



2018 NZFBI EXAMINATION

Member A: Fireground Operations

**Saturday 1 September
0900 to 1200 hours**

EXAMINATION RULES AND INSTRUCTIONS TO CANDIDATES

1. Ten minutes will be allowed prior to the commencement of the examination for candidates to read the question paper, but they are not permitted to commence the examination until instructed.
2. Candidates are prohibited from introducing any books or papers of any kind into the examination room.
3. Candidates are not to communicate with, copy from each other, or communicate with anyone outside the examination room. Cellular phones are not permitted in the examination room.
4. Slide rules and silent non-programmable calculators may be used, subject to the scrutiny and satisfaction of the examination supervisor.
5. All written work must be completed in ink or good ball point pen, with drawings and/or diagrams in pencil. Drawing instruments may be used and are to be supplied by the candidate. Marks may be deducted for untidy work.
6. All answers are to be written in the combined question/answer books which will be handed in at the end of the examination. You can request additional paper from the examination supervisor if required.
7. Candidates should ensure that only their allocated examination number appears in the answer book. Do NOT write your name or brigade in the answer book or use them in the text of any of your answers – if required, use fictitious identification.
8. Candidates accept to abide by the rules of the New Zealand Fire Brigades Institute and accept the examination result as final. No correspondence will be entered into.
9. This examination contains five questions. Candidates are to attempt all questions.
10. Write the candidate number provided to you in the boxes below:

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Question 1: Fire Science

30 Marks

Knowledge of how materials are affected by fire helps identify hazards that may be present and determine possible fire spread in a structure.

1.1 Crews under your supervision have been tasked with fighting the following fires. Describe how fire affects common building materials below.

6 Marks

E.g. During a fire, steel:

- expands, and beams may push out load-bearing walls
- loses half its strength at approximately 550°C, leading to potential building collapse

During a fire, aluminium:

During a fire, concrete:

During a fire, masonry/stone:

During a fire, brick:

During a fire, glass:

During a fire, wood/timber:

1.2 Outline the four extinguishing principles. Give its definition, explain which essential component of a fire it removes and illustrate with examples.

8 Marks

i. _____

ii. _____

iii. _____

iv. _____

1.3 Fill in the missing information.

3 Marks

The _____ for fire are often represented using the 'fire triangle'. This shows the _____ between the elements. The _____ process is a continuous chemical reaction between fuel particles and oxygen. The heat released by this chemical reaction can cause fire to spread – and grow, as it transfers its energy into nearby _____ (combustibles). While the fire triangle illustrates the three main components of fire, there is a _____ combustible component – the chemical chain reaction. The 'fire _____' is a three-dimensional triangular figure.

1.4 Latent heat of vaporisation is the amount of energy absorbed when one kilogram of liquid is converted into a gas at its boiling point. Use the below examples to explain the effects of latent heat of vaporisation:

5 Marks

Steam burns

Cooling - (e.g. the release of LPG)

Volatile liquids - (e.g. methylated spirits or ether)

Refrigeration systems

Wind

1.5 The state of the extinguishing medium (solid, liquid, or gas) determines how successfully it can attack and affect the fire. Crews under your supervision have been tasked with fighting the following fires. Describe how the extinguishing medium affects the fire and give examples of extinguishing media (e.g. water)?

6 Marks

Gas extinguishing media

Liquid extinguishing media

Solid extinguishing media

1.6 Outline the difference between the *Flash Point* and the *Fire Point* of a bulk flammable liquid:

2 Marks

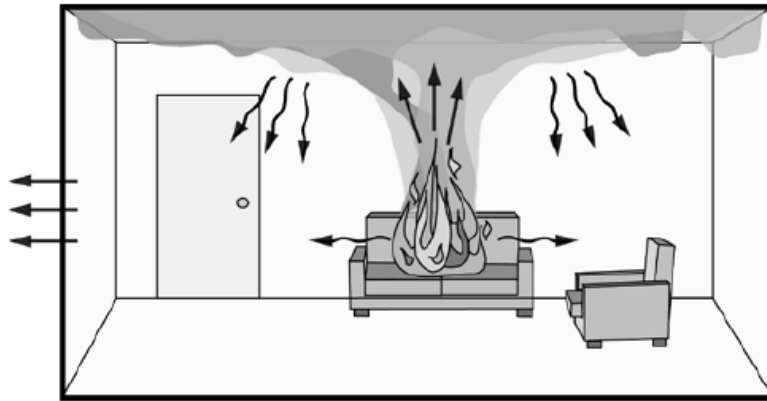
Question 2: Fire Attack

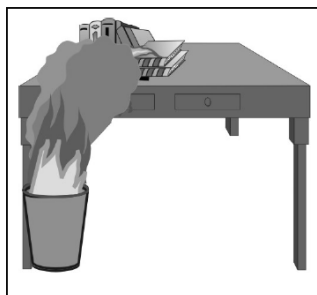
30 Marks

Heat is the by-product of combustion. It is the transfer of heat that causes fire to spread.

