

Name: _____ Student ID _____

**Prince of Songkla University
Faculty of Engineering**

Exam: Mid-Term, Semester II

Academic Year: 2006 – 2007

Date: December 20, 2006

Time: 9:00 – 12:00 PM

Subject: 230-434 – Safety

Room: R201

(Safety in Chemical Engineering Operations)

ทูลริตในการสอบโทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทูลริต และพักการเรียน 1 ภาคการศึกษา

Instructions: There are a total of 3 parts 9 pages (not including the cover sheet). Place your name and the student ID number on every page. Students are allowed to use only a pen or pencil and an English dictionary (Talking Dictionary is permitted). No exams are allowed to leave the room.

Points Distribution (For Grader Only)		
Part	Points Value	Score
I	35	
II	60	
III	55	
Total	150	

**Exam prepared by
Ram Yamsaengsung
December 14, 2006**

**PLEASE CHECK TO MAKE SURE THAT
YOU HAVE ALL 9 PAGES OF THE EXAM BEFORE BEGINNING
(not including the cover sheet).
GOOD LUCK!**

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Closed Book Exam (No books or notes allowed)

I. Fill in the blanks (35 points)

1. The _____ appoints the laboratory safety officer and is usually the head of the department.
2. The _____ acts as the secretary of the laboratory safety committee.
3. The _____ is responsible for arranging inspection of the storage materials. The inspection should be conducted every _____.
4. The _____ ensures that equipment used in work under their direction is of safe design and construction.
5. The safety policy of the Department of Chemical Engineering must be signed by the _____.
6. _____
7. To produce a fire, it is necessary to have _____, _____, and _____. This is also known as _____.
8. If organic solvents are used for cleaning equipment, the work (cleaning) should be done in a _____.
9. Cobalt (27) and _____ are two examples of _____.
10. _____ are highly toxic by ingestion and are rapidly absorbed by the skin producing intensive burns.
11. A signature on behalf of the _____ must be present on the safety policy.
12. In a well design facility, the equipment should only take up about _____ % of the entire floor space.
13. An inflammation of the skin that causes an allergic reaction is called _____.
14. _____ should be worn when working with toxic and _____ chemicals.
15. The sudden release of vacuum is called _____.
16. Phenol, Cresol, and Xylenol are very dangerous _____.
17. For high pressure equipment, the safety devices that must be installed include _____, _____, and _____.
18. HAZOP is an abbreviation for _____ which is a safety check lists that should be carried out before authorizing work liable to have serious mechanical, flammable, or toxic hazard.
19. Metal containers should have about _____ % extra space to allow for liquid expansion.

4. Name 4 ways of extinguishing a fire. **(4 points)**

5. Which type of fire is the following: (Type A, B, C, or D) **(4 points)**

- Metallic fire such as magnesium
- Gas or oil fire
- Fire involving paper, wood, cloths
- Electrical Fire

6. Name 4 things that must be included in a general safety policy. **(4 points)**

7. Name 4 major dangers from electrical hazards. **(4 points)**

8. With long term exposure to toxic hazards, what are the damages that may be caused to the body? **(2 points)**

9. What are the 2 types of human indiscipline mentioned that could cause hazards to others? **(2 points)**

10. List 5 emergency facilities (or equipment) that must be listed in the labs?
(5 points)

11. Name 5 purposes of experimentation on the pilot-scale. (5 points)

12. When working with machineries or moving parts, how must the machines be chosen? (2 points)

13. Identify the following symbols. (6 points)

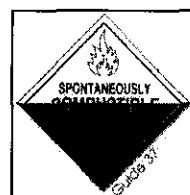
- (a)
- (b)
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- (d)
- (e)
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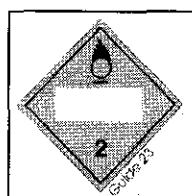
(a)



