

Questions on Astronomy

FOR THE USE OF THE PUPILS OF

The Institution for the Deaf and Dumb,

HALLIFAX, N. S.

The Earth as a Planet.

(Calkin's *Geography*, pp. 14—18.)

QUESTIONS.

1.

Form of the Earth.

1. What did people once believe the shape of the Earth to be?
2. Is it so? Is this the case?
3. Can you give me any proofs of this?
4. What have Navigators often done?
5. When was the first voyage made round the world, and by whom?
- 3.
6. What part of a ship do we first see when it comes in sight? What next? And what next?
7. What is the part we see last? When? If the Earth were flat, would this be so?
8. What parts of the land remain longest visible as we sail away from the shore?
9. Which disappear first?
- 4.
10. How far would a man six feet high standing by the seashore see a boat? When?

11. How far would he see if he were to stand on a high rock 24 feet above the water?
12. How high would he need to stand to see nine miles? 12 miles? 15 miles? 18 miles? 21 miles?
- 5.
13. Who now believe that the Earth is a vast ball?
14. Why do they believe this?
15. Do any persons still think the Earth is flat? What kind of persons are they?
16. Does the Earth appear round? Why not?
17. What would we need to do to see the roundness of the earth?
18. If we ascended in a balloon far above the Earth, how would it appear?
- 6.
19. What is meant by the **Sensible Horizon**?
20. What is meant by the **Rational Horizon**?
21. Is the Sensible Horizon always the same size?
22. Does the Rational Horizon vary in extent?
23. Did you ever see the Rational Horizon? Did anyone? How not?
- 7.
24. What about the unevenness of the Earth's surface? Does not that seem against the theory that it is round?
25. How is it that the inequalities—the mountains and valleys—on the Earth's surface do not affect its general roundness?
26. To what may these inequalities be compared?

27. Does the roughness of the rind of the orange interfere with its general roundness? How would these roughnesses perhaps appear to an animal-cule?
- 8.
28. Is the Earth an exact sphere?
29. What are the **Poles**?
30. What part is called the **Equator**?
31. What gives the best representation of the Earth?
32. Can you see the difference between the globe and a perfect sphere? Why not?
33. How much would the polar diameter be lessened in a globe two feet in diameter?
- 9.
34. Can you give any other proofs of the Earth's spherical form besides those already mentioned?
35. If the Earth were not spherical, would its shadow be circular?
36. What is the shape of the shadow cast by an angular body?
37. If the Earth were angular in shape, what kind of a shadow would it cast?
38. What happens as we travel east? And what as we travel west? What does this prove?
39. What is required in cutting canals? How much of a curve is required? Why so? If the Earth were flat, would this be necessary?
40. Is the curvature of the Earth as great near the poles as at other parts of the Earth? How do we infer this?

11.

Attraction of the Earth.

41. What must we do in lifting a stone?
 42. What does the stone do?
 43. What is this resistance called?
 44. What causes this?
 45. Can we see, or taste, or handle attraction?
 46. What is it—a person or a thing?
 47. What does the force of attraction cause?
 48. Why does a stone fall to the ground if we leave it unsupported?
 49. Why does the ripe apple fall from the tree?
- 12.
50. What is the weight of any body equal to?
 51. How are some bodies heavier than others?
 52. Why is a wooden ball heavier than an india rubber ball of the same size?
 53. What is the **law of attraction**?
 54. Does the falling stone attract the Earth, or the Earth attract the stone?

13.

55. Does the force of attraction act in curved, or crooked lines, or in what direction?
56. From what point does it act—from what part of the Earth—from the surface, or how?
57. Is a body attracted more, or less, as it is farther from the centre of the Earth?

58. How does the power of attraction increase or diminish?
59. If the Earth were swelled out to twice its present size, without any increase of matter, how much would a body now weighing a pound weigh?

16.

Size of the Earth.

60. How long would a railway train, moving at the rate of 60 miles an hour, take to go around the Earth?
61. If it went at the rate of 30 miles an hour, how long would it take?
62. If it went at the rate of 60 miles an hour, but only ran during 12 hours each day, how long would it take?
63. What do you mean by the **circumference** of the Earth?
64. How many miles is it—what is the distance around the Earth?
65. What is the area of Nova Scotia?
66. How much greater is the area of the Earth's surface?
67. Whether is the **polar** diameter, or the **equatorial** diameter the greatest?
68. How much is the former? How much the latter?

17.

Light and Heat.

69. What is the Sun ?
 70. What would the Earth be without the Sun ?
 71. How far is the Sun from us ?
 72. How swiftly does **Light** travel ?
 18.
 73. How much larger is the Sun than the Earth ?
 How much heavier ?
 74. How is it that the Sun is not so much heavier than the Earth, when it is so vastly greater in size ?
 75. What is the diameter of the Earth ? And what is the Sun's diameter ?
 76. What is the distance in miles of the Sun from the Earth ?