2.1 Name the methods of heat transfer for each of the images below and discuss how heat moves.

3 Marks







2.2. In each of the methods of fire spread identified above, use your knowledge of fire transfer to explain how you would control fires, and reduce the possibility of further transfer of the fire

6 marks

2.3. As a crew member, you need to understand burning rates as it determines how big the fire grows, and how quickly it develops. Explain the concept of Heat Release Rates, how is it measured and what a Heat Release Rate influences.

5 marks

2.4 Understanding Heat Release Rates is essential in recognizing potential fire hazards and estimating fire growth potential. In each of the cases below, explain the effects of fire and the hazards posed to the occupants. Refer to notions of fire load and fire load density.

8 marks

2.4.1 In a conference centre, chairs (metal frame and a small amount of low-density polyurethane foam structural material on the seat) stacked in tall piles and stored close together in a small storeroom.

2.4.2 In a house, single chairs are distributed in four separate rooms. The chairs are metal framed and consist of high density cotton padding on the seats and seat backs. There is one chair in each room.

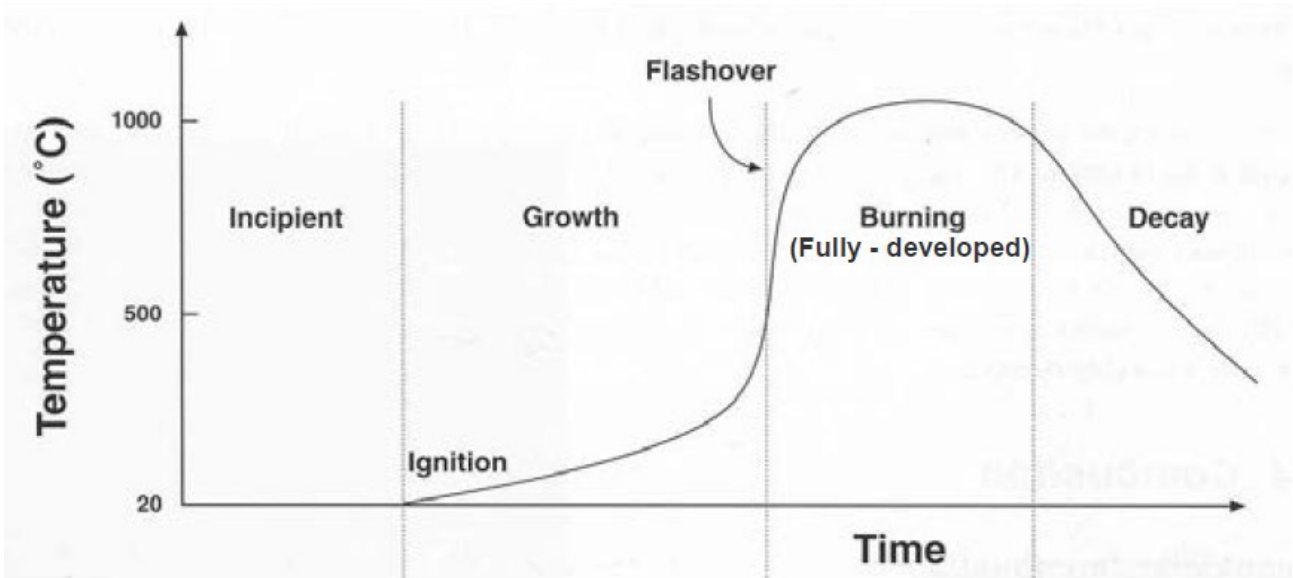
2.5.1 Fill in the missing information in the sentences below.

4 Marks

Many fires follow a pattern of _____ development phases, although the time-scales, rates, and magnitude of fires vary widely. A fire will only develop through the stages shown if sufficient _____, heat and _____ are present. Only a small proportion of fires that start will progress to the _____ phase, even when it appears conditions are favourable.

