

Name: \_\_\_\_\_ Student ID \_\_\_\_\_

**Prince of Songkla University  
Faculty of Engineering**

**Exam: Mid-Term, Semester II**

**Academic Year: 2004 – 2005**

**Date: August 4, 2004**

**Time: 9:00 – 12:00 PM**

**Subject: 230-434 – Safety**

**Room: R200**

**(Safety in Chemical Engineering Operations)**

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*ทฤษฎีในการสอบโทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทฤษฎี และพักการเรียน 1 ภาคการศึกษา*

**Instructions: There are a total of 3 parts 10 pages. Place your name and the student ID number on every page. Students are allowed to use only a pen or pencil. No exams are allowed to leave the room.**

<b>Points Distribution (For Grader Only)</b>		
<b>Part</b>	<b>Points Value</b>	<b>Score</b>
<b>I</b>	<b>50</b>	
<b>II</b>	<b>65</b>	
<b>III</b>	<b>50</b>	
<b>Total</b>	<b>165</b>	

**Exam prepared by  
Ram Yamsaengsung  
July 29, 2004**

**PLEASE CHECK TO MAKE SURE THAT  
YOU HAVE ALL 10 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 (50 points)**

1. To produce a fire, it is necessary to have \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. This is also known as \_\_\_\_\_.
2. The \_\_\_\_\_ ensures that equipment used in work under their direction is of safe design and construction.
3. The \_\_\_\_\_ is responsible for arranging inspection of the storage materials. The inspection should be conducted every \_\_\_\_\_.
4. If organic solvents are used for cleaning equipment, the work (cleaning) should be done in a \_\_\_\_\_.
5. The maximum amount of flammable materials that should be stored in the lab is \_\_\_\_\_.
6. Experiments can be classified as \_\_\_\_\_ and \_\_\_\_\_.
7. Cobalt (27) and Radium (28) are two examples of \_\_\_\_\_.
8. \_\_\_\_\_ are highly toxic by ingestion and are rapidly absorbed by the skin producing intensive burns.
9. A signature on behalf of the \_\_\_\_\_ must be present on the safety policy.
10. LPG is an abbreviation for \_\_\_\_\_ and must be stored in properly designed vessels, in which at least \_\_\_\_\_ unfilled space must be allowed to prevent the development of dangerous pressure.
11. The \_\_\_\_\_ appoints the laboratory safety officer and is usually the head of the department.
12. The \_\_\_\_\_ acts as the secretary of the laboratory safety committee.
13. The storage of bulk amount of toxic and chemical liquids is preferably stored in \_\_\_\_\_.
14. In a well design facility, the equipment should only take up about \_\_\_\_\_ % of the entire floor space.
15. The \_\_\_\_\_ have the responsibility of assisting the orderly evacuation of the building.
16. An inflammation of the skin that causes an allergic reaction is called \_\_\_\_\_.
17. Fire fighters, rescuers, first-aid providers are all \_\_\_\_\_ and will work under the direction of the \_\_\_\_\_ and later the \_\_\_\_\_.

18. The sudden release of vacuum is called \_\_\_\_\_.
19. Tanks containing \_\_\_\_\_ have a red band and tanks that contain \_\_\_\_\_ have yellow band.
20. Metal containers should have about \_\_\_\_\_ % extra space to allow for liquid expansion.
21. The preferred method of stacking drums in the open air is to stack them \_\_\_\_\_.
22. Steel support should be able to withstand fire for at least \_\_\_\_\_ hour(s).
23. The maximum bulk storage for toxic or flammable liquids is \_\_\_\_\_.
24. Phenol, Cresol, and Xylenol are very dangerous \_\_\_\_\_.
25. The \_\_\_\_\_ should be designated in a safe place in the open air where workers evacuating can meet.
26. \_\_\_\_\_ should leave the building immediately upon hearing the fire alarm.
27. The \_\_\_\_\_ will relieve the lab superintendent of the responsibility of main control and direct the shutting down and evacuation of the laboratory.
28. An \_\_\_\_\_ is used to prepare workers for emergencies such as the release of toxic gas.
29. If there are some workers trapped inside the building, the 3 main tasks of emergency services team are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
30. The first-aid box should be provided in laboratories and should be located near the \_\_\_\_\_ with a list of trained personnel alongside.
31. After spillages, areas should be cleaned and \_\_\_\_\_ for at least \_\_\_\_\_ minutes.
32. Upon discovering a major vapor or liquid escape of a hazardous material, persons should \_\_\_\_\_ and leave immediately.
33. A communicating door must be able to provide fire resistance for at least \_\_\_\_\_.
34. For high pressure equipment, the safety devices that must be installed include \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
35. 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.

