Y1-W4 Practice Quiz

Name and chemistry block: ANSWER KEY

[1] = 1.5 min

There is a total of 20 points. Time suggestion is **30** min. Use your textbook, notes, Data Booklets, calculator, computer... just do it yourself without the help of other people or trying to locate the answers. You can always use diagrams to help illustrate your answer.

1. Cysteine is an amino acid, essential for making proteins in organisms. It structure is shown from three perspectives below.

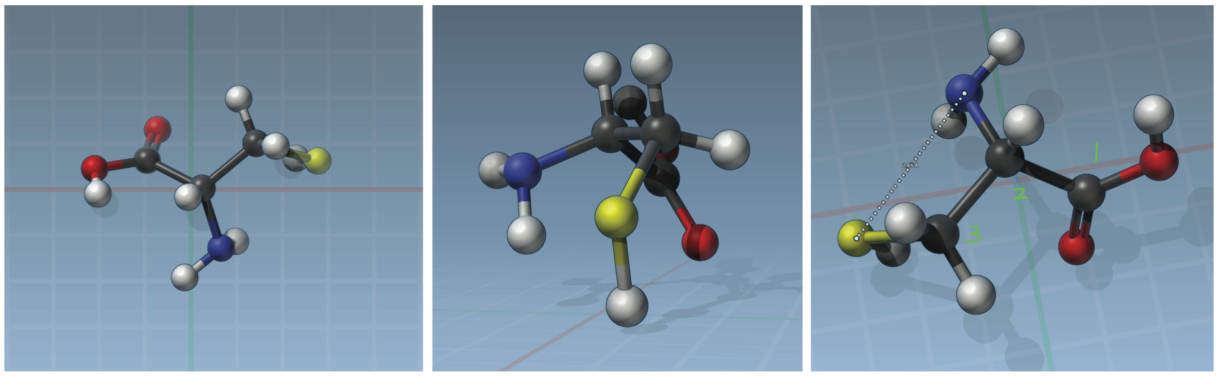
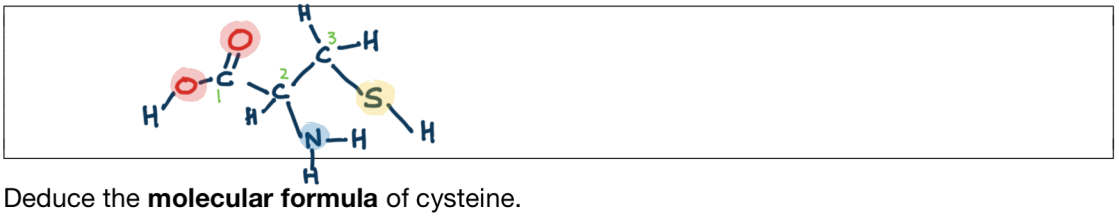


Figure 1 Cysteine in 3D.

[2] (a) Deduce the **full structural formula** of cysteine.



[1] (b) Deduce the **molecular formula** of cysteine.

C : 3
O : 2
N : 1
S : 1
H : 7

CONVENTION:
C H N O S

(b) $C_3H_7NO_2S$

1 "1" DOES NOT NEED TO BE SHOWN (DEFAULT)

[2] (c) Calculate the **molar mass** of cysteine.

IF NOT SPECIFIED, DO 4–5 S.F. NECESSARY!

(c) 121.16 g/mol

$C_3H_7NO_2S$ $M = 3A_C + 7A_H + A_N + 2A_O + A_S$

FIND VALUES FROM DATA BOOKLET, USE CALC.

(d) The distance between the blue and yellow elements was measured to be 2.89 Å.

[2] i. Express this distance in **pm**. Show your calculations.

i. 289 pm

$2.89\ \text{Å} \times \frac{100\ \text{pm}}{1\ \text{Å}} = 289\ \text{pm}$

[2] ii. Express this distance in **µm**. Show your calculations.

ii. 2.89×10^{-4} µm

10^{-6}
10^{-10}
$= 10^{4}$

$2.89\ \text{Å} \times \frac{1\ \mu\text{m}}{10^4\ \text{Å}} = \frac{2.89}{10^4}\ \mu\text{m} = 2.89 \times 10^{-4}\ \mu\text{m}$

[2] (e) Cysteine absorbs light of 250 nm. Suggest the color that would be observed when cysteine is dissolved in water.