19--21.

Day and Night.

77. What causes the change of Day and Night ?
 78. On what does the Earth turn ? Can the axis be seen ?
 79. Where is the North Pole ? The South Pole ?
 80. What do you mean by the *Circle of Illumination* ?
 81. In what direction does the Sun appear to move in the sky ?
 82. Does it really move from East to West ? What makes it appear so ?
 33. Illustrate that. Give an illustration.

23, 24.

Unequal Length of Day.

84. Are our days and nights always equal in length ?
 85. Which is the longest, and which is the shortest day with us ?
 86. Are the day and night ever equal here, and when ?
 87. Where are they always equal ?
 88. Where is the inequality the greatest ?
 89. What is the position of the Sun at noon, at mid-summer when the day is longest ?
 90. Does the Sun really shift his position ?
 91. What causes the apparent shifting ?
 92. What do you mean by the **Earth's Orbit** ?
 26--31.
 93. How long does the Earth take to go once round the Sun ?
 94. How does this cause the inequality of day and night ?
 95. What is the position of the Sun on the 21st of June ?
 96. What is it on the 21st of December ?
 97. What is it on the 20th of March ?
 98. What is it on the 23rd of September ?
 99. What is the 20th of March called ? Why so ?
 100. What is the 23rd of September called ? Why so ?
 101. How far north does the sun appear to go in the course of the year ? How many degrees N. of the Equator ?

102. How far south of the Equator?
 103. What does the sun do when it gets to the Tropic of Cancer? And what is this called?
 104. What is meant by the **Winter Solstice**?
 105. Where is the hottest part of the Earth, and what makes it so?
 106. What makes the Polar Regions the coldest part of the Earth?

33—35.

Change of Seasons.

107. Do all parts of the Earth receive the same quantity of the Sun's rays? How is this?
 108. Where is the heat of the sun greatest? And where is it least?
 109. What causes the *different degrees of temperature* (heat and cold) at different times of the year?
 110. What does this constant changing of the Sun's position cause?

36—40.

Cause of the Earth's Annual Motion.

111. How is the Earth kept revolving round the sun why does it not *fly away from or rush into* the Sun?
 112. What do you call the force that draws the Earth away from the Sun?
 113. And what is the name of the force that draws it towards the Sun?

114. Can you illustrate (give an illustration of) these two forces?
 115. When the Sun is nearest to the Earth, what is that called?
 116. And what, when the Sun is farthest away?
 When is that?
 117. Whether is the Sun nearer to us in winter, or in summer?
 118. How is it then that it is warmer in summer than in winter?

Circles.

41, 42.

119. If you draw a line across your slate, what kind of a line would it be?
 120. What are lines drawn round a globe called?
 121. Name two great circles.
 122. Name some lesser circles.
 123. Into how many parts is a circle divided?
 124. What are these parts called?
 125. How many minutes in a degree?
 126. How many seconds in a minute?
 127. How are degrees, minutes, seconds written?
 128. Is a degree always the same length?

Zones.

43—44.

129. What is a Zone?
 130. How many Zones are there?
 131. Name them.
 132. Which Zone are we in?

133. Which is the centre one?
 134. Which Zones lie north of the Equator?
 135. And which lie south of it?
 136. How is the Torrid Zone so hot?
- Latitude and Longitude.**
 45 and 52.
137. If a place lies north of the Equator, how do we say it is situated?
 138. If a place is south of the Equator, what is that called?
 139. Are we in North Latitude, or South Latitude?
 140. Is Australia in N. or S. Latitude?
 141. What does Latitude mean?
 142. How are lines of latitude drawn on the map?
 143. What are Parallels of Latitude?
 144. What other lines do you see drawn on maps besides the Parallels?
 145. Which way do they run, and where do they all meet?
 146. What does **Meridian** mean? (Noonday.)
 147. What are **Meridian lines**? (Noonday lines)
 148. Where are the Meridians counted from—which is the **First Meridian**?
 149. How many meridians are marked on the globe?
 150. What is East Longitude?
 151. What is West Longitude?
 152. What is the Latitude and Longitude of Halifax?

The Solar System.

61.

The Earth,—a Heavenly Body.

153. What is meant by **Heavenly Bodies**?
 154. What is meant by **Celestial Bodies**?
 155. What is the name of the Evening Star?
 156. In what part of the heavens is it generally seen and at what time?
 157. Is the Earth anything like this star?
 158. How would the Earth appear if viewed from the same distance?
 159. Is the Earth a heavenly body?
 160. What do Astronomers tell us about **Venus**?
 161. What is an Astronomer?
 162. What is Astronomy?

