

TPO 35 – 1 Earth's Age
地球的年齡

整段【多选题】

One of the first recorded observers to surmise a long age for Earth was the Greek historian Herodotus, who lived from approximately 480 B.C. to 425 B.C. 【】 He observed that the Nile River Delta was in fact a series of sediment deposits built up in successive floods. 【】 By noting that individual floods deposit only thin layers of sediment, he was able to conclude that the Nile Delta had taken many thousands of years to build up. 【】 More important than the amount of time Herodotus computed, which turns out to be **trivial** compared with the age of Earth, was the notion that one could estimate ages of geologic features by determining rates of the processes responsible for such features, and then assuming the rates to be roughly constant over time. 【】 Similar applications of this concept were to be used again and again in later centuries to estimate the ages of rock formations and, in particular, of layers of sediment that had compacted and cemented to form sedimentary rocks.

问题 1: 询问单词意思 (**trivial**);

问题 2: 询问 (**He observed that the Nile River Delta**) 是重要的原因;

问题 13: 插入语的位置 → 【】;

第一批记录在册的、推测出地球历史的观察者之一是希腊的历史学家希罗多德。他大致出生于公元前 480 年，去世于公元前 425 年。他观察到，尼罗河三角洲实际上是由连续不断的水流流经时逐渐沉积下来的沉积物组成的。希罗多德还注意到，单独的水流只能带来薄薄的一层沉积物，他因此得出结论：尼罗河三角洲是经过成千上万年才沉积而成的。比希罗多德计算的时间长短更重要的是，他引入了一个概念：假设一个地质特征形成的速率在历史上是相对稳定的，我们可以通过计算形成相应地质特征过程的速率来估计其年龄。在这个概念面前，地球的年龄到底是多大实在是不重要了。在以后的几个世纪里，这个概念被多次应用于计算岩石形成的年龄，尤其是在形成沉积岩层时一层层压紧的各种沉积层的年龄。

整段【多选题】

It was not until the seventeenth century that attempts were made again to understand clues to Earth's history through the rock record. Nicolaus Steno (1638–1686) was the first to work out principles of the progressive depositing of sediment in Tuscany. However, **James Hutton** (1726–1797), known as the founder of modern geology, **was the first to** have the important insight that geologic processes are cyclic in nature. Forces associated with subterranean heat cause land to be uplifted into plateaus and mountain ranges. The effects of wind and water then break down the masses of uplifted rock, producing sediment that is transported by water downward to ultimately form layers in lakes, seashores, or even oceans. Over time, the layers become sedimentary rock. These rocks are then uplifted sometime in the future to form new mountain ranges, which **exhibit** the sedimentary layers (and the remains of life within those layers) of the earlier **episodes** of erosion and deposition.

问题 3: 询问 **James Hutton** 是第一个人 do what;

问题 4: 询问单词意思 (**exhibit**);

问题 5: 询问单词意思 (**episodes**);

直到 17 世纪，人类才再次试图去通过岩石记录来了解可以算出地球历史的线索。 Nicolaus Steno (1638-1686) 是首位推算出托斯卡纳区 (意大利行政区) 沉积过程的演变规则的人。然而，现代地质学的创始人 James Hutton (1726-1797) 才是第一位发现这个重要事实的人：地质过程在自然界其实是循环往复的。与地下热量有关的力使得土地被抬升成高原和山脉。接着，风力和水流的作用分解了大块的凸起的岩石，产生了随水流向下游流去的沉积物，这些沉积物最终形成了湖里、海岸上或者海洋里的沉积层。随着时间的流逝，这些沉积层变成了沉积岩。这些沉积岩在之后的某时间形成新的山脉，把之前侵蚀和沉淀事件形成的沉积层 (以及沉积层里的生命遗迹) 展示出来。

Hutton's concept represented a remarkable insight because it unified many individual phenomena and observations into a conceptual picture of Earth's history. With the further assumption that these geologic processes were generally no more or less vigorous than they are today, Hutton's examination of sedimentary layers led him to realize that Earth's history must be enormous, that geologic time is an abyss and human history a speck by comparison.

