Tossup - *Short Answer* – When a melt is forming, one observes that the border between unique mineral grains will melt first. This change of melting point is due to which important geochemical property?

ANSWER: freezing point depression (Accept: eutectic melting) (written by reverse)

Bonus - *Short Answer* - What property of rocks prevents magmas from being heating to temperature much above the eutectic temperature?

ANSWER: latent heat of fusion (Accept: latent heat of melting) (written by reverse)

Tossup - *Multiple Choice* - In the past 800,000 years, Earth's period of glacial maximums has followed a period of about 100,000 years. Which of the following periodic changes can be attributed as the main forcing factor to cause these glacial maximums?

W) Axial obliquity
X) Axial precession
Y) Brightness of the sun
Z) Eccentricity

ANSWER: Z (written by reverse)

Bonus - *Short Answer* - A direct correlation between the rate of seafloor spreading and global temperature can be made, as the rate of subduction controls volatile outgassing of volcanoes. How would a faster rate of seafloor spreading affect average global temperature, if all other factors controlling temperature are held constant?

ANSWER: increased global temperature (written by reverse)

Tossup - *Short Answer* – Order the following minerals from first to last to decay chemically. 1) Quartz 2) Olivine 3) Augite

ANSWER: 2, 3, 1 (written by reverse)

Bonus - *Short Answer* - An olivine crystal has an iron rich core and a magnesium rich rim, indicative that the temperature increased drastically from influxes of hot magma. What zoning will likely occur from the mechanism?

ANSWER: reverse zoning (written by reverse :)

Tossup - *Short Answer* - If the dry adiabatic lapse rate is less than the atmospheric lapse rate but the wet adiabatic lapse rate is greater than the atmospheric lapse rate, what atmospheric condition has occurred?

ANSWER: conditional instability (do not accept: absolute instability) (written by reverse)

Bonus - *Multiple Choice* - In order for a surface low to gain in intensity, which of the following needs to occur at high altitudes?

W) Convergence
X) Divergence
Y) Absolute geostrophic flow
Z) Conditional geostrophic flow

ANSWER: X (written by reverse)

Tossup - *Multiple Choice* – Which of the following minerals commonly has trace amounts of uranium and thorium, and plays an important role in radiometric dating?

W) Andalusite
X) Zircon
Y) Dolomite
Z) Aragonite

ANSWER: X (written by reverse)

Bonus - *Short Answer* - The internal structural damage of many zircon crystals is caused by self-irradiation from the radioactive decay of uranium and thorium in the crystal structure. This process of continuous structural disintegration is known as what?

ANSWER: metamictization (accept: metamiction) (written by reverse)

Tossup - *Multiple Choice* – Which of the following sedimentary structures is indicative of a sand desert environment?

W) Thick alternating layers of loess and glacial erratics
X) Layers of cross bedding seen in sandstone
Y) Symmetrical ripple marks several centimeters in width
Z) Graded patterns of well-sorted sediment

ANSWER: X (written by reverse)

Bonus - *Short Answer* - The composition of sandstone arenites can be indicative of the maturity of the rock. Giving your answer as mature, intermediate, or immature, what is the relative maturity of a quartz rich sandstone arenite composed of 80% quartz?

ANSWER: mature (written by reverse) (this might be a bad question, if people say this one is vague, let me know)

Tossup - *Short Answer* - Which of the following minerals has a sheet-like silicate structure? 1) Biotite 2) Muscovite 3) Microcline 4) Talc

ANSWER: 1, 2, 4 (written by reverse)

Bonus - *Multiple Choice* - Large, euhedral crystals of muscovite embedded in an igneous rock are indicative of which of the following environments?

W) Quick cooling time at high temperatures
X) Quick cooling time at low temperatures
Y) Slow cooling time at high temperatures
Z) Slow cooling time at low temperatures

ANSWER: Z (written by reverse)

Tossup - *Short Answer* - What type of supernova is characterized by very similar absolute luminosity light curves, thus being useful as a standard candle in extragalactic astronomy?

ANSWER: Type 1a (do not accept Type 1) (written by reverse)

Bonus - *Multiple Choice* - Which of the following is indicative of a Type 1a supernova?

W) Strong silicon line at 615 nm, no hydrogen lines
X) Strong helium lines, no hydrogen lines
Y) Strong iron line at 810 nm, no hydrogen lines
Z) Strong helium and hydrogen lines

ANSWER: W (written by reverse)

Tossup - *Multiple Choice* - Which of the following best describes the main formation mechanism of tropospheric ozone?

W) Splitting of H_2O into H_2 and O by ionosphere-to-ground electrolysis, recombination of O and O_2 into ozone
X) Splitting of NO_2 into NO and O by high energy radiation, then recombination of O and O_2 into ozone
Y) Combination of two O_2 molecules, releasing O_3 and O
Z) Splitting of O_2 into two O radicals, recombination of O radical with O_2 into ozone

ANSWER: X (written by reverse)

Bonus - *Multiple Choice* - The urban heat island effect is strongest during which of the following conditions?

W) Night, low pressure and relatively strong converging winds
X) Night, high pressure and light winds
Y) Day, low pressure and relatively strong converging winds
Z) Day, high pressure and light winds

ANSWER: X (written by reverse)

Tossup - *Short Answer* - Out of all the celestial bodies, which have previously or are currently experiencing active surface volcanism? 1) Io 2) Mercury 3) Earth's moon 4) Venus

ANSWER: 1, 3, 4 (written by reverse)

Bonus - *Short Answer* - One of the main controls for crystal size in igneous rocks is the diffusion rate and the time given for ions to diffuse. If an igneous rock contains many complex silica frameworks and the time given to cool is relatively short, giving your answer as aphanitic, intermediate, phaneritic, or pegmatitic, what is the most likely texture of the rock?

ANSWER: aphanitic (complex silica networks -> slow diffusion time) (written by reverse, this one might be a little vague too, let me know if people complain about it)