IFE Level 3 Certificate in Fire Investigation

Examiner Report – March 2026

Introduction

Of the 20 candidates who took this examination, 15 (75%) achieved a pass mark.
Candidates generally performed well on questions 3 and 7, both of which were popular and, in most cases, answered to a good standard. Question 3 (average mark 12.1) assessed knowledge of electrical protection devices, while question 7 (average mark 13.1) examined candidates' understanding of the scientific method. Both topics relate to fundamental principles of fire investigation, and it is therefore expected that candidates operating as fire investigation officers would demonstrate a sound level of competence in these areas.
Candidates performed least well on questions 2 and 8. Question 2 (average mark 6.1) required candidates to explain the characteristics of deflagration and detonation explosive events, while question 8 (average mark 6.2) examined their understanding of commonly used fire investigation terminology, specifically annealing, spalling, and calcination.
Examiners noted a recurring issue in questions requiring explanation or application of knowledge. Candidates did not consistently provide the type or depth of response needed to access higher marks. Many answers remained descriptive or list-based, even where a more developed discussion was required. As a result, responses often lacked sufficient depth, context, and reasoning.

Question 1

a) Describe how photovoltaic solar panels work. (10 Marks)

b) Describe the common causes of fires attributed to photovoltaic solar panel systems. (10 Marks)

Examiner Feedback
This question proved unpopular, and the overall standard of responses was relatively low.
In part (a), many candidates demonstrated a basic understanding of photovoltaic (PV) systems, recognising that PV cells generate DC electricity which is converted to AC for use within a building or for storage. However, relatively few responses explored the underlying principles of electricity generation within PV cells or demonstrated a broader understanding of system configuration, voltages, and protection measures.
Part (b) proved more challenging, with few candidates demonstrating a detailed understanding of the fire risks associated with PV systems. Stronger responses recognised the hazards associated with DC systems, particularly the increased risk from sustained arcing, and considered a wider range of failure modes such as installation defects, equipment faults, hotspots, damaged cabling, and battery storage system failures.
Overall, responses to both parts would benefit from a more detailed and applied understanding of photovoltaic systems and their associated fire risks. Candidates are encouraged to review the relevant reading material, including *A Guide to Fire Investigation* and *Future Homes* by Electrical Safety First, to support their knowledge in this area.

Question 2

Define and briefly explain the characteristics of the following explosive events:

a) Deflagration. (10 Marks)

b) Detonation. (10 Marks)

Examiner Feedback
This was a relatively popular question; however, most responses did not achieve a pass standard.
In part (a), many candidates described the combustion process but did not fully explain the explosive characteristics of deflagration. Stronger responses recognised that deflagration involves rapid combustion within a flammable fuel–air mixture, with flame propagation occurring at subsonic speeds and pressure increasing as combustion develops, particularly in confined spaces.
Part (b) presented similar challenges, with many candidates struggling to clearly distinguish detonation from deflagration. Higher-scoring responses demonstrated an understanding that detonation involves a supersonic shock wave and produces significantly greater overpressure and destructive effects. Candidates who recognised the association with high explosives and the role of confinement generally achieved higher marks.
Overall, candidates would benefit from a clearer understanding of the differences between deflagration and detonation, particularly the mechanisms of flame propagation, pressure development, and the effects produced by each phenomenon. Candidates are encouraged to consult A Guide to Fire Investigation (Chapter 20, pages 218–221) to support their learning in this area.

Question 3

In relation to electrical protective devices, describe the physical and operating features of the following devices:

a) A cartridge fuse. (8 Marks)

b) A miniature circuit breaker (MCB). (5 Marks)

c) A residual current device (RCD). (7 Marks)

Examiner Feedback
This was a popular question, although the overall standard of responses was average.
In part (a), a number of candidates confused cartridge fuses with rewireable fuses and did not fully describe their construction or operation. Stronger responses demonstrated an understanding of how cartridge fuses operate, their key components, and their role in protecting against overcurrent conditions.
Part (b) was generally answered more effectively, with higher-scoring candidates demonstrating a sound understanding of the construction and operation of miniature circuit breakers (MCBs), including their thermal and magnetic tripping mechanisms and resettable nature.
Part (c) was the strongest section overall, although some confusion remained regarding the function of residual current devices (RCDs). Stronger responses correctly identified that RCDs provide protection against electric shock by detecting earth leakage currents rather than overload or short-circuit faults.

Overall, candidates would benefit from a clearer understanding of the differences between these protective devices, particularly their construction, operating principles, and specific protective functions. Candidates are encouraged to consult A Guide to Fire Investigation, Chapter 14 (pages 147–151) and Chapter 11 (pages 104–105), to support their learning in this area.

