

279 Ways to Avoid Summer School or to Get that 100!

1. The #1 Tested item is using the Reference Tables (between 15-25 points), you need to do a 40-50 question Reference Table Test before taking the regents, You Must Be Able To Use the ESRTs!!!!
2. Know how to round numbers to the tenth 0.5, to the hundredth 0.53 and thousandth 0.531
3. Know Scientific Notation - 345,876 --> 3.5×10^5
4. Use Percent Error Formula on Front of ESRTs and the Rate of Change Formula.
5. Cyclic Relationships repeat and are predictable (ex. Moon Phases, Tides, Seasons).
6. Density is how close or compact the molecules are in matter.
7. As Temperature Increases, molecules spread out (Volume Increases) and Density Decreases.
8. As Pressure Increases, molecules move closer together (volume decreases) and Density Increases.
9. The same objects have the same density NO MATTER WHAT SIZE or SHAPE.
10. Water is most dense at 4°C in the liquid form (density is 1 g/cm³).
11. Everything else is most dense in the solid form.
12. For objects with densities less than 1, the lower it is the higher it floats.
13. As population increases, pollution increases, water quality decreases.
- Planet Earth ~ Contour Maps, Layers of the Earth, Latitude/Longitude (ESRT p 14, 15)**
14. The true shape of the earth is an oblate spheroid, Bulging Equator, Flattened at the poles.
15. Looks like a perfect sphere from space, only SLIGHTY oblate.
16. The altitude of Polaris equals your latitude (be able to use NYS map to find altitude).
17. **Always**, I mean **Always** look north to see Polaris, hence “north star”.
18. Polaris is only special because it is in line with Earth’s axis of rotation (doesn’t move).
19. Lithosphere is the solid land part of the earth (made of crust and rigid mantle).
20. Hydrosphere is the liquid layer of the Earth (oceans).
21. Atmosphere is the gas portion, broken down into 4 layers, with the Troposphere the lowest layer.
22. Latitude lines run horizontal across like the equator, read North or South of Equator.
23. Longitude lines run up and down, read east and west of the Prime Meridian. 180° is the International Date Line (IDL).
24. An astrolabe is used to measure the altitude of a star above the horizon.
25. Pointer stars in the big dipper point to Polaris (Dubhe and Merak).
26. Time zones are separated by 15° degrees of longitude based on Earth's Rate of Rotation.
27. Going to the west (California) time gets earlier, going east it gets later (London).
28. Isoline-a line representing points of equal value.
29. Special isolines include: Isobars-pressure, Isotherms-temperature, Contours-elevation

30. A set of circles inside circles indicates a hill, the smallest circle in the middle is the hilltop. Ocean is sea level 0'.
31. Tick marks-depressions, the first tick marked line is the same elevation as adjacent contour line.
32. Contour Interval - amount between adjacent contour lines.
33. Lines close together = steep gradient, water goes downhill and opposite bends in contour lines (Rule of Vs).
34. Use Gradient Formula in ESRT, use contour interval to determine highest elevation of hills.
35. Count on getting a Profile, which is a side view of a topographic cross section.
36. When drawing a profile remember to round the top of hills and bottom of valleys.
37. Be able to draw Isolines, the boxes with numbers inside where you have to connect the dots.

Rocks and Minerals (ESRT pages are huge here, Rock pages on 6, 7, 16 and top of 11)

39. Minerals are solid, naturally occurring, inorganic (not living) substances.
40. There are over 3000 known minerals but only 12 are commonly found.
41. Most rocks are made from a few of those 12 minerals I just mentioned.
42. Oxygen and Silicon ~ two most abundant in crust, form a pyramid shape (Si-O₂ tetrahedron).
43. Almost all rocks contain minerals (coal & limestone are exceptions, but they never ask about it).
44. Mineral properties hardness, cleavage, shape - ***based on the internal arrangement of atoms.***
45. Color is not a good way to ID a mineral b/c some minerals come in lots of colors like quartz.
46. Streak is the powdered form of a mineral, as found by using a streak plate.
47. Cleavage is flat sides on a mineral - minerals break along planes of weak bonding.
48. Use the Rock Cycle Chart in the ESRT to see how each of the 3 rock types form.
49. Calcite is the mineral that is shaped like a rhombus and bubbles in acid.
50. The origin of the rock determines if it is a SED rock, IGN rock or MET rock.
51. Igneous rocks form from the solidification or crystallization of magma or lava.
52. Texture or crystal size in Igneous rocks is determined based on rate of cooling.
53. Fast cooling is glassy or fine texture where slow cooling is coarse crystals (big).
54. Clastic Sedimentary rocks are classified based on grain size (shale vs. sandstone).
55. Be able to determine sediments based on grain size 0.0007 is silt and 0.008 is sand.
56. Sedimentary Rocks form 3 ways, Compaction & Cement, Organically, Chemically. All of these must be lithified.
57. Chemically formed Sedimentary rocks form from evaporating seawater, leaves behind evaporates and precipitates.
58. Sedimentary Rocks are the only ones with fossils in them.
59. Sedimentary Rocks are found as a thin layer (a veneer) covering the continents, beneath this thin layer are metamorphic rocks and igneous rocks which make up most of the crust.

