

IESO 2016

Written Test No 2

Please follow the instructions while answering the questions. The questions are independent.

回答问题时请遵循指导语。不同的问题是相互独立的。

Marking the questions will be as follows:

- *Questions with only one correct answer*: 1 point (= mark) for the correct answer; zero point for a wrong answer
- *Questions with many correct answers*: 1 point (= mark) for each correct answer, minus 0.5 for each wrong answer; no question will be marked less than 0 (zero) even if the number of wrong answers exceeds the number of correct answers. There is always at least one wrong answer. So, even if you choose ALL the given answers, 0 (zero) will be applied.

Some questions may have a specific way of marking.

评分标准如下:

-单选题: 选对得 1 分, 选错不得分

-多选题: 每个正确答案 1 分, 每个错误答案倒扣 0.5 分; 超出正确答案个数的答案一律不得分; 通常至少有一个错误选项, 因此, 如果将全部选项选上, 会得 0 分。

-一些题目可能会有特殊的作答方法。

Write answers on separate answer sheet.

请在答题纸上作答

1. The figure below depicts the temperature profiles of the northwestern Pacific Ocean during summer and winter. In both the profiles, the seasonal change in the structure of the ocean water column is limited to the shallow part.

下图描述了西北太平洋在夏季和冬季的温度变化。在两个资料中，海水温度结构的季节性变化是指浅海部分。

Choose the most appropriate explanation from the choices given below:

在下列选项中选择最恰当的解释。

The seawater is well mixed down to a few hundred meters because .(Just one correct answer).

海水直到海平面以下数百米的深度都可以很好地混合，因为（单选）

- a) In summer, the wind speed in the area is very high.
夏季，这一海区的风速很大
- b) In summer, sunlight warms the shallow water strongly.
夏季，阳光强烈加热浅海海水
- c) In winter, the wind speed in the area is very high.
冬季，这一海区的风速很大
- d) In winter, sunlight warms the shallow water strongly.
冬季，阳光强烈加热浅海海水

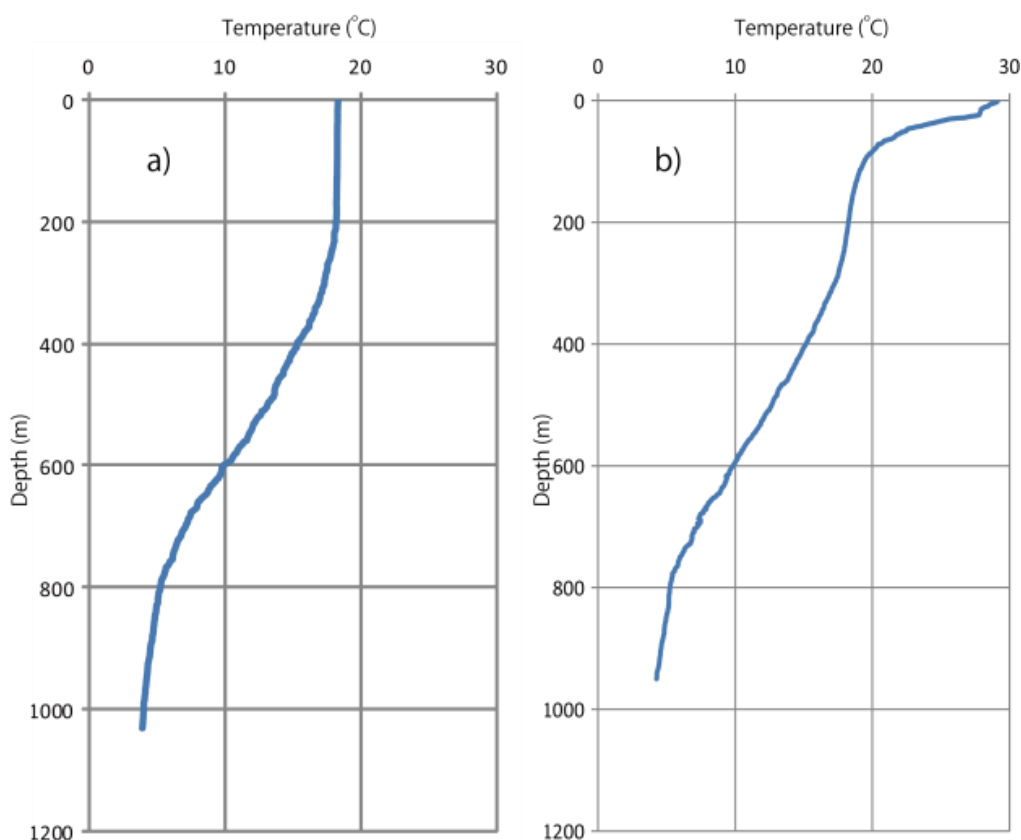


Figure: Temperature profiles of the northwestern Pacific Ocean during winter and summer.

