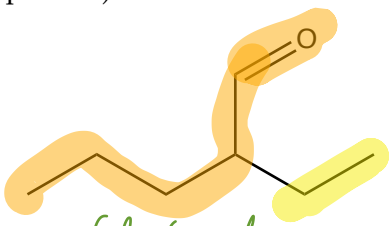
Name _____ Test 3 (4/22)
CHEM 0203 (Organic) Spring 2022

1. a. (2 pts. ea.) Identify the following compounds as aldehydes or ketones.
b. (4 pts. ea.) Provide IUPAC names for the following compounds.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

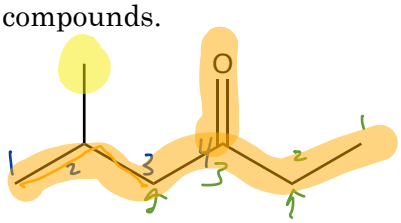
i.



a. aldehyde

b. 2-ethylpentanal

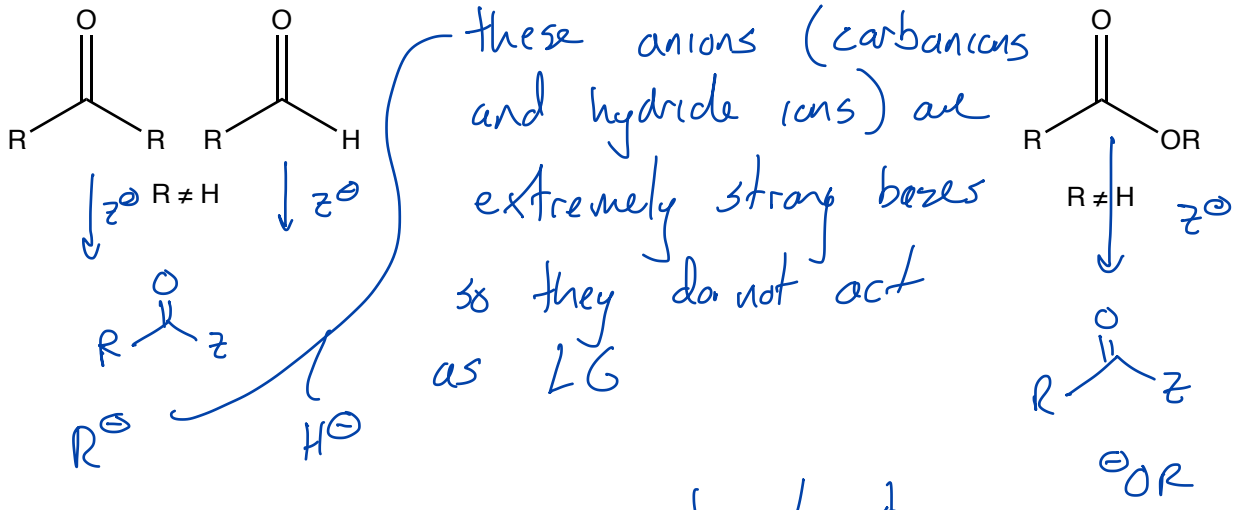
ii.



a. ketone

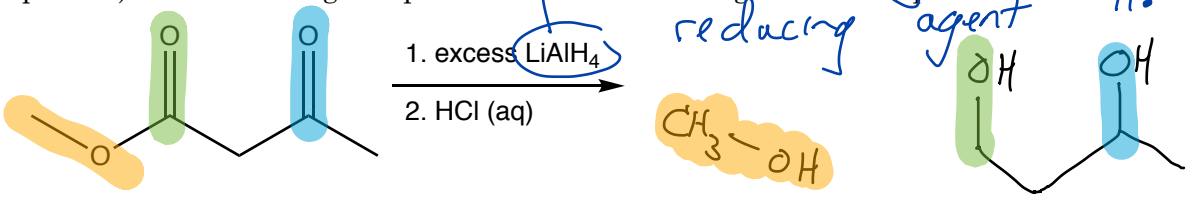
b. 5-methyl-3-hexanone

2. (12 pts.) Aldehydes and ketones undergo nucleophilic addition reactions instead of nucleophilic acyl substitution reactions. Compare the potential leaving groups on aldehydes and ketones with the potential leaving group on an ester, and explain why aldehydes and ketones do not undergo nucleophilic acyl substitution.

