

C37 INDUSTRIAL AND PROCESS HAZARDS

IMPORTANT

The time allowed for this exam is 3 hours.

Total marks: 200

You must hand in this paper and any paper used for rough work to the supervisor when you leave the examination room. Failure to do so may result in disqualification.

Section A: Multiple-Choice Questions

Question 1. For the following multiple-choice questions, fill in the circle of the letter that identifies the most correct answer.

Example: (A) (B) ● (D)

DO NOT MARK THE ANSWERS ON THESE PAGES.

USE THE FIRST PAGE OF YOUR ANSWER BOOK.

1. Which of the following require little attention as they are completely automated?
- (A) Industrial boilers
 - (B) Package boilers
 - (C) Utility boilers
 - (D) (A) and (C)

2. Which of the following controls would NOT be found typically on a steam boiler?
- (A) High water temperature sensing device
 - (B) Mechanical pressure relief valve
 - (C) Visual internal pressure gauge
 - (D) Excess steam pressure sensing switch
3. A vacuum furnace that operates at temperatures above ambient to over 5000° F and at pressures below atmosphere is termed a
- (A) Class A furnace.
 - (B) Class B furnace.
 - (C) Class C furnace.
 - (D) Class D furnace.
4. An example of a Class B industrial oven is a
- (A) paint drying oven.
 - (B) blast furnace.
 - (C) wood drying kiln.
 - (D) newsprint drying oven.
5. In industrial ovens, the method of heating in which the products of combustion enter the work chamber and contact the work in progress is known as
- (A) direct fired.
 - (B) continuous fired.
 - (C) indirect fired.
 - (D) spontaneous fired.
6. With respect to ovens, which of the following is NOT true of explosion relief vents?
- (A) They are required for ovens where fuel or vapour hazards are present.
 - (B) They minimize damage to the oven and surrounding structures should an explosion occur inside the oven.
 - (C) They should be placed on the sides of the oven.
 - (D) They should be reasonably distributed throughout the entire oven length.
7. A pilot that is lighted automatically each time there is a call for heat is called a(n)
- (A) intermittent pilot.
 - (B) interrupted pilot.
 - (C) continuous pilot.
 - (D) expanded pilot.

8. The compressor in a refrigeration system
- (A) causes the absorption of heat by the refrigerant, thereby cooling the desired location or material.
 - (B) decreases the pressure in the evaporator.
 - (C) increases the pressure of the vapourized refrigerant.
 - (D) removes heat from the refrigerant and causes it to condense.
9. The component of a refrigeration system that operates to remove heat from the refrigerant and cause it to liquefy is the
- (A) compressor.
 - (B) condenser.
 - (C) evaporator.
 - (D) expansion valve.
10. An example of the most flammable class of refrigerant is
- (A) carbon dioxide.
 - (B) trichlorotrifluoroethane.
 - (C) butane.
 - (D) ammonia.
11. The component of a direct refrigeration system that is in direct contact with the space or material being cooled is the
- (A) evaporator.
 - (B) brine.
 - (C) condenser.
 - (D) compressor.
12. Air conditioning systems are NOT designed to control
- (A) humidity.
 - (B) mould.
 - (C) temperature.
 - (D) dust.
13. What class of ULC listed air conditioning filter emits negligible amounts of smoke when subjected to flames?
- (A) Class 1
 - (B) Class 2
 - (C) Class 3
 - (D) Class 4