图表：夏季和冬季西北太平洋的温度资料

2. Choose the correct statements describing the paleomagnetism of sediments and igneous rocks of the oceanic plate. (More than one correct answer.)

关于大洋板块中沉积岩和岩浆岩的古地磁学特征，选择正确的陈述（多选）

- a) The igneous rocks can record an ancient magnetic field acquired when they cool from high temperatures.
当岩浆岩从高温冷却时，可以记录古代地磁场
- b) The igneous rocks cannot record an ancient magnetic field because they were originally hot magma before solidification.

岩浆岩不可以用于记录古代地磁场因为它们在凝固成岩之前是炽热的岩浆

- c) The sediments deposited on the igneous rocks record an ancient magnetic field, as magnetization is acquired by heat derived from the igneous rocks.

岩浆岩上的沉积物可以记录古地磁场因为磁化过程需要从岩浆岩中获得热量

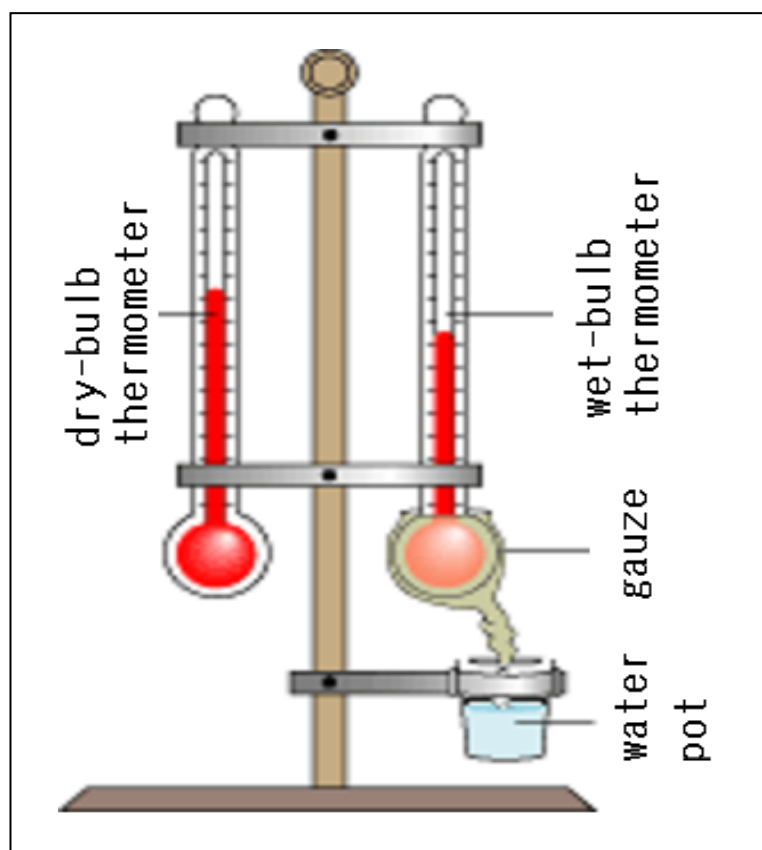
- d) The sediments deposited on the igneous rocks have magnetic minerals that record an ancient magnetic field at the time of deposition.

岩浆岩上的沉积物具有方向性因为含有金属的矿物成分在沉积时可以记录古地磁场

3. As shown in the figure below, relative humidity is measured by using a pair of thermometers with a dry bulb and a wet bulb. The wet bulb is wrapped by gauze to keep it moist by the pot of water. Which of the statements below are correct? (*More than one correct answer.*)

如下图所示，相对湿度是使用一对干球和湿球温度计进行测量的。湿球被纱布包裹以保持浸在水中时的湿润。下列哪些陈述是正确的？（多选）

- a) If the air is unsaturated, dry bulb temperature is always higher than wet bulb temperature.
如果空气未饱和，干球温度总会比湿球温度高
- b) If the air is unsaturated, wet bulb temperature always equals dew-point temperature.
如果空气未饱和，湿球温度总会等于水凝结成露珠时的温度，即露点温度。
- c) If the difference in temperature between the dry bulb and wet bulb remains the same, relative humidity is higher when the dry bulb temperature is higher.
如果干湿球之间的温度差没有变化，当干球温度读数更高时，相对湿度更大
- d) If the difference in temperature between the dry bulb and wet bulb remains the same, water vapor content is greater when the dry bulb temperature is higher.
如果干湿球之间的温度差没有变化，当干球温度读数更高时，水汽含量更大