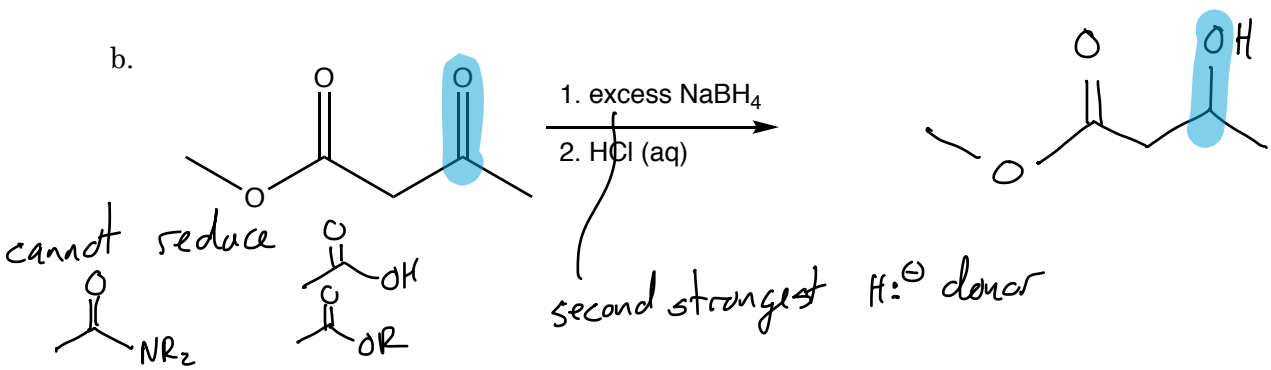


3. (6 pts. ea.) Predict the organic products for the following reaction sequences.

a.

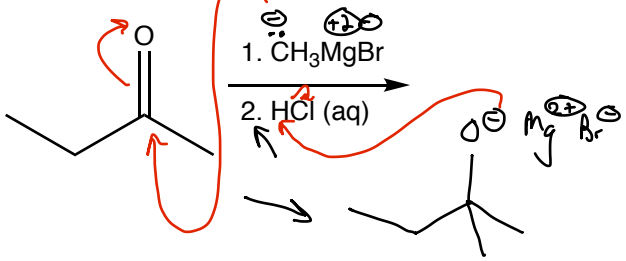


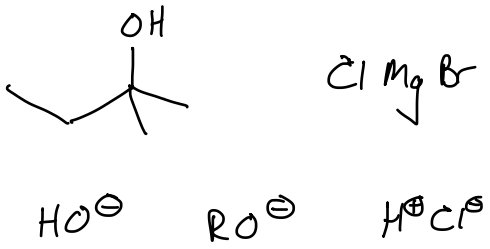
b.



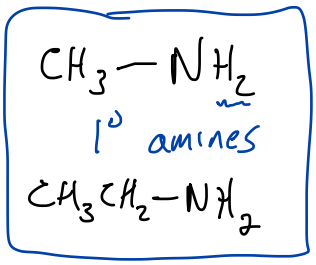
nucleophilic addition

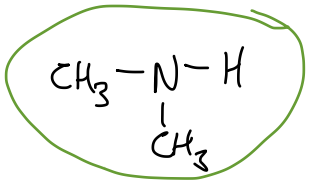
4. (6 pts.) Predict the organic product for the following reaction sequence.





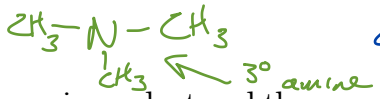
5. The reactions of 1° and 2° amines with ketones or aldehydes produce different products.
a. (6 pts.) Draw an example of a 1° amine and an example of a 2° amine.
b. (4 pts.) Briefly explain why 1° and 2° amines produce different products.





