

Review for Unit Test #3: Fire Emergencies

Be able to recognize the definitions for the following terms for fire emergencies:

oxidation	lower flammable limit (LFL)	insulator
combustion	upper flammable limit (UFL)	compartment
self-sustaining	explosive (flammable) range	piloted ignition
explosion	too rich to burn	non-piloted ignition
fire	too lean to burn	plume
oxidizing agent	spontaneous ignition	entrain
fire tetrahedron	smoke	thermal layering
fuel	superficial (first degree) burn	flashover
Class A fire	partial thickness (2 nd degree) burn	ventilation
Class B fire	full thickness (third degree) burn	backdraft
Class C fire	PPE	extinguishment
Class D fire	SCBA	inert gas
Class K fire	hypoxia	scene size-up
pyrophoric metals	hazardous combustion products	balloon construction
exothermic reaction	hydrogen cyanide	platform construction
endothermic reaction	carbon monoxide	truss construction
ignition	complete combustion	stick construction
vapourization	incomplete combustion	engineered I beams
pyrolysis	conduction	hazardous material
auto-ignition	convection	placard
temperature	radiation	combustible
surface area	direct flame contact	compressed gases
concentration	conductor	dike

Practice Multiple Choice Questions

- Which of the following is an oxidizing agent?
 - sodium sulfide
 - calcium carbide
 - potassium nitrate
 - octane
- Your fire truck is dispatched to a domestic dispute. The situation is violent and the husband is present at the scene. You should:
 - put on your turn-out suit and helmet, and walk in to confront the husband
 - hook up a fire hose and hose down the husband
 - put a ladder up to an upstairs window and rescue the wife from there
 - stage at a safe distance and wait for the police to secure the scene
- A student is testing a clear, colourless, odourless gas with a flaming splint. When the splint is placed in the gas, it goes out with a loud “pop” noise. The gas is:
 - carbon dioxide
 - carbon monoxide
 - oxygen
 - hydrogen
- Which of the following is TRUE about fire?
 - fire is an oxidation reaction
 - fire may be an explosion
 - fire is endothermic
 - rusting and corrosion are types of fires
- Oily rags are left in the corner of a garage. Over time they start to smoulder, then they ignite. What is the source of energy for ignition?
 - light energy
 - mechanical energy
 - chemical energy
 - compression energy

6. During combustion:
- the fuel is oxidized
 - the oxidizing agent burns
 - solid fuels burn
 - all of the above
7. Which of the following is/are considered to be fires?
- potassium gradually turns from silver to grey as it oxidizes in the air
 - magnesium ribbon produces white light after it is heated in a Bunsen burner
 - magnesium dust explodes in the flashbulb of a camera
 - all of the above
8. Fire is classified as an exothermic reaction because it:
- absorbs energy in the form of heat
 - releases energy in the form of heat
 - requires oxygen
 - produces smoke
9. Which of the following metals is NOT pyrophoric?
- potassium
 - magnesium
 - lithium
 - gold
10. When two solid powders are mixed together, the mixture gets very cold. This reaction is:
- endothermic
 - cryogenic
 - a combustion reaction
 - impossible
11. Which element in the fire tetrahedron is missing from the fire triangle?
- oxidizing agent
 - self-sustaining chemical reaction
 - matches
 - oxygen
12. The WHMIS symbol shown to the right indicates:
- a flammable organic material
 - a corrosive material
 - an oxidizing agent
 - a radioactive substance
13. The presence of an oxidizing agent will affect a fire by:
- increasing the oxygen supply to the fire
 - increasing the rate that the fire burns
 - making it so that the fire cannot be smothered
 - all of the above
14. A fire is burning in live electrical equipment. This would be classified as a:
- Class A fire
 - Class B fire
 - Class C fire
 - Class E fire
15. A fire is a Class A fire if:
- flammable liquids are burning
 - wood and paper are burning
 - pyrophoric metals are burning
 - self-oxidizing burnables are burning
16. Which of the following is a source of mechanical energy?
- friction
 - static electricity
 - a magnifying glass focussing light
 - both a and b
17. Many flammable gases can explode if they are compressed. The source of ignition energy is:
- friction
 - electrical
 - mechanical
 - chemical energy
18. Which of the following statements is **true**?
- gasoline vapours in an engine cylinder are ignited by mechanical energy
 - diesel vapours in a diesel engine cylinder are ignited by mechanical energy
 - diesel vapours in a diesel engine cylinder are ignited by electrical energy (a spark)
 - gasoline vapours in an engine cylinder are ignited by chemical energy



