University of Kasdi Merbah, Ouargla
Faculty of Natural and Life Sciences
Academic Year 2023-2024

1^{st} year Common core
Duration : 01h30
Date : 24/01/2024

Final exam: general and organic chemistry (Answers)

Last name: .... First name .... Group ....

Exercise 1:

During the Chernobyl disaster, ${}^{134}_{55}Cs$ was released into the atmosphere. It disintegrates into ${}^{134}_{56}Ba$ with the emission of a charged particle.

1- Write the decay equation knowing that the decay of ${}^{134}_{55}Cs$ is accompanied by the emission of radiation.

${}^{134}_{55}Cs \rightarrow {}^{134}_{56}Ba + {}^{0}_{-1}e$ (2 pt)

2- What type of decay is it?

β^{-} (1 pt)

The half-life (t½) of ${}^{134}_{55}Cs$ is 2 years.

1- Deduce the decay constant (λ).

$\lambda = \frac{\ln 2}{t½} = \frac{\ln 2}{2} = 0{,}347\ year^{-1}$ (1 pt)

2- How long will it take for 99% of the released cesium nuclei to disappear?

The initial number of nuclei N_0 =100%, the number of decayed nuclei = 99% ⇒ N_t= 1%

$N_t=N_0 \cdot e^{-\lambda t} \Rightarrow t = -\frac{1}{\lambda}\ln\frac{N_t}{N_0} \Rightarrow t = -\frac{1}{0.347}\ln\frac{1}{100} = 13.27\ year$ (1 pt)

Exercise 2:(1 pt/ question)

For each question, only **one answer** is correct. Circle the correct answer.

Consider the following chemical elements: Bromine (${}_{35}Br^{-}$), Molybdenum (${}_{42}Mo$), and Cesium (${}_{55}Cs^{+}$)

1) The valence level of Mo is:

a) $4s^2\ 3d^4$	**b)** $5s^1\ 4d^5$	**c)** $4s^2\ 3d^5$	**d)** $5s^2\ 4d^4$	**e)** No correct answer

2) The valence level of Br^{-} is:

a) $4s^2\ 3d^{10}\ 4p^6$	**b)** $4s^1\ 3d^{10}\ 4p^6$	**c)** $4s^2\ 3d^{10}\ 4p^5$	**d)** $4s^2\ 4d^{10}\ 3p^6$	**e)** No correct answer

3) The 04 quantum numbers of the unpaired electron of the element Br is:

a)	n = 4, l = 2, m = +2, s = +1/2
b)	n = 3, l = 1, m = +1, s = -1/2
c)	n = 4, l = 1, m = +1, s = +1/2
d)	n = 4, l = 1, m = 0, s = +1/2
e)	No correct answer

4) The period and the group of Cs^{+} is:

a) 6, $VIII_A$	**b)** 5, II_A	**c)** 6, V_B	**d)** 6, I_A	**e)** No correct answer

5) The classification of the atomic radius of Mo, Br, and Cs elements is:

a) Mo > Br > Cs	**b)** Cs > Br > Mo	**c)** Br > Cs > Mo	**d)** Cs > Mo > Br	**e)** No correct answer

6) Hybridization of the central atom of H_3O^+ is:

a) sp	**b)** sp^2	**c)** sp^3	**d)** No correct answer

7) The VSEPR model of H_3O^+ (for central atom) is:

a) AX_4	**b)** AX_3	**c)** AX_2E_2	**d)** AX_3E_1	**e)** No correct answer

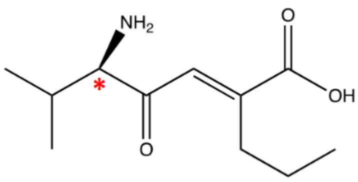
8) What is the molecular shape of the following molecules:

a)	BeF_2	H_2O	NCl_3
b)	Linear	pyramidal	Trigonal planar
c)	angular	pyramidal	Linear
d)	Linear	Trigonal planar	pyramidal
e)	**e)** No correct answer		

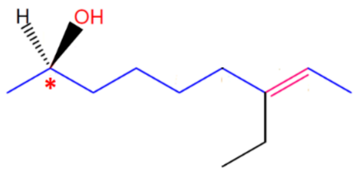
${}_1H$, ${}_4Be$, ${}_7N$, ${}_8O$, ${}_9F$, ${}_{17}Cl$

<u>Exercise 3:</u>

1) Indicate the asymmetric carbons (C*) for A and B molecules.



(A) (1 pt)



(B) (1 pt)

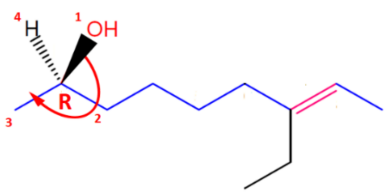
2) Name the functional groups present in molecule A. (1.5 pt)

C=O : Ketone NH_2: Amine COOH : carboxylic acids

3) According to IUPAC system, give the systematic name of the compounds (A) and (B):

(A)	**5-amino-6-methyl-4-oxo-2-propyl hept-2-enoic acid** (1 pt)
(B)	**7-ethyl non-7-en-2-ol** (1 pt)

4) What is the absolute configuration (R, S) of each asymmetric carbon of molecule B with justification?



(1 pt)

5) How many stereoisomers does have compound (B)?

$2^n = 2^1 = 2$ (0.5 pt)