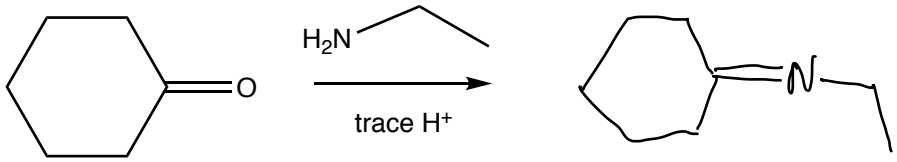
2° amine

1° amines have 2 H atoms that can be transfered to the C=O O atom to convert it to a water molecule which can act as a LG



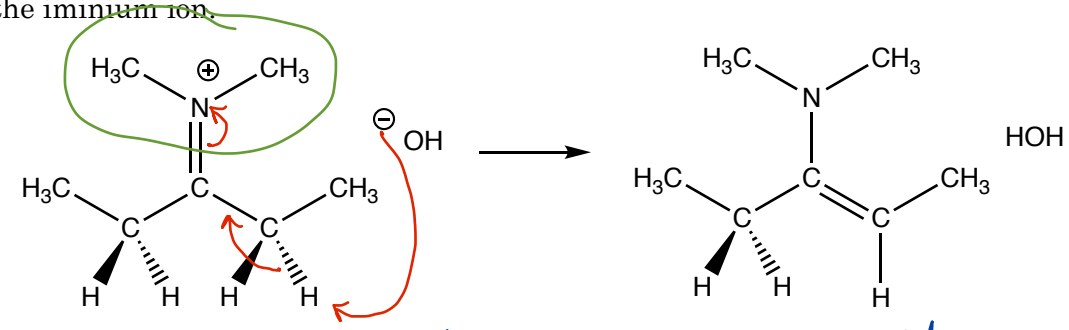
3° amine

6. (6 pts.) Predict the organic product and the non-organic byproduct for of the following reaction.



H-O-H

7. (6 pts.) Draw electron movement arrows that show how the enamine below can be produced from the iminium ion.



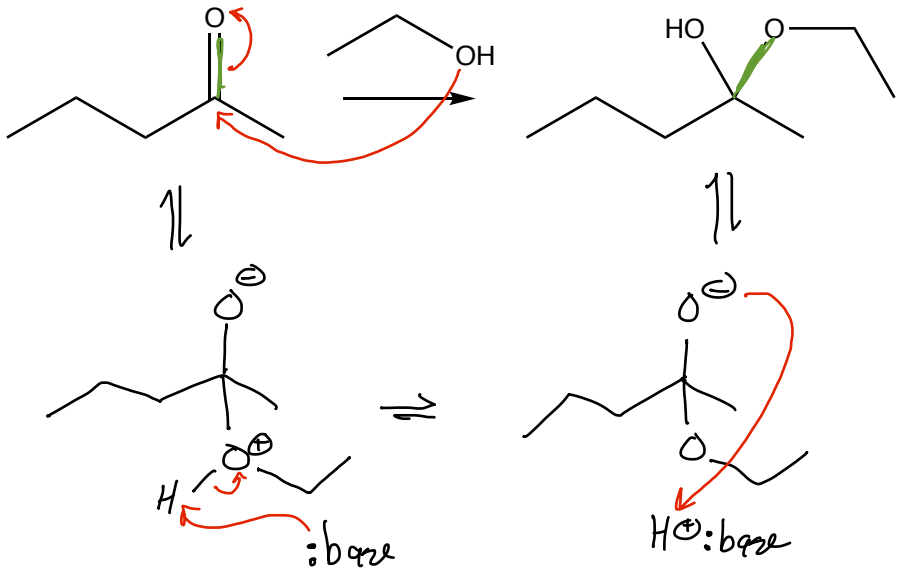
reactions under kinetic control are usually done cold

8. (8 pts.) When a reaction is said to be under "thermodynamic control" and two products are possible what factor determines what the major product will be?