60. Metamorphic rocks form from heat and/or pressure.
61. Key words for Metamorphic rocks are; foliation, re-crystallization, distorted structure, and density.
62. Contact metamorphic rocks are found between igneous intrusions and sedimentary rocks.
63. According to ESRT p7 shale turns into slate, sandstone into quartzite, limestone into marble.
64. Nonrenewable resources include fossil fuels (coal, petroleum, natural gas) and metals.
- Weathering, Erosion, Deposition, and Landscapes (ESRT p6 top right also page 2 Landscapes)**
65. Weathering is the breaking down of rocks into smaller pieces.
66. Physical Weathering - breaking down of a rock into smaller pieces by mechanical means, best example is frost action.
66. Frost action is when water seeps in crack, freezes and expands; the climate needed is a wet one where the temperature alternates from above and below freezing.
67. Rocks become smaller and rounder in a stream due to abrasion (rock chipping in river bed).
68. Rivers Carve V-shape valleys.
69. Chemical Weathering - changes the chemical composition of the rock, best example is rust, also cave formation and acid rain. Whenever one thing turns into another.
70. Best climate for chemical weathering is Warm and Wet (Humid).
71. Soil - mixture of weathered rock and organic remains (bugs, etc.) that covers bedrock.
72. As organic material increases soil thickness increases, Organics are on top layer of soil.
73. Discharge is the amount of water in a stream (Stream Volume).
74. Velocity of a river determined by Slope and Discharge, as either increases, velocity increases.
75. In a river flowing in a straight line, water flows fastest in the center just below the surface.
76. When a river flows around a curve, it is fastest on the outside edges.
77. Outside curves in rivers are fast, erosion is dominant and the water is deep.
78. On inside curves the water flows slow, deposition is dominant and the water is shallow.
79. Smallest particles are carried by suspension, salt by solution, largest sizes bounce & roll.
80. Glaciers form when yearly snowfall exceeds melting, continental form when the climate is cold.
81. Glaciers carve U-shaped valleys, deposit Unsorted and Unlayered sediments, and scratch bedrock.
82. Other Glacier Landscape characteristics are numerous lakes, and erratics (large boulders).
83. Outwash plains form as a glacier melts and rivers carry small sediments away from the glacier. (Stratified Drift – sorted and layered).