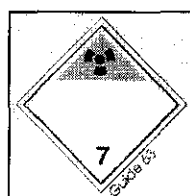
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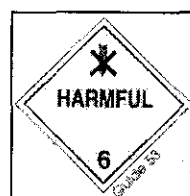
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(d)



(e)



(f)

13. Read the article below and answer the following questions? (8 points)

Thai factory explosion kills 35 workers

By Steve Dean

9 October 1999

A large explosion at the Hong Thai Kaset Pattana fruit processing plant in Thailand on September 19 flattened the buildings, killing 35 workers and injuring over 100. More than 40 people are still unaccounted for. Two explosions ripped apart the factory complex near the northern Thai city of Chiang Mai and created a 30-metre wide crater. Bricks and large lumps of concrete were spread over a four-acre area. The blasts were caused by the ignition of a stock of the volatile chemical, potassium chlorate, illegally stored in the plant.

Debris landed over a mile from the plant, the roof of a nearby temple was blown off and houses in a one and a half-mile radius from the factory were damaged. A further disaster was only averted by seconds when firefighters extinguished flames around two 5,000-litre oil tanks in the factory grounds.

Police have said that up to 10 tonne of potassium chlorate was stored at the plant without a license. The chemical is extremely dangerous if not handled and stored correctly. It is highly explosive and is used in the manufacture of gunpowder and other explosives for fireworks, hand grenades, and landmines. It is flammable, combustible and highly unstable when mixed with substances such as sulphur.

13.1 What caused the accident?

13.2 What is this chemical usually used for?

13.3 What did the farmers in the area use it for?

13.4 What was stored in the factory area that would have caused further disaster?

14. Read the article below and answer the following questions? (6 points)

Oil slick threatens Pattaya beaches

By Anchalee Kongrut and Assawin Pakkawan

November 21, 2005

Chon Buri _ An oil slick about 3km long containing about 100,000 litres of crude could be heading for Pattaya after a pipe on an unloading Japanese oil tanker ruptured yesterday, leading to a large spill. The Ryuho Maru was discharging a load of crude oil from Oman at a buoy about three nautical miles off Udom cove when the accident occurred.

It took about 30 minutes to shut the valve, and by then about 100,000 litres of oil, or a third of the tanker's cargo, had spilled into the sea.

The Marine Department has ordered an investigation to establish whether the tanker's crew had mishandled the transfer, or if a faulty pipe was to blame.

The oil was being transferred to the Thai Oil refinery plant in Si Racha district.

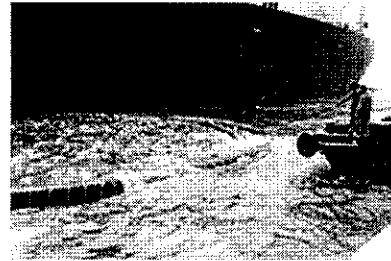
The tanker threw a floating boom around the slick in a futile attempt to contain its spread. Strong winds and choppy seas pushed the oil slick over the top of the boom and were still hampering clean-up efforts last night.

A Marine Department official said the situation should be under control in a few days. The department would send in the Chontharanurak, a vessel used specifically to battle oil spills. If necessary a second vessel, the Den Suthi, would be dispatched from nearby Samut Prakan.

14.1 How much crude oil was spilled into the sea?

14.2 What may have caused the accident?

14.3 How will the government treat the oil spill?



Officials inspect a boom set to contain spilt oil off the coast of Si Racha district, Chon Buri, yesterday. A pipe burst as the tanker Ryuho Maru was unloading, spilling about 50 tonnes of crude oil into the sea. The slick is drifting toward Pattaya. — JERDSAK SANGTHONGCHAROEN

3. Name 10 types of hazards that are found in our Chemical Engineering Department. Give specific examples of each (i.e. the slippery, greasy floor of the vacuum frying unit is a hazard). An example cannot be used more than once. Also give one way to prevent each hazard from occurring. **(20 points)**