问题 6: 等价替换语句 (Sentences = which of the CHOICES)

Hutton 的概念展示给我们一个重要的想法，因为它将很多单独的地质现象和观察整合成了一个地球历史的概念图。进一步假定这些地质过程过去的活跃程度和现在的活跃程度所差无几，Hutton 对于沉积层的研究让他意识到，地球的历史会是非常漫长的，人类的历史之于地球的历史，就如同灰尘之于深渊，是微不足道的。

整段【多选题】

After Hutton, geologists tried to determine rates of sedimentation so as to estimate the age of Earth from the total length of the sedimentary, or stratigraphic, record. Typical numbers produced at the turn of the twentieth century were 100 million to 400 million years. These underestimated the actual age by factors of 10 to 50 because much of the sedimentary record is missing in various locations and because there is a long rock sequence that is older than half a billion years that is far less well defined in terms of fossils and less well preserved. || Various other techniques to estimate Earth's age fell short, and particularly noteworthy in this regard were flawed determinations of the Sun's age. It had been recognized by the German philosopher Immanuel Kant (1724-1804) that chemical reactions could not supply the tremendous amount of energy flowing from the Sun for more than about a millennium. Two physicists during the nineteenth century both came up with ages for the Sun based on the Sun's energy coming from gravitational contraction. Under the force of gravity, the compression resulting from a collapse of the object must release energy. Ages for Earth were derived that were in the tens of millions of years, much less than the geologic estimates of the time.

问题 7: 询问 (当 so as to estimate the age of Earth) 发生了什么;

问题 8: 询问单词意思 (flawed);

问题 9: 询问为什么提及 gravitational contraction;

问题 10: 询问 Immanuel Kant (1724-1804) 识别出，太阳能量能够...;

在 Hutton 之后，地质学家试图确定沉积过程的速率，因为他们想通过沉积记录或者地层记录的整体长度来估计地球的年龄。在 20 世纪，地质学家估计的地球年龄一般是在 1 亿年到 4 亿

年间。但是这个数字实际上十倍到五十倍地低估了地球的年龄，原因有二：一是很多沉积记录在很多地点已经找不到了；二是存在一种长的岩石序列，这种序列比 5 亿年还要古老，而这种岩石序列在化石方面并没有很好地被定义，或者没有被很好地保存到现在。还有各式各样的估算地球年龄的技术，但普遍都会低估地球的年龄，在这方面值得注意的是人类对于太阳年龄的不完美计算。德国哲学家康德认为，化学反应并不足以支撑太阳放射如此巨大的能量超过 1 千年。在 19 世纪，两个物理学家基于太阳能量来源于引力收缩这个原理算出了太阳的年龄。在重力作用下，这种来源于物体碰撞的引力收缩一定会释放能量。地球的年龄也因此被推测出来，大约是几千万年，这个数值比通过石灰岩的地质演变过程推测出来的数值要小很多。

整段【多选题】

It was the discovery of radioactivity at the end of the nineteenth century that opened the door to determining both the Sun's energy source and the age of Earth. From the initial work came a suite of discoveries leading to radioisotopic dating, which quickly led to the realization that Earth must be billions of years old, and to the discovery of nuclear fusion as an energy source capable of sustaining the Sun's luminosity for that amount of time. By the 1960s, both analysis of meteorites and refinements of solar evolution models converged on an age for the solar system, and hence for Earth, of 4.5 billion years.