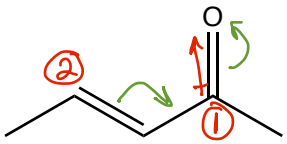
thermodynamic control means that the reaction establishes an equilibrium ... and the concentration of the more stable molecule will be the higher conc

major product is the more stable product

9. (14 pts.) Alcohols react with ketones to form hemiacetals. An example of the reaction appears below. Draw a mechanism, including electron movement arrows, that shows the formation of the hemiacetal from the ketone and alcohol. Remember to show all proton transfer steps.

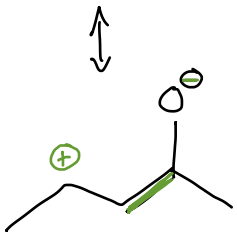


10. An α,β-unsaturated is drawn below.



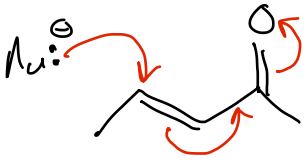
a. (6 pts.) Identify the two electrophilic carbon atoms.

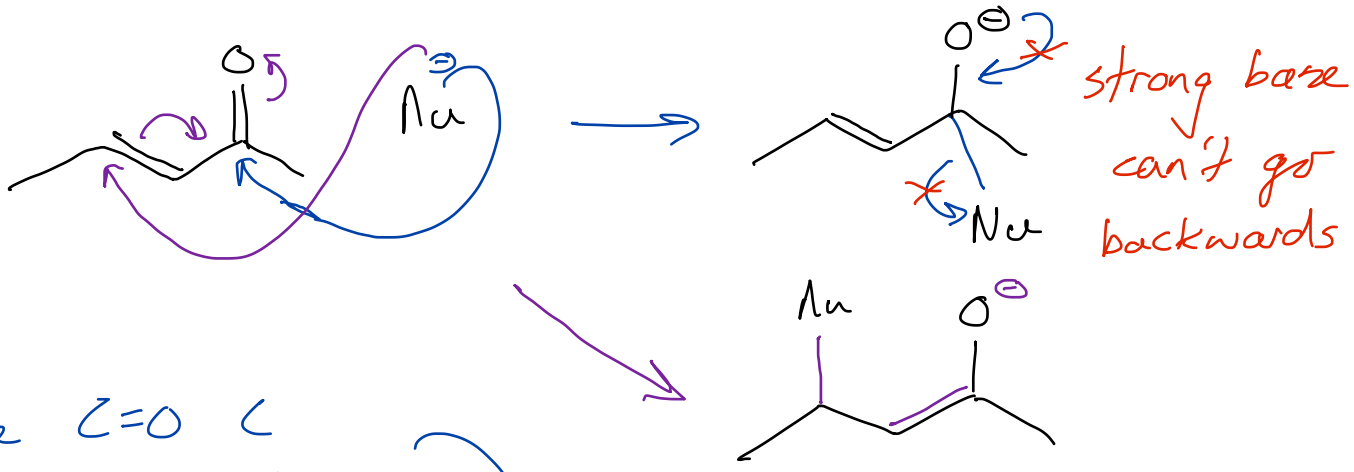
b. (8 pts.) Draw a resonance contributor, and briefly explain why each carbon is electrophilic.



C labeled 1 is electrophilic because it is next to an O which is more electronegative than C

C labeled 2 is electrophilic because the e⁻ delocalization places a ⊕ charge on that C