∵ CYSTEINE ABSORBS AT 250nm, THIS IS OUTSIDE THE VISIBLE LIGHT RANGES. NO VISIBLE LIGHT IS ABSORB = COLORLESS.

DATA BOOKLET TABLE 3

2. Neon (Ne) has three stable isotopes. Wikipedia shows their distribution as follows.

Main isotopes of neon ($_{10}$Ne)

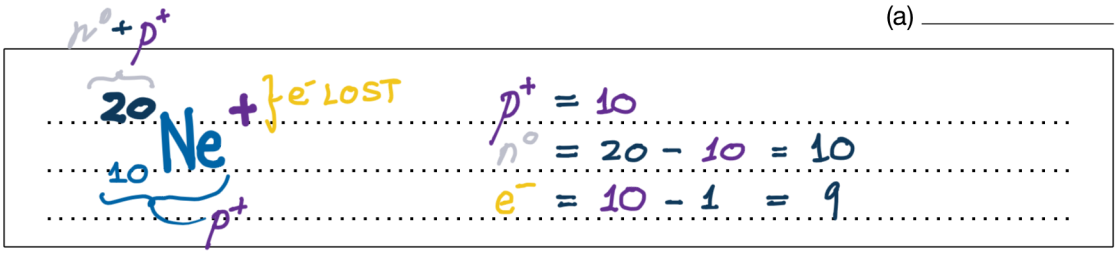
Isotope			Decay	
	abun-dance	half-life ($t_{1/2}$)	mode	pro-duct
^{20}Ne	90.48%	stable		
^{21}Ne	0.27%	stable		
^{22}Ne	9.25%	stable		
Standard atomic weight $A_{r,\,standard}$(Ne)		20.1797(6)[1]		

view · talk · edit

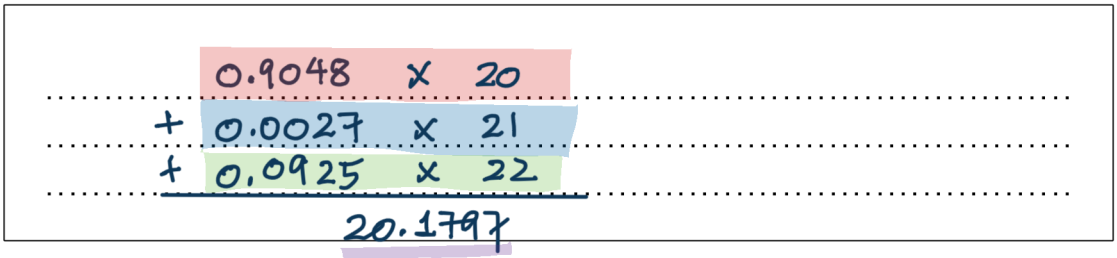
Figure 2 Neon Wikipedia ChemBox.

[2] (a) Deduce the number of protons, neutrons, and electrons present in $^{20}Ne^{+}$.

(a)



[2] (b) Show how the atomic mass of neon can be calculated.



[3] (c) Calculate the volume of a neon atom. Give your answer in m^3 and to three significant figures. Show your work for intermediate credits.

(c) $9.98 \times 10^{-31}\ m^3$

THE ATOMIC RADII IS FOUND IN DATA BOOKLET TABLE 9.

$r_{Ne} = 62 \times 10^{-12}\ m$

$V_{Ne} = \frac{4\pi}{3} r_{Ne}^3 = \frac{4\pi}{3} \left(62 \times 10^{-12}\ m\right)^3$

$= (4\pi/3)(62)^3 (10^{-36})\ m^3 = 998305 \times 10^{-36}\ m^3$

$= 9.98 \times 10^{-31}\ m^3$

[3] (d) Calculate the number of neon atoms in a 1.000 g sample. Give your answer to 4 significant figures.

(d) 2.983×10^{22} ATOMS

ATOMIC MASS: 20.1797 g/mol

IN 1.000 g THERE WOULD BE ? mol.

$1.000\ g \times \frac{1\ mol}{20.1797\ g} = 0.049555\ mol$

$0.049555\ mol \times \frac{6.02 \times 10^{23}\ ATOMS}{1\ mol} = 2.983 \times 10^{22}\ ATOMS$

$\times \frac{mol}{g} = \div \frac{g}{mol}$