Atomic Structure Problems

Clearly and as completely as possible describe the structure of the following atoms and ions.

1. ^{13}C

C ≡ Carbon
AN = 6 (from the Periodic Table)
MN = 13 (from the superscript)
$\mathbf{p^+}$ **= AN** = 6 (i.e., ∴ 6 protons in the nucleus)
n = MN - AN = 13 - 6 = 7 (i.e., ∴ 7 neutrons in the nucleus)
This is a Neutral Atom ∴ $\mathbf{e^-}$ **= AN** = 6 (i.e., ∴ 6 electrons around the nucleus)

2. ^{12}C

C ≡ Carbon
AN = 6 (from the Periodic Table)
MN = 12 (from the superscript)
$\mathbf{p^+}$ **= AN** = 6 (i.e., ∴ 6 protons in the nucleus)
n = MN - AN = 12 - 6 = 6 (i.e., ∴ 6 neutrons in the nucleus)
This is a Neutral Atom ∴ $\mathbf{e^-}$ **= AN** = 6 (i.e., ∴ 6 electrons around the nucleus)

3. ^{14}C

C ≡ Carbon
AN = 6 (from the Periodic Table)
MN = 14 (from the superscript)
$\mathbf{p^+}$ **= AN** = 6 (i.e., ∴ 6 protons in the nucleus)
n = MN - AN = 14 - 6 = 8 (i.e., ∴ 8 neutrons in the nucleus)
This is a Neutral Atom ∴ $\mathbf{e^-}$ **= AN** = 6 (i.e., ∴ 6 electrons around the nucleus)

4. ^{1}H

H ≡ Hydrogen
AN = 1 (from the Periodic Table)
MN = 1 (this is indicated when the superscript is not shown)
$\mathbf{p^+}$ **= AN** = 1 (i.e., ∴ 1 proton in the nucleus)
n = MN - AN = 1 - 1 = 0 (i.e., ∴ 0 neutrons in the nucleus)
This is a Neutral Atom ∴ $\mathbf{e^-}$ **= AN** = 1 (i.e., ∴ 1 electron around the nucleus)

5. ^{2}H

H ≡ Hydrogen
AN = 1 (from the Periodic Table)
MN = 2 (this is indicated when the superscript is not shown)
$\mathbf{p^+}$ **= AN** = 1 (i.e., ∴ 1 proton in the nucleus)
n = MN - AN = 2 - 1 = 1 (i.e., ∴ 1 neutron in the nucleus)

This is a Neutral Atom ∴ **e^- = AN** = 1 (i.e., ∴ 1 electron around the nucleus)

6. ^{3}T

T ≡ Tritium is an Isotope of Hydrogen
AN = 1 (from the Periodic Table)
MN = 3 (this is indicated when the superscript is not shown)
p^+ = AN = 1 (i.e., ∴ 1 proton in the nucleus)
n = MN - AN = 3 - 1 = 2 (i.e., ∴ 2 neutrons in the nucleus)
This is a Neutral Atom ∴ **e^- = AN** = 1 (i.e., ∴ 1 electron around the nucleus)

7. ^{11}B

B ≡ Boron
AN = 5 (from the Periodic Table)
MN = 11 (from the superscript)
p^+ = AN = 5 (i.e., ∴ 5 protons in the nucleus)
n = MN - AN = 11 - 5 = 6 (i.e., ∴ 6 neutrons in the nucleus)
This is a Neutral Atom ∴ **e^- = AN** = 5 (i.e., ∴ 5 electrons around the nucleus)

8. ^{10}B

B ≡ Boron
AN = 5 (from the Periodic Table)
MN = 10 (from the superscript)
p^+ = AN = 5 (i.e., ∴ 5 proton in the nucleus)
n = MN - AN = 10 - 5 = 5 (i.e., ∴ 5 neutrons in the nucleus)
This is a Neutral Atom ∴ **e^- = AN** = 5 (i.e., ∴ 5 electrons around the nucleus)