问题 11: 询问 Not True 关于科学家最近评估地球的年龄；

问题 12: 询问关于太阳系的形成，能推断出什么；

在 19 世纪末尾，对于放射现象的发现打开了计算太阳能量来源和地球年龄的大门。基于最初的研究工作，人类发现了放射性同位素追溯时间的办法。这种方法很快让人类意识到，地球肯定有几十亿年之久，以及核融合可以为太阳长时间的发光持续供能。到 1960 年代，陨石分析法和更新的太阳演化模型统一了对于太阳系年龄，也就是地球年龄的计算，45 亿年。

TPO 35 – 2 The Development of Social Complexity 社会复杂性的发展

For most of human history, we have **foraged** (hunted, fished, and collected wild plants) for food. Small nomadic groups could easily supply the necessities for their families. No one needed more, and providing for more than one's needs made little sense. The organization of such **societies** could be rather simple, revolving around age and gender categories. Such **societies** likely were largely egalitarian; beyond distinctions based on age and gender, **virtually** all people had equivalent rights, status, and access to resources.

问题 1: 询问没有提到的特点 (关于 early nomadic foraging societies);

问题 2: 询问单词意思 (**virtually**);

在人类历史的大多数时间里, 我们是通过搜寻活动 (捕猎、捕鱼, 以及采集野生植物) 来获得食物的。小的游牧群体可以很容易地为自己家人获得生存下去的必需品。每个人只需要自己必须的量, 给他们提供超出需要的食物没有什么意义。这种社会的组织可以是很简单的, 它围绕着年龄和性别运作。这样的社会很大可能是奉行平等主义的, 超越了年龄和性别的差异, 在它里面实际上所有的人拥有平等的权利、地位和对资源的获取权。

整段【多选题】

Archaeologist Donald Henry suggests that the combination of a rich habitat and sedentism (permanent, year-round settlement) led to a dramatic increase in human population. In his view, nomadic, simple foragers have **relatively** low levels of fertility. Their high-protein, low-carbohydrate diets result in low body-fat levels, which are commonly associated with low fertility in women. High levels of physical activity and long periods of nursing, which are common among **modern simple foragers**, probably also contributed to low levels of female fertility if they were likewise common among ancient foragers.

问题 3: 询问单词意思 (**relatively**);

问题 4: 询问作者为什么提到 **modern simple foragers**;

人类学家 Donald Henry 认为, 物产富饶的居住地和定居主义 (即永久的、全年的定居生活) 的结合导致人类人口出现了爆发式的增长。他认为, 游牧生活、简单的采集食物的生产方式相对来说人口增长率较低。游牧民族的高蛋白、低碳水的饮食导致他们体脂率低, 这就导致了女人的生育率低。如果古代游牧民族与现代游牧民族相像的话, 那么在靠简单采集食物的方式为生的游牧民族里, 高强度的体力活动和长时间的养育儿童可能也同样导致了女性的低生育率。

整段【多选题】

In Henry's view, the adoption of a more settled existence in areas with **abundant** food resources would have contributed to higher fertility levels among the **sedentary foragers**. A diet higher in wild cereals produces proportionally more body fat, leading to higher fertility among women. Cereals, which are easy to digest, would have supplemented and then replaced mother's milk as the primary food for older infants. Since women are less fertile when they are breast-feeding, substituting cereals for mother's milk would have resulted in closer spacing of births and the potential for a greater number of live births for each woman.

A more sedentary existence may also have lowered infant mortality and perhaps increased longevity among the aged. These more vulnerable members of society could safely stay in a fixed village rather than be forced regularly to move great distances as part of a nomadic existence, with its greater risk of accidents and trauma.

问题 5: 询问单词意思 (**abundant**);

问题 6: 询问从 P2 & P3 中可以推断到关于 sedentary foragers 什么信息;

问题 7: 询问 a more sedentary existence among foragers 的可能的 effects; 【4 选 2】

问题 8: 询问相比于 simple foragers, foragers 怎样;

Henry 认为, 在食物丰富的地区, 人们对于更加固定的生存方式的选择导致了更高的生育率。野生谷物占比更高的食谱导致人们体内的体脂更高, 女人的生育率也就更高了。更容易消化的谷物会促进哺乳期女性产奶, 并且可以替代母乳成为稍微大一点的婴儿的食物。因为女性在母乳喂养孩子的时候生育率会变低, 谷物代替母乳就导致了每个女人生育间隔的缩短和更高的婴儿成活率。更稳定的生活方式可能同时也降低了婴儿的死亡率并且增加了老人的长寿率。像老人婴儿这种社会里最易受伤害的群体可以安全地待在定居的村庄里, 而不是像在游牧生活中需要经常在东奔西跑长途迁徙中受到伤害。

