

Chimie (corrigé)Th = théorie (=question de cours)CT = compréhension et transfertAn = application numériqueI. Aromates et mélange tampon

1) cf. livre p. 46-47

2) a) cf. livre: encadré p. 54

b) le réactif électrophile Br^+ est orienté vers la position méta
→ m-bromonitrobenzène3) a) $pK_2(\text{C}_6\text{H}_5\text{COOH}/\text{C}_6\text{H}_5\text{COO}^-) = 4,20$

$$pH = pK_2 + \log \frac{n(\text{C}_6\text{H}_5\text{COO}^-)}{n(\text{C}_6\text{H}_5\text{COOH})}$$

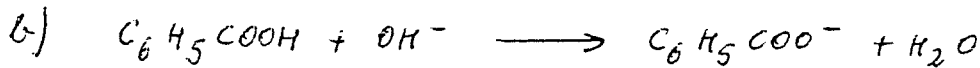
$$\text{doit être } 0 \implies n(\text{C}_6\text{H}_5\text{COO}^-) = n(\text{C}_6\text{H}_5\text{COOH})$$

$$n(\text{C}_6\text{H}_5\text{COOH}) = c(\text{C}_6\text{H}_5\text{COOH}) \cdot V(\text{C}_6\text{H}_5\text{COOH}, \text{aq})$$

$$= 0,05 \text{ mol} \cdot \text{l}^{-1} \cdot 0,30 \text{ l} = 1,5 \cdot 10^{-2} \text{ mol}$$

$$n(\text{C}_6\text{H}_5\text{COO}^-) = c(\text{C}_6\text{H}_5\text{COO}^-) \cdot V(\text{C}_6\text{H}_5\text{COO}^-, \text{aq}) = 1,5 \cdot 10^{-2} \text{ mol}$$

$$V(\text{C}_6\text{H}_5\text{COO}^-) = \frac{1,5 \cdot 10^{-2} \text{ mol}}{0,1 \text{ mol} \cdot \text{l}^{-1}} = 0,15 \text{ l} = \underline{150 \text{ ml}}$$



$$n(\text{NaOH}) = \frac{m(\text{NaOH})}{M(\text{NaOH})} = \frac{0,1 \text{ g}}{40 \text{ g} \cdot \text{mol}^{-1}} = 2,5 \cdot 10^{-3} \text{ mol}$$

$$n(\text{C}_6\text{H}_5\text{COOH}) = 1,5 \cdot 10^{-2} \text{ mol} - 2,5 \cdot 10^{-3} \text{ mol} = 1,25 \cdot 10^{-2} \text{ mol}$$

$$n(\text{C}_6\text{H}_5\text{COO}^-) = 1,5 \cdot 10^{-2} \text{ mol} + 2,5 \cdot 10^{-3} \text{ mol} = 1,75 \cdot 10^{-2} \text{ mol}$$

$$pH = pK_2 + \log \frac{1,75 \cdot 10^{-2} \text{ mol}}{1,25 \cdot 10^{-2} \text{ mol}} = 4,20 + 0,146 \approx \underline{4,35}$$

$$c) c(\text{NaOH}) = \frac{n(\text{NaOH})}{V} = \frac{2,5 \cdot 10^{-3} \text{ mol}}{0,45 \text{ l} (!)} = 5,56 \cdot 10^{-3} \text{ mol} \cdot \text{l}^{-1}$$

$$pOH = -\log c(\text{OH}^-) = -\log c(\text{NaOH}) = -\log 5,56 \cdot 10^{-3} = 2,25$$

