Learning Assessment #3: Ig and Sed Rocks ANSWER KEY

Part 1 – Igneous Rocks and Processes

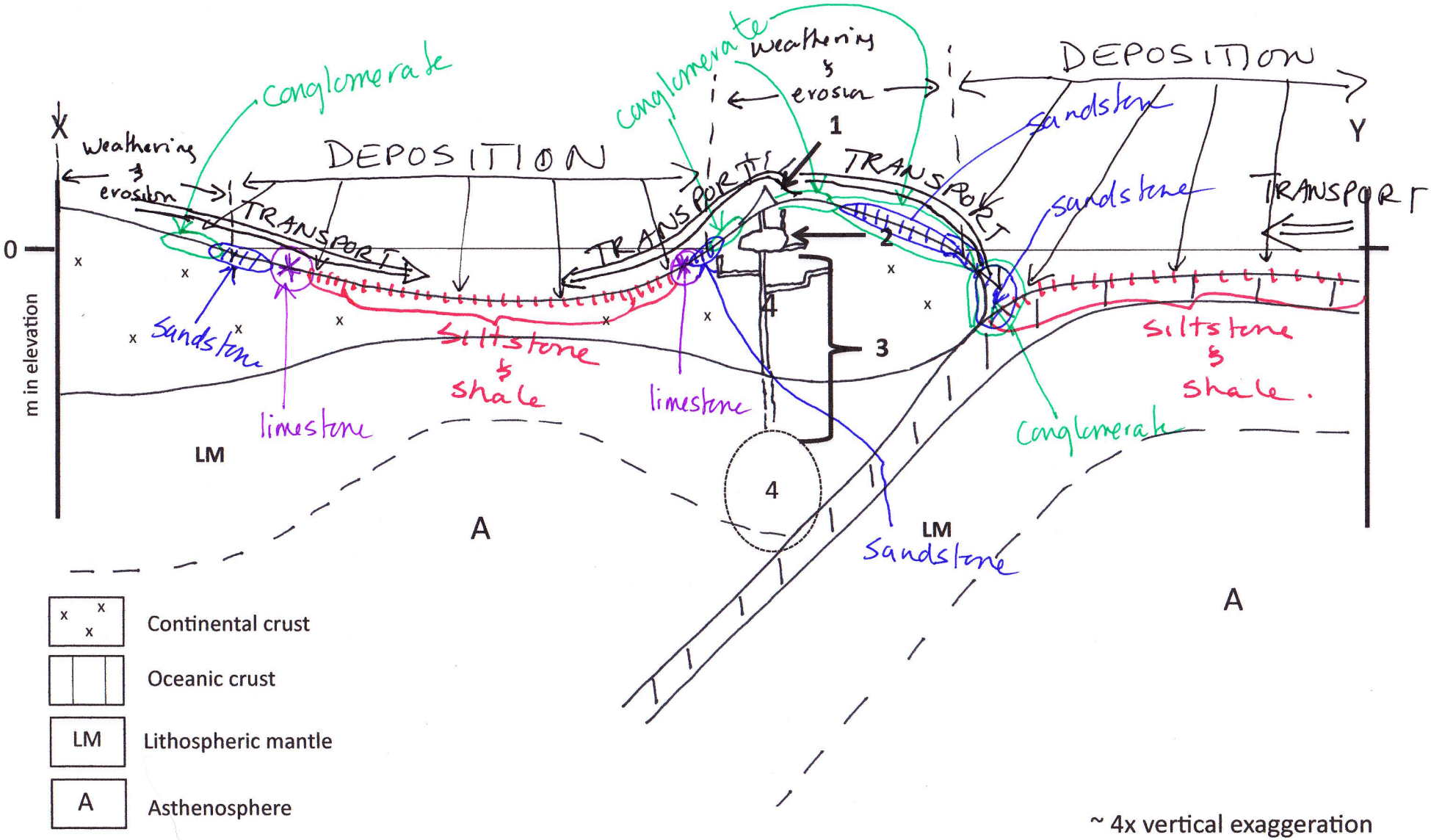
The cross section X-Y has four areas labeled 1, 2, 3 and 4. For each area describe the igneous rocks and rock cycle processes you would expect to be occurring at these areas. Use the table below to organize your response. You can use point form and sketches to help illustrate a process.