19. The static charge that can be built up getting into and out of a car is:
- a) 6 volts
 - b) 12 volts
 - c) 2000 V
 - d) 12,000 V
20. Why do 78% of fires started by static charges at gas stations happen to women?
- a) they are talking on cell phones
 - b) they are smoking cigarettes
 - c) they get in and out of their cars frequently
 - d) their shoes act as conductors
21. Fires started by static electricity at gas stations are becoming more common. What is one possible reason why?
- a) gasoline now contains much more ethanol, which ignites easily
 - b) people are wearing more synthetic clothing which builds up static
 - c) people are talking on cell phones while they pump gas
 - d) global warming has increased the temperature of the gasoline, so it ignites more easily
22. When you fill a gasoline container for your lawnmower, you should place it on:
- a) a blanket in the back of your vehicle
 - b) a rubber sheet in the back of the vehicle
 - c) on a damp piece of cloth at the front of the vehicle
 - d) the ground outside of the vehicle
23. What should you do if the gas vapours around your car ignite?
- a) immediately remove the nozzle from the gas tank
 - b) touch the front of your car to remove any static charges
 - c) immediately put the gas cap on the gas tank
 - d) leave the nozzle in the tank and get everyone out of, and away from, the car
24. Temperature is a measure of:
- a) the chemical energy of a substance
 - b) the state of a substance
 - c) how fast the particles in a substance are moving
 - d) the distance between the particles in a substance
25. Before it can burn:
- a) a solid fuel must vapourize
 - b) a liquid fuel must vapourize
 - c) a gaseous fuel must pyrolyze
 - d) all of the above
26. Why are finely divided powders, such as those used to make medicines, so dangerous?
- a) they can burn in the solid state
 - b) they have huge surface area
 - c) they are inhalation hazards
 - d) all of the above
27. Which of the following substances will burn most quickly in adequate oxygen?
- a) a chunk of magnesium
 - b) sawdust
 - c) gasoline
 - d) acetylene
28. The normal concentration of oxygen in the air is:
- a) 0.035%
 - b) 5%
 - c) 21%
 - d) 78%
29. What is the lowest concentration of oxygen that can usually support combustion?
- a) 1%
 - b) 8%
 - c) 14%
 - d) 21%
30. In which of the following locations would you anticipate an oxygen-enriched environment?
- a) a senior citizens' residence
 - b) a paper factory where paper is bleached with hydrogen peroxide
 - c) a chemical laboratory where a variety of compressed gases are used
 - d) all of the above