$$pH = 14 - 2,25 = \underline{11,75}$$

Th: 6

Th: 2

CT: 2

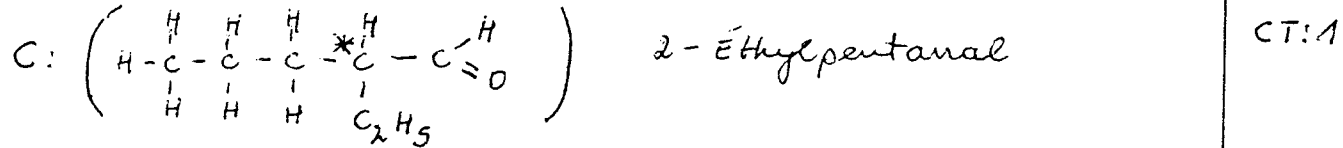
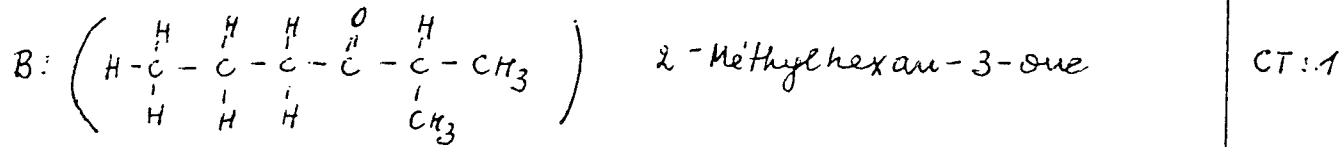
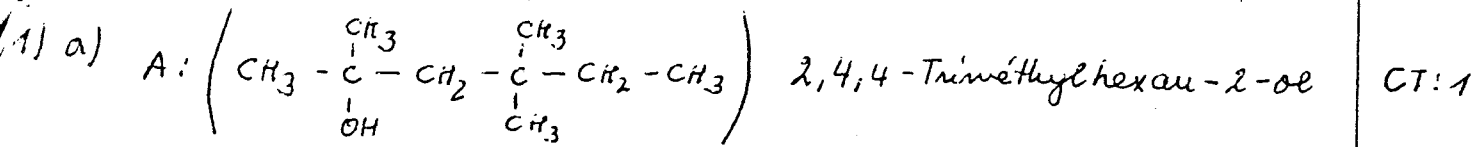
An: 3

An: 4

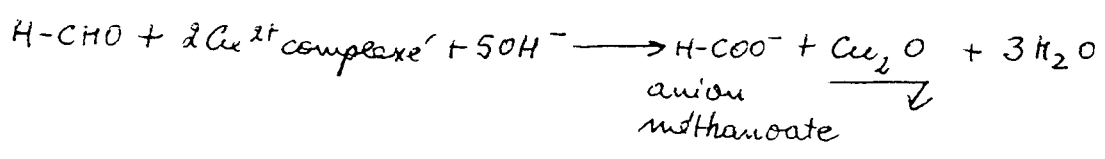
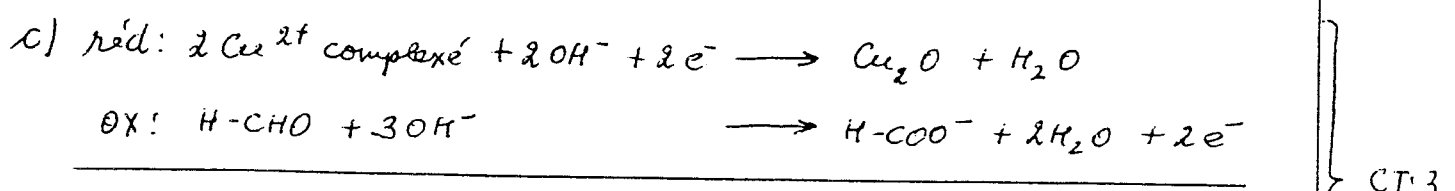
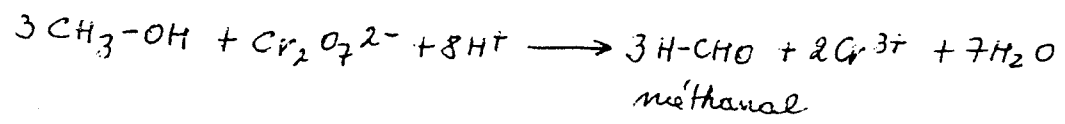
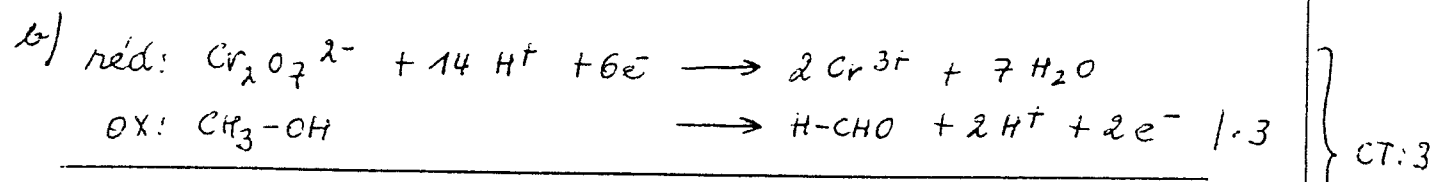
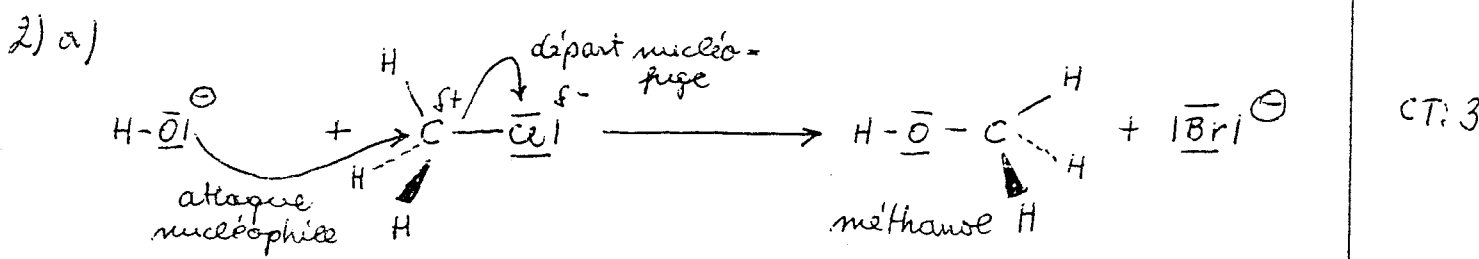
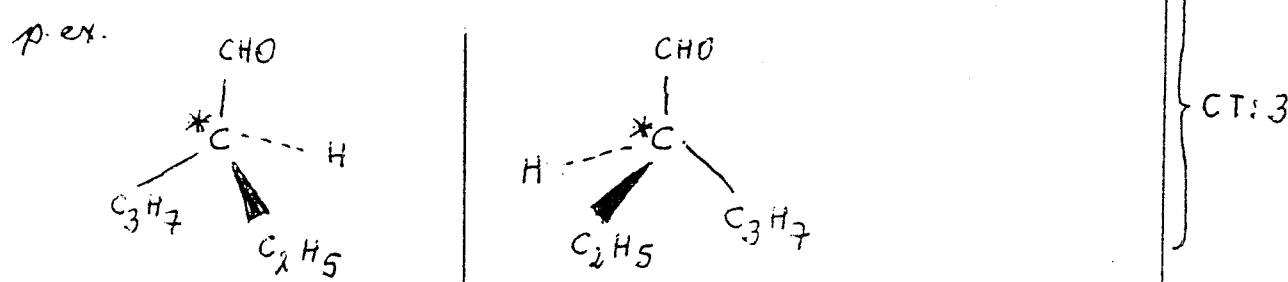
An: 2

