

International Diploma in Safety Engineering (IDSE)
Qualifi Endorsed Qualification

UNIT 2: Principles and Applications of Science and Technology in Safety

Total Time: 24 Hours (+2 hours for submission)
Total Questions: 13

Total Marks: 150
Passing Marks: 75

Exam Instructions

- This is an Open Book Non-invigilated exam. Total Marks are 150 and maximum marks for the questions are given against each.
- Do not add any picture or sketch from the internet as part of your answer. You can however draw a linear sketch as part of your answer.
- Support your answers with **logical arguments** and **examples** relevant to the given scenario. Generic and Bookish answers will not be accepted by the examiners.
- All Questions are compulsory and must be answered to gain maximum marks
- **Do not directly copy/paste from any source. Write all answers in your own words.**
- Do not take help from any individual/ organization in any manner, to complete your answers.
- Do not help other learner/s to complete their answers, in any manner
- Your answers will be compared with other learners' work and any collusion found in terms of similar ideas, similar responses will form the basis for malpractice investigation and the results will be withheld.
- **You must only type your answer in the given answer sheet. Hand written responses will not be accepted.**

Note: This is a sample exam only for reference. Actual exam Questions may vary but total exam score will be 150 marks

Section A

Carefully analyze the following scenario and answer to the 5 questions in context with given scenario only. Any generic or irrelevant response will not be accepted by the examiner

Workplace Situation/ Scenario

“Silk Aviation Suppliers Pvt. limited Company” is a reliable supplier for aviation components, hardwares and chemicals to a number of airlines in the region. The company employs 3000 workforce including supervisors, managers and directors. Their business strategy is to be amongst top 10 suppliers (in terms of business revenue) in the region within next 5 years. They maintain huge inventory of aviation parts and deliver those parts to their customers using 3rd party courier service. The courier company staff is often required to pick some heavy products directly from the warehouses using their own manpower and necessary equipment. The company has 10 huge warehouses which are used to store various inventory items based on their sizes, chemical properties, fragility etc. The retrieval of the items from the warehouses require the manual as well as mechanical operations which are often done simultaneously creating various safety hazards for the workers. There are certain health hazards as well while working in the chemical warehouse or pulling/pushing the inventory on manual carts. The pushing of carts to or from the warehouse becomes very tedious as ramps are used to approach the warehouses. Latest regulatory limit for pushing force for the cart has been set to 50 Lbs. however, it has been observed that workers are required to use force beyond the legal limit when they push the cart on a ramp.

The company has previously trialed a semi-automated storage and retrieval system without the need for workers to physically store or retrieve the loads but it caused delays in delivery. The company has now planning to redesign the ramps so lesser pushing force is required for storage/ retrieval manually through the carts in order to be regulatory compliant.

Another problem with the chemical warehouse is that it is used to store a number of chemicals under the same roof. Although the company ensures that short term and long term exposure limits (STEL and LTEL) for various hazardous airborne chemicals should be complied yet there have been instances when workers had health issues due to the exposure with airborne chemicals. The company has put a time bar on every worker (Reduced from 8 hours to 6 hours) beyond which the workers cannot be in the chemical warehouse but again this practice has caused delays in the deliveries. Moreover, the production managers found it very difficult to ascertain the exact time for which the workers remain present inside the warehouse as it requires frequent movements between the warehouse and the packing/delivery point by each worker which cannot be documented in real time.

All 5 questions carry 10 marks each (Total 50 Marks)

Keeping in view the above mentioned scenario, please answer to the following questions;

Question 1- Calculate the suitable ramp angle for a maximum of 100 lbs. load on the cart so the required pushing force remain under 50 lbs.?

10 Marks

Question 2- Why do you think there have been ill health issues at the chemical warehouse if the STEL and LTEL limits are being complied? What additional measures will you take to eliminate/mitigate the risk of ill-health in the given scenario. **10 Marks**

Question 3- What control measures you may wish to take (without any financial implications) in the prevailing circumstances in order to increase the OHS performance. **10 Marks**

Question 4- What technological solution you may advise to the management in order to ensure that each worker does not remain inside the chemical warehouse beyond 6 hours during their 8 hours shift and an additional 4 hours over-time duration? You must explain the technical details along with the cost implications of the proposed solution. **10 Marks**

Question 5- What technological options will you suggest for fully automated storage and retrieval system? You must explain the technical details of the proposed solution in terms of the process flow including the use of Information technology tools where applicable. **10 Marks**

Section B

Carefully analyze the following scenarios and answer to the question/s in context with given scenarios only. Any generic or irrelevant response will not be accepted by the examiner.

