Cambridge Chemistry Challenge Lower 6th

December 2025

Marking scheme for teachers

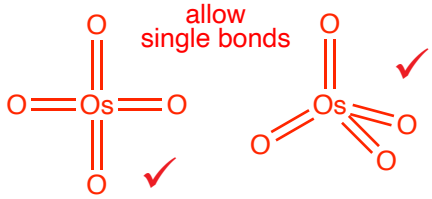
	p2	p3	p4	p5	p6	Total
mark	12	12	20	8	14	66

Marks available

1(a) (i) 8 ✓ — 2

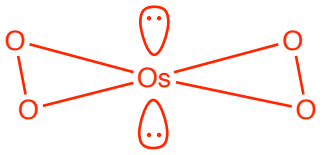
(ii) +8 ✓

(iii) allow single bonds



square planar ✓

tetrahedral ✓ — 2



allow peroxide Os(IV)

(iv) 109° 28' (allow 109°) ✓ — 1

1(b) (i) +8 ✓ — 1

(ii) K : Os

22.1 / 39.10 : 51.5 / 190.23

0.565 : 0.271

2 : 1 x = 2 ✓✓ — 2

1(c) (i) +6 ✓ — 2

(ii) +4 (increases by 4) ✓

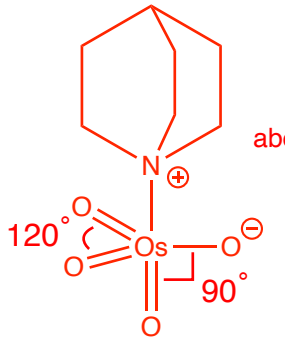
(iii) $2OsO_4 + 4KOH + CH_3CH_2OH + H_2O \longrightarrow 2K_2[OsO_2(OH)_4] + CH_3CO_2H$ ✓✓ — 2

OR $2OsO_4 + 5KOH + CH_3CH_2OH \longrightarrow 2K_2[OsO_2(OH)_4] + CH_3CO_2K$

Page total 12

Marks available

1(d) (i)



don't worry about formal charges

structure ✓

angles ✓

(ii)

1 ✓

3

(iii)

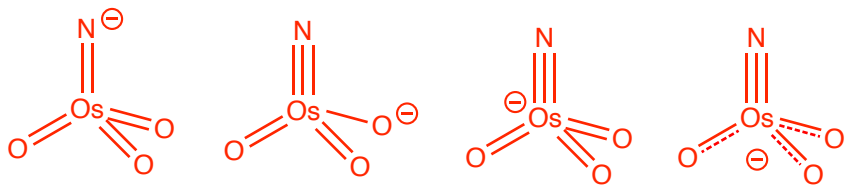
C	:	H	:	N	:	OsO_4
11.3 / 12.01	:	1.6 / 1.008	:	8.7 / 14.01	:	78.4 / 254.23
3	:	5.2	:	2	:	1 ✓
6	:	10	:	4	:	2

A$[OsO_4]_2$ or $(C_6H_{12}N_4)\,[OsO_4]_2$ ✓

2

(iv)

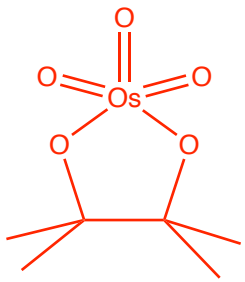
allow any of these



✓✓

2

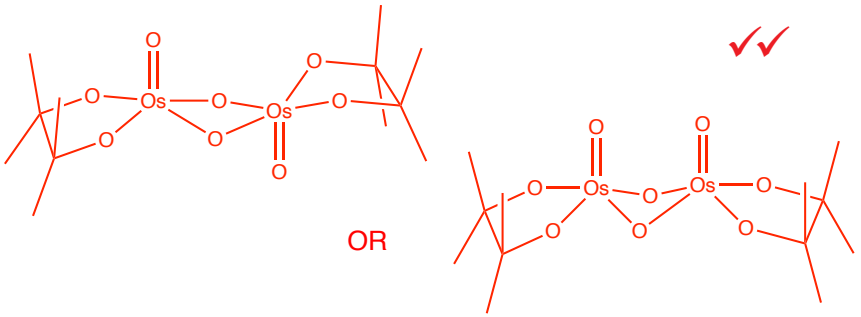
1(e) (i)



✓

1

(ii)



✓✓

2

(iii)

$K_2[OsO_2(OH)_4] + 2K_3Fe(CN)_6 + xKOH$ ✓✓

$\longrightarrow K_x[OsO_4(OH)_x] + 2K_4Fe(CN)_6 + 2H_2O$

2

Page total 12

1(f) (i)

–1 each (to 0) for each incorrect

8, 10

✓✓

(ii)

–1 each (to 0) for each incorrect

4, 7, 12

✓✓✓

(iii)

–1/2 each (to 0) for each incorrect

1, 4, 7, 8, 10, 12

half mark each

✓✓✓

(iv)

–1 each (to 0) for each incorrect

4, 7, 12

✓✓✓

(v)