Dry-bulb thermometer 干球温度计 wet-bulb thermometer 湿球温度计
Gauze 纱布 water pot 水槽

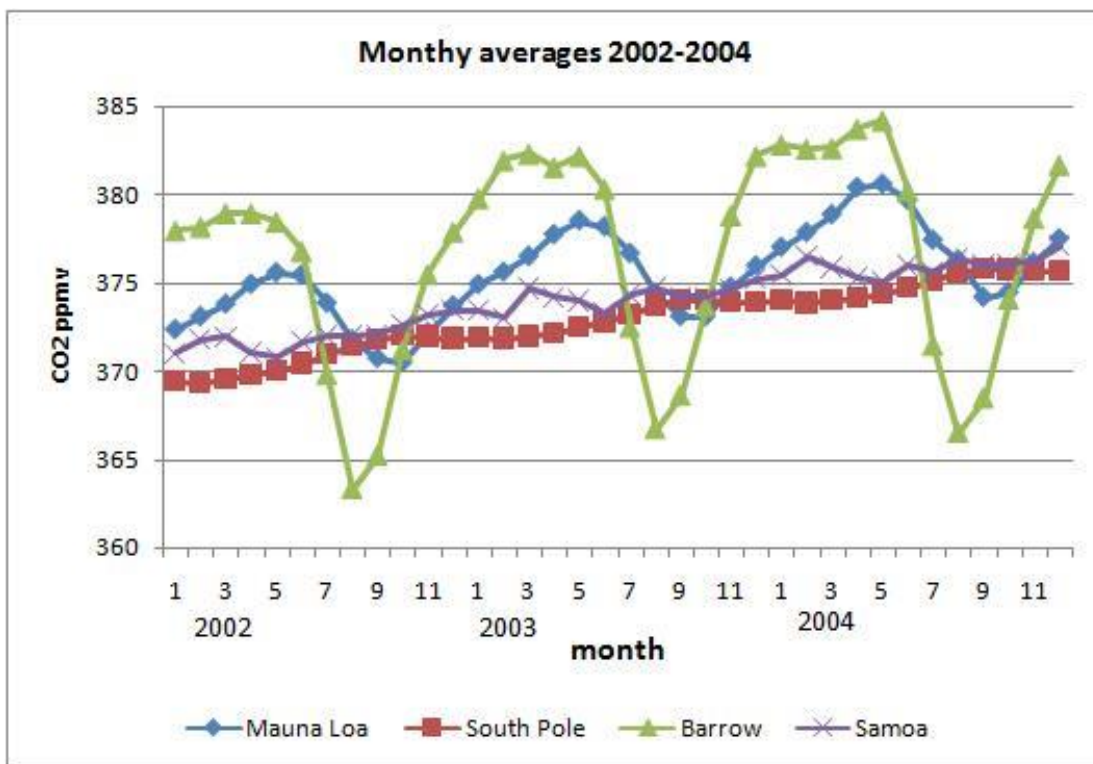
4. The figure below shows the seasonal variations of atmospheric carbon dioxide as measured in Barrow, Alaska (71.3° N, green triangles), Mauna Loa, Hawai'i (19.6° N, blue diamonds), South Pole (90° S, red squares), and Samoa (Pacific island at 13.76° S, purple crosses) for three consecutive years, 2002-2004.

下图表示阿拉斯加的 Barrow (71.3° N, 绿色三角线图例)、夏威夷的 Mauna Loa (19.6° N, 蓝色菱形图例)、南极点 (90° S, 红色方块图例) 和太平洋的 Samoa 岛 (13.76° S, 紫色小叉图例) 四个地点大气中 CO₂ 自 2002-2004 连续三年的季节变化数据。

- Why are the amplitudes of oscillation relatively higher in the Northern Hemisphere? (*More than one correct answer.*)

为什么在北半球的曲线振动幅度更大? (多选)

- a) Human population is relatively higher in the Northern Hemisphere.
北半球人类活动相对更为集中
- b) Forest cover is relatively higher in the Northern Hemisphere.
北半球的森林覆盖率相对更高
- c) Vascular plants are absent in Antarctica.
南极洲缺乏高大的植物
- d) Ocean area is relatively more in the Southern Hemisphere, which causes more CO₂ absorption.
南半球海洋面积相对更大, 这使得更多的 CO₂ 被吸收



5. Seasonal CO₂ maxima in the South Pole occur in September (9th month), whereas in Barrow and Mauna Loa, they occur in May (5th month). Why? (*Just one correct answer.*)

南极点的 CO₂ 季节性极端值出现在 9 月, 但是 Barrow 和 Mauna Loa 的极端值出现在 5 月。为什么? (单选)

- a) Energy production and thus emission of CO₂ peak in winter.
能量产生与 CO₂ 排放峰值在冬季
- b) Excess of respiration over photosynthesis peaks in winter.
在冬季, 植物的呼吸作用比光合作用的峰值更大

