

壹、 閱讀 (70%)

I. Renewable Energy (30 points)

Replacing fossil fuel- i power stations with renewable energy sources, such as wind and solar, is a vital part of ii climate change and iii net zero carbon emissions.

Non-renewable energy comes from natural iv such as coal, oil and natural gas that take billions of years to form, which is why we call them fossil fuels. They are present in finite amounts and will run out, as we are using them far more quickly than they form. Research based on 2015 data v that coal stocks will last well into the next century, but oil and natural gas reserves will run out in the late 2060s. However, scientific models suggest that if we are to limit global warming to 2°C - the target vi at COP26 (2021 年聯合國氣候變遷大會) is 1.5°C - over 80% of coal, 50% of gas and 30% of oil reserves will need to be left untouched. When we burn fossil fuels, we can generate electricity quite efficiently. But the process releases a lot of CO₂ into the atmosphere, which contributes to the greenhouse effect, global warming and biodiversity loss.

Renewable energy comes from sources that vii naturally and continually within a human lifetime and is often called viii energy. Biomass energy is one of major sources of renewable energy. It comes from burning plants, plant by-product or waste. Examples include ethanol (from corn or sugarcane), biodiesel (made from vegetable oils, used cooking oils and animal fats), green diesel (derived from algae, sustainable wood crops or sawdust) and biogas (derived from animal manure and other waste). Biomass energy has several ix . It can be abundant and cheaply produced and is a novel use of waste product and leftover crops. It creates less emissions than burning fossil fuels and biofuels are also considered relatively easy and inexpensive to implement, as they are compatible with existing agriculture and waste processing and used in existing petrol and diesel vehicles. However, the disadvantages include generating biofuels requires land and water so growing demand for them could lead to deforestation and biodiversity loss. Burning biomass also emits CO₂ unless carbon capture is x .

Clean energy doesn't produce any pollution once installed. Most renewable energy sources can also be considered clean and green. However, clean energy sources are not always renewable. Nuclear energy doesn't release greenhouse gases into the atmosphere, so some people consider it to be clean -providing the radioactive waste is stored safely and doesn't escape into the environment. But the uranium energy source used in nuclear power plants is not renewable.

1. Please fill each blank (i-x) in the above article (Renewable Energy) with the most appropriate word listed below (a to o) (2 points for each blank; 20 points in total)

a. achieving	b. advantages	c. agreed	d. biodiversity	e. consider
f. define	g. implemented	h. placing	i predicts	J. qualify
k. reliant	l. replenish	m. resources	n. stabilizing	o. sustainable
2. According to research based on 2015 data, if we are to slow down global warming the use of which fossil fuel should be mostly limited at the present time? (2 points)
(A) Coal (B) Oil (C) Natural gas (D) green diesel
3. Which of the following is not a benefit of replacing fossil fuels with biomass energy? (2 points)
(A) Biomass energy is rich in source and low-cost in terms of production
(B) Biomass energy can be produced within a short time (probably less than 100 years)
(C) Biomass energy is a novel use of waste product (D) Biomass energy increases biodiversity

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4. Biomass energy is (2 points)
 (A) a renewable but not a clean energy (B) neither a renewable energy nor a clean one
 (C) a renewable and clean energy as using it does not emit greenhouse gases
 (D) a renewable and also a clean one if carbon capture is in place
5. Nuclear energy is (2 points)
 (A) a clean energy (B) a clean energy when carbon capture is in place
 (C) a clean energy if radioactive waste can be stored safely (D) not a clean energy at all
6. Which of the following is a most likely reason that nuclear energy is considered non-renewable?
 (2 points)
 (A) It does not emit greenhouse gases (B) Nuclear power station requires water and land
 (C) It generates electricity less efficiently than biomass energy does
 (D) Uranium is present in finite amounts and we are using them far more quickly than they form

II. A Vicious Cycle (40 points)

Methane is a greenhouse gas with an effect on global warming 28-36 times more potent than CO₂. In the past 10 years, atmospheric methane concentrations have increased rapidly, with about half of the increase 1 to emissions from livestock.