整段【多选题】

All of these factors may have resulted in a trend of increasing size among some local human populations in the Holocene (since 9600 B.C.E.). 【】 Given sufficient time, even in very rich habitats, human population size can reach carrying capacity, the maximum population an area can sustain within the context of a given subsistence system. 【】 And human population growth is like a runaway train: once it picks up speed, it is difficult to control. 【】 So even after reaching an area's carrying capacity, Holocene human populations probably continued to grow in food-rich regions, overshooting the ability of the territory to feed the population, again within the context of the same subsistence strategy. 【】 In some areas, small changes in climate or minor changes in plant characteristics may have further destabilized local economies.

问题 9: 询问哪一个 could have destabilized local economies; 【Except】

问题 13: 插入语的位置 → 【】:

上述所有因素导致了全新世的一些当地居民人口的增长趋势(从公元前 9600 年开始)。只要时间充足, 即使是在非常富饶的定居地, 人类的人口数量终究会到达生态最大可承载量, 也就是一个地区在现有的生活系统下可以维持的最大人口数。并且, 人口数量的增长就像是一辆脱轨电车, 一旦加速起来, 就控制不住了。所以即使一个地方的人口数已经达到了最大可承载量, 全新世的人类人口数在物产富饶的地区继续增长, 超过了在这种生活系统中, 这片土地可以养活的数量。在一些地区, 气候或者植被特征的微小变化可能会进一步使得他们变得不稳定。

One possible response to surpassing the carrying capacity of a region is for a group to exploit adjoining land. However, good land may itself be limited—for example, to within the confines of a river valley. Where neighbors are in the same position, having filled up the whole of the desirable habitat available in their home territories, expansion is also problematic. Impinging on the neighbors' territory can lead to conflict, especially when they too are up against the

capacity of the land to provide enough food.

问题 10: 询问 **One possible response to**....是什么;

应对人口过多的办法之一就是去开发相邻的土地。然而,好的土地毕竟稀少——比如,河谷里的肥沃土地总是有限的。当人们聚集在一个地方,并且把所有的好的栖息地都占据了以后,人口的扩张就成了一个问题。去侵入临近民族的土地会导致冲突,尤其是当对方同样也到达了人口可承载极限、现有的土地也不能提供足够食物的时候。

整段【多选题】

Another option is to stay in the same area but to shift and intensify the food quest there. The **impulse** to produce more food to feed a growing population was satisfied in some areas by the development of more-complex subsistence strategies involving intensive labor and requiring more cooperation and greater coordination among the increasing numbers of people. This development resulted in a change in the social and economic equations that defined those societies. Hierarchies that did not exist in earlier foraging groups but that were helpful in structuring cooperative labor and in organizing more-complex technologies probably became established, even before domestication and agriculture, as pre-Neolithic societies (before the tenth millennium B.C.E.) reacted to the population increase.

问题 11: 询问单词意思 (**impulse**);

问题 12: 等价替换语句 (**Sentences = which of the CHOICES**)

另一种解决办法是仍旧待在旧地方,但是改变和加强这片土地的食物供应量。依靠着更复杂的生产技术的发展,加上劳动力的密集化,还有人與人之间更好的协调合作,养活不断增长的人口所需要的食物量可以被满足。这种发展导致了定义这些社会的社会和经济法则的变化。在早期的社会中不存在的等级制度开始形成,它促进了劳动力协调合作组织结构的形成,也促进了更复杂的技术的形成。作为旧石器时代(在公元前万年)应对人口增长的解决方法,等级制度甚至早于家畜驯化和农业的产生。

