

IFE Level 4 Certificate in Fire Safety and Fire Science

Unit 6 – Fire Investigation

Examiner Report – March 2018

Introduction

Entries for this examination were low with only 60 candidates booking examinations. Performance in the examination was better than in 2017 with 29% of candidates who sat the examination attaining a Pass.

Candidates generally performed best on question 4 and least well on questions 5 and 6.

Many candidates provided only brief responses to questions and often provided only a few points even where many marks were available. It was notable that candidates often omitted to provide the detailed scientific explanations that were required. The main reason why candidates failed the examination was lack of depth in responses.

Question 1

Explain the considerations to be taken into account when excavating and removing a body from a fire scene. (20 marks)

Examiner Feedback

The focus of the question was on the considerations when “excavating and removing a body”. Those candidates that focussed on considerations related to excavating and removing were able to attain high marks.

Unfortunately, many candidates failed to focus on the logistical issues involved in *moving* a body and wrote only about preserving evidence and recording the scene. Whilst some marks were awarded for considerations related to the scene and evidence, higher marks could have been attained for considering other issues such as potential damage to the body and subsequent implications for movement, requirements for PPE and the need to examine the floor area underneath the body.

Some candidates failed to consider the importance of taking into account the damage to the body and clothing as this was relevant both in terms of logistics of movement and also in terms of care in recording the condition for evidence purposes.

Question 2

a) Explain the conditions required for a stack of hay to self-heat to ignition. (12 marks)

b) Describe the evidence that would indicate a fire in a stack of hay is a result of self-heating as opposed to an introduced ignition source. (8 marks)

Examiner Feedback

Part a) asked candidates to identify and describe relevant conditions but few candidates provided more than a few basic points related to the way in which heat could build up. Few explored the ideal conditions for self-heating, the effect of moisture, the effect of the density and size of the stack or the length of time required for ideal conditions to develop.

Part b) was often answered very poorly with few referencing more than the fact that self-heating occurs within the centre of the stack. Other points that could have been made included:

- Burns to form a 'chimney' or 'flue' to the exterior of the stack.
- Unburned hay will often be a very dark colour caused by acid.
- Higher acidity than normal.
- Odours such as caramel or tobacco-like may be present.
- When spread apart, areas of unburnt hay may burst into flames with the addition of oxygen.

Question 3

a) Describe what is meant by a "plume pattern". (5 marks)

b) Explain how marks on ceilings and walls may be interpreted. (15 marks)

Examiner Feedback

In response to part a), most candidates were able to describe what is meant by a plume pattern although few identified that there are three types ie heat and flame impingement, soot deposits and radiated heat.

Responses to part b) generally lacked the depth required to secure high marks. Candidates were usually able to describe different types of marks but most failed to explain in any detail how these could be interpreted.

Question 4

a) Interviews with witnesses form an important part of any fire investigation. Explain the possible limitations of evidence provided by lay witnesses. (5 marks)

b) The PEACE Method is a system of interviewing that is used by police and fire investigators. Describe the components of this method of interviewing. (15 Marks)

Examiner Feedback

This question was generally answered well. Those candidates who were familiar with the PEACE method usually attained a high proportion of the marks available.

Question 5

Explain in detail the effects of both environmental temperature and humidity on fire initiation and development. (20 marks)

Examiner Feedback

This question was the least popular option for candidates. Those candidates that did attempt the question generally provided only brief responses and make few relevant points.

A wide range of issues could have been considered in responses including:

- The warmer the environment the faster the reaction in the incipient stage of the fire where the fire's own heat is very small (a warm fuel ignites easier than a cold fuel).
- Pre-fire ambient temperature may influence the self-heating process, the vapour pressure of ignitable liquids and the mixing of ignitable liquid vapour.
- Porous fuels dry out when relative humidity is low and are therefore more combustible.
- Humidity can influence the effect of small electrical arcs resulting from static and from striking materials such as a steel object with a rock.
- Static tends to accumulate in dry conditions because in wet conditions the charge can dissipate more readily through the moist air.

Question 6

The careless handling of cigarettes is widely accepted as one of the most common causes of accidental fires.

- a) *Explain in detail how a cigarette causes a suitable fuel source to ignite. Use furniture as an example to support your points. (15 marks)*
- b) *Explain why a lighted cigarette is not considered likely to cause the ignition of flammable vapours. (5 marks)*

Examiner Feedback

This question was a popular option for candidates but unfortunately few candidates attained more than a few marks.

Responses to part a) often included some relevant points. However, points made were not expanded sufficiently to describe issues or to illustrate the science behind the point and this limited the marks that could be attained.

In response to part b), many candidates repeated their response to part a) in relation to the heat release rate of cigarettes. Few candidates focussed specifically on the ignition of "flammable vapours" as required by the question. Points that could have been made included the following:

- Oxygen levels in the cigarette in the combustion zone are very low and CO₂ levels are very high, reducing the chance of ignition.

- Residence time of airborne vapour in the cigarette is so short that there is not enough time for any but the most reactive fuels to ignite.
- Only hydrogen, hydrogen sulphide, carbon disulphide, acetylene, ethylene oxide, phosphine and diethyl ether have the potential to be ignited by a burning cigarette.
- The ash surrounding the burning tobacco acts in the same way as with a miner's safety lamp.
- Although the temperature of burning tobacco is high, the surrounding ash is lower and may reduce the efficiency of heat transfer.

Question 7

Fire Investigators rely on many "indicators" at fire scenes to assist in identifying where a fire may have originated and in which direction it spread once ignited.

- a) *Describe in detail the properties of gypsum board (also known as plaster board) and explain how the process of "calcination" of gypsum board can assist the fire investigator. (12 marks)*
- b) *Explain the term "annealing" and explain how annealing can be a useful indicator when examining the steel springs of furniture involved in a fire. (8 marks)*

Examiner Feedback

Part a) of the question was often answered well. Some candidates described the use of gypsum wall boards rather than focussing on the composition and properties as required by the question. This meant that they were unable to explore how the process of calcination can assist the fire investigator. Candidates should be aware that the detectable changes (mechanical and visible) are proportional to the intensity and duration of the exposure to fire and that mapping of the degrees in calcination in rooms can be compared to other indicators. The lack of detail and scientific explanation provided in responses limited the marks that could be attained.

In response to part b), some candidates demonstrated good understanding of annealing and attained high marks. Candidates sometimes provided good explanations of annealing but did not go on to explain how it can be used in fire investigation –again, the science behind the issues was largely omitted.

Question 8

- a) *With regards to the structure of flames, explain the following terms:*
- Diffusion and pre-mixed flames. (6 marks)*
 - Laminar and turbulent flames. (6 marks)*
- b) *An integral part of every fire is the transfer of heat, both to the fuel and away from it.*
- Define the term "heat flux". (4 marks)*
 - Briefly explain the terms "heat" and "temperature". (4 marks)*

Examiner Feedback

Responses were often very brief and generally lacked the scientific detail required at this level. The marks available indicate how many relevant points are required but candidates often only provided only very brief statements. Candidates should be aware that understanding the science behind fire is essential to the fire investigator.