

CAT 1 1999:**Sample Answers**Section A

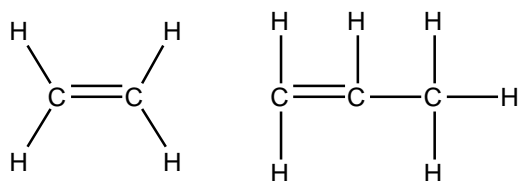
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|-------------|--------------|--------------|
| 1. D | 8. A | 15. C |
| 2. A | 9. B | 16. D |
| 3. C | 10. C | 17. D |
| 4. C | 11. A | 18. A |
| 5. B | 12. B | 19. C |
| 6. D | 13. C | 20. A |
| 7. D | 14. A | |

Section B

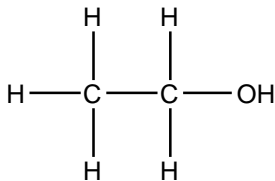
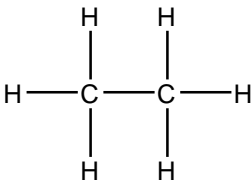
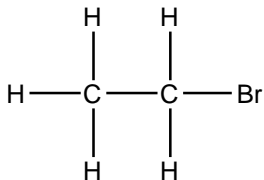
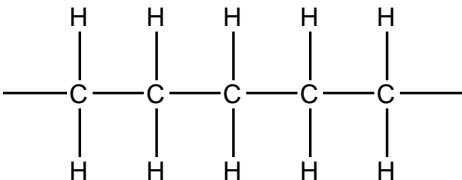
- 1.a. $S(s) + O_2 \rightarrow SO_2(g)$ $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$
- b. Low temperature, high pressure, excess oxygen
- c. Finely divided catalyst/high surface area, several passes over catalyst/long contact time
- d. for example: $H_2SO_4(aq) + 2NaOH(aq) \rightarrow 2H_2O(l) + Na_2SO_4(aq)$
- e. $H_2SO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + H_2(g)$
- f. $C_6H_{12}O_6$ or $C_{12}H_{22}O_{11}$
- 2.a. Many examples possible
- b. For example: $C(s) + CO_2(g) \rightarrow 2CO(g)$
- c. $CH_3CH_2CH=CH_2$
- d. i. $CH_3CH_2CH_2SO_3H$
ii. Hydrophobic hydrocarbon chain, hydrophilic - SO_3H group
- e. SO_2 (from coal burning power stations), CO (from internal combustion engines)
- 3.a. Surfactant
- b. Test for:
- Solubility of water soluble and oil soluble dyes in the dressing
 - Electrical conductivity of the salad oil
 - Cooling effect of dressing on the skin
- c. Result for each test listed
- Water soluble dye dissolves
 - Moderate to high electrical conductivity
 - Feels cool on the skin
- d. See a textbook for a diagram

- 4.a. $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{H}_2(\text{g}) + \text{MgCl}_2(\text{aq})$
 b. $n(\text{HCl}) = (0.012/24.3) \times 2 = 9.9 \times 10^{-4} \text{ mol}$
 c. $V = nRT/P = (4.9 \times 10^{-4} \times 8.31 \times 296) / 102000 = 1.2 \times 10^{-5} \text{ m}^3 = 12 \text{ mL}$
 d. Line should be above the existing curve at all times and asymptote to the same value on the volume axis

- 5.a. i. CH_3CH_3 or $\text{CH}_3\text{CH}_2\text{CH}_3$ or $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
 ii.



b.

1 ethanol: $\text{CH}_3\text{CH}_2\text{OH}$ 	2 ethane: CH_3CH_3 
3 bromoethane: $\text{CH}_3\text{CH}_2\text{Br}$ 	4 $-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2-$ 

- 6.a. average titre = $1/3(25.10 + 25.21 + 25.17) = 25.16 \text{ mL}$
 b. $n(\text{I}_2) = (25.16 / 1000) \times 0.110 = 0.00277 \text{ mol}$
 c. $n(\text{C}_6\text{H}_8\text{O}_6)$ in 25 mL = $n(\text{I}_2) = 0.00277 \text{ mol}$
 $n(\text{C}_6\text{H}_8\text{O}_6)$ in 200 mL = $0.00277 \times 0.200 / 0.025 = 0.0222 \text{ mol}$
 d. $m(\text{C}_6\text{H}_8\text{O}_6)$ in 5 tablets = $0.0222 \times (72 + 8 + 96) = 3.9072 \text{ g}$
 $m(\text{C}_6\text{H}_8\text{O}_6)$ in tablet = $3.9072 / 5 = 0.718 \text{ g}$
 e. % mass in a tablet = $0.718 \times 100 / (6.67 / 5) = 58.6 \%$