- c) Excess of photosynthesis over respiration peaks in winter.
在冬季，植物的光合作用比呼吸作用的峰值更大
- d) Oceans liberate more CO₂ in summer.
在夏季，海洋释放出更多的 CO₂

6. Paleo coral terraces are usually dated using a suitable method for reconstruction of paleo sea level changes. This is made possible because of: *(Just one correct answer).*

常常用古珊瑚礁形成的阶梯状地貌，即古珊瑚礁阶地的方法来重构过去的海平面变化。这种方法成为一种可能因为（单选）

- a) Corals grow at a slower rate during high sea level stands and faster during low sea level stands.
海平面较高时，珊瑚生长速度慢，海平面较低时，珊瑚生长速度快
- b) Corals growing in the deep sea are sensitive to the overhead pressure, which is a function of sea level
深海中珊瑚生长由于受到顶部水压的影响更加敏感，这是海平面的一种功能
- c) Most corals host photosynthetic symbionts, which require sunlight. This makes corals grow within ~50 m of the sea surface.
大多数珊瑚及其宿主光合共生，需要阳光。这使得珊瑚增长不深于海平面以下 50 米
- d) Carbonate precipitation by corals is thermodynamically favored only close to the sea surface.
珊瑚的碳酸盐沉积在热力学上更倾向于只在海平面附近沉积

7. Paleosurfaces containing dead corals, when dated precisely, give information on the time of : *(More than one correct answer.)*

古老的地表发现了死去的珊瑚，当进行精确测定时，可以得到关于下列哪些事物的时间信息？（多选）

- a) abrupt sea level rise 突然的海平面上升
- b) sea level fall 海平面下降
- c) abrupt subsidence of land 突然的陆地沉降
- d) abrupt uplift of land 突然的陆地抬升

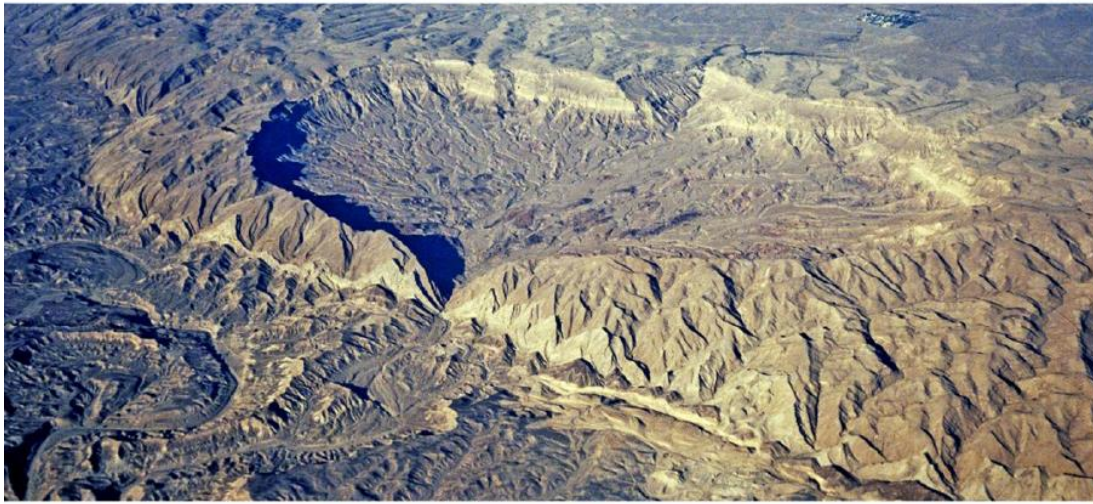
8. A time of higher sea level stand (corrected for tectonic changes on land) usually indicates: *(More than one correct answer.)*

当海平面位置较高时（已进行陆地构造变化的修正）通常反映了？（多选）

- a) Lower atmospheric CO₂ and CH₄.
大气中更低的 CO₂ 和 CH₄ 含量
- b) Lower ice volume of the Earth.
地球上更少的冰的体积
- c) Higher carbonate precipitation in the oceans by marine organisms (corals, pteropods, coccoliths and foraminifera).
海洋生物（如珊瑚、翼足目动物、球石、有孔虫类）使得海洋中碳酸盐沉积更高
- d) Higher dust content in the atmosphere.
大气中尘埃含量更高

9. What is the geological structure of the picture below? *(Just one correct answer.)*

下图中的地质构造是什么（单选）



- a) Meteorite crater 流星撞击坑
- b) Volcanic crater 火山环形山
- c) Erosional anticline 侵蚀的背斜
- d) Erosional syncline 侵蚀的向斜

10. The photographs below represent sedimentary structures observed in the field.

下列四幅照片表示某地可观测到的沉积结构。

- a) Which of the photographs below represents a sedimentary feature formed by biogenic activity ?