## II. Shorts Answers (65 points)

1. What is fire point? (2 points)
2. What is a non-flammable gas and can it be dangerous? Name two examples of non-flammable gas that are generally stored in gas cylinders. (4 points)
3. Name 4 basic ways to prevent a fire in home and office. (4 points)
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)
  - \_\_\_ Gas or oil fire
  - \_\_\_ Fire involving paper, wood, cloths
  - \_\_\_ Electrical Fire
  - \_\_\_ Metallic fire such as magnesium

6. Name 4 things that must be included in a general safety policy. **(4 points)**
7. For each rig, name 5 items that the operating instructions must cover. **(5 points)**
8. Name 4 purposes of experimentation on the pilot-scale. **(4 points)**
9. Name 3 outside resources are generally contacted in cases of laboratory emergencies. **(3 points)**
10. When an emergency alarm goes-off (toxic gas release), what should personnel/workers do? In case of toxic releases, if the building is located upwind, what should you do? **(2 points)**

11. Name 3 specific aims of first-aid. (3 points)

12. What does this symbol represent? What does it generally transport? How is this liquid stored at customers location? (3 points)



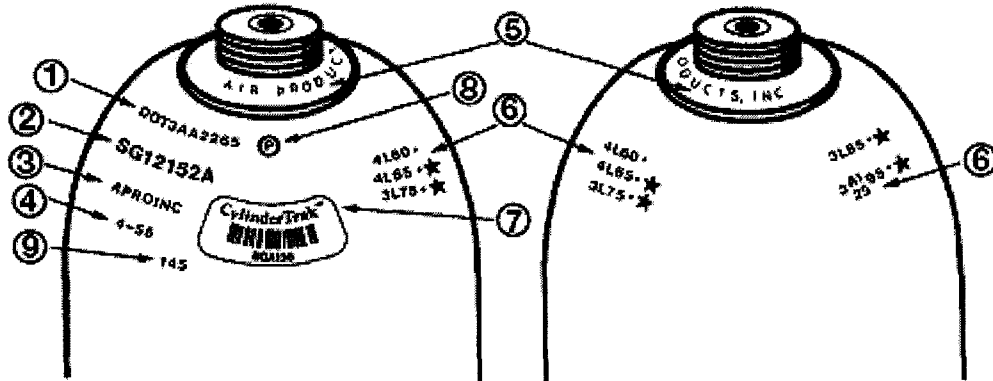
13. What does this symbol represent? What does it generally transport? How is this liquid stored at customers location? (3 points)



14. What is this a symbol of? What type of liquid does it generally store? Give 2 examples of chemicals that are stored in this container? (3 points)



15. Cylinder Identification (8 points)



Use the following information to answer the following questions.

1. DOT3AA3200
2. SG12152A
3. GASINC (Registered Symbol of Gas Inc.)
4. 5-55
5. Faculty of Engineering
6. 7L95 +★
7. Cylinder Tank Bar Code Label – BGA136
8. Cylinder Manufacturer's Inspection marking
9. TW 110

15.1 When was this tank manufactured?

15.2 Who is the current owner of this tank?

15.3 What is the tare weight of this tank?

15.4 What is the working pressure of this tank?

15.5 Who is the original owner of this tank?

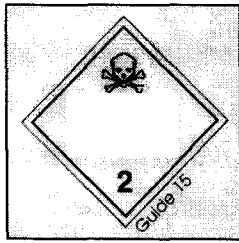
15.6 What do the letters SG stand for?

15.7 When was this tank retested? (month and year)

15.8 Does this cylinder meet the requirement for 10-year retest?

16. Identify the following symbols. (6 points)

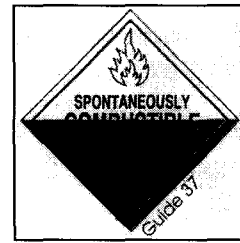
- (a)
- (b)
- (c)
- (d)
- (e)
- (f)



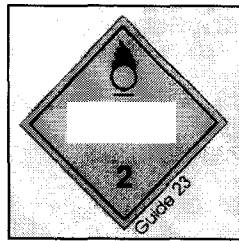
(a)



