

Question	Marking Guidance	Mark	Comments
02.1	M1 $(q = mc\Delta T = 100 \times 4.18 \times 38(.0))$ = 15 884 / 15 880 / 15 900 / 16 000 (J) (OR 15.884 / 15.88 / 15.9 / 16 (kJ))	1	Award full marks for correct answer
	M2 Moles (methanol = 1.65 / 32.0) = 0.0516 or 0.052	1	M1 mark is for value not expression (at least 2sf); penalise incorrect units here only if M1 is the only potential scoring point in M1-M3
	M3 Heat change per moles = M1/M2 (15 884 / 0.0516 / 1000 = 308 (kJ mol ⁻¹) (allow 305 to 310)	1	M2 at least 2sf M3 at least 2sf; answer must be in kJ mol ⁻¹
	M4 Answer = -308 (kJ mol ⁻¹) (allow -305 to -310)	1	M4 this mark is for – sign (mark independently)
02.2	Heating up copper / calorimeter / container / thermometer / heat capacity of copper / calorimeter / thermometer not taken into account OR Evaporation of alcohol/methanol OR Experiment not done under standard conditions	1	Not human errors (e.g. misreading scales) Not impure methanol Allow evaporation of water
02.3	(100 x 0.5 / 38 =) 1.3 or 1.32 or 1.316% (minimum 2 sf)	1	Allow correct answer to at least 2sf; Allow 1.31 or 1.315%
02.4	Idea that heat loss is more significant issue OR Idea that temperature <u>change/rise</u> is (significantly / much) bigger than uncertainty	1	One of these two ideas only and each one must involve a comparison

02.5	M1 Mass of ethanol = 500×0.789 (= 394.5 or 395 (g)) M2 Moles of ethanol = $M1 / 46.0$ (= 8.576 or 8.58) M3 Heat released = $M2 \times 1371$ = 11800 (kJ) must be 3 sf	1 1 1	Correct answer to 3sf scores 3; correct value to 2sf or more than 3sf scores 2 Answers that are a factor of 10^x out score 2 if given to 3sf or 1 if given to a different number of sf M3 ignore units, but penalise incorrect units M3 ignore sign M2 and M3 – allow consequential marking
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