TPO 35 – 3 Seasonal Succession in Phytoplankton 浮游植物的季节性演替

整段【多选题】

Phytoplankton are **minute**, free-floating aquatic plants. In addition to the marked changes in abundance observed in phytoplankton over the course of a year, there is also a marked change in species composition. 【】 This change in the dominant species from season to season is called seasonal succession, and it occurs in a wide variety of locations. 【】 Under seasonal succession, one or more species dominate the phytoplankton for a shorter or longer period of time and then are replaced by another set of species. 【】 This pattern is repeated yearly. 【】 This succession is different from typical terrestrial ecological succession in which various plants replace one another until finally a so-called climax community develops, which persists for many years.

问题 1: 询问单词意思 (**minute**);

问题 13: 插入语的位置 → 【】;

浮游生物是一种微小的、自由漂浮的水生植物。除了每年里浮游生物数量的明显变化，它们的种类组成也有显著改变。这种季节性的优势物种的变化被称为季节性更替，这种更替会在很多地点发生。这种更替模式是年年重复的。这种更替与典型的陆地生态更替是不同的，在典型的陆地生态更替中，一些植物代替另一些植物，直到最后发展为一种所谓的持续多年的顶级群落。

What are the factors causing this phenomenon? Considering that seasonal succession is most often and clearly seen in temperate seas, which have a marked change in temperature during a year, temperature has been suggested as a cause. This may be one of the factors, **but it is unlikely to be the sole cause** because there are species that become dominant species at various temperatures. Furthermore, temperature changes rather slowly in seawater, and the replacement of dominant species often is much more rapid.

问题 2: 询问 **but it is unlikely to be the sole cause** 原因;

那么是什么原因导致了这个现象呢？如果我们认为季节性更替在温带海洋（在这里气候全年里有显著变化）里更可能出现、更明显地可以被观察到的话，那么温度就应该是原因之一。温度可能是原因之一，但不可能是唯一一个原因，因为存在某些物种，它们可以在不同的温度下成为优势物种。另外，温度在海水中变化相对较慢，而优势物种的更替经常更快。

Another suggested reason is the change in nutrient level over the year, with **differing** concentrations favoring different phytoplankton species. While this factor may also contribute, observations suggest that **phytoplankton populations rise and fall much more quickly than nutrient concentrations change**.

问题 3: 询问单词意思 (**differing**);

问题 4: 询问作者为什么提这个;

另一种原因是全年里海水所含营养的水平导致了季节性浮游生物的更替，因为不同种类的营养物质的浓度升高会促进不同种类的浮游生物的生长。这个因素可能也仅仅是原因之一，观察到的现象告诉我们，不同浮游生物数量的变化远远快于海水里营养物质浓度的变化。

整段【多选题】

Yet another explanation is that species succession is a consequence of changes in seawater brought about by the phytoplankton living in it. Each species of phytoplankton **secretes** or excretes organic molecules into the seawater. These **metabolites** can have an effect on the organisms living in the seawater, either inhibiting or promoting their growth. For any individual organism, the amount of metabolite secreted is small. But the effect of secretions by all the individuals of the dominant species can be significant both for themselves and for other species.

问题 5: 询问关于 **secretes metabolites** 的陈述是真的;【Except】

然而,另一个解释是海水里原有的浮游生物的变化导致了其自身种类的更替。每一种浮游生物会向海水中分泌有机物质。这些新陈代谢物可以影响生存在海水里的生物,抑制或者促进它们的生长。对于任意一个单独的生物体,其分泌的物质是很少的。但是如果优势物种的大量个体一起分泌的话,对于其自身和其他物种的影响会是巨大的。

These organic metabolites could, and probably do, include a number of different classes of organic compounds. Some are likely toxins, such as those released by the **dinoflagellates** (a species of plankton) during red tides, which inhibit growth of other photosynthetic organisms. In such cases, the population explosion of dinoflagellates is so great that the water becomes brownish red in color from the billions of dinoflagellate cells. Although each cell secretes a minute amount of toxin, the **massive** dinoflagellate numbers cause the toxin to reach concentrations that kill many creatures. This toxin can be concentrated in such filter-feeding organisms as clams and mussels, rendering them toxic to humans.

