(15)

MENGO SENIOR SCHOOL

EXAMINATIONS DEPARTMENT

Answer Sheet

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ITEM 4

a) i) Percentage composition of solid Q

RMM of CO_2 = 12+16x2 = 44

RMM of H_2O = 2+16 = 18

44g of CO_2 Contain 12g of Carbon

3.08g of CO_2 Contain $\frac{12 \times 3.08}{44}$

= 0.84g of Carbon.

1.38g of Q Contains 0.84g of Carbon

∴ 100g of Q Contain $\left(\frac{0.84 \times 100}{1.38}\right)$ g of Carbon

Percentage of Carbon = 60.87%

18g of H_2O Contain 2g of H

0.54g of H_2O Contain $\left(\frac{2 \times 0.54}{18}\right)$ g of H

0.06g

1.38g of Q Contain 0.06g of H

100g of Q Contain $\left(\frac{0.06 \times 100}{1.38}\right)$ g of H

Percentage of Hydrogen = 4.35%

Percentage of Oxygen in Q = 100 − (60.87 + 4.35)

= 34.78%

(2 scores For All Percentages Correctly determined
1 score For only 2 Correctly determined with clear working. i.e C & H)

(ii) Percentage Composition of P

44g of CO_2 Contain 12g of Carbon

13.21g of CO_2 Contain $\left(\frac{12}{44} \times 13.21\right)$ g of Carbon

= 3.603g of Carbon

5.45g of P Contain 3.603g of Carbon

∴ 100g of P Contain $\left(\frac{3.603 \times 100}{5.45}\right)$ g of Carbon

∴ Percentage of Carbon = 66.11%

18g of H_2O Contain 2g of H

3.15g of H_2O Contain $\left(\frac{2 \times 3.15}{18}\right)$ g of H

0.35g of H.

5.45g of P contain 0.35g of H.

100g of P Contain $\left(\frac{0.35 \times 100}{5.45}\right)$ g of H

Percentage of H in P = 6.42%

Percentage of Oxygen in Q = 100 − (66.11 + 6.42 + 12.84)

= 14.63%

2 Scores For All percentages of C, H, O correctly determined,

1 Score for 2 only Correct (i.e. C, H)

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b) i) Empirical formula of Q.

Elements	C	H	O
percentages	60.87	4.35	34.78
Moles	$\frac{60.87}{12}$	$\frac{4.35}{1}$	$\frac{34.78}{16}$
	= 5.0725	4.35	2.174
Mole ratio	$\frac{5.0725}{2.174}$	$\frac{4.35}{2.174}$	$\frac{2.174}{2.174}$
	2.3	: 2	: 1
Simplest ratio	(2.3) x3	(2) x3	(1) x3
	: 7	: 6	: 3

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Deny any misses.

∴ Empirical formula of Q is $C_7H_6O_3$

If described as empirical formula.

ii) Empirical formula of P.

Elements	C	H	N	O
Percentages	66.11	6.42	12.84	14.63
Moles	$\frac{66.11}{12}$	$\frac{6.42}{1}$	$\frac{12.84}{14}$	$\frac{14.63}{16}$
	= 5.5092	= 6.42	= 0.917	= 0.914
Mole ratio	$\frac{5.5092}{0.914}$	$\frac{6.42}{0.914}$	$\frac{0.917}{0.914}$	$\frac{0.914}{0.914}$
	6	: 7	: 1	: 1

For Both.

For both.

∴ Empirical formula of Q is C_6H_7NO

If Correct if cited as empirical formula

c) : Molecular mass of Q.

i) 1 dm³ of Q weighs 6.161g
22.4 dm³ of Q weigh (6.161 × 22.4)g
∴ Molecular mass of Q = 138g

For determining Molecular mass

ii) Let RMM of $(C_7H_6O_3)_n$ = 138

$(12\times7 + 1\times6 + 16\times3)n = 138$

$138n = 138$

$n = \frac{138}{138}$

$\therefore n = 1$

For determining 'n'

Thus Molecular formula of Q is $C_7H_6O_3$

For correct conclusion

ii) For P

1 dm³ of P weighs 4.8661g
22.4 dm³ of P weigh (4.8661 × 22.4)g

Molecular mass of P = 109g

Let RMM of $(C_6H_7NO)_n$ = 109

$(6\times12 + 1\times7 + 14\times1 + 16\times1)n = 109$

$109n = 109$

$\therefore n = 1$

Thus Molecular formula of P is C_6H_7NO

—do as—

—do as—

—do as—

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d) ~~Solid~~ Solid Q ($C_7H_6O_3$) burnt on Monday has a higher carbon content such that the oxygen in air is not enough to burn it completely, that is why the unburnt carbon remains as dense smoke and soot. Incomplete burning also produces carbon monoxide ~~which causes~~ which is toxic and causes breathing discomfort.

The Solid P (C_6H_7NO) has nitrogen element such that its combustion releases brown fumes of nitrogen dioxide that is acidic and causes acidic rain, plus eye irritations and chocking, plus smog.

Substance Q poses greater risk to climate because it has higher carbon content and thus produces more carbon dioxide gas which is a green house gas that promotes global warming.

Solid P poses greater health risk because its combustion releases toxic nitrogen dioxide as well as toxic carbon monoxide gas.

d) Disposing of the raw materials by open burning in air releases carbon dioxide gas which is a green house gas that promotes global warming.
~~This can be mitigated by burning the materials in areas with scrubbers~~
or through planting more trees that use the carbondioxide gas in photosynthesis process.

1 score for correct explanation of both observations

2 scores for correct explanation ...

1 score for a correctly identified and reason

1 score for danger impact and mitigation

0 score: for any mitig...

Total 20 scores