

選擇題 請作答於答案卷首頁之「選擇題作答區」(每題五分)

1. Who obtains reducing power from H<sub>2</sub>O?
  - A. Oxygenic phototrophs
  - B. Anoxygenic phototrophs
  - C. Purple sulfur bacteria
  - D. *E.coli*
2. The primary producer in fresh water lakes is \_\_\_\_\_?
  - A. Phytoplankton
  - B. Benthic organisms
  - C. Mildew
  - D. Fish
3. Which organism is the major backbone frame for sludge floc?
  - A. Zooglea
  - B. Cilate
  - C. Protozoa
  - D. Filamentous algae
4. Which of the following organism is the best one for estimating fecal pollution in drinking water?
  - A. Coliform
  - B. *Pseudomonas*
  - C. Total bacteria
  - D. *Escherichia coli*
5. Which of the following is NOT a "fecal origin" waterborne pathogen?
  - A. *Legionella pneumophila*
  - B. *Cryptosporidium parvum*
  - C. Norovirus
  - D. *Salmonella typhi*
6. In an ozone-BAC drinking water treatment system, the primary purpose of ozonation is to:
  - A. Increase DOC in water
  - B. Partially oxidize NOM
  - C. Degrade organic micropollutants
  - D. Increase dissolved oxygen in water
7. What is the role of ciliate protozoa in activated sludge process?
  - A. Consume BOD in wastewater
  - B. Prey on sewage bacteria
  - C. Provide physical structure for floc
  - D. Perform photosynthesis
8. Which of the following is the major compound that "glue" bacteria cell together in biofilm or sewage floc?
  - A. Extracellular polymeric substance
  - B. Fibers
  - C. Metal-Fibril bonds
  - D. Antibiotics
9. Most chemolithotrophs use what compound as a source of energy?
  - A. Glucose
  - B. Organic compounds other than glucose
  - C. Carbon dioxide
  - D. Inorganic compounds

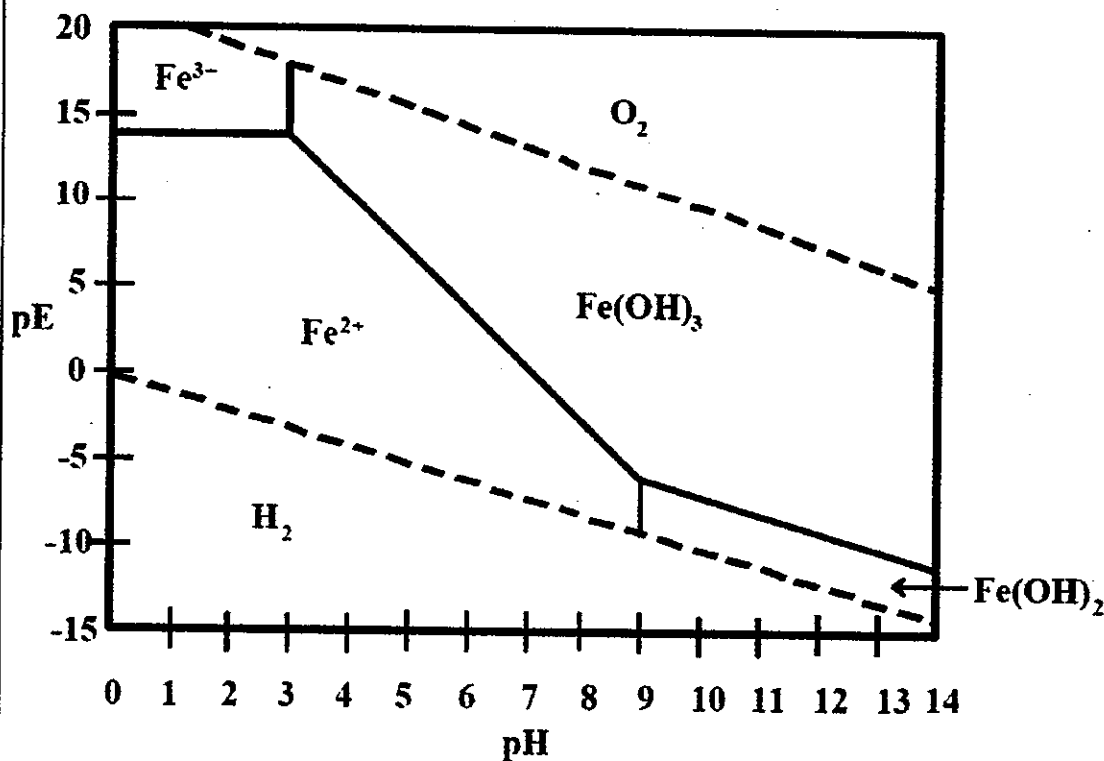
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10. Which statement about microbes in ocean environment is NOT true?

