IB chemistry exam

Atomic structure.

Name:
Date:

All answers must be reasoned. In case of true/false questions, both answers will give 0 points if unreasoned.

1. Which of these transitions in the hydrogen atom has the largest associated wavelength? Explain why. (2)

a) n=4 to n=3
b) n=6 to n=2
c) n=3 to n=2
d) n=5 to n=4
e) n=5 to n=3
f) n=7 to n=4

2. True or false (and explain why)(1 each)

a) When an electron hops from an orbital to another orbital with lower energy, it absorbs energy in form of light.

b) When the energy difference between two orbitals is higher, the wavelength of the light associated with the jump of an electron between them is longer.

3. Complete this table assuming that all the atoms are neutral. (1 per element)

Symbol	Atomic number	Neutrons	Mass number	Electrons
^{41}K				
^{37}Cl				
	20	22		
Si			29	
	30		70	

4. a) Calculate the atomic mass of lithium knowing that it has two isotopes: one with a mass of 6 amu that makes up for 7.6% of the existing lithium and another with a mass of 7 amu that makes up for the rest. (2)

b) The atomic mass of iron is 55.84 amu.
Assuming it only has three isotopes (^{54}Fe, ^{56}Fe and ^{57}Fe) and that the abundance of the last two are 91.16% and 3.04%, what is the abundance of the first one?
(Assume also that their masses are 54, 56 and 57 respectively) (2)

5. Write the electron configuration of the following elements in the aufbau order (no need to use boxes): (1 each)

B

K

P

Ti

Cd

6. a) Define ionisation energy (HL) (1)

b) Explain why the first ionisation energy of K is much lower than that of Ar. (HL) (1)

c) Explain, with help of a drawing, what the convergence limit is. (2)

d) Explain how the fact that emission spectra are made of lines is proof that the energy in an atom is quantized. (2)

7. Show the box electronic configurations of

a) Be

b) C

c) Cl

d) S^{2-} (HL)

e) Ar^{2+} (HL)

8. Evaluate the correctness of this definition:

“An ion is an atom that, because it has lost or gained electrons, has a net electric charge”

9. Bonus question.

a) Define what an orbital is. (1)

b) Explain an orbital’s quantum numbers, how the type of orbital depends on them and also how the number of electrons a shell or subshell can hold depends on them. (3)