The Planets.

62.

163. Are there any other bodies, like the Earth and Venus, which revolve round the Sun?
 164. What are all such bodies?
 165. Are the planets all the same size as the Earth?
 166. Are they all the same distance from the Sun?
 167. Are they dark or light—opaque or transparent?

168. How many planets are there?
 169. Name the eight largest planets in the order of their distance from the Sun?
 170. Which is the nearest to the Sun?
 171. Which is the farthest from the Sun?
 172. Which is the nearest to the Earth?
 173. What small planet is nearer the sun than Mercury?
 174. What are **planetoids**? (Little planets.)
 175. Where are they situated?
 176. How many of them are known?
 177. When were all these discovered?
 178. Are there others besides those now known?
 179. How do all the planets and planetoids move?
 180. What do we call the Sun with the planets revolving round it?

MOONS.

64.

181. What kind of a body is the Moon—is it light or dark?
 182. How does it shine so brightly then if it be opaque?
 183. Does the Moon move? How?
 184. How often does it revolve round the Earth in a year?
 185. How many days does it take to revolve around the Earth once?
 186. What division of time does this give us?
 187. Do we ever see the other side of the Moon? How is it that the Moon always presents the same face to us?

188. How far is it from the Earth?
 189. Is it as large as the Earth?
 190. What is its diameter?
 65.
 191. Does the Moon always appear the same size to us?
 192. How is this?
 193. What are these different appearances of the Moon called?
 194. When do we see the **whole face** of the Moon?
 195. When is it **full moon**?
 196. When is it **new moon**?
 197. How much of the Moon do we see when it is **new moon**?

Eclipses.

66.

198. Did you ever see an eclipse of the Sun or Moon?
 199. What causes an eclipse of the Sun?
 200. What causes an eclipse of the Moon?
 201. When only can an eclipse of the Moon take place?
 202. And when an eclipse of the Sun?
 203. Do eclipses occur at every new and full moon? Why not?

Satellites or Moons.

67.

204. Have any others of the planets moons, besides the Earth?
 205. What other name is sometimes given to these moons?

206. How many moons has Jupiter ?
 207. How many moons has Saturn ?
 208. How many moons has Uranus ?
 209. How many moons has Neptune ?
 210. How are eclipses of Jupiter and other planets useful ?
- 68.
211. Name the principal planets, and compare them with the Earth as to size.
 212. Give the diameter of each.
 213. Give the distance of each from the Sun.
 214. Mention the number of moons to each.

Distances of Planets.

215. Give an illustration of these distances from a cannon ball travelling at the rate of 1000 miles an hour.
 216. How long would an express train, going at the rate of 40 miles an hour, take to reach the Moon from the Earth ?
 217. How long to reach the Sun from the Earth ?
 218. How long to reach the Sun from Mercury ?
 219. How long to reach the Sun from Venus ?
 220. How long to reach the Sun from Mars ?
 221. How long to reach the Sun from Jupiter ?
 222. How long to reach the Sun from Saturn ?
 223. How long to reach the Sun from Uranus ?
 224. How long to reach the Sun from Neptune ?

Length of Years.

225. Find the length of the year in each of the planets.
 226. How many years on the Earth are equal to about one year in Jupiter ?
 227. How old are you ?
 228. Find out how old you would have been, if you had been living in Venus, Mercury, Mars, Saturn, or Uranus, respectively ?
 229. How old is your father ?
 230. Had he been in Neptune, how old would he have been now ?

Fixed Stars.

69.

231. How can you distinguish the fixed stars from the planets in the sky ?
 232. Are there other systems in the Universe like our solar system ?
 233. What are the Fixed Stars supposed to be ?
 234. What is the name of the nearest Fixed Star ? (Sirius.)
 235. How long does light take to reach us from the Sun ?
 236. How long does light take to travel to us from the nearest fixed star ?
 237. What does that show ?
 238. How far distant from us to the nearest fixed star ?
 239. What idea do these facts give us of the vastness of the Universe ?
 240. What lessons do the wonders of Astronomy teach us as to the great Creator of the Universe ?

Interesting Facts.

About the Heavenly Bodies.

1. A cannon ball flying at the rate of 1000 miles an hour, would take to reach the Sun from

Mercury	4½ years	Jupiter	59½ years
Venus	8 "	Saturn	102 "
Earth	11 "	Uranus	205½ "
Mars	16½ "	Neptune	350 "

2. The sizes of the other planets compared with the Earth, are as follows:

- (1.) **Mercury** and **Mars** are about half the size of the Earth.
- (2.) **Venus** is a little smaller than the Earth.
- (3.) **Jupiter** is between eleven and twelve times the size of the Earth.
- (4.) **Saturn** is between nine and ten times larger than the Earth.
- (5.) **Uranus** is more than four times larger than the Earth.
- (6.) **Neptune** is more than five times larger than the Earth.