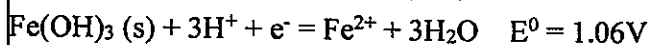
- A. Deep ocean has mostly chemoorganotrophs
- B. Archaea live near cold seeps can oxidize methane anaerobically
- C. Ocean eutrophication often found in nearshore marine waters because terrestrial runoffs
- D. Deep ocean oil platform accidents can often result in substantial changes of microbial ecosystem due to a large quantities of hydrocarbon intrusion

11. Owing to the increasingly severe challenge of global climate change, the regulation of worldwide carbon emissions has gained significant attention. Elevated levels of atmospheric CO<sub>2</sub> not only contribute to the greenhouse effect but can also result in various environmental impacts. At present, the atmospheric concentration of CO<sub>2</sub> stands at around 400 ppm, coinciding with a global average temperature of approximately 15°C. However, recent studies predict that by the end of this century, the levels of atmospheric CO<sub>2</sub> could reach 600 to 700 ppm, resulting in an expected increase in the average temperature of 2.5°C to 2.7°C. Assuming that by the end of this century, the average temperature increases to 20°C and the CO<sub>2</sub> concentration reaches 600 ppm, what impact is anticipated on the pH of rainwater? Please refer to the established solubility data for CO<sub>2</sub> in addressing this inquiry. (Approximately 0.3346 g/100ml at 0°C, 1 atm, and 0.1449 g/100ml at 25°C, 1 atm. pK<sub>a1</sub>=6.3.) (20 pts)

12.



The equilibrium of Fe<sup>2+</sup> with Fe(OH)<sub>3</sub> and its electrochemical reaction:

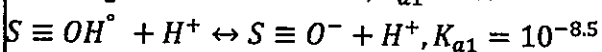
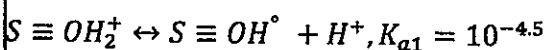


(1) Please calculate the stability range of Fe<sup>3+</sup> determined by pE and pH value. (The concentration of Fe<sup>3+</sup> in solution is assumed to be 10<sup>-7</sup> M) (5 pts)

(2) Under the condition that other ions do not interfere, please determine the existence form of iron in water using the above formula from (1). (The pH value is 7.0) (5 pts)

13.

The conversion of various forms of sulfur under anoxic conditions:



where S ≡ represents the mineral surface

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題號： 196

國立臺灣大學 113 學年度碩士班招生考試試題

科目： 環境化學及環境微生物學

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- (1) Calculate the point of zero charge ( $\text{pH}_{\text{zpc}}$ ) of this mineral. (5 pts)
  - (2) Assuming that the pH of the mineral is 7.0, try to judge and explain which ion,  $\text{Cd}^{2+}$  or  $\text{Cr}_2\text{O}_7^{2-}$ , is more likely to be adsorbed on the mineral surface from the perspective of electrostatic adsorption. (5 pts)
14. Sulfur oxides ( $\text{SO}_x$ ) are common atmospheric pollutants, primarily emitted from the combustion of fossil fuels, especially coal and heavy oil. The presence of these gases in the atmosphere poses a serious threat to the environment and human health.  $\text{SO}_x$  undergo a series of chemical transformations in the atmosphere, forming substances that are harmful to ecosystems and human health. Please try to explain the process of sulfur oxides transformation in the atmosphere. (10 pts)

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