Enriched Chem Ch6 WKSt: Trends - AP Level questions

1)

A) The 6 isotopes of selenium have the same number of protons (34). But a different number of neutrons causing different masses 1pt

B) Se complete electron configuration
$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^4$ 1pt
(No credit for $[Ar]4s^2 3d^{10} 4p^4$)

$\underline{\uparrow\downarrow}\ \underline{\uparrow}\ \underline{\uparrow}$
unpaired electrons

There are 2 unpaired electrons 1pt
Reason: Hunds Rule, each orbital (P has 3) gets 1 electron Before another gets a second 1pt

c)

i) Br $[Ar]\ 4s^2\ 3d^{10}\ 4p^5$
$\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow}$

Se $[Ar]\ 4s^2\ 3d^{10}\ 4p^4$
$\underline{\uparrow\downarrow}\ \underline{\uparrow}\ \underline{\uparrow}$

The ionized electron in Both Se & Br are in the same energy Level (N=4), But Br has one more proton than Se ∴ radius is smaller for Br & it has a greater Nuclear charge than Se. Z_{eff} higher for Br than Se

1pt

C)

ii) Te $[Kr]\,5s^2 4d^{10} 5p^4$

The electron for Te is removed from $5p^4$ vs $4p^4$ for Se. Te $5p^4$ has more Shielding, due to another energy level ∴ Te's electron will require less energy to remove than Se

1pt

2)

		Radius		
A)	Ca	.197nm	why?	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
	Ca^{+2}	.099nm		$1s^2 2s^2 2p^6 3s^2 3p^6 4s^{2-2=0}$

1pt

Ca^{+2} has 2 fewer electrons. The Ca^{+2} ion has lost its 4s subshell making the ion smaller.

1pt explanation

B) Ca Zn ? why

O vs O

$[Ar]4s^2$ $[Ar]4s^2 3d^{10}$

Zn atom has more protons (10) than an Ca atom,

causing more Z_{eff} for Zn 1pt