–1 each (to 0) for each incorrect

2, 3, 9, 11

✓✓✓✓

15

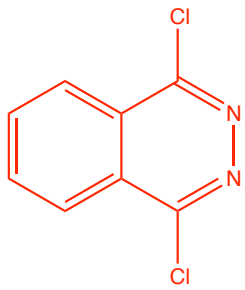
1(g)

4

✓✓

2

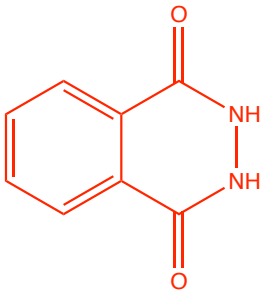
1(h) (i)



✓

1

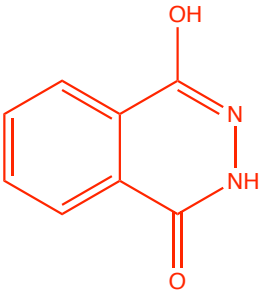
(ii)



✓

1

(iii)



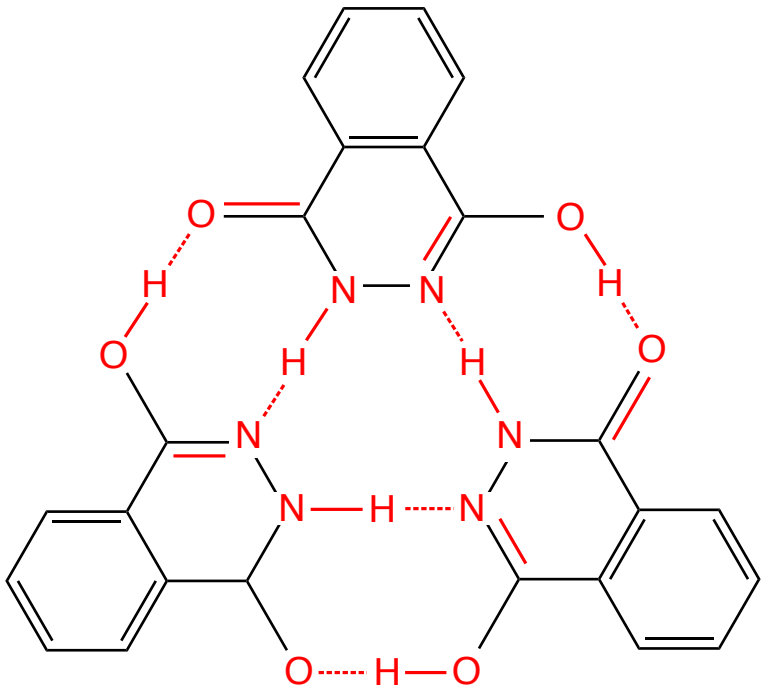
✓

1

Page total 20

Marks available

1(h) (iv)



✓✓

2

1(j) (i)

mol dm^{-3} ✓

(ii)

s^{-1} ✓

2

(iii)

$$v = \frac{k_{cat}\,[\text{catalyst}]_{tot}\,[\text{alkene}]_0}{K_M}$$

✓✓

2

(iv)

$$v_{max} = k_{cat}\,[\text{catalyst}]_{tot}$$

✓✓

2

Page total 8

Marks available

1(k) (i)

$$\text{slope} = \frac{K_M}{k_{cat}\,[\text{catalyst}]_{tot}} \quad \left[= \frac{K_M}{v_{max}} \right]$$ ✓✓

2

(ii)

$$\mathbf{S} = \frac{1}{k_{cat}\,[\text{catalyst}]_{tot}} \quad \left[= \frac{1}{v_{max}} \right]$$ ✓✓

2

(iii)

$$\mathbf{T} = -\frac{1}{K_M}$$ ✓✓

2

(iv)

$\mathbf{S} = 8000\ \text{mol}^{-1}\ \text{dm}^3\ \text{s}$ ✓✓

$v_{max} = 1 / 8000 = 1.25 \times 10^{-4}\ \text{mol dm}^{-3}\ \text{s}^{-1}$

$v_{max} = k_{cat}\,[\text{catalyst}]_{tot}$

$[\text{catalyst}]_{tot} = 0.5 \times 10^{-3}\ \text{mol dm}^{-3}$

$k_{cat} = 1.25 \times 10^{-4} / 0.5 \times 10^{-3} = 0.248\ \text{s}^{-1}$ ✓✓

gradient = 11000 / 80 = 137.5

$K_M = 137.5 \times 1.25 \times 10^{-4} = 0.0172\ \text{mol dm}^{-3}$ ✓✓

(check: $-1/0.0172 = -58.2\ \text{mol}^{-1}\ \text{dm}^3 \approx \mathbf{T}$)

6

(v)

if $[\text{catalyst}]_{tot}$ = 4 times original amount,

$v_{max} = 4 \times 1.25 \times 10^{-4}\ \text{mol dm}^{-3}\ \text{s}^{-1}$

$= 5.00 \times 10^{-4}\ \text{mol dm}^{-3}\ \text{s}^{-1}$ ✓✓

2

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