下面哪一幅照片表示生物造成的沉积特征？

Photo A B C D

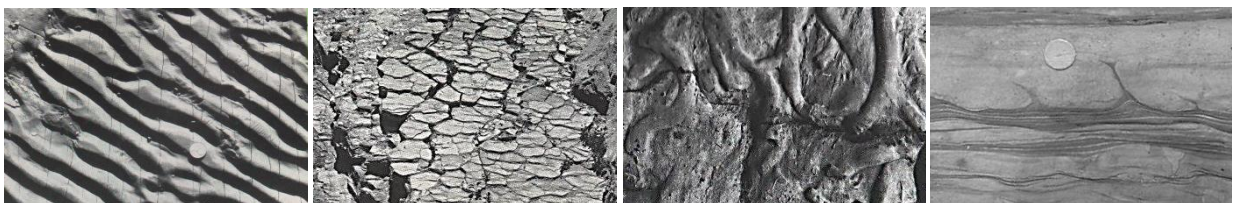
- b) Which of the photographs below represents a sedimentary structure formed by differential loading ?

下面哪一幅照片表示不同的填充物形成的沉积结构？

Photo A B C D

- c) Which of the photographs below represents a sedimentary structure formed by desiccation ?

下面哪一幅照片表示失水形成的沉积结构？



A B C D

Photo A B C D

11. The following are some laws of historical geology. Which is a correct choice of laws unsuitable for determining the relative ages of two kinds of rocks in contact?

下面是一些地质历史的研究规律/法则。下列哪一项是在判断两种相互接触的岩石的相对地质年代时不太适用的规律/法则？

- 1: Law of original/lateral continuity 岩层的原始连续性法则
- 2: Law of original horizontality 岩层的原始水平层理
- 3: Law of cross-cutting relationship 横切关系（剖面上判断岩层新老关系）
- 4: Law of superposition 重叠序律
- 5: Law of faunal succession 古生物群演替规律
- 6: Law of inclusion 内含物法则

Choose the correct alternative: (Only one correct answer.) 选择正确的组合（单选）

Alternative a : 1, 2

Alternative b : 3, 4

Alternative c : 5, 6

Alternative d : 1, 2, 3

Alternative e : 4, 5, 6

备选答案 a: 1、2、

备选答案 b: 3、4

备选答案 c: 5、6

备选答案 d: 1、2、3

备选答案 e: 4、5、6

12. P wave from an earthquake arrived at a station at 03:01 am. Figure 1 shows the seismogram recorded at the station. Figure 2 shows the relation between the P-wave and S-wave travel times (t_p and t_s , respectively) and epicentral distance (km).

一次地震的 P 波（纵波）在凌晨 03:01 到达某测定站。图 1 展示了该站记录的震动图。图 2 展示了 P 波和 S 波（横波）传播时间与震中距（km）之间的关系（图中 t_p 和 t_s ）。