84. Glaciers advance from the north, they formed Long Island, left sand and gravel and they flow like a river, fastest in the middle.
85. The steep side of a drumlin indicates the direction the glacier advanced from (usually north).
86. Gravity is the force responsible for all the agents of erosion.
87. Evidence of gravity erosion is unsorted and angular rocks at base of cliffs.
88. Deposition – occurs when an agent of erosion slows down and drops sediments.
89. As roundness increases, rate of Deposition increases; As density increases, rate of Deposition increases; As size increases, rate of deposition increases.
90. Large particles have a high settling **rate** but a low settling **time** (careful with graphs on this).
91. Longshore drift moves sand along the beach in the direction of the ocean current.
92. Landscapes are determined by the climate, bedrock, and geologic structures.
93. Mountains have high relief, igneous or metamorphic rock, built along plate boundaries.
94. Plateau's are medium elevation, horizontal sedimentary rock, with river carved V-Shaped valleys.
95. Plains are flat, low relief, sedimentary rock, and have meandering streams.
96. Arid Climates-dry, steep slopes, -- Humid climates rounded hills, wet.
97. Mountains create a radial drainage pattern, all water runs downhill away from the Mt. peak.
98. A random drainage pattern occurs on plains similar to the Mississippi river (lots of meanders).
99. When matching bedrock pictures to drainage pattern, main rivers form in valleys (low spots).
100. If uplift > erosion – elevation increases (uplift), if Erosion > uplift then elevation decreases.
- Plate Tectonics and Earthquakes (ESRT pages 5, 10, 11, sometimes the centerfold)**
101. Earthquake is the sudden movement along a fault, usually happens at plate boundaries.
102. P waves are fastest waves, can go through anything, they go faster through more dense layers.
103. S waves are slowest, move in S motion, can not go through liquids (outer core).
104. P Waves are compression waves (back and forth - horizontal) S Waves are transverse waves (up and down - vertical). L-waves (surface) are the most destructive.
105. Seismic data allows scientists to determine the thickness of earth's layers and liquid outer core.
106. 1 seismic station is used to determine the distance to the epicenter (Not Direction).
107. Use time lag between the arrival of P and S waves to get distance to Epicenter!
108. A minimum of 3 are needed to determine the epicenter location (Big circles and far distances) – Triangulation.
109. Ocean Crust - High Density (in ESRT), Young Age, Thin, made of Basalt. Shows evidence of magnetic reversals.

- 110. Continental Crust - Low Density, Old Age, Thick (think Mt. Everest) made of Granite.
- 111. The core of the earth is thought to be Iron and Nickel based on Meteorite data (not tested?).
- 112. Most Earthquakes and Volcanoes are found together along Plate Boundaries.
- 113. Tsunamis (tidal wave) are caused by underwater earthquake.
- 114. Proof of Continental Drift - Continents fit together, fossils/rocks/mts. all match up along coasts.
- 115. Divergent Boundary (Ridge, Spreading Center) where magma comes up through the sea floor.
- 116. New ocean floor is created at mid ocean ridges. Crust is hottest at ridges (rising magma).
- 117. Age of rock increases as distance from ridge increases (youngest at ridge).
- 118. Convergent Boundary (Continent-Ocean), the more dense plate (ocean) subducts beneath the continent plate. Proof of this is how the depth of earthquake foci increases as you move inland.
- 119. Two continents collide at Mt. Everest (Himalayas).
- 120. Transform Boundary - Plates slide past each other at the San Andreas Fault.
- 121. Hot spot - mantle plume through the middle of a plate, like Hawaii.
- 122. Plates move due to Convection Currents in the upper Mantle (Asthenosphere).
- 123. Magma rising causes divergent boundaries, sinking magma causes convergent boundaries.

History of the Earth (centerfold in ESRT and radioactive decay box on front page)

- 124. Oldest rocks are on the bottom unless, the rocks have been overturned.
- 125. Any event that crosses another layer is younger than it (faults, folds, intrusions).
- 126. Need to observe contact metamorphism to determine the relative age of layers. (burns it-younger). If a rock layer has tick marks on it, it is older than the intrusion.
- 127. Be able to tell the difference between folding, faulting, and tilting of rock layers.
- 128. Fossils in mountains prove crustal uplift occurred (an uplifted sea floor).
- 129. Marine fossils indicate the area was once covered by water.
- 130. Index fossils are found all over (widespread) and only lived for a short geologic time period.
- 131. Earth is 4.6 billion years old (that is when the sun and solar system formed).
- 132. Precambrian Time Period is 4 billion years long (only simplest life forms existed).
- 133. Life evolved from simple to complex organisms, evolved b/c changes in environment.
- 134. Sedimentary Rocks are ALWAYS deposited in horizontal layers and underwater.
- 135. Sedimentary rocks found at high elevations are proof of crustal uplift.
- 136. Unconformity -ancient erosional surface - represents missing rock layers - time gap. Also seen as the line that separates crazy layers from straight layers.
- 137. Volcanic ash - good time marker because it spreads out quickly over a large area (like #130).