9. ^{56}Fe

Fe ≡ Iron
AN = 26 (from the Periodic Table)
MN = 56 (from the superscript)
p^+ = AN = 26 (i.e., ∴ 26 protons in the nucleus)
n = MN - AN = 56 - 26 = 30 (i.e., ∴ 30 neutrons in the nucleus)
This is a Neutral Atom ∴ **e^- = AN** = 26 (i.e., ∴ 5 electrons around the nucleus)

10. ^{57}Fe

Fe ≡ Iron
AN = 26 (from the Periodic Table)
MN = 57 (from the superscript)
p^+ = AN = 26 (i.e., ∴ 26 protons in the nucleus)
n = MN - AN = 57 - 26 = 31 (i.e., ∴ 31 neutrons in the nucleus)
This is a Neutral Atom ∴ **e^- = AN** = 26 (i.e., ∴ 26 electrons around the nucleus)

11. ^{184}**W**

W ≡ Tungsten
AN = 74 (from the Periodic Table)
MN = 184 (from the superscript)
$\mathbf{p^+}$ **= AN** = 74 (i.e., ∴ 74 protons in the nucleus)
n = MN - AN = 184 - 74 = 110 (i.e., ∴ 110 neutrons in the nucleus)
This is a Neutral Atom **∴** $\mathbf{e^-}$ **= AN** = 74 (i.e., ∴ 74 electrons around the nucleus)

12. ^{1834}**W**

W ≡ Tungsten
AN = 74 (from the Periodic Table)
MN = 183 (from the superscript)
$\mathbf{p^+}$ **= AN** = 74 (i.e., ∴ 74 protons in the nucleus)
n = MN - AN = 183 - 74 = 109 (i.e., ∴ 109 neutrons in the nucleus)
This is a Neutral Atom **∴** $\mathbf{e^-}$ **= AN** = 74 (i.e., ∴ 74 electrons around the nucleus)

13. ^{235}**U**

U ≡ Uranium
AN = 92 (from the Periodic Table)
MN = 235 (from the superscript)
$\mathbf{p^+}$ **= AN** = 92 (i.e., ∴ 92 protons in the nucleus)
n = MN - AN = 235 - 92 = 143 (i.e., ∴ 143 neutrons in the nucleus)
This is a Neutral Atom **∴** $\mathbf{e^-}$ **= AN** = 92 (i.e., ∴ 92 electrons around the nucleus)

14. ^{238}**U**

U ≡ Uranium
AN = 92 (from the Periodic Table)
MN = 238 (from the superscript)
$\mathbf{p^+}$ **= AN** = 92 (i.e., ∴ 92 protons in the nucleus)
n = MN - AN = 238 - 92 = 146 (i.e., ∴ 146 neutrons in the nucleus)
This is a Neutral Atom **∴** $\mathbf{e^-}$ **= AN** = 92 (i.e., ∴ 92 electrons around the nucleus)

15. ^{19}**F**

F ≡ Fluorine
AN = 9 (from the Periodic Table)
MN = 19 (from the superscript)
$\mathbf{p^+}$ **= AN** = 9 (i.e., ∴ 9 protons in the nucleus)
n = MN - AN = 19 - 9 = 10 (i.e., ∴ 10 neutrons in the nucleus)
This is a Neutral Atom **∴** $\mathbf{e^-}$ **= AN** = 9 (i.e., ∴ 9 electrons around the nucleus)

16. ^{20}**F**

F ≡ Fluorine
AN = 9 (from the Periodic Table)

MN = 20 (from the superscript)
p^+ = AN = 9 (i.e., ∴ 9 protons in the nucleus)
n = MN - AN = 20 - 9 = 11 (i.e., ∴ 11 neutrons in the nucleus)
This is a Neutral Atom **∴ e^- = AN** = 9 (i.e., ∴ 9 electrons around the nucleus)

17. ^{35}Cl

Cl ≡ Chlorine
AN = 17 (from the Periodic Table)
MN = 35 (from the superscript)
p^+ = AN = 17 (i.e., ∴ 17 protons in the nucleus)
n = MN - AN = 35 - 17 = 18 (i.e., ∴ 18 neutrons in the nucleus)
This is Neutral Atom **∴ e^- = AN** = 17 (i.e., ∴ 17 electrons around the nucleus)