31. An “empty” gasoline contains about 75% octane vapour, 10% oxygen and air. This mixture is:
- too rich to burn
 - too lean to burn
 - an explosive mixture
 - impossible
32. Propane vapour is heavier than air. If a propane tank leaks, the propane can:
- settle into low areas like ditches
 - be ignited by static electricity
 - spontaneously ignite on a hot summer day
 - all of the above
33. Gasoline is a mixture of ethanol (which has two carbon atoms) and octane (which has eight carbon atoms). Which part of gasoline is more dangerous?
- octane because it is a larger molecule so it burns more quickly
 - ethane because it burns with a very hot, almost colourless, flame
 - octane because it burns in the liquid state
 - all of the above
34. Which of the following metals is **most** reactive?
- sodium
 - aluminum
 - copper
 - iron
35. Which of the following has the largest surface area?
- a 10 g chunk of magnesium
 - 10 g of magnesium ribbon
 - 10 g of powdered magnesium dust
 - all of these have the same surface area
36. A substance has a very high auto-ignition temperature. This indicates that the substance is:
- extremely combustible
 - highly explosive
 - unlikely to spontaneously ignite
 - safe to drink
37. Which of the following statements is/are true about the rate of combustion of a fuel?
- as the concentration of fuel vapours increases, reaction rate always increases
 - as the concentration of oxygen increases, reaction rate always increases
 - as the temperature of the fire increases, reaction rate increases
- I and II only
 - II and III only
 - I and III only
 - I, II and III
38. Which of the following substances will burn the most rapidly?
- ethane (C_2H_6)
 - butane (C_4H_{10})
 - hexane (C_6H_{14})
 - octane (C_8H_{18})
39. Which colour of flame indicates incomplete combustion?
- a colourless flame
 - a bright blue flame
 - a pale blue flame
 - a deep orange flame
40. Smoke is:
- a product of combustion
 - a complex mixture of gases
 - often highly toxic
 - all of the above
41. Which of the following substances produces the most toxic combustion products when it burns?
- paper
 - gasoline
 - alcohol
 - plastics
42. What is the greatest cause of fire-related death in firefighters?
- severe burns
 - inhaling toxic gases
 - getting trapped in a burning building
 - falling off ladders

43. Which of the following factors affects the type of combustion products produced by a fire?
- the type of fuel that is burning
 - the concentration of oxygen
 - the temperature of the fire
 - all of the above
44. What disease in firefighters has been linked to toxic smoke inhalation?
- certain cancers
 - Alzheimer's disease
 - obsessive-compulsive disorder
 - alcoholism
45. What is a firefighter's best protection against toxic smoke inhalation?
- SCBA
 - TLC
 - UFL
 - LD50
46. Which is the only type of heat transfer that can occur in a solid?
- conduction
 - convection
 - insulation
 - radiation
47. In which of the following examples is a fire spread by conduction?
- fire heats hot gases and they rise
 - a gas tank is compressed and explodes
 - fire in one building starts a fire in the building next door
 - a metal I-beam spreads heat from one end to the other
48. Heated gases rise because the heated particles:
- get larger and less dense, so they rise
 - move faster, spread out and become less dense, so they rise
 - absorb heat and move up by radiation
 - absorb heat which makes them smaller, so they rise
49. Which method of heat transfer is the most important in most fires?
- conduction
 - convection
 - radiation
 - direct flame contact
50. The order of the typical stages of fire development are:
- ignition → growth → flashover → backdraft → decay
 - ignition → flashover → growth → fully involved → decay
 - ignition → growth → flashover → fully involved → decay
 - ignition → growth → fully involved → flashover → decay

51. Referring to the diagram to the right, this fire is in the:
- ignition stage
 - growth stage
 - fully developed stage
 - smouldering stage

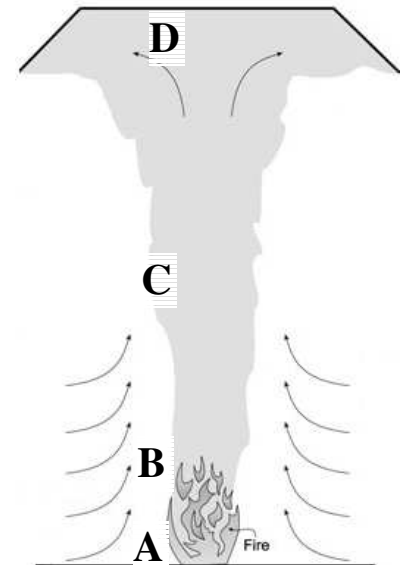
52. Referring to the diagram to the right, the hottest temperature is found at position:

- A
- B
- C
- D

53. Cool air is drawn into the bottom of the fire. The cool air is:
- entrapped
 - entrained
 - pyrolyzed
 - backdrafted

54. The pattern of smoke rising up from a fire is called a:
- flume
 - column
 - plume
 - rollover

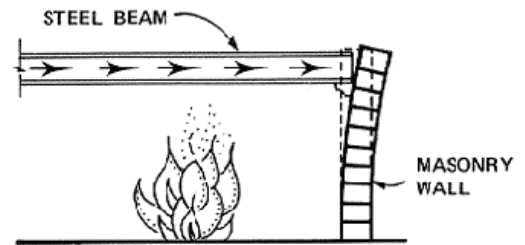
55. The pattern of heat transfer shown in the diagram is:
- conduction
 - direct flame contact
 - radiation
 - convection



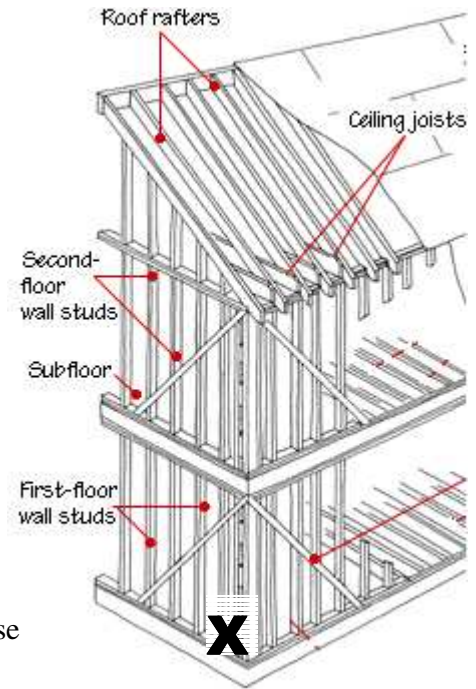
56. During what stage of fire development are you likely to see thermal layering?
- ignition
 - growth
 - post-flashover phase
 - decay
57. What happens during the decay phase of fire?
- the fire spreads and a plume develops
 - all combustible surfaces pyrolyze
 - all combustible surfaces ignite at the same time
 - fuel and oxygen are consumed, the fire dies down
58. Which of the following is/are signs that conditions are correct for backdraft?
- bright orange flames everywhere
 - the smoke is light and wispy
 - smoke moves in & out of the building in puffs
 - all of the above
59. What is the best way to prevent flashover?
- use water to swirl the hot gases over the fire
 - open windows and doors low in the building to cool the fire
 - cut a hole in the roof to ventilate the hot gases
 - keep all doors and windows closed to limit the oxygen in the building
60. Thermal layering is caused by:
- conduction
 - convection
 - radiation
 - ventilation
61. How is a compartment fire different from a fire outdoors? An outdoor fire is limited by:
- the amount of oxygen
 - the amount of fuel
 - the build-up of hot gases
 - all of the above
62. Super-heated combustible gases suddenly explode when oxygen is introduced to a room. This is called:
- backdraft
 - rollover
 - flashover
 - flashpoint
63. What burns during flashover?
- the hot gases from pyrolysis
 - the oxygen in the air
 - the solid furniture
 - all of the above
64. The building construction method shown in the picture to the right is called:
- balloon construction
 - platform construction
 - truss construction
 - board and baton construction
65. What is the major disadvantage of balloon construction?
- fire is contained to a single floor
 - the outside walls can explode
 - the roof can quickly collapse
 - fire can travel easily from the basement to attic
66. If a fire has been burning in a building with truss construction, how long is the building safe to enter after the fire starts?
- 5 minutes
 - 10 minutes
 - 15 minutes
 - 20 minutes
67. The symbol to the right indicates that a building has:
- engineered finger-joint I beams
 - an internal fire reporting system
 - metal I beams
 - a trussed roof and floor