3. The Sun is 500 times greater in size than the whole of the planets put together.

4. The comparative distances of the planets from the Sun are as follows:

- (1.) The Earth is 91,725,000 miles distant from the Sun.

(2.) **Venus** is nearly 28 millions of miles nearer the Sun than the Earth.

(3.) **Mercury** is rather more than 2½ times nearer to the Sun than the Earth.

(4.) **Mars** is rather more than 1½ times farther from the Sun than the Earth.

(5.) **Jupiter** is more than 5 times farther from the Sun than the Earth.

(6.) **Saturn** is nearly 10 times farther from the Sun than the Earth.

(7.) **Uranus** is about 20 times farther from the Sun than the Earth.

(8.) **Neptune** is nearly 31 times farther from the Sun than the Earth.

5. The Lengths of the Year in the other planets, as compared with the Earth:

(1.) The Earth revolves round the Sun in 365 days, and that is called a year.

(2.) The year in **Venus** is only 225 days, or about 8 months of our time. X—is 15 years old on the Earth, but if — had been born in Venus, — would have been nearly 21 years old.

(3.) The year in **Mercury** is only 87 days, or about three months of our time on the Earth. If — had been born there, — would have been four times older than — is now. — would have been 60 years old.

- (4.) The year in **Mars** is 687 days, or about twice as long as our year; so ——— would be *only half as old as* ——— is now, or about eight years old if ——— was living there.
- (5.) The year in **Jupiter** is 4,333 days, or nearly 12 years of the Earth. If ——— had been living there, ——— would have been about a year and three months old now.
- (6.) The year in **Saturn** is 10,759 days, so ——— about 29 $\frac{1}{2}$ of the years of the Earth, so ——— would be only about half a year old if ——— were living there.
- (7.) The year in **Uranus** is 30,867 days, or about 83 $\frac{1}{2}$ of the years of the Earth, so ——— would be less than one sixth of a year, (or less than two months) old, if ——— were there.
- (8.) The year in **Neptune** is 60,625 days, or 166 years. Mr. X ——— is 52 years old now on the Earth. If he were living in Neptune now, he would be only about one third of a year, or about 4 months old.

6 **Illustration of Planetary Distances.** An express train going at the rate of 40 miles an hour would take to reach the Sun from

Mercury	about 106 years.
Venus	“ 197 “
The Earth	“ 262 “
Mars	“ 411 “

Jupiter	about 1410 years
Saturn	“ 2586 “
Uranus	“ 5200 “
Neptune	“ 8185 “

The Starry Heavens.

7. The following are the names of some of the Stars and Constellations. You can see these and many others on a clear night.

Planets.

1. Mercury
2. Venus
3. The Earth, and the Moon
4. Mars
5. Vesta
6. Ceres
7. Pallas
8. Juno
9. Jupiter
10. Saturn
11. Uranus
12. Neptune &c

Fixed Stars.

1. The North or Pole Star (in **Ursa Minor**.)
2. **Ursa Minor**, or the Little Bear.
3. Sirius, or the Dog-Star.
4. Aleyone (one of the Pleiades.)
5. The Pleiades, or Seven Stars.
6. The Plough (in **Ursa Major**.)
7. **Ursa Major**, or the Great Bear.
8. Orion's Belt, &c.

8. **Sirius** is the nearest of the fixed stars, but it is so far from us that light takes 3 $\frac{1}{2}$ years to travel from it to the Earth.

9. **Alcyone** is even vastly more distant than **Sirius**. **Alcyone** is supposed by some to be Heaven, the seat of God's throne, and the centre of the Universe. It is thought that our solar system, and other Suns and Systems besides ours, all revolve around it, and that they will take more than 20 millions of years to make one complete revolution!
10. It is not known whether the other planets and heavenly bodies are inhabited as well as the Earth. They may be inhabited, though by other beings different from those on the Earth, but we cannot tell.
11. From these facts we see how vast, how wonderful is the Universe! And, also, how mighty, how wise, how infinite, must be the great Creator who made, and upholds, and governs it all!

Table of the Planets.

Planets.	Diameter in Eng. miles.	Distance from the Sun in Eng. miles.	Length of Year in days
Mercury,	3,140	37,000,000	...
Venus,	7,700	69,000,000	225
Earth,	7,916	91,725,000	365
Mars,	4,100	144,000,000	687
Jupiter,	90,000	494,000,000	4,333
Saturn,	76,068	906,000,000	10,759
Uranus,	34,500	1,822,000,000	30,687
Neptune,	42,000	2,869,000,000	60,625