138. Radioactive dating - compare percentage of unstable atoms to stable atoms to get age of rock.
139. Half Life - the time it takes for 1/2 the unstable atoms to decay into stable atoms.
140. Half Life never changes NO Matter What! Radioactive elements decay forever!
141. If a rock contains 50% unstable and 50% stable - 1 half life has past (25%-75% - 2 Half Lives).
142. Carbon dating is used for things that were once living and less than 50,000 year old.
143. Asteroid Impacts are thought to cause mass extinctions (dinosaurs died 65 million years ago).
- Weather** (page 12,13 in ESRT)
144. Meteorologist - Weatherman – Weather is the short term atmospheric conditions.
145. 99% of earth's energy comes from the sun (1% from radioactive decay in the core).
146. Air Pressure or Barometric Pressure is caused by weight of the air (measured with barometer).
147. Cold air is high pressure b/c the molecules are close together, and weight more than hot air.
148. Hot air is low pressure b/c the molecules are far apart, and there is more room for water.
149. High pressure is cold and dry – Low pressure is warm and wet.
150. Dew Point Temperature – the temperature at which the air is saturated (filled) with water.
151. When the Air temperature is at or very close to the dew point temperature, then the air is full of water and rain is probable. When the air temp and dew point are far apart it is dry out.
152. Relative humidity is the % of water in the air; temp & dew point close = high relative humidity.
153. Sling Psychrometer - has wet and dry bulb to measure dew point and relative humidity.
154. Finding dew point in ESRT, remember to use the difference between the wet and dry bulb.
155. The wet bulb is always colder than the dry bulb b/c evaporation is a cooling process.
156. Cloud Formation - warm moist air rises (less dense) cools and expands (adiabatic cooling) when it cools to the dew point temperature condensation occurs if condensation nuclei are present; then a cloud drop forms, cloud drop size increases and will fall as a rain drop.
157. Isobars connect points of equal Barometric Pressure or Air Pressure.
158. Isobars close together indicate a fast wind speed --- far apart, calm winds.
159. If the difference in pressure between two weather stations is high wind speed high.
160. Winds are caused by the uneven heating of the earth, and Differences in Air Pressure.
161. Winds blow from high pressure to low pressure.
162. Sea Breeze; daytime, land is hot (Low Pressure), ocean is cold (High Pressure). winds go H to L.

163. Land breeze occurs at night and is the exact opposite of the conditions for Sea Breeze.
164. Coriolis Effect – winds and ocean currents deflected due to Earth’s Rotation.
165. Winds are deflected to the right in northern hemisphere and to the left in southern hemisphere.
166. LICC, (Low, Inward, counterclockwise) HOC (High, outward, clockwise) – Happy High, Lousy Low.
167. Air rises and makes clouds and rain, low pressure; Air sinks, cold air, dry.
168. Precipitation = rain, sleet, hail, snow.
169. Evaporation is greatest when it is HOT, DRY, and Windy -- also increase surface area.
170. Condensation - water vapor turns into liquid water à releases 540 calories of heat energy.
171. Master the station model, use your ESRT and follow the guidelines exactly.
172. Convert pressures 1001.0 is 010 ; 985.1 is 851 ; 112 is 1011.2 ; 985 is 998.5.
173. Air mass-move slowly over an area take the characteristics of that area (Gulf of Mexico=mT).
174. mT – warm and wet forms over gulf of mexico, cP – cold and dry forms over central Canada.
175. mP – cold and wet, cT – warm and dry, cA very cold and very dry.
176. A front is the boundary line between two air masses (mainly between cP and mT airmasses).
177. Behind a cold front is cold dry air, in front of a cold front is warm and wet air.
178. In the middle of a cold and warm front is the mT airmass (see diagram).
179. At the cold front air is very unstable, thunderstorm occur (short heavy rain).
180. In front of a warm front is long, drizzle.
181. All weather in the U.S. moves from west to east or toward the northeast.
182. Hurricanes are very large, strong, low-pressure systems that can last for days. They get their energy from warm ocean water and lose power when they move over land.
183. To prepare for a hurricane; prepare an escape route, learn first aid, tape or board up windows, store up food, water and candles.
184. The typical hurricane track – they move northwest from the southern Atlantic Ocean toward Florida, and then they move northeast when they enter our prevailing wind belt.
185. Tornadoes - short lived (minutes to one hour plus) small in size – prepare by going to the basement.

Energy, Water Cycle and Climate

184. Sun (stars) give off electromagnetic radiation. Radiation such as Radio Waves, UV, visible light, microwaves, X-Rays and Infrared are classified based on their wavelength.
185. Incoming radiation can be absorbed, reflected, refracted, or scattered.
186. The atmosphere (ozone) filters or blocks harmful rays such as Ultra Violet and Gamma.
187. The most intense form of radiation received by earth is short wave VISIBLE LIGHT.

