**Q1: Answer the following** **questions** **briefly**? **( 20M )**

**1- Enumerate four examples of Dioctahedral; Kaolinite group AI4Si4Ol0(OH)8 . (4 M )**

**2- Write five industrial uses of clay minerals: (4 M )**

**3- Write two importances of ion-exchange reactions in clays: (4 M )**

**4- Define Allophane and Imogolite. (4 M )**

**5- This chemical weathering reaction represents which conditions of weathering? (4 M )**

**3Al2Si2O5(OH)4 + 5 H2O —------- 2A1(OH)3 + 2H4 SiO4**

**(kaolinite) (gibbsite) (dissolved silica)**

**Q2: Choose or give the correct answer: ( 10 M )**

**1- Clays when heated at regular rate adsorbed surface water is lost at……….. . (80-90°C) , (100-200°C) , (>500°C).**

**2- The good example of non-hydrated clay minerals is……………. . (Brucite), (Kaolinite), (Halloysite).**

**3- …………………….. ; Molecules enter into the crystal grain, neutralizing the layer charge imbalance that is**

**caused by substitutions in the tetrahedral or octahedral layers. (Absorption) , (Adsorption) , (Desorption) .**

**4- When clay mineral particles face to face common it is meaning …………………….. .**

**(flocculation) , (aggregation )** **, (adsorption) .**

**5- …………………….. Clay structures (random repetition); formed by random alteration layers (and inter-layers),**

**of two or more types, in any percentages. (Irregular mixed-layer), (Regular mixed layer), (uniform repetition) .**

**Q3: Complete the following: ( 10M )**

**1- Scanning electron microscope (SEM); shows texture and morphology of particles very clearly, at resolution ….. µ.**

**2- When particles of clay minerals are separated it is meaning …………………… .**

**3-** **Swelling and shrinkage of clays are kinds of …………………….. weathering.**

**4- The organic matter in clay may convert to ……………………..**

**5- …………………….. ;are montmorillonite rich clay, rarely pure, mostly with little illitic mixed-layer.**

**Q4: Write “True” or “False” and correct the false ones: ( 10M )**

**1- Clay are essentially, weathering products of disintegration and chemical decomposition,**

**detrital sediment.**

**2- Bauxite: Brucite Mg (OH)2 and other aluminum hydroxides formed by leaching of kaoiinitic soils from their silica.**

**3-** **Mudrocks contain completely from clay minerals.**

**4- When erosion rates are rapid, minerals may be transported and buried before much alteration and**

**disintegration can take place.**

**5- Green colour of mudrocks; results from iron present in the lattices of illite and chlorite.**

**Good Luck**

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**Q/ Complete the following sentences:**

1- ---------------------------- is iron-rich trioctahedral chlorite.

2- Bentonite horizon characterized by --------------------------------- contacts.

3- Sodium montmorillonite has ---------------------------------- of water.

4- ------------------- imparts the green colour to chlorite.

5- ----------------------------- is removal of the adsorbed and absorbed molecules.

6- In ------------------------ mixed layer, there are rational series of basal reflections.

7- Dioctahedral layers are rich in -------------------- ions.

8- In DTA analysis, when deflection below, ---------------------------------- take place.

9- The open marine environment is ------------------------- in organic matter.

10- Smectite supplied to the marine farther than other minerals due to their ------------------.

**Q/ Rewrite the following sentences, and correct the underlines if they are wrong:**

1- The basal spacing of montmorillonite various with **calcium** molecules.

2- **Chamosite** is iron-rich illite with bright green colour.

3- Due to highly plasticity, **ball clay** is good for ceramic.

4- When deflections **bellow** in DTA analysis, recrystallization take place.

5- TEM resolution is **less** than SEM.

6- **Absorption** process is addition of molecules onto the grain surface.

7- Zeolite in chemistry is similar to **clays** .

8- In mudrock facies, the **black** colour is indicator to poor circulation.

**Q/ Talk about the following:**

1- Characteristics of bentonite horizon.

2- Importance of ion-exchange reactions in clays.

**Q/ Give the reasons of the following:**

1- Swelling in chlorite.

2- Degradation in illite.

**Q/ Compare between: (12)**

1-Kaolinite; and serpentinite structure.

2-Macrovermiculite; and desaturated vermiculite.

**Q/ Illustrate (with labeling):**

1- Stages of water loss from muddy sediments.

2- Relative abundance of minerals with increasing weathering rates.

3- Structure of inosilicate clay minerals.

**Good Luck**

**Ass. Prof**. **Dr. Farhad A. Mohammad**