14. An office building that has a central air conditioning installation with a capacity of 15,000 CFM is required to have
- (A) a heat detector in the return air duct.
 - (B) a smoke detector in the return air duct.
 - (C) heat detectors in the supply and return air ducts.
 - (D) smoke detectors in the supply and return air ducts.
15. Which of the following is true regarding static electricity?
- (A) Bonding maximizes potential differences between conductive objects.
 - (B) Grounding maximizes potential differences between objects and the ground.
 - (C) Some objects are inherently grounded by their contact with the earth.
 - (D) Inflexible conductors should be used for bonds that are connected and disconnected frequently.
16. Which of the following is NOT true about humidity in relation to static electricity?
- (A) High humidity can cause discomfort to people if the temperature is also high.
 - (B) High humidity might have adverse effects on equipment.
 - (C) Humidifying the atmosphere should never be used as a solution to static problems.
 - (D) Localized humidification may sometimes produce good results in terms of non-conductivity.
17. Which of the following is NOT used to ionize the air?
- (A) Static comb
 - (B) Tinsel bar
 - (C) Radioactive neutralizer
 - (D) Humidification
18. Which of the following is NOT a part of the air terminals used for lightning protection?
- (A) The tripod support
 - (B) The point
 - (C) The elevation rod
 - (D) The spark arrestor
19. Which method of cooling transformers potentially creates the greatest fire hazard?
- (A) Air cooled
 - (B) Oil cooled
 - (C) Inert liquid cooled
 - (D) Water cooled

20. The preferred sprinkler system for protecting computer equipment is the
- (A) Wet system.
 - (B) Dry system.
 - (C) Deluge system.
 - (D) Preaction system.
21. According to the National Building Code, if the alert signal of a two stage fire alarm system is not acknowledged, it automatically causes a general alarm after
- (A) 3 minutes.
 - (B) 5 minutes.
 - (C) 7 minutes.
 - (D) 10 minutes.
22. Which of the following is considered the most effective type of smoke detector?
- (A) Ionization detector
 - (B) Photoelectric detector
 - (C) Thermal detector
 - (D) Water flow detector
23. The type of fire alarm circuit that will transmit a fire signal despite a broken wire is
- (A) Class A.
 - (B) Class B.
 - (C) continuous.
 - (D) pulsing.
24. Which of the following is NOT one of the three categories of fire alarm control units?
- (A) Single zone
 - (B) Dual zone
 - (C) Multiple zone
 - (D) Modular zone
25. According to the National Building Code, which of the following is NOT a criterion for installing a fire alarm system in a building?
- (A) Building height
 - (B) Occupancy loading
 - (C) Occupancy classification
 - (D) Building construction

26. Liquefied petroleum gases (LPGs)
- (A) are lighter than air.
 - (B) are light sensitive.
 - (C) can be changed to their liquid form by applying moderate pressure.
 - (D) usually exist in a liquid form at normal temperatures and pressures.
27. Which of the following is true of dust explosions?
- (A) The intensity of a dust explosion depends partly on dust concentration but not on dust type.
 - (B) The intensity of a dust explosion depends partly on particle size but not on moisture content.
 - (C) The maximum pressure developed in an enclosure is determined by the volume and shape of the enclosure.
 - (D) Turbulence in a dust cloud speeds up the diffusion of oxygen to the burning surfaces.
28. Which of the following is true of woodworking plants?
- (A) Such risks are often located in isolated areas with little or no water supply.
 - (B) The close spacing between buildings reduces the spread of fire from building to building.
 - (C) Such risks generally have a good fire record.
 - (D) Lumber and other wood products are usually stored inside.
29. In a grain elevator operation, fire or explosions in bucket elevators result mainly from
- (A) overloading the buckets.
 - (B) spontaneous combustion of the grain.
 - (C) slipping motor belts.
 - (D) overheated motors.
30. In a grain elevator conveyor gallery, a moveable tripper is a device that
- (A) prevents overfilling of the storage bins.
 - (B) shuts down overloaded conveyors.
 - (C) sets off an alarm if the concentration of dust exceeds a safe limit.
 - (D) directs grain into storage bins.
31. The ventilation design of a dip tank should be such that it confines the flammable vapour concentrations exceeding 25% of the lower explosive limit to a maximum distance from the dip tank of
- (A) 2 feet.
 - (B) 3 feet.
 - (C) 5 feet.
 - (D) 20 feet.