188. Earth Radiates (Terrestrial Radiation) long wave Infrared (Heat Energy). RED HEAT.
189. A greenhouse works because short wave visible light can pass through glass, but longer wave infrared is radiated and does not have enough energy to pass through glass.
190. The greenhouse effect on Earth is similar except the greenhouse gases CO₂, H₂O, and CH₄ (Carbon dioxide, Water Vapor, and Methane) act as the glass to trap infrared (they absorb it and then re-radiate it back to Earth). Therefore cloudy nights are warmer than clear nights.
191. Humans add CO₂ to the air by burning fossil fuels from cars, factories, and pollution.
192. As CO₂ levels increase, the amount of infrared energy trapped increases, temperature increases.
193. If the Earth heats up, the ice caps will melt and sea level will rise.
194. Dark and rough objects absorb light like dark dirt or a forest.
195. Light and smooth objects reflect light like ice and snow.
196. Good absorbers of light are good radiators (black heats up and cools down quickly).
197. Specific heat is the resistance to heating, the higher the specific heat the longer and more energy required to heat the object up. Water has a high specific heat and heats up and cools down slowly. Lead with a low specific heat changes temperature very easily.
198. Evaporation (L-G) adds energy to atmosphere (atmosphere gains 540 calories/gram).
199. Use ESRT to see which process release and absorb energy (front page).
200. Water Cycle – process by which water circulates on Earth. Water enters the atmosphere by transpiration (water given off by trees) and evaporation. Falls back to the ground as precipitation.
201. Water that lands on soil can infiltrate (sink in) or run off (move over the surface of Earth).
202. Infiltration occurs when the land is permeable, unsaturated, low slope, not frozen.
203. Runoff occurs when the land is impermeable, saturated, steep slope, frozen ground.
204. Porosity is the percent of empty space in soil. Grain size does not affect porosity because in a sample with small particles the holes are small but there are many of them, with large particles the spaces are large and there are few of them. Unsorted samples have lower porosity.
205. Permeability – how fast water flows through soil. As grain size increases Permeability increases.
206. Capillarity – upward movement of water into small spaces or the water retained by soil as water passes through a sample. As grain size increases, capillarity decreases.
207. Zone of Aeration – air between soil; Zone of Saturation – water between soil; water table is the boundary line that separates the two zones.
208. Conduction - transfer of energy in solids through molecules vibrating and touching.
209. Convection - transfer of energy in liquids and gases due to differences in density.
210. Radiation - transfer of energy in waves; needs no medium (space).
211. Watershed - geographic area where all the rainwater flows into a river then a body of water.

212. Climate – long term weather for a location (based on temperature and rainfall).
213. As latitude increases, temperature decreases; as elevation increases, temperature decreases.
214. Coastal areas have moderate climates (cool summer, warm winter) b/c the proximity to water which has a high specific heat (doesn't change temperature much).
215. Windward side of mountains: Air rises, cools, expands, rains. Leeward side the air compresses and sinks, becomes dry and warm.
216. Winds cause ocean currents - Planetary Wind Belt and Ocean Currents in ESRT.
217. Monsoons caused by differences in land and water temperatures (Seasonal Winds see # 161 & 162).
- Astronomy** (page 15 ESRT)
218. As the angle of insolation increases, the temperature increases.
219. Solar noon occurs when the sun is highest in the sky, warmest time of day is 2pm coldest 6am.
220. Celestial Objects (sun, moon, stars) rise in the east and set in the west due to earth's rotation.
221. Stars around Polaris make circles, Polaris stays still (North star) (Pole Star).
222. Altitude of Polaris equals your latitude (Use ESRT for Cities in NYS) second time on the list.
223. Use the pointer stars in the big dipper (Ursa Major) to find Polaris in the little dipper (Ursa Minor).
224. Zenith is 90° overhead, Constellations are groups of stars near each other in the sky.
225. Rotation - Spinning on the axis, causes day and night, 360° per day, at a rate of 15°/hour.
226. Proof of Rotation - Foucault Pendulum and Coriolis Effect, Increase Rate of Rotation increases the Coriolis Effect.
227. Be able to tell time of day on Earth from diagrams, Earth rotates counterclockwise 15 degree/hour.
228. Revolution - one body orbits around another body, Earth Revolves ~ 1°/day (gives us the year).
229. Seasons are caused by revolution and tilt of the Earth on its axis.
230. Know the position of the direct ray (sun at zenith). 6/21-23.5°N, 12/21-23.5°S, 3/21 & 9/21-0°.
231. Summer in NYS sunrise NE and sunset NW Winter in NYS sunrise in SE and sunset in SW.
232. The sun is always south at noon in the United States (solar collectors point south).
233. Summer; North Pole faces sun (24hr/day); Winter; North Pole away from sun (24/hour night) using diagrams if the North Pole is all dark it is winter, all light it is summer, ½ and ½ equinox .
234. Equinox means equal day and night 12 hours of each, sun overhead at the equator.
235. Altitude of noon sun greatest on June 21 then decreases to minimum on Dec 21 then rises again.