Area	Rock Name, Rock Type and Chemistry (or magma chemistry) (i.e. Gabbro, intrusive igneous rock, mafic)	Igneous Process(es)	Description of Process(es) (i.e what causes process(es), what happens in the area, what these processes trigger, etc.)
1*	ZONE OF Volcanism - Basalt, Dacite, Andesite & Tuff (at least one of these rocks is listed) - Extrusive igneous - Intermediate and Silicic in composition NO RHYOLITE FOUND IN AREA	Effusive and explosive eruptions Solidification	Effusive eruptions (lava flows) of intermediate & mafic magma onto the surface of the earth through volcanic vents. Magmas solidify to form basalts, andesite and dacites rock. Also explosive eruptions of ash and volcanic fragments, which solidify to form tuffs and volcanic breccia extrusive igneous rock layers.
2	MAGMA CHAMBER - Gabbro, Diorite and Granite*(should match rock type or types listed above in area 1) - Intrusive igneous - Intermediate and silicic	Solidification Fractional crystallization Transport Assimilation / contamination	Magma undergoes fractional crystallization in magma chamber, creating more silicic magma and creating mafic intrusive rocks (gabbro). Magma solidifies in magma chamber creating intrusive igneous rock Assimilation of surrounding country rock can cause contamination of magma in chamber as well, changing magma chemistry Some magma is transported to the surface and erupts to form extrusive igneous rock.
3	TRANSPORT AREA - MAFIC magma - if some magma solidifies in dykes and sills it would form INTRUSIVE rock type GABBRO	Magma Transport Assimilation & Contamination Solidification may occur as well	Magma formed form partial melting in area 4 undergoes transport as it is less dense (more buoyant) than surrounding solid rock. Intrusive dykes and sills may form along the way as some of the magma solidifies. Contamination of the transported magma because of assimilation of crust material also changes magma chemistry to become more intermediate in composition.
4	MELTING AREA Mafic magma is produced here from partial melt of PERIDOTITE ROCK, which is an intrusive, ultramafic igneous rock	Partial melting of peridotite rock	Peridotote rock of the mantle partially melts due to the addition of volatiles to this rock, derived from the subducting oceanic lithospheric plate.

* Refer to geologic map of Daisen volcano for rock types.

Name: _____ ID: _____

Learning Assessment #2 Cross Section X-Y – ANSWER KEY



Learning Assessment #3, Part 3: Daisen Volcano: Volcanic and Sedimentary history – ANSWER KEY

Time Period	Description of Volcanic Activity during time period	Cross-section sketch
Pre- 1.3 Ma	No volcanic activity yet at Daisen volcano area. No volcano exists at this time.	**Daisen volcano pre 1.3 Ma** granites & gneisses
1.3 – 1.2 Ma	First and earlierst lava flows (effusive eruptions) begin in this area of mafic magma forming basalt layers and volcanic landforms that are mostly likely shield-like in their shape. This is the beginning of the formation of the Daisen volcano.	**Daisen volcano at 1.2 Ma** basalt layers shield volcano magma chamber
1 – 0.02 Ma	1 Ma – 0.6 Ma The earliest eruptions at this time are LAVA FLOWS of intermediate and more silic lava that form ANDESITE (at 1 Ma) AND DACITE volcanic rocks. Lava domes made of dacite rock also form between 1 Ma and 0.6 Ma. Over the time period of 1 Ma and 0.6 Ma the predominant volcanic activity involves lava eruptions forming dacite. During this time the volcano takes a composite form. At 0.6 Ma there is a massive explosive eruption of silicic magma, fragments of volcanic rock and volcanic gasses that form the Mizoguchi Tuff. This layer covers much of the Daisen area. After 0.6 Ma (between 0.5 Ma and 0.15 Ma) there is another distinct lava eruption of intermediate magma forming an andesite layer (at 0.5 Ma) as well as periodic eruptions of more silicic magma forming more dacite throughout this time. From the time period between 0.15 and 0.02 Ma there are numerous pyroclastic eruptions and subsequent mudflows (caused by mass movement of the loose volcanic debris during heavy rainfall periods). Volcanic activity wanes at the end of this time.	**Daisen volcano at 0.6 Ma** up to explosive eruption of Mizoguchi Tuff Tuff Tuff dacite dacite dacite andesite andesite magma chamber
0.02 – 0 Ma (today)	During this time period there is no volcanic activity or formation of new volcanic rocks. Sedimentary processes cause weathering, erosion and transport of the existing volcanic rocks to form the gravel and talus deposits. Some of this sediment is also transported and deposited in the Japan Sea.	**Daisen volcano today (0 Ma)** erosion & transport gravel & talus deposits pyroclasic flows & mudfl. 0.5 Ma andesite transport 1.0 Ma andesite dacite dacite dacite Tuff transport of sediment magma chamber gravel & talus deposits