32. In spray finishing, the least effective system for overspray removal is
- (A) dry filters.
 - (B) dry baffles.
 - (C) water wash.
 - (D) down draught.
33. Organic peroxides
- (A) are highly inert chemicals.
 - (B) are neither shock nor heat sensitive.
 - (C) are strong oxidizing agents.
 - (D) require no special handling, storage or disposal.
34. Promoters (accelerators) are used in the process of manufacturing fibreglass reinforced plastics to
- (A) give the finished product added strength and flexibility.
 - (B) slow down the chemical reaction between the catalyst and resin.
 - (C) reduce the reactivity of the catalyst.
 - (D) All of the above
35. Which of the following is a feature of a well-designed fibreglass molding area?
- (A) A one-hour fire wall separating the molding area from the remainder of the plant
 - (B) A storage area where promoters and catalysts are stored together
 - (C) Class I, Group G, electrical equipment in the finishing area
 - (D) An adequate ventilation system
36. Which of the following is true of plastics?
- (A) A thermoplastic is changed chemically when heated.
 - (B) Alcohols and ketones are examples of solvents.
 - (C) Fillers are chemically active substances that increase the bulk of plastics.
 - (D) Polyesters are examples of thermoplastics.
37. In the manufacturing of plastics, blow molding is a process of
- (A) converting thermoplastic resins into hollow products.
 - (B) converting thermoplastic plastic powder or granules into a continuous uniform melt and forcing this melt through a die that yields a desired shape.
 - (C) squeezing material into a desired shape by applying heat and pressure to the material in the mold.
 - (D) injecting soft, melted plastic into a metal mold, under high pressure, using a screw-ram or plunger.

38. **Isotopes** are atoms of the same element
- (A) that have a different atomic number.
 - (B) that have the same atomic mass.
 - (C) whose nuclei have the same number of neutrons but a different number of protons.
 - (D) whose nuclei have the same number of protons but a different number of neutrons.
39. The basic unit used to describe the intensity of radioactivity in a sample of material is known as a
- (A) rad.
 - (B) roentgen.
 - (C) curie.
 - (D) rem.
40. Which of the following is a FALSE statement with respect to the operation and maintenance of industrial lift trucks?
- (A) The battery charging areas should be located in well-ventilated areas.
 - (B) The trucks should be stored in detached buildings.
 - (C) Storage should be kept well above the level of sprinkler piping.
 - (D) The type of truck allowed in hazardous areas should be limited.

(2 marks each = 80 marks)

Section B: Narrative Questions

- Question 2. (a) Identify FOUR (4) desirable characteristics of refrigerants. (4 marks)
- (b) Identify and briefly describe the principal components of a refrigeration system. (8 marks)
- (c) Identify and briefly describe the TWO (2) types of refrigeration systems based on their method of extracting heat. What is the hazard associated with each type? (8 marks)
- Question 3. With respect to a fire alarm system, discuss the purpose and function of the following alarm initiating devices:
- (a) Air duct detectors (10 marks)
 - (b) Manual signalling box (10 marks)

continued on next page

- Question 4. With respect to the process of paint dipping, briefly describe how each of the following should contribute to the reduction of the fire hazard:
- (a) Construction of tanks (5 marks)
 - (b) Location of tanks (5 marks)
 - (c) Overflow pipes (5 marks)
 - (d) Ventilation (5 marks)
- Question 5. With respect to fiberglass reinforced plastics,
- (a) distinguish between **monomer** and **polymer**. (3 marks)
 - (b) identify THREE (3) methods used to harden resins. (3 marks)
 - (c) what is an **accelerator**, and what are its functions? (3 marks)
 - (d) briefly describe both the hand lay-up method of processing and the spray-up method of processing. (11 marks)
- Question 6. Identify and briefly discuss FOUR (4) hazards that are particularly inherent in the production of plastics and the manufacture of plastic products. (20 marks)

Section C: Application Question

- Question 7. The insured is a fiberglass manufacturer of small watercraft. Because he is a major user of organic peroxides, he worries constantly about the storage of these products. As a loss prevention representative, what basic rules would you recommend with respect to the storing and handling of his organic peroxides? (20 marks)