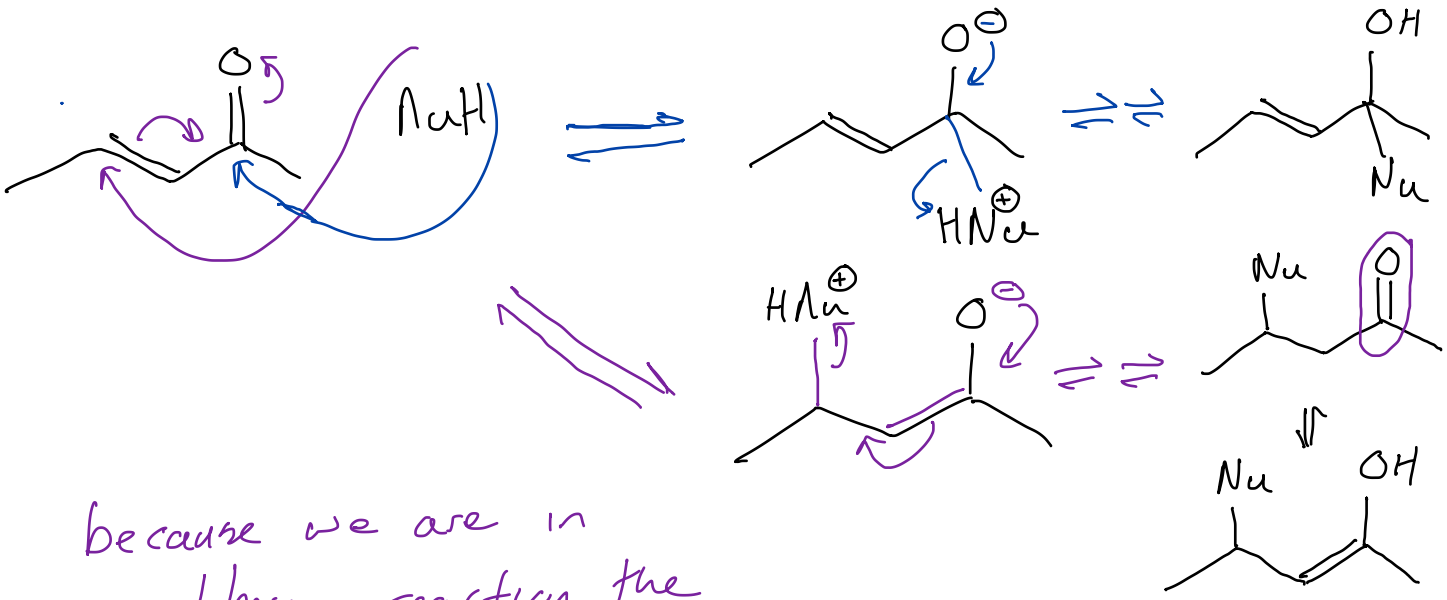
The C=O C is the most attractive spot for Nu to attack so long as the Nu can get there.

fastest attack at this position

strong bases favor the kinetic product because they can't fall back off as a LG. Rxn done

