.g. 100 x (180/138) for one mark

(b)	(i)	62.5% (accept 63%) *correct answer gains two marks with or without working or even with incorrect working.* *if answer is not correct then:* *250/400 x 100 gains one mark*	2
	(ii)	**one** sensible idea such as: • reversible reaction • some of product lost • not all of the reactant converted to product	1
(c)		use lower temperatures **or** less energy needed *allow product made faster or more product made in a given time*	1

[6]