2.5.2 Fill in the missing information in the table below.

4 Marks



Stage	Incipient	Growth	Burning	Decay
Fire Behaviour	_____	_____	_____	_____
Detection	Smoke detectors	_____ or _____ detectors	External _____ and flame	
Active Control	No control	Smoke control Extinguished by sprinklers / FENZ Staff	External smoke and flame	
Passive Control	Control of materials	_____, surface spread of flame	Fire resistance, _____, prevent collapse	

3.1 Firefighting crews and the techniques they use in suppressing and extinguishing fires can have a significant effect on any following investigation into the cause of the fire.

Give eight examples of what firefighting tactics may compromise the investigation process and give an example of each.

8 marks

3.2 Explain the “Big Picture” attitude of fire investigation and give an example of why this is important.

3 marks

3.3 Explain the phenomenon of “Clean Burn”, the most common cause, and the chemical reason for its occurrence.

3 marks

3.4 During an investigation, a Specialist Fire Investigator may request details of the property involved in a "Pre-Fire Condition". Clearly explain what aspects of the pre-fire condition they may be interested in.

6 marks

3.5.1 Your firefighting crews have attended a structure fire in a living room. You have been tasked to assist a Preliminary Fire Investigator in deciding a cause. Using the photograph below, identify five factors that are of relevance to the investigation and the reasons why.

5 marks



3.5.2 Your firefighting crew have attended a structure fire in a garage. On arrival, the upper half of the inside wall above a wall plug was totally involved in fire before firefighting commenced.

As the incident controller you are required to decide a cause. Using the photograph below, identify five factors that are of relevance to your investigation and the reasons why.

5 marks



Question 4: Hazardous Materials

30 Marks

Hazardous Materials incidents require clear and concise strategies and tactics to safely resolve and render safe the materials involved. Crews will often need to draw on their collective training and experience to do this.

- 4.1 Numerous notifications are often made to external agencies as part of an incident. Name five agencies that are often notified by Fire and Emergency NZ staff and in what situation each of these agencies are likely to be notified.

5 marks

4.2 Complete the table below, selecting what level of decontamination is required for each situation, and in what order.

5 marks

Level of contamination	Stages of decontamination
Boots and hands only	
Full or part body – Level 2 PPE	
Full or part body – Level 3 or 4 PPE	
Full or part body – PPE compromised	
Full or part body – member of the public	

4.3 Where a hazardous material emergency exposes member of the public to gases, vapours or a risk of fire or explosion, people can be kept safe by using in-place protection, or evacuation.

Detail the factors that will influence the decision to provide in-place protection or begin an evacuation.

4 marks

4.4 When providing Situation Reports (SitRep) to FireCom for a hazardous substance incident, these generally follow the SHURTS format. Fully detail what each part of a SitRep will contain based on the SHURTS mnemonic and the corresponding information prompted by each letter.

5 marks

4.5 Where a hazardous material emergency requires the decontamination of staff or members of the public, this will vary based on the situation being dealt with. Describe ten different decontamination processes that can be used to resolve the contamination.

5 marks

4.6 Using the space below, draw a diagram or flow chart explaining a Stage Three decontamination setup. Identify each step of the process and clearly label each activity taking place along the setup. Ensure that the process covers each of the situations where a Stage Three decontamination is required.

6 marks

Question 5: Rescue

30 Marks

You are part of a crew responding to a single vehicle rollover with injuries to the driver having been reported. You are responding in a standard pumping appliance and your supporting rescue tender is 20 minutes behind you. Your crew leader has asked you to complete an initial survey of the vehicle and provide advice to the rescue tender crew leader when they arrive.

- 5.1 Based on the image below, detail five key considerations for patient extrication.

5 marks



5.2 The rescue tender arrives, and you brief the crew leader on your initial assessment. The rest of your pumping appliance crew have completed the stabilisation of the vehicle and the rescue tender crew have completed the staging.

The rescue tender crew leader begins the extrication using several methods. For each method outlined below, clearly describe the procedure of each method, naming each of the tools used.

5.2.1 Nader pin latch side crush

4 marks

5.2.2 Guard crush

4 marks

5.2.3 Roof rail spread

4 marks

5.2.4 B-pillar cut and spread

4 marks

5.2.5 Complete roof removal

4 marks

5.3 The extrication has not gone well, and Ambulance staff have advised that the patient needs to be removed immediately following the roof of the vehicle being removed. The patient remains trapped around their feet in the drivers footwell and the dashboard is on top of their knees. The crew leader of the rescue tender has asked you to assemble a crew with a back-board ready to remove the driver up over the back seats and boot area to the ambulance once the patient is freed.

Describe to the crew leader step-by-step the best means of freeing the patient and removing them safely into the ambulance, including the role your team will play.

5 marks