68. In the diagram to the right, the masonry (brick) wall collapses. It collapses because the:
- heated bricks expand and collapse
 - heated steel beam expands and pushes the brick wall out, so it collapses
 - steel beam gets heavier when it is heated and the wall can't support its weight, so it collapses
 - bricks are weakened by the heat from the fire and collapse



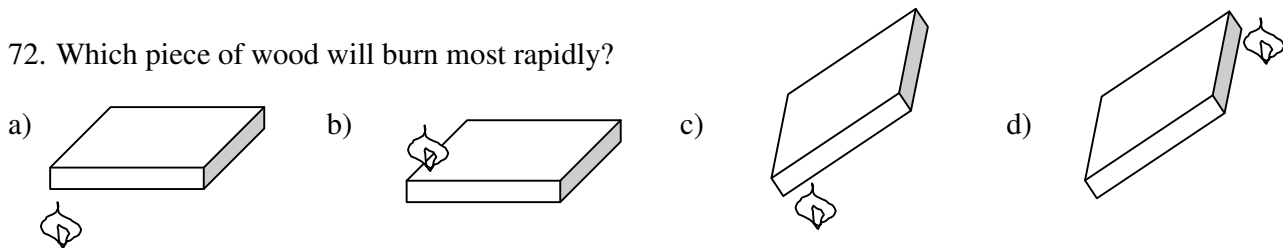
69. What type of construction is shown in the diagram to the right?
- balloon construction
 - platform construction
 - truss construction
 - I beam engineered construction



70. Suppose a fire started in the location marked by the "X" on the diagram, you would expect the fire to:
- be contained in the first floor
 - spread quickly to the second floor
 - spread quickly to the attic
 - burn out without spreading

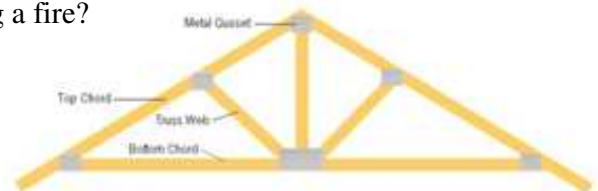
71. A modern home has an engineered finger-joint wooden "I" beam in the basement that supports the first floor. If there is a fire, it is important to know this because:
- the I beam may transfer heat by conduction to other parts of the house
 - the I beam may expand during heating and push out an exterior wall
 - the I beam may quickly burn through and allow the floor to collapse
 - all of the above

72. Which piece of wood will burn most rapidly?



73. For the diagrams in the question above, WHY will this piece of wood burn most quickly?
- heat is spread by conduction through the wood
 - convection carries heat up and pyrolyzes the wood above it
 - heat travels better horizontally than vertically
 - conduction is more important than convection in fire behaviour

74. What will cause the structure to the right to collapse during a fire?
- the metal gusset plates expand and pull out of the wood
 - the wood of the top chord burns through
 - the wood of the truss web burns through
 - the wood of the bottom chord burns through



75. The symbol to the left indicates that an extinguisher is appropriate for use on:
- ordinary combustibles
 - pyrophoric metals
 - flammable liquids
 - flammable gases



76. Class B fires involve burning:

- a) paper, wood or plastic
- b) flammable liquids
- c) live electrical equipment
- d) pyrophoric metals

77. A fire extinguisher has the following symbols on its tank. This extinguisher should NOT be used on fires involving burning:

- a) paper
- b) gasoline
- c) live electrical equipment
- d) furniture



78. A puddle of gasoline is on fire. It should be extinguished with:

- a) lots of cold water
- b) foam applied gently to the surface
- c) a forceful spray of carbon dioxide
- d) a “special K” extinguisher with sodium chloride

79. Water acts as an extinguishing agent by:

- a) smothering the fire
- b) removing oxygen from the fire
- c) cooling the fire
- d) interrupting the chemical reaction

80. Carbon dioxide should not be used on a pile of burning wood because it:

- a) is an oxidizing agent
- b) will spread the fire
- c) will provide additional fuel for the fire
- d) will not put the fire completely out, so it could rekindle