19 pts

Alcools, aldéhydes et cétones

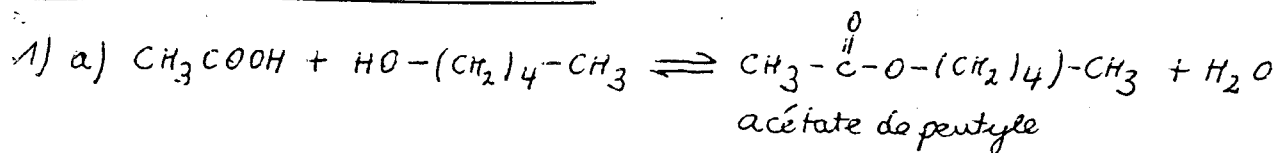


b) C renferme un carbone asymétrique → chiral



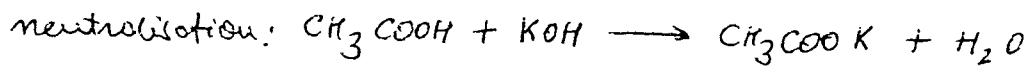
15 pts.

II. Estérification et titrage



$$n(\text{CH}_3\text{COOH}) \text{ au début} = \frac{m}{M} = \frac{12,0 \text{ g}}{60 \text{ g} \cdot \text{mol}^{-1}} = 0,2 \text{ mol}$$

$$n(\text{CH}_3-(\text{CH}_2)_4-\text{OH}) \text{ au début} = \frac{m}{M} = \frac{17,6 \text{ g}}{88 \text{ g} \cdot \text{mol}^{-1}} = 0,2 \text{ mol}$$



au pt. d'équivalence: $n(\text{CH}_3\text{COOH}) = n(\text{KOH}) = c(\text{KOH}) \cdot V(\text{KOH}, \text{eq})$

$$= 0,5 \text{ mol} \cdot \text{l}^{-1} \cdot 13,3 \cdot 10^{-3} \text{ l}$$
$$= 6,65 \cdot 10^{-3} \text{ mol}$$

ds la prise d'essai il reste donc $6,65 \cdot 10^{-3} \text{ mol}$ d'acide

b) mélange à l'équilibre:

$$n(\text{CH}_3\text{COOH}) = 6,65 \cdot 10^{-3} \cdot 10^{(1)} = 6,65 \cdot 10^{-2} \text{ mol}$$