18. $^{35}Cl^{-1}$

Cl ≡ Chlorine
Cl^{-1} is an Anion with # = 1
AN = 17 (from the Periodic Table)
MN = 35 (from the superscript)
p^+ = AN = 17 (i.e., ∴ 17 protons in the nucleus)
n = MN - AN = 35 - 17 = 18 (i.e., ∴ 18 neutrons in the nucleus)
This is an Anion **∴ e^- = AN + #** = 17 + 1 = 18 (i.e., ∴ 18 electrons around the nucleus)

19. $^{37}Cl^{+2}$

Cl ≡ Chlorine
Cl^{+2} is an Cation with # = 2
AN = 17 (from the Periodic Table)
MN = 35 (from the superscript)
p^+ = AN = 17 (i.e., ∴ 17 protons in the nucleus)
n = MN - AN = 35 - 17 = 18 (i.e., ∴ 18 neutrons in the nucleus)
This is an Cation **∴ e^- = AN - #** = 17 - 2 = 15 (i.e., ∴ 15 electrons around the nucleus)

20. $^{13}C^{-4}$

C ≡ Carbon
C^{-4} is an Anion with # = 4
AN = 6 (from the Periodic Table)
MN = 13 (from the superscript)
p^+ = AN = 6 (i.e., ∴ 6 protons in the nucleus)
n = MN - AN = 13 - 6 = 7 (i.e., ∴ 7 neutrons in the nucleus)
This is an Anion **∴ e^- = AN + #** = 6 + 4 = 10 (i.e., ∴ 10 electrons around the nucleus)

21. $^{12}C^{+4}$

C ≡ Carbon
C^{+4} is an Cation with # = 4

AN = 6 (from the Periodic Table)
MN = 12 (from the superscript)
$\mathbf{p^+ = AN}$ = 6 (i.e., ∴ 6 protons in the nucleus)
n = MN - AN = 12 - 6 = 6 (i.e., ∴ 6 neutrons in the nucleus)
This is an Cation ∴ $\mathbf{e^- = AN - \#}$ = 6 - 4 = 2 (i.e., ∴ 2 electrons around the nucleus)

22. $^{14}C^{+2}$

C ≡ Carbon
$\mathbf{C^{+2}}$ is an Cation with # = 2
AN = 6 (from the Periodic Table)
MN = 14 (from the superscript)
$\mathbf{p^+ = AN}$ = 6 (i.e., ∴ 6 protons in the nucleus)
n = MN - AN = 14 - 6 = 8 (i.e., ∴ 8 neutrons in the nucleus)
This is an Cation ∴ $\mathbf{e^- = AN - \#}$ = 6 - 2 = 4 (i.e., ∴ 4 electrons around the nucleus)

23. $^{1}H^{+1}$

H ≡ Hydrogen
$\mathbf{H^{+1}}$ is an Cation with # = 1
AN = 1 (from the Periodic Table)
MN = 1 (from the superscript)
$\mathbf{p^+ = AN}$ = 1 (i.e., ∴ 1 proton in the nucleus)
n = MN - AN = 1 - 1 = 0 (i.e., ∴ 0 neutrons in the nucleus)
This is an Cation ∴ $\mathbf{e^- = AN - \#}$ = 1 - 1 = 0 (i.e., ∴ 0 electrons around the nucleus)

24. $^{2}D^{+}$

D ≡ Deuterium is an Isotope of Hydrogen
$\mathbf{^2D^+}$ is an Cation with # = 1
AN = 1 (from the Periodic Table)
MN = 2 (from the superscript)
$\mathbf{p^+ = AN}$ = 1 (i.e., ∴ 1 proton in the nucleus)
n = MN - AN = 2 - 1 = 1 (i.e., ∴ 1 neutron in the nucleus)
This is an Cation ∴ $\mathbf{e^- = AN - \#}$ = 1 - 1 = 0 (i.e., ∴ 0 electrons around the nucleus)

25. $^{3}H^{-}$

T ≡ Tritium is an Isotope of Hydrogen
$\mathbf{^3T^-}$ is an Anion with # = 1
AN = 1 (from the Periodic Table)
MN = 3 (from the superscript)
$\mathbf{p^+ = AN}$ = 1 (i.e., ∴ 1 proton in the nucleus)
n = MN - AN = 3 - 1 = 2 (i.e., ∴ 2 neutrons in the nucleus)
This is an Anion ∴ $\mathbf{e^- = AN + \#}$ = 1 + 1 = 2 (i.e., ∴ 2 electrons around the nucleus)