236. When the sun is highest in the sky it has maximum intensity & your shadow is shortest.
237. Duration of Insolation is the length of day; high in summer, low in winter.
238. The sun is never overhead in NYS (sun only overhead between the tropics).
239. If the earth was not tilted there would be no seasons (more tilt, more extreme seasons).
240. Shadows are longest when the sun is low, shortest when the sun is highest.
241. The tilt of the earth 23.5° causes the uneven length of daylight during the year.
242. Revolution causes different constellation to be visible at different times of the year.
243. Heliocentric Model - Sun Centered, planet revolve in elliptical orbits, sun at one focus.
244. Geocentric Model - Earth Centered, wrong model, planets and sun revolve around earth.
245. If a satellite is close to a star, orbital velocity is greatest; far away, moves slow.
246. Satellite/Planet is closest, high gravitation force, high Kinetic Energy, high apparent diameter.
247. Planets sweep out equal area's in equal amounts of time.
248. As distance from a star increases, rate of revolution decreases by inverse square.
249. As the mass of an object increases, gravity increases proportionally (2x mass, 2x gravity).
250. Eccentricity is a measure of how flattened the orbit is (highest =1, line) (lowest=0, circle).
251. Satellites are kept in elliptical orbits by inertia and gravity.
252. The earth's orbit is extremely round, almost perfect, but it is slightly elliptical.
253. Moon Phases are caused by the Revolution of the moon around the earth.
254. One Revolution of the moon takes 27 days - 29.5 days from Full moon to Full moon.
255. When the moon is between the earth and sun this is a New Moon (all dark from Earth).
256. Solar Eclipses can occur during a new moon, it gets dark during the middle of the day.
257. Lunar Eclipses can occur during the full moon phase (earth's shadow on the moon).
258. Eclipses don't happen every month because the moon's orbit is inclined five degrees to Earth's lane of orbit.
259. When an object is close it looks bigger (has a large angular diameter) {far is small}.
260. Tides are caused by the moons gravitational pull on the earth (also the sun's but not as much).
261. When the Earth, Moon, and Sun are in a line these are extreme Tides (spring tide).
262. When the Moon and Sun are working against each other we get small tides (neap tides).
263. Two high tides and two low tides per day (cyclic change).
264. Inner four planets are rocky, outer 4 planets are gas giants (Jovian).
265. Venus is the hottest planet due to runaway greenhouse effect.
266. Earth is the only one with liquid water on the surface.

267. Asteroid- big rock in space, most are between Mars and Jupiter.
268. Meteor –shooting star, rock burns up in our atmosphere, no atmosphere no burning up (moon).
269. Comet - Dirty Snowball, highly elliptical orbit.
270. Sun is a regular star, burns by converting Hydrogen into Helium (Nuclear Fusion).
271. Increasing Size -- planet, star, solar system, galaxy, universe.
272. Galaxy - collection of billions of stars (solar systems).
273. Big bang – universe formed 13 billion years ago from an explosion.
274. Proof of Big Bang - Galaxies are moving away from us, the further the galaxy is from us the faster it is moving away.
275. 2nd proof of big bang is the cosmic background radiation (noise from the big bang).
276. Big Bang seen in Spectroscope as a red shift which is longer wavelength.
277. Know our position in our Milky Way Galaxy.
278. Age of universe is approximately 10-15 billion years old, solar system is only 4.6 billion years old.
279. Light year- distance light travels in one year.