$$n(\text{alcool}) = 6,65 \cdot 10^{-2} \text{ mol}$$

$$n(\text{ester}) = 0,2 - 6,65 \cdot 10^{-2} = 13,35 \cdot 10^{-2} \text{ mol}$$

$$n(\text{H}_2\text{O}) = 13,35 \cdot 10^{-2} \text{ mol}$$

$$\text{rendement} = \frac{n(\text{ester}) \text{ réel}}{n(\text{ester}) \text{ théorique}} = \frac{0,1335}{0,2} = 0,6675 \text{ ou } 66,75 \%$$

$$c) K = \frac{c(\text{ester}) \cdot c(\text{eau})}{c(\text{acide}) \cdot c(\text{alcool})} = \frac{n(\text{ester}) \cdot n(\text{eau})}{n(\text{acide}) \cdot n(\text{alcool})} = \frac{0,0178}{4,422 \cdot 10^{-3}} = 4,025$$

2) a) cf. livre p. 81 en bas

b) cf. livre p. 82

Am: 3

Am: 3

Am: 1

Th: 1

Th: 5

13 pts.

IV. Composés azotés

1) cf. livre p. 89

2) a) $R = C_2H_{2z+1}$

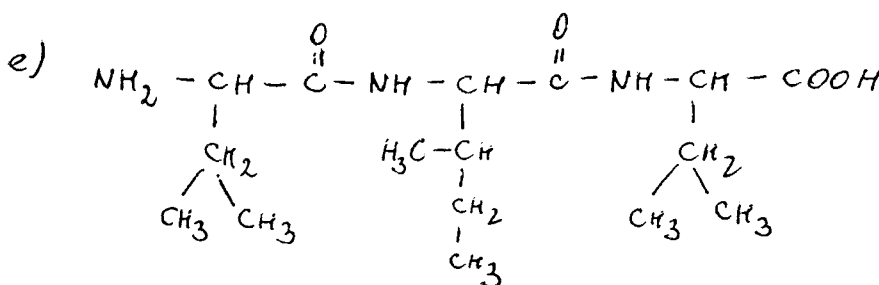
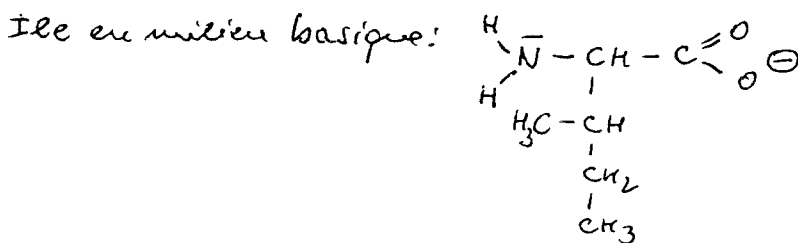
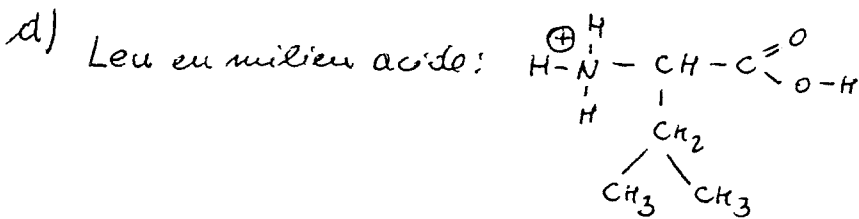
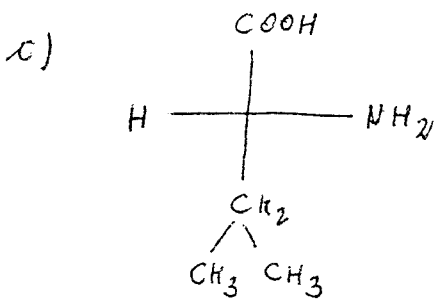
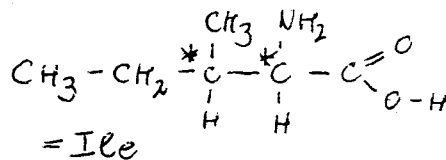
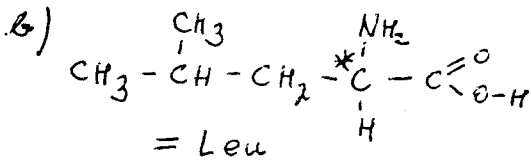
$$2M(C) + 2z M(H) + 1M(H) + 2M(C) + 1M(N) + 2M(O) + 4M(H) = 131 \frac{g}{mole}$$

$$12z + 2z + 1 + 24 + 14 + 32 + 4 = 131$$

$$14z = 131 - 75$$

$$z = 4$$

$$\Rightarrow R = C_4H_9-$$



Th: 6

Am: 2

CT: 2

CT: 1

CT: 1

CT: 1