

DEPARTMENT OF CHEMICAL ENGINEERING  
FACULTY OF ENGINEERING  
PRINCE OF SONGKLA UNIVERSITY

Midterm Examination : 2<sup>nd</sup> Semester

Academic year : 2007

Date : December 30<sup>th</sup>, 2007

9:00 – 12:00, Room : A100

**Subject : 230-591 Special Topic in Chemical Engineering (Renewable Energy and Renewable Material Technologies)**

กฎระเบียบในการสอบ โภชนาศึกษาและบริบทในรายวิชาหนึ่น หรือ พักรการเรียน  
*I การการศึกษา และ โภชนาศึกษาและบริบทในรายวิชาหนึ่น*

**Rules**

1. **Do not** bring this exam paper out of the exam room.
2. All book, class material and calculator are allowed.
3. **No talking or borrowing** during taking the exam.
4. Answer every question in **THAI**

Name.....

Student ID.....

**Each problem is worth 5 points.**

**Total score = 100**

**You got .....**

ให้ตอบทุกข้อเป็นภาษาไทย (อนุญาตให้เขียนเศษท์ทางวิชาการเป็นภาษาอังกฤษได้)

1. (5 points) Give three good reasons why renewable energy should replace petroleum-based energy.

**2. (5 points) What is Bio-oil?**

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**3. (5 points) In your point of view, whether is biodiesel from vegetable oil a sustainable energy and why? And give an example of sustainable energy.**

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**4. (5 points) How to apply E85 or E100 in cold environment?**

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**5. (5 points) What are neat biodiesel or neat bioethanol?**

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6. (5 points) Can biodiesel be used as petrochemical-based diesel without requiring any modification of a diesel engine? And give a couple comparisons between biodiesel and petroleum-based diesel.

**7. (5 points) Briefly show a process of making bioethanol from any agricultural product.**

8. (5 points) Biodiesel from fats and oils can be produced by two different reactions, explain two of them. And what is the criterion to design whether your process should be?

9. (5 points) Rather than methanol, ethanol, propanol and butanol, give a simply example of liquid biofuel that you learn from this class. And how to use it.

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10. (5 points) Briefly explain the stages of producing methane from anaerobic digestion. And show the typically compositions of biogas.

11. (5 points) Briefly explain the UASB process. And how was the anaerobic hybrid reactor developed from the UASB reactor?

**12. Why was the technology of two-stage anaerobic digestion developed? And how does it work?**

13. (5 points) Briefly explain four different processes that occur during the gasification of solid biomass.

**14. (5 points) What are different between wood distillation, carbonization and destructive distillation?**

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**15. (5 points) Explain a recent technology of the pyrolysis of solid biomass.**

16. (5 points) Why should we sometime remove CO<sub>2</sub> and H<sub>2</sub>S in biogas before used?

17. (5 points) According to the publication of Meng Ni, et al. (2006), explain how to produce hydrogen from the pyrolysis of biomass. And what are the pyrolysis products?

18. (5 points) According to the publication of Yolanda S. Stein, et al. (1983), what are main products from the pyrolysis of glycerol? And which one is concerned to be a toxic chemical?

19. (5 points) According to the publication of Stefan Czernik, et al. (2007), why did they propose to produce hydrogen gas from bio-oil which required two-step process instead of working on one-step process (like pyrolysis) to produce the same product? And briefly explain the two-step process.

**20. (5 points) Briefly explain the following process. Do you think this process is possible to be applied in Thailand and why?**