Workplace Situation/ Scenario

A large textile company “Star Textiles” has its own weaving, dyeing, stitching and packaging units employs 6500 workforce at different administrative and functional levels. The company operates in 3 shifts on weekdays and 2 shifts on weekends. There are 6 separate buildings as follows;

- 1- Admin block (4 storey building) with the capacity of 150 people on each floor.
- 2- Weaving and stitching unit (2 storey building) with capacity of 500-600 workers on each floor
- 3- Dyeing Unit (single storey) with capacity of 300 workers in each shift
- 4- Packaging unit (Single storey) with capacity of 350 workers in each shift
- 5- Raw materials warehouse (2 storey) with capacity to accommodate 50 workers in each shift
- 6- Maintenance unit (single storey) with capacity to accommodate 60 workers in each shift

Each building/ storey has an entrance and a separate exit doors (each 10 foot wide).

The company believes in “Equal Opportunity” and therefore 50% of the manpower is female. There are 10 workers who have hearing impairment while 7 workers have mobility issues. The administrative building is a 4 storey building where lifts are used however, 10 feet wide stairs have been made available as well.

Question 6 - Write down a comprehensive “Fire Evacuation Plan” as per the given scenario requirements. **20 Marks**

Workplace Situation/ Scenario

A large construction company utilizes various lifting equipment for the transportation of men and materials on large storey under construction buildings. Lately there have been an accident when a material lifting equipment failed resulting free fall of the lifting platform and collapse of the whole assembly. Fortunately there have been no injuries but the incident alarmed the regulatory body as well as the management who are concerned with the safety of people. You are working as safety manager in the construction company head office and has been assigned to carry out a technical investigation.

Question 7 - Establish the scope of the investigation for the perusal of Safety Director and the management? **10 Marks**

Question 8 - Based on the scope of the investigation, establish a checklist as per the following format;

Sr#	Potential Cause of the Accident	Evidences you wish to collect to "Establish" or "Rule Out" the potential cause	10 Marks

Scenario

The recent Corona Virus Pandemic has affected the whole world. It caused business and life disruptions all over the world. There were various administrative measures taken by each and every country to curtail the spread of the virus but the efforts were mostly not very effective as to-date, there are thousands of people being affected daily. The situation alarmed the scientists, politicians as well as the citizens who urged the need for more scientific development in the field of public health. The Health and Safety Officer have also been observing the impacts of Pandemic and the way it is being managed. They have also been discussing the limitations of prevailing technological options which could not effectively work to reduce the spread of Corona Virus.

Question 9 - Which technological invention you wish to have in near future which may curtail the spread of virus or increase the effectiveness of existing control measures? Propose a single specific product/service (Except the vaccine) and explain in detail how it will be used in order to control the spread of similar or more deadly viruses in future. **20 Marks**

Workplace Situation/ Scenario

An oil refinery company "Silverline Oil Refinery" had deployed various engineering controls for its process safety to eliminate the risk of explosion. There have been lately an occurrence when a "Pressure Release Valve" could not maintain the required pressure flow resulting huge pressure build-up within the system. The abnormal situation was observed by the vigilant staff of main control room who brought the pressure "under control" by shutting down the process (administrative Controls) which resulted in heavy financial losses to the refinery. The refinery has carried out a technical investigation and the cause of the failure was identified as "Equipment Failure" i.e. the subject valve failed to perform its intended function although it was calibrated and tested only a week ago.

Question 10 - Why Engineering controls cannot be 100% reliable and Which factors influence their performance?

10 Marks

Question 11 - The management has decided to deploy redundant engineering control for the subject process. An additional "Pressure Release Valve" will be installed in parallel so if one fails, the other will take over. If the reliability of existing valve is 93% and for additional valve, its 97% then what will be the combined availability of the system during next one year?

10 Marks

Workplace Situation/ Scenario

A local theme park "Joy City" has installed a range of joy rides including a roller coaster. The company carries out frequent inspections (mostly visual inspections) using its own staff to ascertain the integrity of the structures and its components. The company also has a 3rd party annual inspection contract with a renowned inspection body who certifies them against the given criteria. During a routine daily pre-use inspection, one of the worker accidentally found 2 large bolts supposedly disengaged from the roller coaster and reported to you (safety manager). The matter was discussed with the management who were alarmed to foresee the potential impact on public safety and the business had it not been timely reported.

Question 12 - What do you think are the issues with the existing inspection scope, method or criteria?

10 Marks

Question 13 – Which different inspection methods can be used to ascertain the structures integrity without dismantling them?

10 Marks

End of Question Paper