图 1: 1min=1 分钟

图 2: epicentral distance 震中距

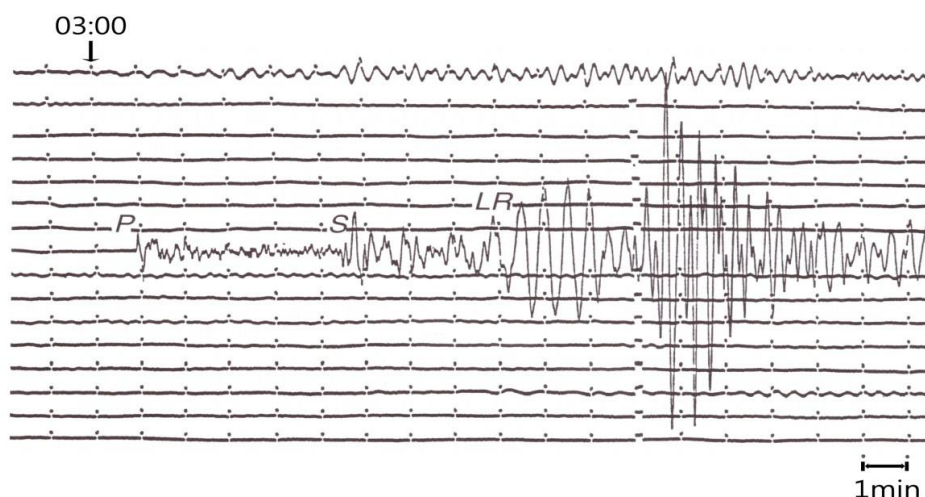


Figure 1

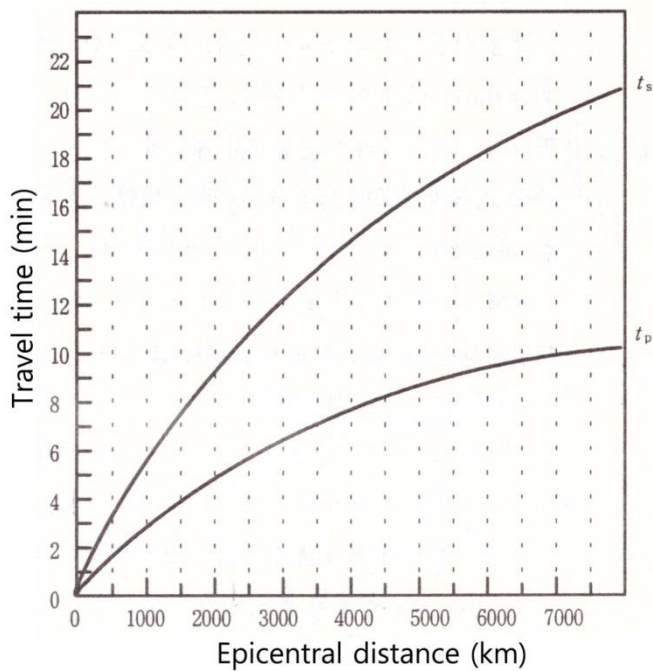


Figure 2

13 Choose the correct answer (only one correct answer) 选择正确答案（单选）

- (1) Approximately how far is the seismic station from the earthquake epicenter?

测定站距离震中大约多远？

- a. 1000 km
- b. 2500 km
- c. 4000 km
- d. 5000 km

- (2) Approximately at what time did the earthquake occur?

地震大约发生在什么时候？

- a) 2:36
- b) 2:46
- c) 2:56
- d) 3:01

- (3) Approximately at what time will the P-wave arrive at a station 4500 km away from the epicenter?

大约什么时候P波可以到达距离震中4500km的地方？

- a) 3:00
- b) 3:02
- c) 3:04
- d) 3:10

14. The table below shows surface sea water properties observed at regions, "A", "B" and "C". Which statements given below are correct? (*More than one correct answer.*)

下表表示观测到的三个区域 A、B 和 C 的海水性质。下面哪些陈述是正确的？（多选）

(Assume that surface salinity can be affected by evaporation and precipitation only.)

（假设海洋表面盐度只受到蒸发和降水的影响。）

Salinity 盐度 density 密度

Region	Temperature(°C)	Salinity (g/kg)	Density (kg/m ³)
A	(a)	36.0	1027
B	12	35.5	1027
C	12	34.0	(b)

- a) The temperature of region “A” is less than 12°C.
A 区域的海水温度低于 12°C
- b) The density of region “C” is between 1000 and 1027 kg/m³.
C 区域的海水密度在 1000-1027 kg/cm³ 之间
- c) The value of 'evaporation minus precipitation' at region “A” is higher than those at regions “B” and region “C”.
A 区域的蒸发量减去降水量的值比 B 和 C 区域都高
- d) If we sample equal volumes of water from “A” and “B” and mix them (assuming they are maintained at their original temperature), water density will increase.
如果从 A 和 B 海区取等体积的海水并混合（假定它们维持初始温度不变），海水密度会增加

15. Global warming can be caused by _____: (several correct answers.)

全球变化是由于（多选）

- a) Increased rate of thermonuclear fusion in the Sun.
太阳热原子核聚变速度的增加
- b) Increased greenhouse gases in the Earth's atmosphere.
地球大气中温室气体的增加
- c) Increased atmospheric humidity.
大气湿度的增加
- d) Increased sulphate aerosols in the atmosphere.
大气中硫酸盐微粒的增加

16. Oceanic regions of both the hemispheres lying in the same latitude as the desert belts are characterized by _____. (More than one correct answer.)

两个半球中的海洋区域位于同一纬度带，就像沙漠地区的特点是（多选）

- a) Dry, stable conditions with little cloud. 干燥、少云的稳定条件
- b) Hot, humid days with high winds. 湿热、大风
- c) Rainy conditions. 多雨条件
- d) A rapid increase in temperature. 气温迅速上升
- e) High surface salinity. 地表高盐度

17. Heat and gravity and geosphere dynamics. Choose all the correct statements below. (More than one correct answer.)

热量、重力和地壳运动。选择所有正确的答案。（多选）

- a) The energy type leading to the geosphere dynamics is only heat.
地壳运动的能量来源仅仅是热量
- b) The energy type leading to the geosphere dynamics is only potential energy.
地壳运动的能量来源仅仅是势能
- c) The energy type leading to the geosphere dynamics includes both heat and potential energy (linked with “gravity”).
地壳运动的能量来源包括热量和势能（与重力相关）
- d) The density differences between the various zones of the lithosphere are only due to differences in chemical and mineral composition.
不同地区岩石圈的密度差异的原因仅是化学物质和矿物组成的差异
- e) The density differences between the various zones of the lithosphere are only due to temperature differences and their cooling over time.
不同地区岩石圈的密度差异的原因仅是温度的不同和冷却时间的不同
- f) The density differences between the various zones of the lithosphere are due to differences in chemical and mineral composition AND their cooling over time due to heat exchange.
不同地区岩石圈的密度差异的原因包括化学物质和矿物组成的差异和温度的不同和冷却时间的不同

