

IFE Level 4 Certificate in Fire Science and Fire Safety

Unit 6 – Fire Investigation

Examiner Report – March 2020

Introduction

Entries for this examination were low and only 28 candidates attended to sit their examination.

46% of the candidates who sat the examination achieved a Pass. Candidates generally performed best on question 5 and least well on question 2.

Question 1

There are four recognised categories of combustion or fire types: diffusion flames, pre-mixed flames, smouldering combustion and spontaneous combustion as a result of self-heating. Describe each of these fire types in detail. (20 marks)

Examiner Feedback

This was the most popular option for candidates and all but two of the candidates attempted the question. The question covered the essential underpinning understanding required by fire investigators and it was not surprising that many candidates performed well. The average mark achieved was 8.

Question 2

The examination of the scene of an explosion differs to the examination of a fire scene in several ways. Explain in detail the approach and the methods used at an explosion scene, as opposed to a fire scene, in determining its origin. (20 marks)

Examiner Feedback

This question was not a popular option for candidates and those candidates that did attempt it often provided responses that contained generic points about fire investigation rather than focussing on methods specific to an explosion scene.

Examples of the sort of points that would have secured marks include the following:

- Preliminary search will reveal the extent of the direction of the spread of debris and fragments as well as an apparent seat of the explosion
- Scene overview and documentation is best accomplished from above eg via hydraulic platforms or drones
- The distance from the apparent seat to the farthest discovered fragment should be multiplied by 1.5 to establish a preliminary perimeter

- The perimeter may need expanding as the search progresses and reveals a specific direction such as produced by a pipe bomb
- In order to secure the scene, only essential personnel should be allowed to enter the scene
- Unlike evidence at fires where evidence can be more visible, explosion evidence is a lot smaller - ie tiny fragments and can more easily be disturbed
- Some explosions send debris/fragments in all directions but others have direction (pipe bombs)
- The primary goal of the scene search is the ID of displaced debris and a measurement of their distance from starting point

Question 3

- a) *Whenever human, or suspected human, remains are discovered at a fire scene, the fire investigator must consider six questions. The first question is whether the remains are human or not. If the remains are identified as being human, what are the remaining five questions that the investigator must consider? (5 marks)*
- b) *Explain why using friends or relatives to visually identify victims should be avoided. (7 marks)*
- c) *Carbon Monoxide (CO) is poisonous and is produced in fires due to incomplete combustion of carbon-containing fuel. Explain how the human body reacts to CO exposure and the process that can lead to death. (8 marks)*

Examiner Feedback

In responding to part a), many candidates failed to identify the key questions ie:

- Who is the victim?
- What was the cause of death?
- What was the manner of death?
- Was the person alive at the time of the fire and, if so, why did they not escape?
- Was the death due to the fire or only associated with it?

Part b) was usually answered well and many candidates secured most of the marks for their response to this element of the question.

Part c) required technical understanding. Most candidates secured only one or two marks for this element of the question as they were unable to provide the depth of detail required.

Question 4

- a) *Fires in open land involving grass, bush and trees are often termed “wildland fires”. In determining a fire’s origin, detail the burn indicators that can exist on trees to identify the direction of fire spread. (14 marks)*
- b) *Wildland fires are caused by many things including overhead power lines. Describe how power lines could initiate a fire. (6 marks)*

Examiner Feedback

This question was one of the most popular options for candidates. However, few candidates scored high marks. It appeared that candidates often relied on guesswork and/or wrote about their operational experience in extinguishing fires in this context.

Candidates generally performed better on part a) than on part b). Points that would have scored marks in responses to part b) included:

- Transformer short circuits causing overheated oil or molten metal to fall onto fuel
- Leakage over dirty insulators when moist leading to 'pole top' fires
- Fallen wires that arc with the ground
- Arcing between conductors in strong wind
- Grounding of in-place conductors by external objects (trees etc.)
- Unprotected fuses dropping hot metal

Question 5

An electrical circuit provides power to eight 500 watts halogen lamps fitted to flood lights positioned on the outside of a building. The cable is run internally through the insulated loft space of the building. The mains voltage supplied to the building is 240 volts, the circuit is protected by a 32 amp fuse and the cable is rated to carry a current of 17 amps when covered by 150mm of insulation.

- a) *Calculate the total current that will be drawn when all eight lights are switched on. Name and explain the formula used for the calculation. (5 marks)*
- b) *Calculate the current that will be drawn if an additional two lights are added to the circuit and state whether the miniature circuit breaker is sufficient to protect the circuit. (3 marks)*
- c) *If a fire occurs within the loft space of this building, and assuming that the fire originated with the lighting circuit, with the information provided:*
- i) *state what you think the most likely cause of the fire was and explain why. (3 marks)*
 - ii) *state whether the fuse would actuate. (1 mark)*
 - iii) *describe the evidence that may be observed to support your hypothesis. (8 marks)*

Examiner Feedback

Part a) and part b) were generally answered well with many candidates able to apply their underpinning understanding to complete the calculations.

Part c) was less well answered. Although some candidates were able to identify the most likely cause of the fire (ie that the current flowing in the circuit exceeds the current carrying capacity of the cable so the cable is likely to have overheated and caused the fire probably due to the insulating effect of the loft insulation), few were able to describe the relevant evidence in sufficient detail to secure more than a few (if any) marks.

Question 6

Fabrics differ greatly in their properties of combustion.

a) *Describe the properties of combustion for the following fabrics and give one example where each type of fabric might be found:*

i) *cotton (6 marks)*

ii) *wool (6 marks)*

iii) *nylon (6 marks)*

b) *Explain the effect that the weave of a fabric can have on its burning behaviour. (2 marks)*

Examiner Feedback

This was not a popular question. However, those candidates who did answer the question often provided good responses. The average mark attained for this question was 8.

Question 7

The fixed main wiring system within a domestic premises is a potential ignition source.

State five electrical faults and for each one describe:

- *how it occurs*
- *the evidence you would expect to find in the event of the fault*
- *the likelihood of the circuit protection operating and clearing the fault before ignition can occur.* (20 marks)

Examiner Feedback

This was a popular question. Although there were some good responses to this question, most candidates presented only basic information. Few candidates were able to provide five electrical faults and those that did often omitted to address all of the specific requirements set out in the question. The faults that could have been discussed in responses were:

- Mechanical damage to conductor
- Break in conductor/s
- Overload of cables
- High resistance connection
- Degradation/breakdown of cable insulation.
- Tracking fault

Question 8

Cigarettes are determined to be the ignition source for many fires. Describe the burning characteristics of a cigarette and explain the circumstances required for a cigarette to be considered as a competent ignition source. (20 marks)

Examiner Feedback

This was a popular option for candidates but few candidates scored high marks for their response due to the lack of technical understanding provided in responses.

Many candidates lacked understanding of the burning characteristics of cigarettes and, as a result, were unable to explore in detail the scientific factors affecting ignition.

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