Q1/ Identify the elements with the atomic numbers (Z) listed below. Find their electronic configurations, valence electrons. Establish the block and group to which each element belongs and find their valency. Z =13, 26, 37, 54

Q2/ The ground state of an element contains an unpaired 3s electron, which of the following of the element? Li, Na, Mg and K.

Q3/ Find the electronic configuration of the following atoms, representing the electron core by the symbol of the preceding inert gas. To which blocks do they belong? Ti, Os, and Sr.

Q4/ Which of the following is the most likely empirical formula of the ionic compound that forms between Cs and S? (CsS, Cs_3S, Cs_2S).

Q5/ A compound is composed of 31.57% Carbon, 5.26% Hydrogen, and 63.15% Oxygen by mass. What the empirical formula of 100% g from this compound?

Q6/ The metamorphic mineral assemblage garnet + plagioclase + orthopyroxene + quartz occur within granulite facies rocks of pelitic bulk composition. The equilibrium among these minerals can be represented by the reaction Calculate the equilibrium constant (K) for the reaction if the composition of the minerals at equilibrium and ideal mixing but impure is as follows:

Garnet (grossular): $(Ca_{1.04} Fe_{1.43} Mg_{0.46} Mn_{0.07})_3 Al_2 Si_3 O_{12}$

Plagioclase: ($Ca_{0.91} Na_{0.07} K_{0.02}) Al_2Si_2O_8$

Orthopyroxene: $(Ca_{0.08} Fe_{1.67} Mg_{0.19} Al_{0.06})_2 Si_2 O_6$

Q7/Calculate activities of end-member components in the solid solutions as specified below, assuming ideal behavior and impure mixing:

Components**: Mg_2SiO_4 (forsterite) and Fe_2SiO_4 (fayalite) in Olivine,**

$(Mg_{1.63} Fe_{0.35} Mn_{0.02})_2(Si_{0.97} Al_{0.03}) O_4$

Q8/ Calculate the change in internal energy (dE) for the reaction:

Andalusite ↔ Sillimanite at 1atm and $25C^0$

the molar volume of Andalusite is $51.53cm^3$ and of Sillimanite is $49.90cm^3$, heat transferred =740.1calories/mol.?

If it's known:

1 atm. =1.013 bars =1.013 * 10^6 dyne/cm^2

1 erg. =1 dyne • cm= 2.39 * 10^{-8} calories.

Q9/ Draw the curves for these reactions at equilibrium state:

a) Kyanite ↔ Sillimanite
   ΔH =+1770, ΔS= +2.95, ΔV =+0.1389
b) Andalusite ↔ Sillimanite
   ΔH=+730, ΔS =+0.71, ΔV = -0.03896
c) Kyanite ↔ Andalusite

Q10/ Find the direction of these reactions at two states:

1- Change in temperature with constant pressure.
2- Change in pressure with constant temperature.

a) Quartz ↔ Glass
   ΔS= +1.45, ΔV= +4.58
b) Albite ↔ jadeite +Quartz
   ΔS = -8.42, ΔV = 17.18

Q11/ Calculate the Chemical Index of Alteration (CIA) and Chemical Index of Weathering (CIW) from the data below with discussion the results:

Oxides	% Gercus red bed	%Sandstone
SiO2	38.44	58.32
Al2O3	2.79	13.76
Fe2O3	8.65	6.61
MgO	32.00	1.86
CaO	6.28	3.40
Na2O	0.85	5.36
K2O	0.81	5.61
TiO2	0.58	1.35
P2O5	0.09	0.06
MnO	0.09	0.11
H_2O	9.42	3.56
CaO*	5.98	3.2

Q12/ Data for calculating gain and loss for these oxides (% L) during weathering of black shale.