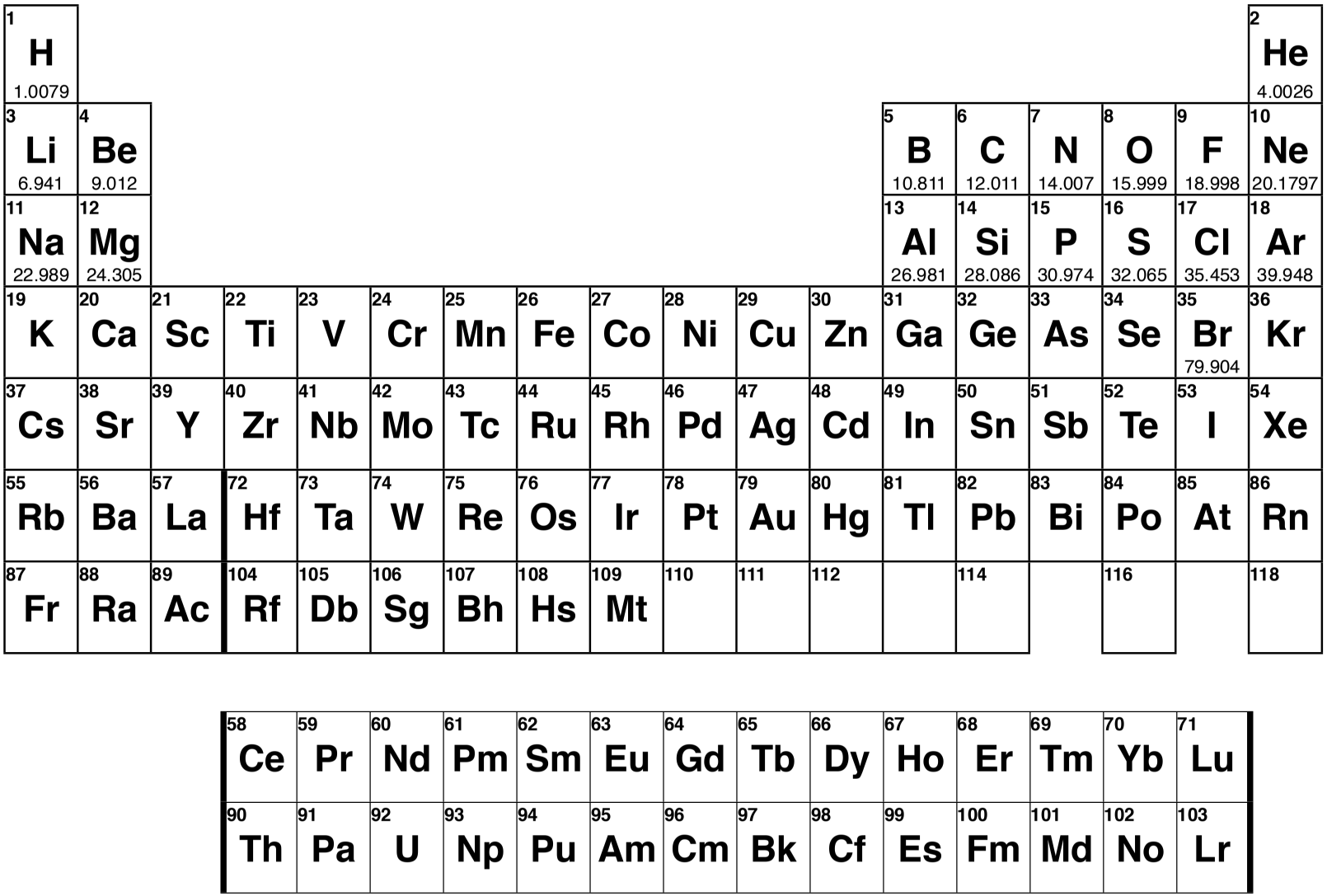
1 way reaction will favor the "kinetic product" the one that forms fastest

weak base can go backwards



because we are in equilibrium reaction the most stable product is the major product

C=O stronger than C=C


1 H 1.0079
2 He 4.0026
3 Li 6.941
4 Be 9.012
5 B 10.811
6 C 12.011
7 N 14.007
8 O 15.999
9 F 18.998
10 Ne 20.1797
11 Na 22.989
12 Mg 24.305
13 Al 26.981
14 Si 28.086
15 P 30.974
16 S 32.065
17 Cl 35.453
18 Ar 39.948
19 K
20 Ca
21 Sc
22 Ti
23 V
24 Cr
25 Mn
26 Fe
27 Co
28 Ni
29 Cu
30 Zn
31 Ga
32 Ge
33 As
34 Se
35 Br 79.904
36 Kr
37 Cs
38 Sr
39 Y
40 Zr
41 Nb
42 Mo
43 Tc
44 Ru
45 Rh
46 Pd
47 Ag
48 Cd
49 In
50 Sn
51 Sb
52 Te
53 I
54 Xe
55 Rb
56 Ba
57 La
72 Hf
73 Ta
74 W
75 Re
76 Os
77 Ir
78 Pt
79 Au
80 Hg
81 Tl
82 Pb
83 Bi
84 Po
85 At
86 Rn
87 Fr
88 Ra
89 Ac
104 Rf
105 Db
106 Sg
107 Bh
108 Hs
109 Mt
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58 Ce
59 Pr
60 Nd
61 Pm
62 Sm
63 Eu
64 Gd
65 Tb
66 Dy
67 Ho
68 Er
69 Tm
70 Yb
71 Lu
90 Th
91 Pa
92 U
93 Np
94 Pu
95 Am
96 Cm
97 Bk
98 Cf
99 Es
100 Fm
101 Md
102 No
103 Lr