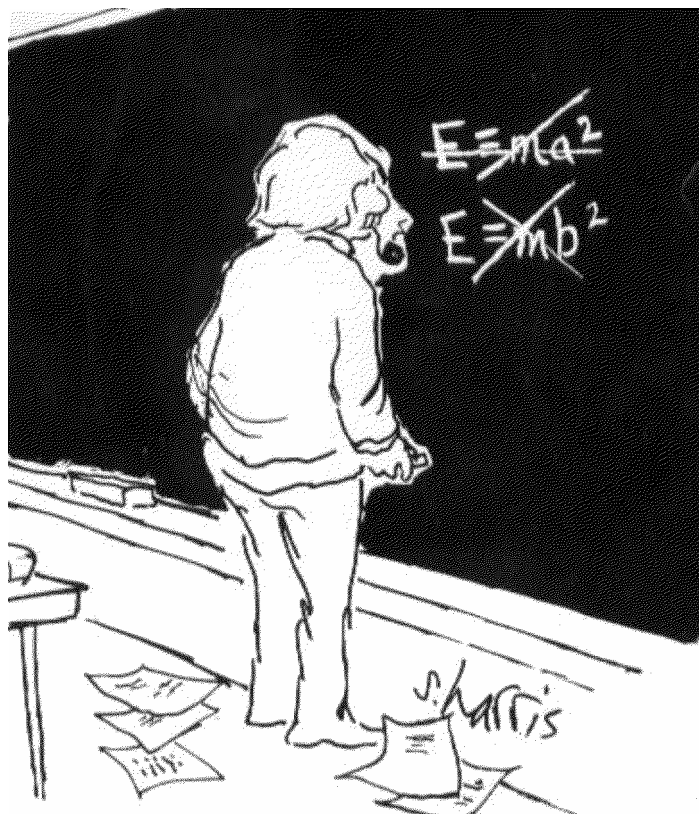


**Chemistry 34**  
**Exam II**  
**February 18, 2005**



**Form A**

There are 20 questions on this exam. Check that you have done all of the problems and filled in the first 20 bubbles on the scantron. All questions are worth the same number of points. The maximum score on this exam is 20 points.

*Instructions*

**Answer sheet**

- 1) On the scantron, you need to clearly fill:
  - your **name** and your **student number**,
  - **test form** (white = test form A; yellow = test form B).
- 2) Use a #2 pencil

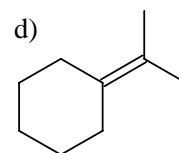
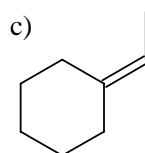
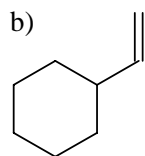
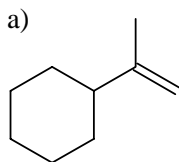
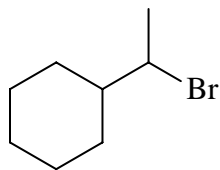
**Exam policy**

- 1) Molecular models are allowed,
- 2.) Calculators or any electronic devices (cell phones, BlackBerries etc.) **are not allowed**.
- 2) Any blank spaces on the exam can be used as scratch paper.
- 3) The periodic table is printed at the end of this exam.
- 4) Feel free to take this copy of the exam with you. The answer key will be posted on the web after the exam (under "News and Announcements").

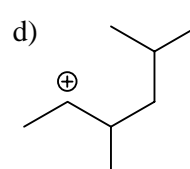
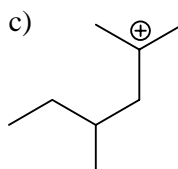
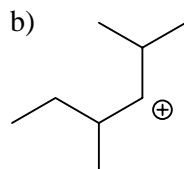
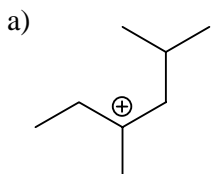
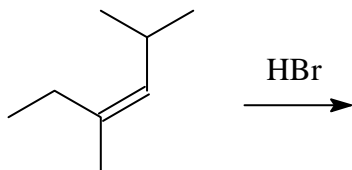
**Hints**

- 1) As you read the question, underline or circle key words to highlight them for yourself.
- 2) Questions have only one correct answer. No partial credit will be given.
- 3) There is no penalty for guessing.

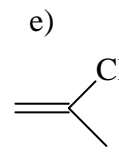
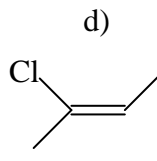
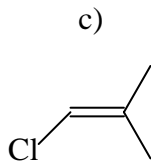
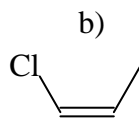
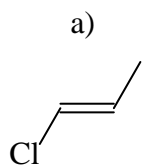
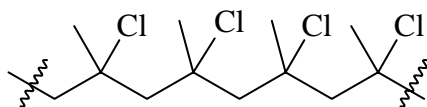
1. (p. 4.2) Which alkene would you use to prepare the following alkyl bromide?