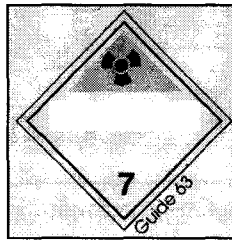
(b)



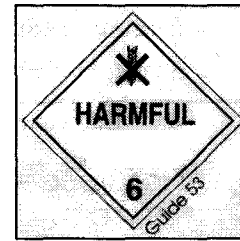
(c)



(d)



(e)



(f)

17. Name the 3 types of metals used to make gas cylinder. (3 points)







# Designing R&D Facilities

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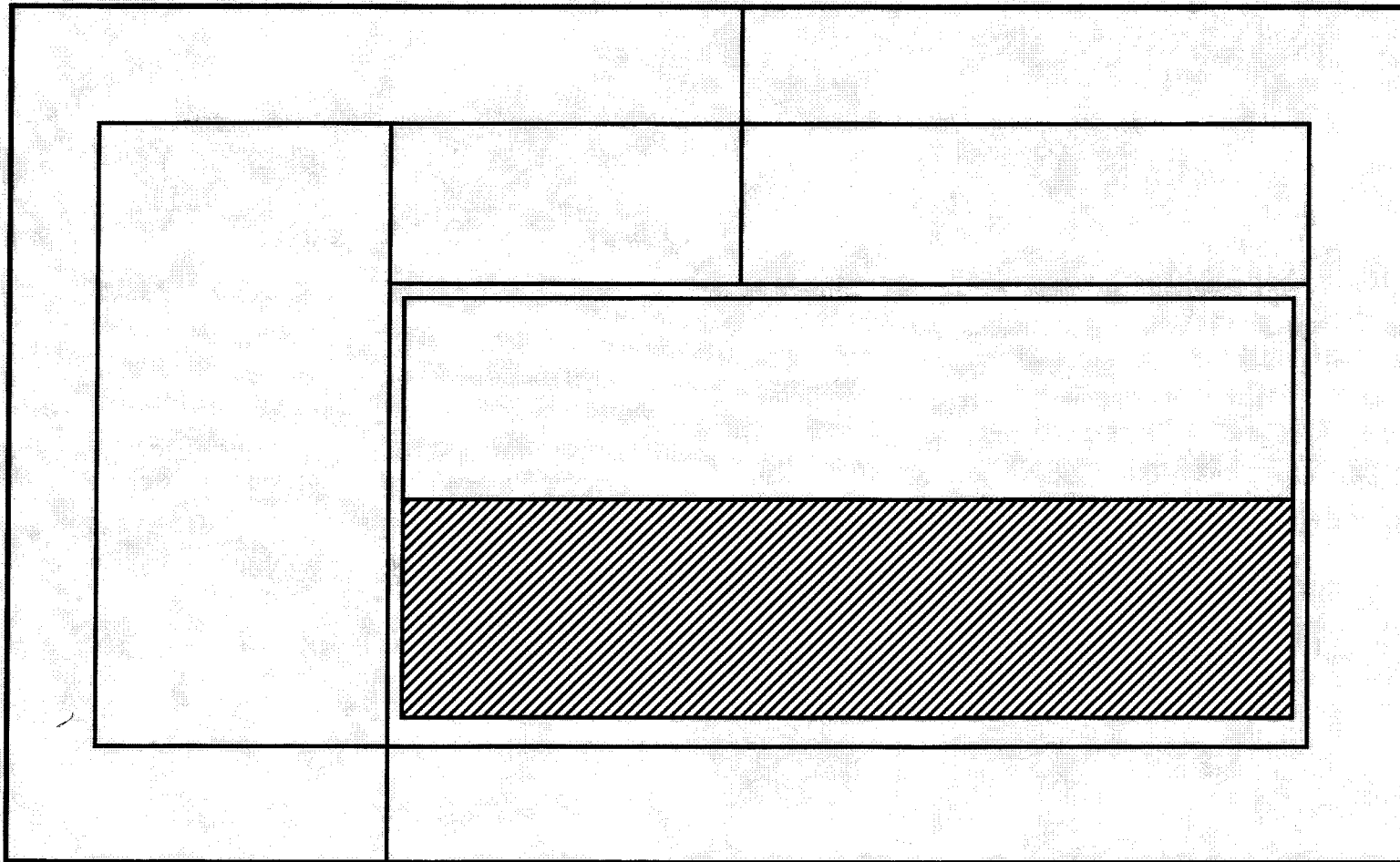


Fig. 3.3 Typical R&D facility layout