Research by Amanda Koltz, senior scientist in biology in Arts & Sciences at Washington University, identified a potential 2 loop arising from interactions among climate, infectious diseases and methane emissions. The researchers examined data from studies of sheep that showed that animals infected with 3 worms produced up to 33% more methane per kilogram of feed than uninfected animals. The research team also reviewed studies of dairy cattle suffering from mastitis, a common disease caused by 4 infections. These studies 5 that cows with mastitis release up to 8% more methane per kilogram of milk produced than uninfected cows. The authors calculated that infectious diseases in 6 livestock could lead to a sizable increase in methane released into the atmosphere.

Parasites are infamous for their direct negative effects on host individuals and populations. However, parasite effects on host behavior, physiology and demography could also have far-reaching effects on ecosystem-level processes such as climate and nutrient cycling. For example, parasites may indirectly alter the flow of energy and nutrients through ecosystems by reducing host densities, altering host traits and modifying the ways in which hosts process nutrients.

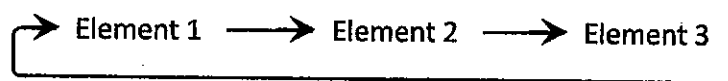
There is evidence that climate change, and warming temperatures in particular, are 7 some infectious diseases and increasing total number of animals having the diseases. If that's happening for livestock diseases, and simultaneously higher 8 is triggering increased methane release, which could end up with a vicious cycle. With meat 9 by humans increasing four- to five-fold since the 1960s along with the ever-increasing impacts from climate change, this vicious climate-disease cycle is one more example of the interconnection of our greatest 10 ills — climate change and emerging infectious diseases.

7. Please fill each blank (1-10) in the above article (A Vicious Cycle) with the most suitable word listed below (a to o). (2 points for each blank; 20 points in total)

- | | | | | |
|---------------|-----------------|----------------|-----------------|--------------|
| a. attributed | b. bacterial | c. consumption | d. contributing | e. cycle |
| f. feedback | g. geographical | h. impacting | i. intestinal | j. planetary |
| k. prevalence | l. positive | m. production | n. revealed | o. ruminant |

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8. According to the article, which of the following factor increases methane emission into the air by sheep? (2 points)
 (A) Nutrient in the diet (B) The behavior (C) Parasites in the gut (D) The population densities
9. Livestock are (2 points)
 (A) animals that live on or in other animals of different types and feeds from the hosts
 (B) animals or birds that are kept on a farm (C) animals that eat plants and meats
 (D) a type of animal that brings up food from its stomach and chews it again
10. According to the article, which of the followings are the **3 key** elements in the discussed vicious cycle? (3 points)
 (A) Climate change (B) Flow of energy and nutrients through ecosystems
 (C) Altering livestock traits (D) Infectious diseases of livestock
 (E) Atmospheric methane concentrations (F) Methane emission by livestock
11. The following circle illustrates the relationship of the 3 elements in the vicious cycle, what are Elements 1, 2 and 3? (3 points)



12. Translate the 3rd (**bold**) paragraph, starting from “Parasites are infamous for..” and ending at “...
altering host traits and modifying the ways in which hosts process nutrients”, of the article into Chinese (10 points)

貳、 英文科學短文 (30%)

The following two Figures illustrate an action potential propagating along a myelinated axon (Figure 1) and a molecular structure of hemoglobin (Hb) and Hb-Oxygen dissociation curve (Figure 2). Based on the figures, please write 2 essays to explain these 2 physiological mechanisms. Your writings should include all the terms and labels in the figures.

