



**General Certificate of Education (A-level) Applied
June 2011**

Applied Science

SC11

**(Specification
8771/8773/8776/8777/8779)**

Unit 11: Sports Science

Final

Mark Scheme

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Question 1

(a)	Change in concentration of reactant/product Over time	(1) AO1 (1) AO1	2
(b)(i)	Zero As concentration of X is doubled rate is unchanged First As concentration of Y is multiplied by 3 rate is multiplied by 3	(1) AO2 (1) AO2 (1) AO2 (1) AO2	4
(ii)	Temperature	(1) AO1	1
(c)(i)	Horizontal axis = Energy Vertical axis = number of molecules	(1) AO1 (1) AO1	2
(ii)	Curve skewed to right of original Peak lower than original	(1) AO1 (1) AO1	2
(iii)	the <u>minimum</u> amount of energy Particles require to react when they collide	(1) AO1 (1) AO1	2
(iv)	At a higher temperature the particles will move faster and so collide more frequently The proportion of particles that possess an energy greater than or equal to the E_a will increase There will therefore be more successful collisions per second	(1) AO2 (1) AO2 (1) AO2	3

Total Mark: 16

Question 2

(a)(i)	17 132	(1) AO2 (1) AO2	2
(ii)	Moles ammonium sulphate = $2 \times 10^7 / 132 = 151515$ 2:1 therefore moles ammonia = $2 \times 151515 = 303030$ (mark is for multiplying by 2) Mass = $303030 \times 17 = 5.15 \times 10^6$ g or 5.15 tonnes (all 3 marks awarded if this answer given)	(1) AO2 (1) AO2 (1) AO2	3
(b)(i)	Thermometer Burette/pipette/measuring cylinder Polystyrene cup	(1) AO3 (1) AO3 (1) AO3	3
(ii)	QWC - A good answer might include: 25cm^3 of 1.0 mol dm^{-3} sulphuric acid would be measured using a bulb pipette and placed into the polystyrene cup. The temperature of the acid would be measured every minute for 4 minutes before 25cm^3 of 2.0 mol dm^{-3} ammonia (also measured with a bulb pipette) were added at 4.5 minutes. The reaction mixture would be thoroughly stirred and the temperature would be measured after 5 minutes and then after each minute until 10 minutes had passed. A graph would then be plotted with time on the horizontal axis and temperature on the vertical axis. The two lines obtained would both be extended to 4.5 minutes and so the temperature rise would be determined.	(5) AO3	5
(iii)	Insulate container/lid Measure temperature of ammonia before reaction to ensure it is the same as that of the acid before reaction.	(1) AO3 (1) AO3	2
(iv)	ΔT = temperature rise m=mass of the water present	(1) AO1 (1) AO1	2

Total Mark: 17

Question 3

(a)	homogeneous	(1) AO1	1
(b)	Both forward and reverse reactions occur At same rate / equal concentrations of reactants and products	(1) AO1 (1) AO1	2
(c)(i)	$[C_2H_2][H_2]^3/[CH_4]^2$ Correct terms (includes square brackets) Correct indices	(1) AO2 (1) AO2	2
(ii)	Concentration needs to be calculated Number of moles	(1) AO1 (1) AO2	2
(d)	A system in <u>equilibrium</u> Will <u>oppose any change</u> imposed upon it	(1) AO1 (1) AO1	2
(e)	QWC: A good answer might include There are a smaller number of gaseous molecules on the LHS (or converse) Therefore if the pressure is decreased the equilibrium will shift to the RHS to increase the pressure of the system and so the yield of ethyne will increase. However, the decrease in pressure will reduce the number of gas particles in a given volume. The number of successful collisions per second and the subsequent rate of reaction will therefore decrease.	(5) AO2	5
(f)	Reactants and products labelled correctly (or actual formulae) Correct general shape Products higher than reactants	(1) AO1 (1) AO1 (1) AO2	3
(g)(i)	$336/22.4 = 15$	(1) AO2	1
(ii)	$15/2 = 7.5$ moles of ethyne formed Energy = $7.5 \times +377 = 2827.5$ kJ	(1) AO2 (1) AO2	2

Total Mark: 20

Question 4

(a)	electrolysis	(1) AO1	1
(b)	Flammable Toxic	(1) AO1 (1) AO1	2
(c)	Eye protection/gloves	(1) AO2	1
(d)(i)	Set up cost/cost of plant equipment	(1) AO1	1
(ii)	Cost of electricity Salaries of workforce/marketing Cost of electrolysis cell	(1) AO2 (1) AO2 (1) AO2	3
(e)	Products are removed at same time as reactants are added Process never stops	(1) AO1 (1) AO1	2
(f)(i)	-1 0	(1) AO2 (1) AO2	2
(ii)	Oxidised As oxidation state increased/ electrons are lost	(1) AO2	1

Total Mark: 13

Question 5

(a)(i)	The <u>enthalpy change</u> OR <u>heat energy released/absorbed</u> When <u>one mole</u> of the compound is formed	(1) AO1 (1) AO1	2
(ii)	$\Sigma\Delta H_f(\text{products}) - \Sigma\Delta H_f(\text{reactants})$ /appropriate Hess's cycle $\Sigma\Delta H_f(\text{products}) = -739.9$ $\Sigma\Delta H_f(\text{reactants}) = -787.8$ $-739.9 - (-787.8) = +47.9$ (ignore units)	(1) AO2 (1) AO2 (1) AO2 (1) AO2	4

(b)(i)	$2.4 \times 5.2 / 1.5^2$ = 5.55	(1) AO2 (1) AO2	2
(ii)	No units.	(1) AO1	1
(c)	No effect Increases rate of both forward and reverse reactions equally	(1) AO2 (1) AO2	2
(d)(i)	Reactants are added and reaction occurs And then products are removed	(1) AO1 (1) AO1	2
(ii)	Easily change to the production of a different fragrance	(1) AO2	1

Total Mark: 14

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