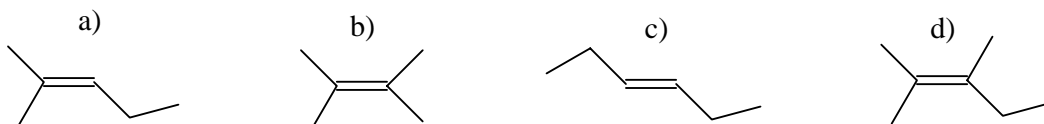
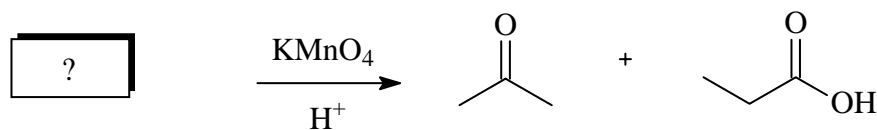
2. (p. 4.3) What is the structure of the carbocation intermediate when the following reaction is carried out?



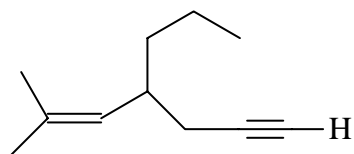
3. (p. 4.53) Which monomer needs to be used to prepare the following polymer?



4. (pp. 4.4) Which alkene gives a mixture of acetone and propanoic acid on reaction with acidic  $\text{KMnO}_4$ ?

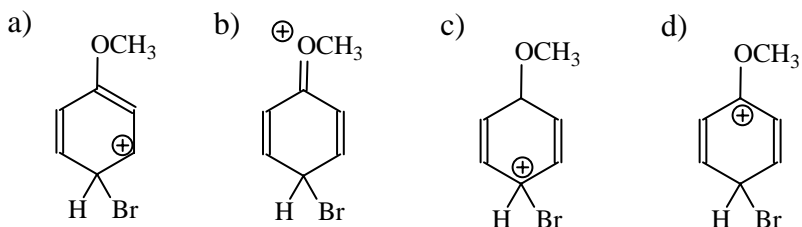


5. (p. 4.25) What is the IUPAC name of the following compound?



- a) 2-methyl-4-propenylhept-2-yne  
 b) 6-methyl-4-propyl-5-hepten-1-yne  
 c) 4-(2'-methylpropenyl)heptyne  
 d) 2-methyl-4-propynyl-hept-2-ene  
 e) 2-methyl-4-propyl-2-hepten-6-yne
6. (p. 5.14) What product would you expect from sulfonation of nitrobenzene?
- a) *o*-nitrobenzenesulfonic acid  
 b) *p*-nitrobenzenesulfonic acid  
 c) *t*-nitrobenzenesulfonic acid  
 d) *m*-nitrobenzenesulfonic acid  
 e) benzenesulfonic acid

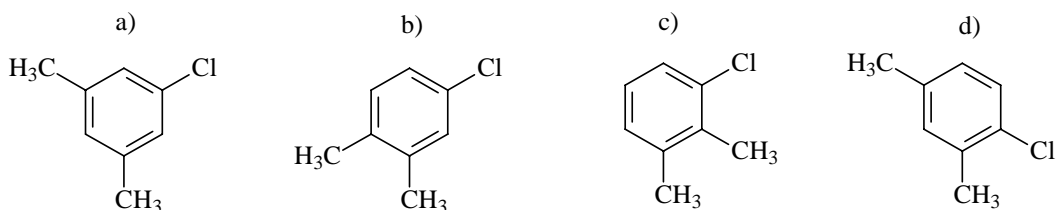
7. (p. 5.15) Which resonance structure of the carbocation formed in the electrophilic bromination of methoxybenzene ( $\text{PhOCH}_3$ ) is **incorrect**?



8. (p. 5.9) If steric reasons are not a concern, how many products might be formed in electrophilic chlorination of *m*-dimethylbenzene?

- a) 1            b) 2            c) 3            d) 4            e) 5

9. (p. 5.5) Which of the following is 1-chloro-3,5-dimethylbenzene?



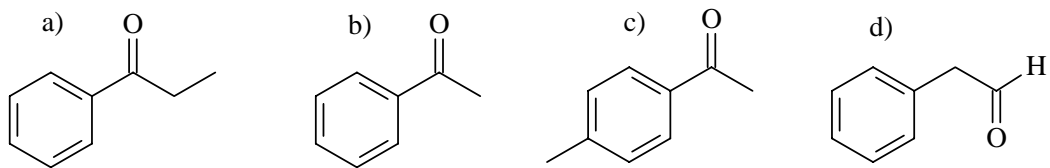
10. (pp. 5.6) Which is the best sequence of reagents to carry out the synthesis of *p*-bromobenzoic acid (*p*-Br-C<sub>6</sub>H<sub>4</sub>-COOH) from benzene?