I. Action Potential Propagation (15 points)

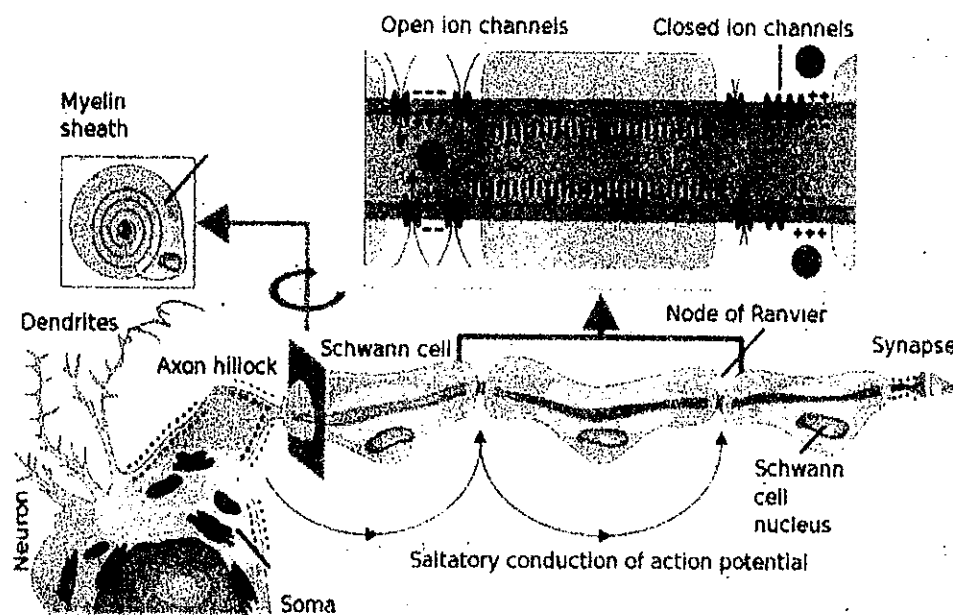


Figure 1

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II. Hemoglobin (Hb) and Hb-Oxygen dissociation curve (15 points)

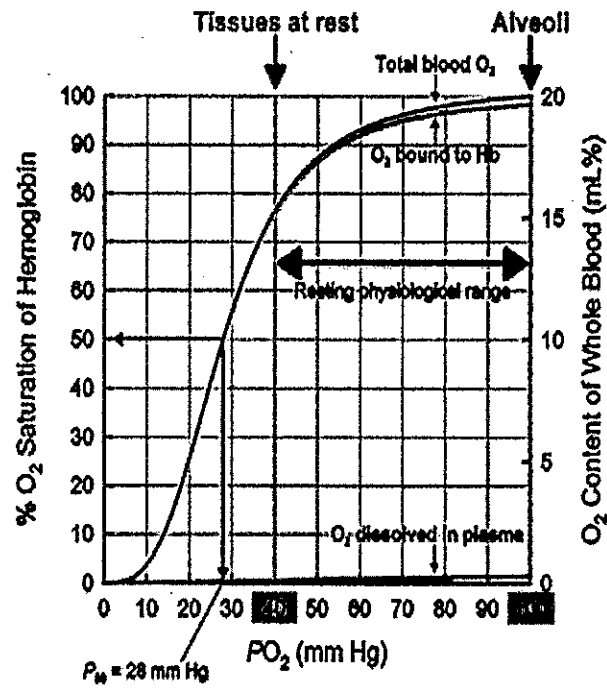
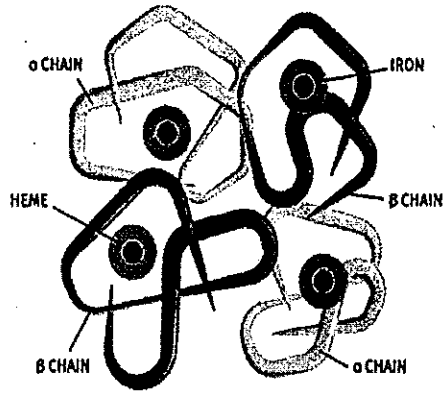


Figure 2

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