18. Geothermal energy and its uses.

地热及其应用

Temperature increases gradually as depth increases in the lithosphere. (*More than one correct answer.*)

在岩石圈，温度随深度的增加而增加。（多选）

- a) The geothermal gradient is the same at all points of the lithosphere.
地热的热量梯度与在岩石圈所有的点都一样
- b) The geothermal gradient is steeper/higher in areas where extension thinned the lithosphere.
地热的热量梯度在比较薄的岩石圈区域更高
- c) The geothermal gradient is steeper/higher in continental areas where the crust is thick.
地热的热量梯度在地壳较厚的大陆区域更高
- d) The geothermal gradient is steeper/higher in areas of intense volcanism.
地热的热量梯度在火山活动密集的地方更高

19. Which of the statements below correctly describe the origin of the Earth’s heat? (*More than one correct answer.*)

下列哪一项关于地球原始热量的陈述是正确的？（多选）

- a) The Earth formed by accretion of planetesimals that collided with the growing Earth by converting their kinetic energy into heat.
地球形成于小星体撞击，在撞击过程中动能转化为热量
- b) The Earth formed by fragments pulled from an original Sun and gave initially a hot planet.
地球形成于原始太阳吸引的宇宙中碎片物质，最初是一个热行星
- c) The solidification of the liquid outer core into an inner solid core generated some of the heat.
液体外核固化成岩变为固体内核产生一些热量
- d) The heat emission from the hot inner core lead to the melting of the outer core area.
从地球内核释放出来的热量导致地球外核的熔化

20. Which of the statements below correctly describe the temperature of the planets of the solar system ?(*More than one correct answer.*)

下列哪些陈述描述了太阳系中行星的温度？（多选）

- a) The temperature of the Earth remains fairly constant; the heat output by radioactivity compensates the loss of heat.
地球的温度维持相对稳定，放射性辐射输出的热量补偿了损失的热量
- b) The Earth gradually cools.
地球在逐渐变冷
- c) The cooling of the Earth caused the transition from liquid to solid, to form the first crust 4 billion years ago.
逐渐冷却的地球引起了液体向固体的转化，由此在 40 亿年前首先形成了地壳
- d) All the planets of the solar system loose heat.
太阳系内所有的行星都散失热量

21. When a person on the Earth witnesses a solar eclipse, an astronaut standing on the night side of the moon will _____(*only one answer*).

当地球上的一个人看到日食时，一个站在月球夜半球的宇航员将？（单选）

- (a) also witness the solar eclipse 也能看到日食
- (b) witness no eclipse 看不到日食
- (c) witness an Earth eclipse 看到地食
- (d) witness a lunar eclipse 看到月食

22. The planet Mercury rotates around its axis every ~sixty days and orbits around the Sun every ~90 days. How many “Mercury days” (from sunrise to the next sunrise) make a “Mercury year”? (*only one answer*).

行星水星自转周期约为 60 天，其公转周期为约 90 天。多少个水星日（从水星日出到水星日落）构成一个水星年？（单选）

- (a) 0.5
- (b) 6
- (c) 9
- (d) 15
- (e) 30

23. At any given instant of time, the difference between the temperatures of the hottest and coolest places on the surface a planet in the Solar System is the highest _____(*only one answer*)

在任意给定的时间内，太阳系中某行星表面最热的地方和最冷的地方的温度差最大值（单选）

- (a) on the Earth because of the presence of hot deserts and polar ice
在地球上因为地球上有热的沙漠和极地冰川
- (b) on Uranus, because its rotational axis is almost perpendicular to its orbit
在天王星上，因为其自转轴是几乎垂直于其公转轨道的

- (c) on Venus, because it has a carbon dioxide rich atmosphere
在金星上，因为金星大气富含二氧化碳
- (d) on Mercury because mostly the same side faces the Sun for a longer duration and it has no atmosphere
在水星上，因为太阳会长时间持续照射同一面且水星没有大气

24. Although Mercury is the smallest planet in the Solar System, its density (5400 kg/m^3) is close to that of the Earth (5500 kg/m^3), and has a weak magnetic field. The possible reason could be that _____ (*only one answer*)