26. $^{11}B^{+3}$

B ≡ Boron
$^{11}B^{+3}$ is an Cation with # = 3
AN = 5 (from the Periodic Table)
MN = 11 (from the superscript)
$\mathbf{p^+ = AN}$ = 5 (i.e., ∴ 5 protons in the nucleus)
n = MN - AN = 11 - 5 = 6 (i.e., ∴ 6 neutrons in the nucleus)
This is an Cation ∴ $\mathbf{e^- = AN - \#}$ = 5 - 3 = 2 (i.e., ∴ 2 electrons around the nucleus)

27. $^{10}B^{-5}$

B ≡ Boron
$^{10}B^{-5}$ is an Anion with # = 5
AN = 5 (from the Periodic Table)
MN = 10 (from the superscript)
$\mathbf{p^+ = AN}$ = 5 (i.e., ∴ 5 protons in the nucleus)
n = MN - AN = 10 - 5 = 5 (i.e., ∴ 5 neutrons in the nucleus)
This is an Anion ∴ $\mathbf{e^- = AN + \#}$ = 5 + 5 = 10 (i.e., ∴ 10 electrons around the nucleus)

28. $^{56}Fe^{+2}$

Fe ≡ Iron
$^{56}Fe^{+2}$ is an Cation with # = 2
AN = 26 (from the Periodic Table)
MN = 56 (from the superscript)
$\mathbf{p^+ = AN}$ = 26 (i.e., ∴ 26 protons in the nucleus)
n = MN - AN = 56 - 26 = 30 (i.e., ∴ 30 neutrons in the nucleus)
This is an Cation ∴ $\mathbf{e^- = AN - \#}$ = 26 - 2 = 24 (i.e., ∴ 24 electrons around the nucleus)

29. $^{57}Fe^{+3}$

Fe ≡ Iron
$^{56}Fe^{+3}$ is an Cation with # = 3
AN = 26 (from the Periodic Table)
MN = 57 (from the superscript)
$\mathbf{p^+ = AN}$ = 26 (i.e., ∴ 26 protons in the nucleus)
n = MN - AN = 57 - 26 = 31 (i.e., ∴ 31 neutrons in the nucleus)
This is an Cation ∴ $\mathbf{e^- = AN - \#}$ = 26 - 3 = 23 (i.e., ∴ 23 electrons around the nucleus)

30. $^{184}W^{+2}$

W ≡ Tungsten
$^{184}W^{+2}$ is an Cation with # = 2
AN = 74 (from the Periodic Table)
MN = 184 (from the superscript)
$\mathbf{p^+ = AN}$ = 74 (i.e., ∴ 74 protons in the nucleus)
n = MN - AN = 184 - 74 = 110 (i.e., ∴ 110 neutrons in the nucleus)

This is an Cation ∴ **e^- = AN - #** = 74 - 2 = 72 (i.e., ∴ 72 electrons around the nucleus)

31. $^{184}W^{0}$

W ≡ Tungsten
$^{184}W^{0}$ is a Neutral Atom
AN = 74 (from the Periodic Table)
MN = 184 (from the superscript)
p^+ = AN = 74 (i.e., ∴ 74 protons in the nucleus)
n = MN - AN = 184 - 74 = 110 (i.e., ∴ 110 neutrons in the nucleus)
e^- = AN = 74 (i.e., ∴ 74 electrons around the nucleus)

32. $^{184}W^{+6}$

W ≡ Tungsten
$^{184}W^{+6}$ is an Cation with # = 6
AN = 74 (from the Periodic Table)
MN = 184 (from the superscript)
p^+ = AN = 74 (i.e., ∴ 74 protons in the nucleus)
n = MN - AN = 184 - 74 = 110 (i.e., ∴ 110 neutrons in the nucleus)
This is an Cation ∴ **e^- = AN - #** = 74 - 6 = 682 (i.e., ∴ 68 electrons around the nucleus)