Designing R&D Facilities

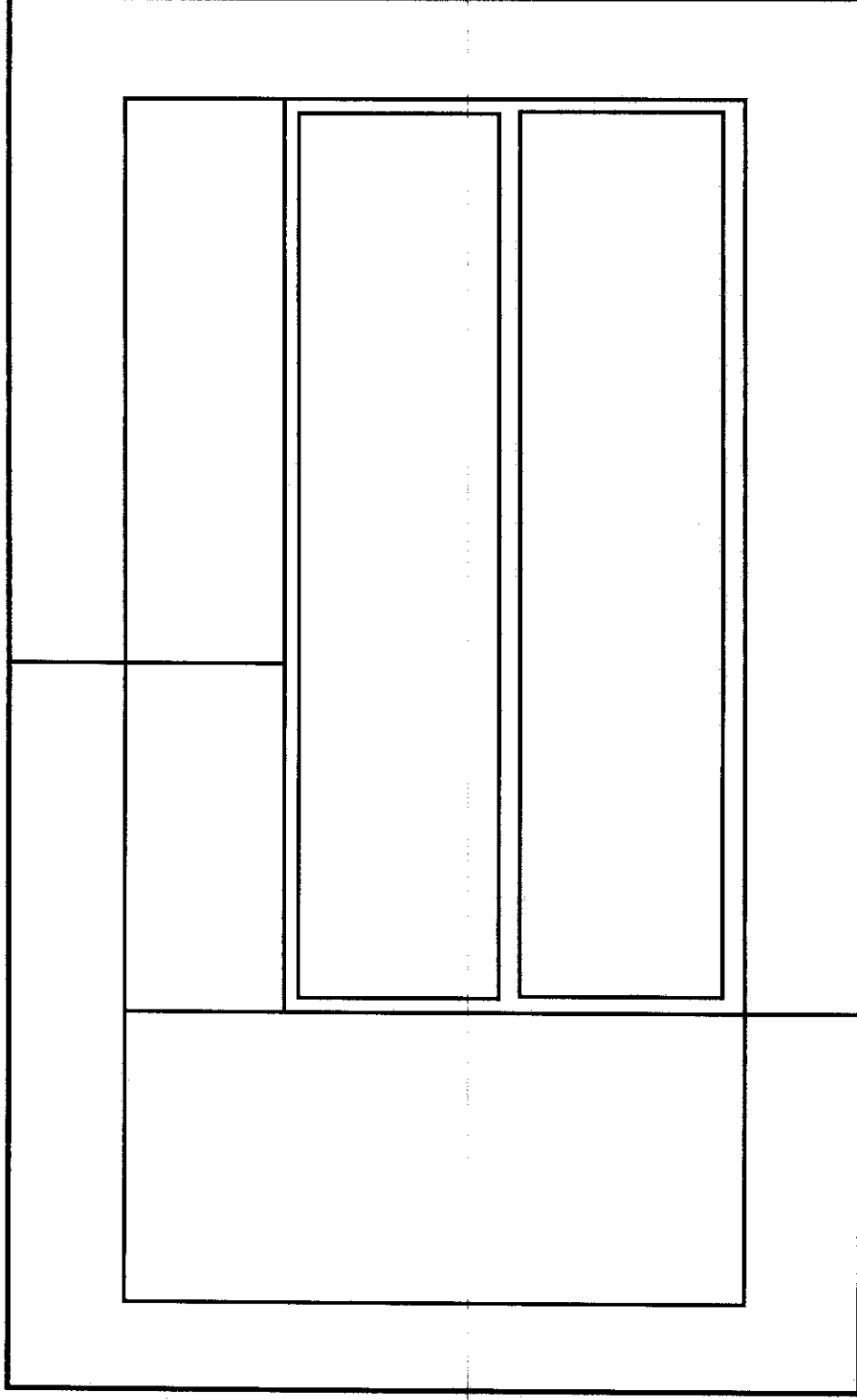


Fig. 1: Typical R&D facility layout