尽管水星是太阳系中最小的行星，其密度（ 5400 kg/m^3 ）与地球十分接近（ 5500 kg/m^3 ），且其磁场很弱。最可能的原因是（单选）

- (a) Its chemical composition is identical to that of the Earth
其化学组成和地球是相同的
- (b) Like the Earth, it has an iron core.
与地球相似，它具有铁核
- (c) Like the Earth, it has an ionosphere ; this causes a weak magnetic field.
与地球相似，它有电离层，这削弱了水星磁场
- (d) Its core has a chemical composition similar to that of the Sun, which has a core density of about 20000 kg/m^3
水星核的化学构成与太阳相似，具有一个密度约为 20000 kg/m^3 的核心

25. Although Venus is farther away from the Sun than Mercury, the average surface temperature of Venus is higher than that of Mercury because _____ (*several possible answers*)

尽管金星距离太阳比水星遥远，其表面平均温度比水星高，因为（单选）

- (a) Mercury has no atmosphere
水星没有大气
- (b) Venus has a carbon dioxide rich atmosphere
金星大气中富含二氧化碳
- (c) Mercury has an atmosphere made of inert gases
水星具有惰性气体
- (d) Venus has sulphuric acid clouds
金星大气有硫酸云

26. The atmosphere of Venus is much denser than that of the Earth. Some possible consequences are _____ (*several possible answers*) :

金星大气比地球密度更大。一些可能的结果是（多选）

- (a) meteoroids less than 1.5 km in diameter completely burn out before touching the surface of Venus
直径小于 1.5km 的流星在接触到金星表面前会完全燃尽
- (b) Crater number density on Venus is much smaller than that on the Moon and Mars
金星上的撞击坑密度比月球和火星小得多

- (c) Winds have lower kinetic energy per unit volume
单位体积的风具有更低的动能
- (d) Sound propagation speed is faster
声音传播速度更快

27. We find a large number of meteoritic impact craters on the Moon, but very few on the Earth. Why? (*only one answer*)

我们发现了大量影响月球撞击的流星体，但是它们中很少会影响到地球。为什么？（单选）

- (a) Earth's magnetic field prevents most meteoroids from falling on the Earth.
地球磁场阻止了大多数流星落到地球上
- (b) The reducing Earth's early atmosphere weathered all the meteoritic impact crater records.
地球早期大气的减少风化了所有的流星体撞击坑证据
- (c) About 70% of the Earth is covered by oceans.
地球上 70% 被海洋覆盖
- (d) The Moon has no atmosphere and hydrological cycle.
月球上没有大气和水循环

28. Which of the atmospheric components below **mainly control** the Earth's weather (*only one answer*)?

下面哪一种大气成分 **主要影响** 地球上的 **天气变化**？（单选）

- (a) Oxygen, which is liberated by plants during photosynthesis. It absorbs UV radiation in the stratosphere, thus heating the atmosphere.
氧气，由植物光合作用释放出来。吸收了对流层中的紫外线，由此加热大气
- (b) Nitrogen, because it combines with oxygen to form NO during thunderstorms.
氮气，因为在雷电交加的暴风雨时可以和氧气结合形成一氧化氮
- (c) Water vapor, because it evaporates from the oceans and condenses in the atmosphere transferring latent heat.
水蒸气，因为它可以从海洋中蒸发并在大气中冷凝的过程中转化为潜热
- (d) Carbon dioxide, which is a greenhouse gas.
二氧化碳，因为是温室气体

29. The rotation periods of Jovian planets (Jupiter to Neptune) range between 9 to 17 hours. They all have atmospheres made of hydrogen, helium, methane and ammonia. What could be a major consequence of fast rotation? (*Only one answer*)

类木行星（木星到海王星）的自转周期范围在 9-17 小时之间。他们的大气都是由氢、氦、甲烷和氨气组成。下列哪一个可能是它们快速自转的结果？

- (a) large differences in surface temperatures 表面温度差异大
- (b) absence of storms 风暴很少
- (c) very strong winds 强风
- (d) very low albedo 反照率很低

30.When a comet is far away from the Sun, we observe it to be a small spherical object through a telescope, but when it comes near the Earth, its appearance is with a coma and long tails. Which of the following statements are true ?(*several possible answers*)

当一颗彗星远离太阳，我们通过望远镜观察到它是一个小的球状物体。但是当他接近地球的时候，其外表包括一个彗核和长长的尾巴。下列哪些陈述是正确的？（多选）

- (a) Gravitational force of the sun increases when the comet comes nearer and it stretches the comet
当彗星临近时太阳的引力增加使彗星延展
- (b) Invisible dark matter around the Sun smears the comet into a longer shape
太阳周围的暗物质使彗星形状变得更长
- (c) Volatile matter in the comet startssublimating; solar radiation pressure and wind cause the tails to form.
彗星中的挥发物质开始升华，太阳辐射压力和风形成彗尾
- (d) The statement (c) is evidenced by the fact that the comet's tail always points away from the Sun
彗尾总是在背向太阳的一面这一事实可以支持 C 选项的陈述