

Test Topic 2 Atomic structure Tues 10/24/17

[18 marks]

1. What is the electron configuration of the copper(I) ion, Cu^+ ?

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9$ → True
 B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$ — Partial
 C. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$ — Cu
 D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$ — Cu^+

lose from 4s

Cu

Cr exceptions should be known

[1 mark]

2. Successive ionization energies for an element, Z, are shown in the table below.

Electrons removed	1st	2nd	3rd	4th	5th
Ionization energy / kJ mol^{-1}	736	1450	7740	10500	13600

What is the most likely formula for the ion of Z?

- A. Z^+
 B. Z^{2+}
 C. Z^{3+}
 D. Z^{4+}

900 6000 3000 3000
↑
huge

[1 mark]

3. Which equation represents the second ionization energy of potassium?

- A. $\text{K(g)} \rightarrow \text{K}^{2+}(\text{g}) + 2\text{e}^-$
 B. $\text{K}^+(\text{g}) \rightarrow \text{K}^{2+}(\text{g}) + \text{e}^-$ must be gas
 C. $\text{K(s)} \rightarrow \text{K}^{2+}(\text{g}) + 2\text{e}^-$
 D. $\text{K}^+(\text{s}) \rightarrow \text{K}^{2+}(\text{g}) + \text{e}^-$

[1 mark]

Iron has three main naturally occurring isotopes which can be investigated using a mass spectrometer.

4. State the full electronic configurations of a Cu atom and a Cu^+ ion.

Cu: ~~but 3d⁹~~ # 1C
 ↑
 Cu⁺: same a ~~# 1B~~ # 1D

[2 marks]

.....

.....

.....

5. Between which ionization energies of boron will there be the greatest difference?

- A. Between 1st and 2nd ionization energies
 B. Between 2nd and 3rd ionization energies
 C. Between 3rd and 4th ionization energies
 D. Between 4th and 5th ionization energies

B.

[1 mark]

6. What is the correct number of each particle in an oxygen ion, $^{16}\text{O}^{2-}$?

[1 mark]

	Protons	Neutrons	Electrons
A.	8	8	10
B.	8	10	8
C.	8	8	6
D.	8	10	10

$16 - 8 = 8$ $8 + 2 = 10$

7. Which subatomic particles are located in the nucleus of an atom?

[1 mark]

- A. Protons and electrons
- B. Neutrons and electrons
- C. Protons and neutrons
- D. Protons, neutrons and electrons

^{131}I is a radioactive isotope of iodine.

8a. Define the term *isotope*.

[1 mark]

A single element of which some atoms have different numbers of neutrons

8b. Determine the number of neutrons in one atom of iodine-131.

[1 mark]

$131 - 53 = 78$

9. Consider the relative abundance of the isotopes of element X.

[1 mark]

Isotope	Relative abundance (%)
^{24}X	80
^{25}X	10
^{26}X	10

$24 \times 0.8 + 25 \times 0.1 + 26 \times 0.1$
 $= 24.3$

What is the relative atomic mass of X?

- A. 24
- B. 25
- C. Between 24 and 25
- D. Between 25 and 26

10. The full electron configuration of an element is:

[1 mark]



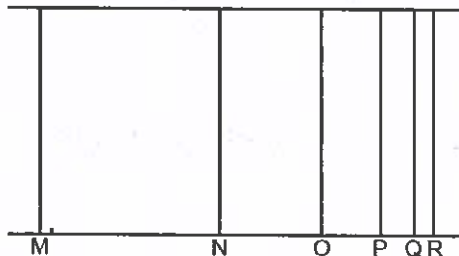
To which group and period does the element belong?

Si

	Group	Period
A.	2	3
B.	3	2
C.	3	4
D.	14	3

11. Which is correct for the line emission spectrum for hydrogen?

[1 mark]

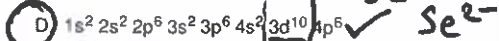


high energy
high frequency
short wavelength

- A. Line M has a higher energy than line N. ✗
 B. Line N has a lower frequency than line M. ✗
 C. Line M has a longer wavelength than line N. ✓
 D. Lines converge at lower energy. ✗

12. Which electron configuration is correct for the selenide ion, Se^{2-} ?

[1 mark]

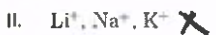
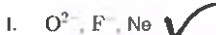


+2e⁻

Same

13. Which species have the same electron arrangements?

[1 mark]



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

14. How many protons, neutrons and electrons are present in each atom of ^{31}P ?

[1 mark]

	Protons	Neutrons	Electrons
A.	✗	15	16
B.	15	16	15
C.	15	✗	15
D.	✗	✗	16

$$31 - 15 = 16$$

pt n^o
e⁻

15. What is the atomic number of a neutral atom which has 51 neutrons and 40 electrons?

[1 mark]

- A. 40
- B. 51
- C. 91
- D. 131

$$p^+ = e^-$$

$$40 p^+$$

16. The table below shows the number of protons, neutrons and electrons present in five species.

[1 mark]

Species	Number of protons	Number of neutrons	Number of electrons
X	6	8	6
Y	7	7	7
Z	7	7	8
W	8	8	8
Q	8	10	8

Which two species are isotopes of the same element?

- A. X and W
- B. Y and Z
- C. Z and W
- D. W and Q

Same p^+ & different n^0