81. You should use a portable extinguisher if:

- a) the fire is more than 2 meters across
- b) there is so much dark black smoke you can't see the flames
- c) the fire is partially hidden by a wall or ceiling
- d) the fire is small and limited to the original material

82. A house is under construction and has not yet had the hydro or gas turned on. If the plastic coating on the wiring catches on fire, it is a:

- a) Class A fire
- b) Class B fire
- c) Class C fire
- d) both Class A and C fire

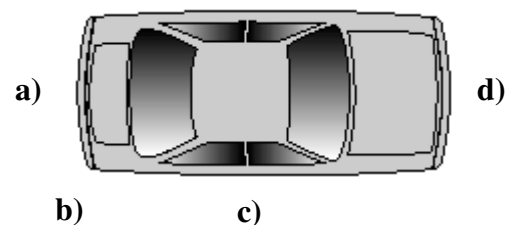
83. Breathing hot, toxic smoke can cause fire related deaths by:

- a) burning the throat and lungs
- b) triggering a heart attack
- c) containing poisons which can cause cancer
- d) all of the above

84. When responding to a fire involving a car or hazardous material, you should approach from:

- a) uphill and downwind
- b) downhill and upwind
- c) uphill and upwind
- d) downhill and downwind

85. Refer to the diagram to the right. When fighting a vehicle fire, where should the firefighters stand?



86. What hazard is often found in the posts that support the roof of newer cars?

- a) hydraulic cylinders
- b) plastic gas lines
- c) airbags
- d) batteries

87. What can explode during a vehicle fire?

- a) the gas tank
- b) the battery
- c) undeployed airbags
- d) all of the above

88. Which statement is true about car fires?
- firefighters do not need to wear SCBA because the fire is outside
 - the orange cables for the batteries of hybrid vehicles should be cut immediately
 - spilled fuel should be allowed to run into storm sewers and drains
 - firefighters should park the fire trucks 30 – 50 m from the burning car
89. When fighting a car fire, when it is safe to do so, the car battery should:
- be disconnected, if it is safe to do so
 - not be touched except to sprayed it with water to cool it
 - be removed from the car and set at the side of the road, if it is safe to do so
 - all of the above
90. In modern cars, hydraulic or compressed gas cylinders may be found in the:
- hatchbacks of small cars
 - under the hood
 - as tensioners on seatbelt assemblies
 - all of the above
91. What pyrophoric metal is increasingly being used in car construction?
- manganese
 - stainless steel
 - magnesium
 - potassium
92. The picture to the right shows a:
- WHMIS symbol for a compressed gas
 - Ministry of the Environment poison marker
 - placard for a truck carrying a dangerous good
 - marker to show the location of an underground natural gas line
93. If a pot of oil used for deep fat frying catches on fire, you should:
- carry it outside
 - pour water into it
 - put a lid on it
 - spray it with an A, B, C extinguisher



Answers:

1. c	11. b	21. a	31. a	41. d	51. b	61. b	71. c	81. d	91. c
2. d	12. c	22. d	32. d	42. b	52. d	62. a	72. c	82. a	92. c
3. d	13. d	23. d	33. b	43. d	53. b	63. a	73. b	83. d	93. c
4. a	14. c	24. c	34. a	44. a	54. c	64. a	74. a	84. c	
5. c	15. b	25. b	35. c	45. a	55. d	65. d	75. b	85. b	
6. a	16. a	26. b	36. c	46. a	56. b	66. a	76. b	86. c	
7. b	17. c	27. d	37. b	47. d	57. d	67. d	77. c	87. d	
8. b	18. b	28. c	38. a	48. b	58. c	68. b	78. b	88. d	
9. d	19. d	29. c	39. d	49. b	59. c	69. b	79. c	89. a	
10. a	20. c	30. d	40. d	50. c	60. b	70. a	80. d	90. d	