University of Mosul **4th Year/Geology**
College of Science **Practical ore geology**

Lab No.3 Monday 23/10/2017

Lazky's Law

The change in trend of ore exploitation from high-grade/small volume ores to low-grade /very large volume ores is adopted by Lazky's Law which states that: "The arithmetic decrease in ore-grade is associated by a geometrical increase in both the quantity of extracted ore and the quantity of purified metal as shown in Figure (1).

Question 1

(A) Using Figure (1), calculate the tonnage of ore that must be extracted for copper deposits having ore grades of
(a)1%, (b)0.5% and (c) 0.1%.

(B) Calculate the weight of the metal present in each case.

(C) Discuss the results you obtained in (B). Are your results reasonable?

Question 2:

(A) Given that the average crustal abundance of copper is 55 ppm, calculate the weight of continental crust that could yield one million tons (10^6) of Cu.

(B) Given that the average density of the crust is 2700 kg m^{-3}, calculate the volume of crust that this represents.

(C) If the average thickness of the continental crust is 30 km and it covers 30% of the earth's surface area (r= 6370 km), what proportion of the total continental crust volume does your answer to (B) represent?

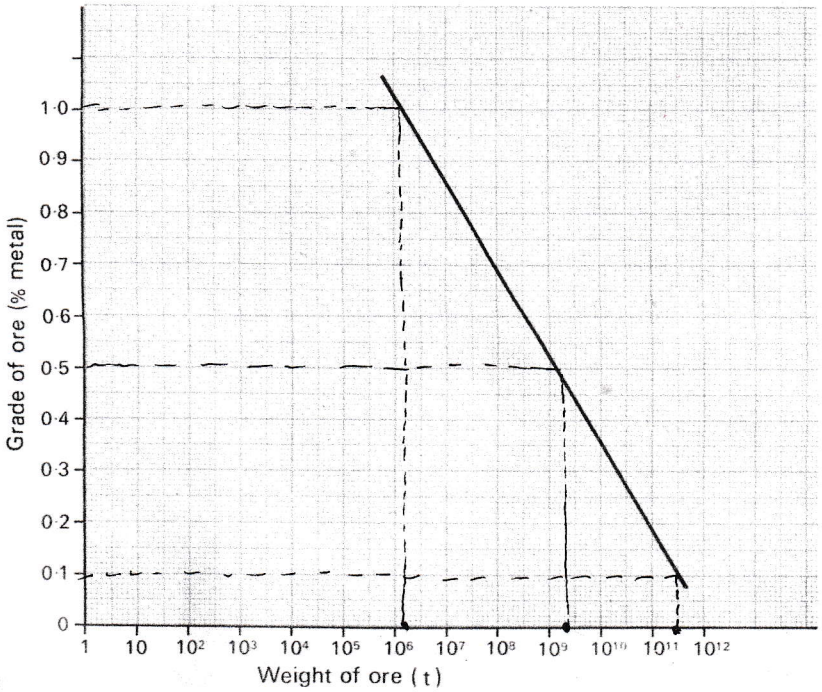

Figure 5 Graphical representation Lasky's Law, for use with SAQ 6.

Solutions:

Question 1

(A)

(a) 1% grade, from graph, the weight of ore to be extracted is $1x10^6$ t.

(b) 0.5% grad, the weight of ore is $2x10^9$ t.

(c) 0.1% grade, the weight of ore is $5x10^{11}$t.

(B) The weight of copper at 1% is $1x10^4$ t.

Weight of ore (t)	weight of metal (t)
100	1
$1x10^6$	x

$X=(1x1x10^6)/100=1x10^4$t.

The weight of copper at 0.5% is $1x10^7$t.

The weight of copper at 0.1% is $5x10^8$t.

(C) The results for 1% are realistic, but for 0.5% and 0.1% they are exaggerated (for example in 1973, the total estimated world reserves of Cu were only $3x10^4$t (with average 0.5% grade).

Question 2

(A)

Weight of continental crust (t)	weight of Cu (t)
10^6	55
x	10^6

$X=(10^6 x106)/55=1.86x10^{10}$t.

(B)

D= 2700 kg m^{-3} = 2.7 t m^{-3}

D=W/V

$2.7 =1.86x10^{10} /v$

V= $1.86 \times 10^{10} /2.7 = 6.9 \times 10^9$ m^3 = 6.9 km^3.

(C) The surface area of the earth crust = $4\pi r^2 = 4 \times 3.14 \times (6370)^2$

= 509645864 km^2.

The surface area of the continental crust= 30/100 x 509645864

= 152893759.2 km^2.

The volume of the continental crust = thickness x continental surface area

= 30 x 152893759.2= 4586812776 km^3.

= $4.6x 10^9$ km^3

The proportion is = $6.9 / 4.6x10^9$

Lab3