**HEALTH SAFETY AND ENVIRONMENTAL MANAGEMENT**

**2 - Marks**

1. Define accident and Hazard.
2. Why Health safety and environmental management is inevitable in petroleum and offshore industry.
3. List out the requirements of safety program in an industry.
4. Define safety.
5. Differentiate between incident and accident.
6. Define Risk and Risk analysis.
7. Define Individual risk.
8. Define societal risk.
9. Explain risk index of a department.
10. Explain percentage risk index of a department.
11. Define composite risk of a department.
12. Explain Acceptable Risk.
13. What you mean by the term **KICKS** in offshore drilling? List out its consequences and a method to prevent it.
14. What is the need of re-investigations of previous accidents in offshore industry?
15. List out common hazards groups on offshore and petroleum industry
16. Explain Hazard analysis.
17. What you mean by Hazard surveys?
18. What you mean by Safety Review?
19. What you mean by Human error analysis?
20. Explain HAZOP study and its objectives.
21. Define Design intent and Deviation in HAZOP with examples.
22. Define Causes and Consequences in HAZOP.
23. Define Safe guards and Actions in HAZOP analysis.
24. What you mean by a process flow diagram (PFD)?
25. Explain meaningless combinations of Keywords in HAZOP with examples.
26. Define Pseudo keywords in HAZOP analysis.
27. Explain a general team composition of HAZOP study for new design and existing plant.
28. What are the primary environmental issues caused by Offshore Drilling industry.
29. Explain how invasive species are formed by Drilling operation.
30. What is Gas flaring?
31. What is Fugitive Release?
32. Why offshore drilling affects especially the Shelf ecosystem?
33. List out the stages of a common offshore project.
34. What are the physical and chemical properties of oil hydrocarbons which determine the impacts in eco system?
35. What will be the area in km2 covered by a spill of 1 ton of oil in the first 10 minutes?
36. Describe one methodology used to monitor marine pollution by oil contamination.
37. What is the difference between Auto – Ignition point and Flash point?
38. How UFL and LFL of a material vary with temperature?
39. How UFL and LFL of a material vary with Pressure?
40. Describe Limiting oxygen concentration level.
41. Define Explosion.
42. What is confined vapor cloud explosion?
43. What is boiling liquid expanding vapor explosion?
44. What you mean by Dust Explosion?
45. What is a Blast wave?
46. Define ignition energy.
47. Compare pressure purging and vacuum purging.
48. What is sweep through purging?
49. What are the stability classifications of atmosphere in dispersion modeling?
50. List out different types of sprinkler systems used in fire prevention.

**4 -Marks**

1. Explain how a safety program works in an industry.
2. Give at least four reasons why accidents in petroleum and offshore industries are said to be disaster, even though they are very rare.
3. What are the functions of Health safety and environmental management in petroleum and offshore industry?
4. Explain the step by step procedure to conduct Morgan and Frank logical Risk analysis.
5. What you mean by composite exposure of a department. Explain its components.
6. Explain the steps of defeating accident process.
7. What you mean by Hazard identification? List down three popular hazard identification methods.
8. Define HAZOP. Explain Primary and secondary keywords with Examples.
9. What are the things that previous accidents/events in offshore industry teaches us?
10. List out the classifications of Hazard.
11. What you mean by a Gold plated system?
12. Explain process Hazard checklist with an example.
13. Explain What if Analysis.
14. Explain Failure mode effects and criticality analysis (FMECA)
15. What are the outcomes of Hazard identification and Operability (HAZOP) analysis?
16. What are the data required for HAZOP analysis?
17. Explain different types of HAZOP.
18. Explain importants of HAZOP analysis applied to new designs.
19. Explain Primary and Secondary Key words of HAZOP with examples.
20. Differentiate HAZOP – Record by exception and Full recording.
21. What are the impacts of Drilling process in ocean floor?
22. Explain the process of gas flaring. List out the inevitable situations Gas flaring.
23. What are the direct impacts of gas flaring?
24. Explain the grouping of marine pollutants based on their hazardous nature.
25. What are the criteria used for estimating the impact of marine pollutions?
26. What are the functions of drilling fluid?
27. Explain the classification of constituents of oil based drilling fluids based on their toxicity.
28. What are the impacts of drilling mud discharge in ocean environment?
29. What are the impacts of drill cutting discharge in ocean environment?
30. What are the impacts of produced water discharge in ocean environment?
31. What are the different physical states of crude oil that can be formed while contact with ocean environment?
32. Why in most of the time, detection of oil content in marine pollution is difficult?
33. Explain the stages of Oil spills and its corresponding impacts.
34. What are the common factors considered for oil spill marine pollution study?
35. What are the factors to be considered for developing Environmental management policies?
36. List out at least five regulations developed by GESAMP regarding drilling discharges.
37. What you mean by Ecological monitoring?
38. Explain the stages of Ecological monitoring.
39. Explain the Fire and Explosion characteristics of a material.
40. Explain the steps to draw a Flammability diagram.
41. Explain Air line and d Stoichiometric line in a flammability diagram.
42. Explain the characteristics of an explosion.
43. What are the design criteria for preventing fire and explosion.
44. Explain vacuum purging
45. Explain pressure purging
46. Explain Siphon purging.

**14 - Marks**

1. Why Health safety and Environmental Management is important in Petroleum and offshore industry? Explain with the help of an industry disaster with its causes and consequences.
2. Explain **Morgan and Frank** logical Risk analysis and Rank the departments of Company X based on Risk given below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Department | Hazard score | Control score | Property value | Business Interruption cost | Loss of person  | Exposure in dollars ($)  |
| A | 300 | 325 | 2500 | 1500 | 1000 | 5000 |
| B | 65 | 220 | 1000 | 1200 | 700 | 2900 |
| C | 160 | 150 | 1800 | 800 | 1700 | 4300 |

1. What you mean by Risk. Explain the type of risks and how they are estimated with the help of examples.
2. What you mean by Safety in design and operation. Explain with the help of some advanced technology that are used in offshore drilling industry.
3. Explain primary and secondary key words in a HAZOP report with examples. Create a HAZOP report for the following process. Give at least three deviations.



1. Explain the process of Hazard Evaluation.
2. Explain Hazard Identification process and common methods used for hazard identification.
3. Explain Hazard identification and Operability study (HAZOP).
4. Explain the impacts of offshore drilling industry on Ocean Environment.
5. What you mean by Gas flaring and Fugitive release. Explain their impacts on Eco – system.
6. Explain different stages of offshore developments and their corresponding impacts.
7. What are the main constituents of underwater drilling discharges and explain the pollutions caused by them.
8. Explain different methods available for control of oil spill.
9. Explain the steps to draw a flammability diagram. Draw a flammability diagram for Methane (CH4).

CH4 + 2O2 🡪 CO2 + 2H2O

|  |  |
| --- | --- |
| Characteristics of Methane |  |
| Flammability limit in air | LFL: 5.3% fuel in air |
|  | UFL: 15% fuel in air |
| Flammability limit as pure form | LFL: 5.1% fuel in oxygen |
|  | UFL: 61% fuel in oxygen |
| LOC | 12% oxygen |

1. Explain characteristics and types of explosion.
2. How an explosion causes damages and explain one method of estimation of explosion damage.
3. Explain different kinds of fire and explosion prevention methods.
4. Explain different factors affecting Dispersion.
5. Explain the different safety measures applied in design and process operations.
6. Explain how a Flammability diagram is used for prevention of fire and explosion.