Oxides	% (fresh)	% (weathered)	Oxides	% (fresh)	% (weathered)
SiO_2	66.65	60.20	Na_2O	1.82	3.63
Al_2O_3	18.60	18.59	K_2O	1.84	4.75
Fe_2O_3	10.10	7.85	TiO2	0.04	0.05
MgO	0.12	0.82	P2O5	0.15	0.04

Q13/ Sample from the Dokan river water has the following chemical composition, calculate hypothetical salt, if Specific gravity =1.298

Ions	**mg/L**
Na^{+}	10.13
Ca^{+2}	57.12
Cl^{-}	16.49
HCO_3^{-}	180.42
NO_3^{-}	2.21
Mg^{+2}	13.63
K^{+}	1.35
SO_4^{-2}	57.51

Ions	Atomic weight
Cl	35.457
S	32
O	16
C	12
N	14
Ca	40.08
Mg	24.32
Na	22.99
K	39.1
H	1

Q14/ Here are some data for zircons extracted from granite. How old are these zircons? Decay constant ^{235} U = $9.8485*10^{-10}$ /yr ,^{238}U = $1.55125*10^{-10}$ /yr

sample	$^{206}Pb/^{204}Pb$	$^{238}U/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{235}U/^{204}Pb$
1	796	6800	88.46	49.3
2	1563	6649	257.1	48.2
3	1931	6432	340.1	46.6
4	2554	6302	481.7	45.7
5	2914	6250	560.3	45.3
initial ratios	16.25		15.51	

Q15/ These are some ^{40}Ar and ^{40}K data for biotite and glauconite grains taken from within an Eocene limestone. The clastic sediment intercalated with the limestones was derived from weathering Precambrian basement. Are the biotite and glauconite in the limestone authigenic or inherited

from the basement. You can assume that the sample only contains radiogenic ^{40}Ar and that the decay constant is 0.581×10^{-10}

sample	^{40}K ppm	^{40}Ar ppm
glauconite	6.938	0.01796
biotite	7.891	0.02121
glauconite	6.846	0.01860

Q16/ This figure is a single grain of biotite from a granite. The numbers indicate where laser spot analyses were made. The table gives the data for the spots. You may assume that all the ^{40}Ar is radiogenic, J = 0.0140 and that the total decay constant is 5.543×10^{-10}. What do these data tell you about this biotite grain?

spot number	$^{39}Ar/^{40}Ar$ ($\times 10^{-2}$)
3	1.446
5	1.406
6	1.472
15	1.582
25	1.554
28	1.476
29	1.527

Q17/ Answer the following questions briefly?

1- What are major effects of increasing water pressure on Granitic magma?

2- During α - decay radioactive, how the mass number and atomic number change?

Q18/ Choose or give the correct answer:

1- The formation of wollastonite should be inhibited by high partial pressures of …. (SO_4), (H_2O), (CO_2)

2- High Field Strength Elements (HFSE) are typically …(Compatible) , (Incompatible) , (large ionic radius) .

3- The element is incompatible if partition coefficient (D) ……. (If D > 1), (If D < 1), (If D = 1).

4- Among the first minerals to crystallize from ……. magma are olivine and one or more pyroxenes.

(Dioriteic), (Basaltic), (Granitic).

Q19/Complete the following:

1-Isotope that does not decay radioactively is …… .

2-…….. large gas cloud collapses. Its spin causes it to flatten in to a disk.

3- ……meteorite consist essentially of one or two nickel-iron metallic phases and coarse-grained intergrown crystal structure.

Q20/ Why the elements that form the columns of the periodic table behave similarly largely?

Q21/ Write two ways use for stable isotopes.

Q22/ What is the synonym for incompatible trace elements?

Q23/ When metamorphism occurs, the fugacity of CO_2 becomes important.

Q24/ In the "normal" differentiation process, the pyroxenes and olivines that crystallize first are rich?

Q25/ The highest limit of oxidation potential in natural Environments reduce 0.06 volt to all unit.

(PH increasing), (PH decreasing), (PH removing).