Mark Scheme 2850
June 2005

Question	Expected answers	Marks
2 a i	200 x 4.2 x 20(= 16800 J)(1);=16.8/17 kJ(1)(second mark for correct conversion to kJ) Ignore signs	2
2 a ii	1.2/12 (1) (= 0.1 mole); ecf 0.1 x 394(=39.4) (1) Ecf 39 (1) mark sig figs independently Ignore sign 39.4 scores 2	3
2 a iii	17/39 x 100 = (44)(43.6)% or 16.8/39(39.4) x 100 = 43(42.6)(1) ignore sig figs (Marking process *i.e.* actual/theoretical x 100) but correct answer needed from candidate values.	1
2 b	Nitrogen(& O_2) from air/fuel/coal(1); react with O_2 /combust/oxidized/bond with O_2 (1) (ignore refs. to incomplete combustion)	2
2 c i	**A = Unbranched** alkane; B = **unbranched** alkene; C = cycloalkane; D = **branched** alkane (4 x 1)	4
2 c ii	Skeletal (1)	1
2 c iii	Low/reduced tendency. NOT no/doesn't/prevents/ autoignit(e)ion (1); to autoignite/pre-ignite/knock (1) Can get max one mark if talk in terms of composition (more branched/shorter molecules)	2
2 d i	Benzene(1)	1
2 d ii	2-methylpentane(1)	1
2 d iii	Hydrogen/H_2 (not "H") (1)	1
	Total question 2 = 18	

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Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit ( ) = words which are not essential to gain credit ____ = (underlining) key words which **must** be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument

Mark Scheme	Unit Code 2850	Session Jun	Year 2005	Version TL

1 a i	Protons = 82(1); Neutrons = 124(1); Electrons(allow ecf with protons) = 82(1)	3
1 a ii	234 and 4 top line (1); 90 and 2 bottom (1); $(^{4}_{2})\alpha$ /$He^{(2+)}$ (1) No ecf. Not α^{2+}	3
1 a iii	Time taken(qualified) to decay(1) but NOT half the time taken(CON) for amount/ count rate to drop by half (from starting point)/ half radioactivity decays/half the atoms decay/half radiation emitted/ half radioactive nuclei decay/half mass of original isotope (1) (AW)	2
1 a iv	β /beta(1) correct symbol(with 0 and -1) OK but wrong way round CON	1
1 b	Gas escapes (1); less final lead isotope, decay has not been going on so long /U:Pb ratio greater/ (1)(Idea that loss of a daughter product seems to suggest radioactive decay has not been going on as long as it really has.)	2
1 c i	Correct labels (4 x 1)clockwise from – sample inlet; ionization chamber; ion detector; deflecting magnetic field	4
1 c ii	Reduce/weaken/lessened/decreased (AW) field	1
1 d	Moles of U 88.1/238 (1) (= 0.37); moles of O 11.9/16 (1) (= 0.74); Formula = UO_2 (1) NB UO_2 on its own 3 marks. U_2O can score two if ratio clearly shown to be upside down (UrO_2 = 2.) Any whole number ratio that follows from working can score 1.	3
	Question 1 total 19	

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2 a ii	1.2/12 (1) (= 0.1 mole); ecf 0.1 x 394(=39.4) (1) Ecf 39 (1) mark sig figs independently Ignore sign 39.4 scores 2	3
2 a iii	17/39 x 100 = (44)(43.6)% or 16.8/39(39.4) x 100 = 43(42.6)(1) ignore sig figs (Marking process *i.e.* actual/theoretical x 100) but correct answer needed from candidate values.	1
2 b	Nitrogen(& O_2) from air/fuel/coal(1); react with O_2 /combust/oxidized/bond with O_2 (1) (ignore refs. to incomplete combustion)	2
2 c i	**A = Unbranched** alkane; B = **unbranched** alkene; C = cycloalkane; D = **branched** alkane (4 x 1)	4
2 c ii	Skeletal (1)	1
2 c iii	Low/reduced tendency. NOT no/doesn't/prevents/ autoignit(e)ion (1); to autoignite/pre-ignite/knock (1) Can get max one mark if talk in terms of composition (more branched/shorter molecules)	2
2 d i	Benzene(1)	1
2 d ii	2-methylpentane(1)	1
2 d iii	Hydrogen/H_2 (not "H") (1)	1
	Total question 2 = 18	

3 a i	$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ LHS(1); RHS(1); appropriate states (1)	3
3 b i	Lime water/$Ca(OH)_2$/suitable indicator (*e.g.* bicarbonate/Universal Indicator/Methyl Orange) (1)	1
3 b ii	Goes cloudy/milky/white/ precipitate/appropriate indicator change (1) NOT bubbles/murky	1
3 b iii	Idea of fair test (*e.g.* same amount/mass of carbonate/heating conditions (1); $MgCO_3$/it causes lime water/indicator to change quicker/ more gas in a given time/bubbles faster (1) ORA must be an input variable for fair test	2
3 c i	Slaked lime more soluble/leached off more quickly (ora) (1)	1
3 c ii	Basic/alkaline/accepts H^+/pH > 7/contains OH^- /hydroxide ions NOT OH without – charge. (1)	1
3 c iii	$Ca(OH)_2(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + 2H_2O(l)$ species(2 x 1); balancing(independent)(1)	3
3 d	2	1
3 e i	$Ca(g) \rightarrow Ca^+(g) + e^-$ (1 for correct ionisation); $Ca^+(g) \rightarrow Ca^{2+}(g) + e^-$ (1 for correct ionisation); gaseous (in both) ecf (1) Must be e^- but ignore 0 and -1 if correct way round. Use of wrong elemental (*e.g.* 'X') symbol loses first mark, but then ecf	3
3 e ii	Ionization enthalpies decrease down group/ease of ion formation increases(1) More reactive down the group (1); electrons held less tightly/lost more readily/less energy to remove (1); more energy/electron shells/outer electrons further out (AW)(1); attraction to nucleus /protons(AW) (1); more shielding (from inner shells) (1) ORA	6
	Total question 3 = 22	

Question	Expected Answers	Marks
4 a i	Full structural (1) must show **all** bonds	1
4 a ii	$C_3H_8O_2$ any order (1) NOT discrete OH groups	1
4 a iii	Greater/increases (1); more ways to arrange molecules/particles/increased disorder/ more random when mixed (1) NOT more molecules/particles	2
4 b (i)	Speeds up reaction (1); NOT alters By offering an alternative pathway/lower E_A/catalyst unchanged(1); Heterogeneous – in different phases/states (1);	3
4 b ii	3	1
4 b (iii)	Ether/alkoxy (1)	1
4 b iv	109° (+/_ 2) (1); Then 2 out of 3 from..... Four electron regions/pairs of electrons (1) NOT bonds try to get as far away as possible /achieve lowest energy/minimize repulsion (1); NOT repel as much as possible. results in a tetrahedral arrangement (1); Diagram could score this point.	3
4 c i	Liquid (1)	1
4 c ii	-109 scores three; +109 scores two with correct working; 109 scores two if working shows minus sign has been left off but only one if working would lead to a plus; any number other than 109 can score max 1 if sign follows from working	3
	Total question 4 = 16	

(Paper total 75)