- a) CH<sub>3</sub>Cl/AlCl<sub>3</sub> followed by KMnO<sub>4</sub> followed by Br<sub>2</sub>/FeBr<sub>3</sub>  
b) Br<sub>2</sub>/FeBr<sub>3</sub> followed by KMnO<sub>4</sub> followed by CH<sub>3</sub>Cl/AlCl<sub>3</sub>  
c) KMnO<sub>4</sub> followed by Br<sub>2</sub>/FeBr<sub>3</sub> followed by CH<sub>3</sub>Cl/AlCl<sub>3</sub>  
d) CH<sub>3</sub>Cl/AlCl<sub>3</sub> followed by Br<sub>2</sub>/FeBr<sub>3</sub> followed by KMnO<sub>4</sub>  
e) none of the above sequences will accomplish the desired synthesis

11. (p. 5.12) Which of the following is the most activating substituent in the electrophilic aromatic substitution?

- a) -NO<sub>2</sub>      b) -C≡N      c) -Br      d) -SO<sub>3</sub>H      e) -OCH<sub>3</sub>

12. (p. 5.11) What product would you obtain from the reaction of benzene with CH<sub>3</sub>CH<sub>2</sub>COCl and AlCl<sub>3</sub>?



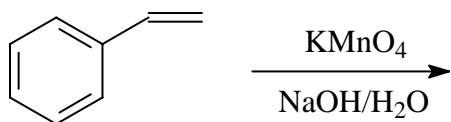
13. (pp. 4.6) How many equivalent resonance structures can be drawn for nitromethane (H<sub>3</sub>C-NO<sub>2</sub>)?

- a) none      b) 1      c) 2      d) 3      e) 4

14. (pp 4.8 and 4.42) 1-Butyne is treated with 1 equivalent of  $\text{NaNH}_2$  followed by ethyl bromide. The resulting product is reacted with 1 equivalent of  $\text{Br}_2$ . What is the final product?

- a) (2Z)-3,4-dibromohexene                      b) (3Z)-3,4-dibromohexene  
 c) (4Z)-3,4-dibromohexene                      d) (4E)-3,4-dibromohexene  
 e) (3E)-3,4-dibromohexene

15. (p. 4.32) What is the product of the following reaction?



- a)      b)      c)      d)      e)

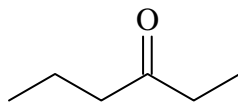
16. (p. 4.6) What is the product of addition of  $\text{Br}_2$  to 1-methylcyclohexene?

- a)      b)      c)      d)

17. (p. 4.13). Which of the following **is not** the product of the reaction of 1,3-pentadiene with 1 equivalent of  $\text{HCl}$ ?

- a)      b)      c)      d)

18. (p. 4.19) Which alkyne is the best starting material to prepare the following ketone?



- a) 1-hexyne      b) 2-hexyne      c) 3-hexyne      d) 3-heptyne

19. (p. 4.42) What is the product of reaction of 2-hexyne with  $H_2$  over the Lindlar catalyst?

- a) 2*Z*-hexene      b) 2*E*-hexene      c) 3*E*-hexene      d) hexane

20. (p. 5.1) How many dibromobenzene derivatives,  $C_6H_4Br_2$ , are possible if benzene were 1,3,5-cyclohexatriene?