问题 6: 询问关于 **dinoflagellates** 的陈述是真的;【Except】

问题 7: 询问单词意思 (**massive**);

这些有机新陈代谢物能够、并且很可能确实包括了大量的不同种类的有机化合物。一些是类似于毒物,比如由腰鞭毛虫在赤潮中释放的物质,这种物质会抑制其他光合作用的有机物。在这些例子里,腰鞭毛虫数量剧增导致海水变成了同其细胞一样的棕红色。尽管每个细胞分泌的毒物的量只有一点点,大量的腰鞭毛虫会导致毒物积累到足以杀死很多生物体的浓度。这种毒物可以在蛤和贻贝这种的滤食性生物体内堆积,最终使得它们对于以此为食的人类有毒。

Another class of metabolite is the vitamins. It is now known that certain phytoplankton species have requirements for certain vitamins, and that there are **considerable** differences among species as to requirements. The B vitamins, especially vitamin B12, **thiamine**, and biotin, seem to be the most generally required. Some species may be unable to thrive until a particular vitamin, or group of vitamins, is present in the water. These vitamins are **produced only by** another species; hence, a succession of species could occur whereby first the vitamin-producing species is present and then the vitamin-requiring species follows.

问题 8: 询问单词意思 (**considerable**);

问题 9: 询问关于不能产生 **thiamine** 的 **phytoplankton species**;

另一种种类的新陈代谢物是维生素。我们知道,特定种类的浮游生物会对于特定种类的维生素有需求,不同种类的浮游生物对于维生素的需求有很大的差异。维生素 B,特别是维生素

B12, 硫胺素和生物素应该算是被最广泛需求的维生素种类。一些物种可能在缺少某种特定维生素、或者在缺少某族维生素的时候无法生存。这些维生素只能由其他物种提供；因此，当生产某一维生素的物种首先出现，需求该维生素的物种跟着出现，物种的更替就发生了。

Other organic compounds that may inhibit or promote various species include amino acids, carbohydrates, and fatty acids. Although it is suspected that these organic metabolites may have an important role in species succession and it has been demonstrated in the laboratory that phytoplankton species vary both in their ability to produce necessary vitamins and in their requirements for such in order to grow, evidence is still inadequate as to their real role in the sea.

其他可以抑制或者促进各种物种的生存的有机化合物包括氨基酸和碳水化合物，还有脂肪酸。尽管我们怀疑这些新陈代谢有机物可能在物种更替中起到重要作用，而且实验也证明不同种类的浮游生物在产生必须维他命的能力和对维他命的需求上是有差异的。它们在海里所起的真正作用还需要更多证据来确定。

There is also evidence to suggest that grazers (animals that feed on plants or stationary animals), particularly selective grazers, can influence the phytoplankton species composition. Many **copepods** (small, herbivorous crustaceans) and invertebrate larvae pick out selected phytoplankton species from mixed groups, changing the species composition.

问题 10: 询问 **copepods** 是什么；

我们也还有证据来证明，食草动物（吃植物或者不动的动物的动物），尤其是挑剔的捕食者，也可以影响浮游植物的种类组成。很多桡足动物（小的、甲壳纲的食草动物）和无脊椎动物的幼体会从复杂的种群中挑出特定的浮游生物种类，这就改变了环境的状况。

A growing body of evidence now suggests that all of the factors considered here are operating **simultaneously** to produce species succession. The importance of any factor will vary with the particular phytoplankton species and the environmental conditions. 浮游生物是一种微小

问题 11: 询问单词意思（**simultaneously**）；

问题 12: 询问 文章组织；

越来越多的证据表明，这里所考虑到的所有因素都在同时作用，导致物种的更替。任何一种因素的重要性会随着特定浮游生物种类不同和环境状况不同的改变而改变。