Rates of reaction

Mark scheme

1	(a)	oxidising		1
		(i) oxygen		1
			ignore any numbers	
		(ii) (catalyst) speeds up a (chemical reaction)		1
			accept changes the rate (of reaction)	

[3]

2.	(a)	sensible line of best fit which goes through or close to all the points **except** the anomalous point	1
		allow wobbly / short double lines	
		± ½ square	
	(b)	loss of gas / loss of CO_2	1
		idea of gas produced / formed	
	(c)	7	1
	(d)	(i) steeper line from around the same starting point and left of the points	1
		*allow crosses if they are fully correct for **1** mark*	
		levelling off at 99	1
		accept short level line at 99	
		± ½ square	
		(ii) any **three** from:	3

- particles / molecules / atoms/ ions have more energy
  allow given / gain / get energy

- move faster
  ignore move about more
  ignore vibrate more / faster

- collide <u>more</u> often

  or <u>more</u> chance of collisions

  or bump into each other <u>more</u>
  ignore collide quicker / faster

- collide with more force / energy

  or <u>more</u> particles have the activation energy

  or <u>more</u> collisions result in reaction

  or <u>more</u> collisions are successful

[8]

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3. (a) (i) a continuous <u>straight line</u> missing anomalous point   1

           allow a line which does not start at zero / origin

      (ii) any **two** sensible errors eg

- timing errors and / or example(*)

- measurement errors and / or example(*)

- apparatus errors and / or example(*)

- human / experimental / random error and / or example
  or 'did not do it right'(*)

  *(*)could be two from **same** category eg two timing errors – watch not started at the same time plus difficulty in deciding when the cross has disappeared.*

- temperature fluctuation

- anomalous point
  accept outlier / wrong result

- results not recorded correctly

- plotting error

- rate calculated incorrectly   2
  ignore 'not repeated'
  *ignore systematic / zero error / weighing error **or** error unqualified*

     (b) (i) straight line

           or

           as concentration increases the rate goes up **or** converse   1

                accept numerical example
                accept positive correlation
                accept same gradient
                ignore 'most points near / on line of best fit'

      (ii) more collisions   1
                accept greater chance of collisions
                accept collide more successfully
                accept alternative versions of collide eg 'bump / hit'
                ignore references to energy / speed of particles / surface area

           more particles (in each volume of solution)(i.e. an attempt at defining concentration)   1

                accept 'particles are closer together'
                allow ions / atoms / molecules for particles ignore reactants
                *accept greater frequency of collisions **or** greater number of collisions per second for **2** marks*

                                                         [6]