- a) 2      b) 3      c) 4      d) 5      e) 6

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End of the exam

IA 1																18				
<b>1</b> <b>H</b> 1.008	IIA 2										IIIA 13		IVA 14	VA 15	VIA 16	VIIA 17	<b>2</b> <b>He</b> 4.003			
<b>3</b> <b>Li</b> 6.941	<b>4</b> <b>Be</b> 9.012											<b>5</b> <b>B</b> 10.81	<b>6</b> <b>C</b> 12.01	<b>7</b> <b>N</b> 14.01	<b>8</b> <b>O</b> 16.00	<b>9</b> <b>F</b> 19.00	<b>10</b> <b>Ne</b> 20.18			
<b>11</b> <b>Na</b> 22.99	<b>12</b> <b>Mg</b> 24.31	IIIB 3		IVB 4	VB 5	VIB 6	VIIB 7			VIII 8 9 10			IB 11	IIIB 12	<b>13</b> <b>Al</b> 26.98	<b>14</b> <b>Si</b> 28.09	<b>15</b> <b>P</b> 30.97	<b>16</b> <b>S</b> 32.06	<b>17</b> <b>Cl</b> 35.45	<b>18</b> <b>Ar</b> 39.95
<b>19</b> <b>K</b> 39.10	<b>20</b> <b>Ca</b> 40.08	<b>21</b> <b>Sc</b> 44.96	<b>22</b> <b>Ti</b> 47.88	<b>23</b> <b>V</b> 50.94	<b>24</b> <b>Cr</b> 52.00	<b>25</b> <b>Mn</b> 54.94	<b>26</b> <b>Fe</b> 55.85	<b>27</b> <b>Co</b> 58.93	<b>28</b> <b>Ni</b> 58.70	<b>29</b> <b>Cu</b> 63.55	<b>30</b> <b>Zn</b> 65.38	<b>31</b> <b>Ga</b> 69.72	<b>32</b> <b>Ge</b> 72.59	<b>33</b> <b>As</b> 74.92	<b>34</b> <b>Se</b> 78.96	<b>35</b> <b>Br</b> 79.90	<b>36</b> <b>Kr</b> 83.80			
<b>37</b> <b>Rb</b> 85.47	<b>38</b> <b>Sr</b> 87.62	<b>39</b> <b>Y</b> 88.91	<b>40</b> <b>Zr</b> 91.22	<b>41</b> <b>Nb</b> 92.91	<b>42</b> <b>Mo</b> 95.94	<b>43</b> <b>Tc</b> (98)	<b>44</b> <b>Ru</b> 101.1	<b>45</b> <b>Rh</b> 102.9	<b>46</b> <b>Pd</b> 106.4	<b>47</b> <b>Ag</b> 107.9	<b>48</b> <b>Cd</b> 112.4	<b>49</b> <b>In</b> 114.8	<b>50</b> <b>Sn</b> 118.7	<b>51</b> <b>Sb</b> 121.8	<b>52</b> <b>Te</b> 127.6	<b>53</b> <b>I</b> 126.9	<b>54</b> <b>Xe</b> 131.3			
<b>55</b> <b>Cs</b> 132.9	<b>56</b> <b>Ba</b> 137.3	<b>57</b> <b>La*</b> 138.9	<b>72</b> <b>Hf</b> 178.5	<b>73</b> <b>Ta</b> 180.9	<b>74</b> <b>W</b> 183.9	<b>75</b> <b>Re</b> 186.2	<b>76</b> <b>Os</b> 190.2	<b>77</b> <b>Ir</b> 192.2	<b>78</b> <b>Pt</b> 195.1	<b>79</b> <b>Au</b> 197.0	<b>80</b> <b>Hg</b> 200.6	<b>81</b> <b>Tl</b> 204.4	<b>82</b> <b>Pb</b> 207.2	<b>83</b> <b>Bi</b> 209.0	<b>84</b> <b>Po</b> (209)	<b>85</b> <b>At</b> (210)	<b>86</b> <b>Rn</b> (222)			
<b>87</b> <b>Fr</b> (223)	<b>88</b> <b>Ra</b> (226.0)	<b>89</b> <b>Ac**</b> (227)	<b>104</b> (261)	<b>105</b> (262)	<b>106</b> (263)	<b>107</b>	<b>108</b>	<b>109</b>												

*Lanthanides	<b>58</b> <b>Ce</b> 140.1	<b>59</b> <b>Pr</b> 140.9	<b>60</b> <b>Nd</b> 144.2	<b>61</b> <b>Pm</b> (145)	<b>62</b> <b>Sm</b> 150.4	<b>63</b> <b>Eu</b> 152.0	<b>64</b> <b>Gd</b> 157.3	<b>65</b> <b>Tb</b> 158.9	<b>66</b> <b>Dy</b> 162.5	<b>67</b> <b>Ho</b> 164.9	<b>68</b> <b>Er</b> 167.3	<b>69</b> <b>Tm</b> 168.9	<b>70</b> <b>Yb</b> 173.0	<b>71</b> <b>Lu</b> 175.0
**Actinides	<b>90</b> <b>Th</b> 232.0	<b>91</b> <b>Pa</b> (231)	<b>92</b> <b>U</b> 238.0	<b>93</b> <b>Np</b> (237)	<b>94</b> <b>Pu</b> (244)	<b>95</b> <b>Am</b> (243)	<b>96</b> <b>Cm</b> (247)	<b>97</b> <b>Bk</b> (247)	<b>98</b> <b>Cf</b> (251)	<b>99</b> <b>Es</b> (252)	<b>100</b> <b>Fm</b> (257)	<b>101</b> <b>Md</b> (258)	<b>102</b> <b>No</b> (259)	<b>103</b> <b>Lr</b> (260)

Form A

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