TOPIC 2 TEST MS

1. (a) (i) M_r = 132.1

1

132

0.0238

Allow 0.024
Allow 0.0237
Penalise less than 2 sig fig once in (a)

1

(ii) 0.0476

1

0.0474-0.0476
Allow (a) (i) × 2

(iii) 1.21

Allow consequential from (a) (ii)
ie allow (a) (ii) × 1000/39.30
Ignore units even if wrong

1

(b) $\frac{34 \times 100}{212.1}$

Allow mass or Mr of desired product times one hundred divided by total mass or Mr of reactants/products
If 34/212.1 seen correctly award M1

1

= 16.0(3)%

Allow 16%
16 scores 2 marks

1

(c) 100(%)

Ignore all working

1

(d) PV = nRT or $n = \frac{PV}{RT}$

If rearranged incorrectly lose M1 and M3

1

$n = \frac{100000 \times 1.53 \times 10^{-2}}{8.31 \times 310}$

M2 for mark for converting P and T into correct units in any expression

1

= 0.59(4)

Allow 0.593
M3 consequential on transcription error only not on incorrect P and T

1

(e) (Na_2SO_4) H_2O
(44.1%) 55.9%

M1 is for 55.9

1

44.1/142.1 55.9/18
0.310 3.11
= 1 = 10

Alternative method gives180 for water part = 2 marks

1

x = 10

X = 10 = 3 marks
10.02 = 2 marks

1

[13]

2. (i) T = 304(K) and P = 100 000 (Pa)

Only T and P correctly converted

1

$\frac{100\,000 \times 3.50 \times 10^{-3}}{8.31 \times 304}$ OR $n = \frac{PV}{RT}$

1

0.139 (mol)

Allow <u>0.138 – 0.139</u>

1

(ii) 0.0276 – 0.0278(mol)

Allow answer to (b)(i) divided by 5 leading to a correct answer

Allow 0.028

1

[4]

3. Ratios 88.5 / 138.2 and 11.5 / 18

Correct answer without working scores one mark only.

1

x = 1

Allow $K_2CO_3.H_2O$ / 1:1 ratio / one molecule of water of crystallisation.

M2 can be awarded for a correct method using incorrect ratios.

Allow correct answer if integer or decimal number.

1

[2]

4. (a)

$$\frac{81.1}{40.1} \qquad \frac{18.9}{14}$$

M1 for correct fractions

1

(=2.02 = 1.35)

1.5 1 or 3 : 2

M2 for correct ratio

1

Ca_3N_2

If Ca_3N_2 shown and with no working award 3 marks

If Ca_3N_2 obtained by using atomic numbers then lose M1

1

(b) $3\ Si + 2\ N_2 \rightarrow Si_3N_4$

Accept multiples

1

[4]

5. (a) Space will fill during titration / titres or volumes added are too high

Do not allow 'to improve accuracy' without qualification.
Do not allow 'incorrect end-point' without qualification.
Do not allow 'titres or volumes added are too low'.
Ignore 'titres or volumes added are different'.

1

(b) Less chance of losing liquid on swirling / liquid doesn't splash on swirling

Do not accept 'easier to swirl' on its own.

1

(c) (i) Returns reagent on the sides of the flask to the reaction mixture (to ensure that all of the acid / alkali reacts)

Do not allow 'to improve accuracy' without qualification.
Ignore reference to cleaning.

1

(ii) This does not change the number of moles of reagents / water is not a reagent / water is one of the products

Do not allow 'water does not affect the titration' without qualification.
Ignore 'water is neutral / has a pH of 7'.

1

(d) Idea that a single titration could be flawed / anomalous

Do not accept 'will improve reliability / reproducibility / accuracy' without further qualification.
Allow 'to obtain concordant results'.

1

[5]

6. (a) $pV = nRT$

Do not penalise incorrect use of capitals / lower case letters.
Accept correct rearrangement of equation.

1

(b) $\mathbf{2}C_4H_{10} + \mathbf{5}O_2 \rightarrow \mathbf{4}CH_3COOH + \mathbf{2}H_2O$

Accept any correct combination of multiples, including fractions.

1

(c) 23.0 g ethanol produces 30.0 g ethanoic acid

1

15.1% (4.54 ×100 / 30)

Do not penalise precision.
15.1% scores 2 marks.
Accept consequential answer on wrong mass of ethanoic acid for second mark only.

1

[4]

7. 29.0%/29% O

If no O calculated, allow M2 if In and H divided by the correct A_r

1

$$\frac{69.2}{114.8/114.5} \quad \frac{1.8}{1} \quad \frac{29.0}{16}$$

1

or

0.603 1.8 1.81

1 3 3

EF = In H_3O_3

Allow $In(OH)_3$
Do not allow last mark just for ratio 1:3:3
If InO_3H_3 given with no working then allow 3 marks
If I not In, lose M3

1

[3]

8. (a) (i) 0.150

Accept 0.15

1

(ii) 0.0750

Accept 0.75
Accept consequential answer from (i)

1

(iii) 106.0

Must have M_r to 1 d.p. to score mark.
Only penalise once in paper
Do not penalise correct answer in g.
Ignore wrong units.

1

(iv) 7.95

Accept consequential answer from (ii) and (iii).

1

(b) Hazard: (acid) corrosive
Precaution: eye protection / gloves

Both hazard and appropriate precaution needed for 1 mark.
Do not accept 'toxic' as hazard.
Accept 'irritant vapour' and 'fume cupboard'.
Do not accept 'ingest'.

1

[5]

9. (a) (i) Blue to green

Accept blue to yellow.

1

(ii) Decrease / less acid needed

Ignore references to rate

1

(iii) Gloves **or** avoid skin contact

Allow 'if reagent contacts skin wash off (immediately)' or answers to that effect.

Do not accept 'wash' only.

Ignore 'eye protection' or 'lab coat' or 'use of fume cupboard' or 'don't ingest'.

1

(iv) Less chance of losing liquid on swirling / liquid doesn't splash on swirling

Do not accept 'easier to swirl' on its own.

Do not accept 'easier to stir'.

1

(v) Idea that a single titration could be flawed / anomalous

Allow an indication that the first titration is a rough titration.

Do not allow 'to improve accuracy' without qualification.

Do not allow vague references to 'outliers'.

1

(b) (i) $2.3(3) \times 10^{-2}$

Do not penalise additional significant figures, but do not allow 0.02

1

(ii) Dilution of acid needed / may react with carbon dioxide in air

Accept 'poor end-point' or 'no suitable indicator' or 'a large volume (of calcium hydroxide) will be needed'.

Ignore references to low solubility or concentration too low.

1

[7]

10. B

[1]

11. D

[1]

12. D

[1]