Question 4

Define the term "combustion" and explain the combustion process in terms of the Fire Tetrahedron. (20 Marks)

Examiner Feedback

This was a popular question and, overall, candidates produced a reasonable standard of response.

Candidates are reminded that combustion is defined as an exothermic oxidation reaction that proceeds at a sufficient rate to produce detectable heat and light. In most cases, combustion occurs in the gaseous phase; however, this fundamental aspect was not always clearly articulated.

Most candidates recognised the four components of the fire tetrahedron: fuel, oxygen (oxidiser), heat, and the chemical chain reaction, with an understanding that removal of any one will prevent combustion.

Stronger responses demonstrated greater depth in explaining how these elements interact. In relation to fuel, better answers noted the need for solids and liquids to undergo pyrolysis or vaporisation to produce flammable gases within their flammable limits. For the oxidiser, some candidates recognised that oxygen is the most common oxidising agent but that other substances (such as nitrates, chlorates, peroxides, and certain halogens) can also support combustion.

In terms of heat, higher-scoring responses identified the requirement to raise the fuel to its ignition temperature and sustain vaporisation or pyrolysis. The chemical chain reaction was less well developed in many answers, although stronger responses referred to the formation and propagation of reactive species (free radicals) that sustain combustion.

Overall, while knowledge of the fire tetrahedron was generally sound, candidates would benefit from more detailed explanation of the underlying processes, particularly phase change and the chemical chain reaction. Candidates are encouraged to consult A Guide to Fire Investigation (Chapter 4, pages 20–23) to support their understanding in this area.

Question 5

With regard to the investigation of vehicle fires:

a) *State the potential ignition sources that may be the cause of an accidental vehicle fire. (10 Marks)*

b) *Describe the circumstances that may lead you to suspect that a vehicle has been set on fire deliberately. (10 Marks)*

Examiner Feedback

This was a popular question; however, it generally attracted lower marks.

In part (a), some candidates incorrectly identified fuel sources (such as leaks) as ignition sources, indicating a lack of distinction between fuel and ignition. Stronger responses demonstrated an understanding of common vehicle-related ignition sources, including hot surfaces (e.g. catalytic converters, exhaust systems, turbochargers), electrical faults, and components such as batteries, alternators, wiring systems, and aftermarket equipment. Additional credit was given where candidates identified less obvious sources such as frictional heating, under-inflated tyres, and ignition from discarded smoking materials. Reference to static electricity also strengthened responses.

In part (b), although some candidates recognised general indicators of deliberate fire-setting, many responses lacked a vehicle-specific focus. Generic statements, such as multiple seats of fire alone, were insufficient. Stronger answers were evidence-based and considered factors such as the introduction of additional combustible materials, absence of expected accidental causes, and indicators of preparation or concealment.

Higher-scoring responses also identified contextual and physical indicators, including forced entry, evidence of ventilation changes, vehicle relocation, altered or removed identification, and unusual positioning. Witness accounts and the presence of ignitable liquid containers or related materials further strengthened responses.

Overall, candidates would benefit from a more structured, vehicle-specific approach, ensuring conclusions are supported by clear investigative reasoning and relevant evidence. Candidates are encouraged to consult A Guide to Fire Investigation, Chapter 18 (pages 193–196), for further guidance.

<u>Question 6</u>

a) *'ELBOWS' is an acronym that relates to the established rules for the taking of contemporaneous notes at the scene of an investigation. Outline the rules as defined by the ELBOWS acronym. (8 Marks)*

b) *State the information that should be included and annotated in diagrams/sketches when recording a fire scene. (12 Marks)*

Examiner Feedback

This was a popular question, and the overall standard of responses was adequate, with part (a) being particularly weak.

In part (a), many candidates demonstrated little or no understanding of the 'ELBOWS' acronym. These practices are essential to maintain the integrity and continuity of evidential records.

E	Erasures - ensuring that no erasures are made to entries. Any errors are instead struck through, initialled, and corrected
L	Lines missed - no blank lines are left, any unused space or pages are struck through with a single line and initialled;
B	Blank spaces – As with Lines missed, strike through with a single line and initialled
O	Overwriting is avoided
W	Written in ink - notes should be written in indelible ink at all times
S	Spare pages or unused pages should be clearly marked, typically with a diagonal line and an annotation such as "omitted in error."

Part (b) was answered to a better standard, with most candidates demonstrating an awareness of the information that should be included within diagrams or sketches. Stronger responses recognised that sketches should provide a clear visual representation of the scene, typically through floor plans or, where appropriate, more detailed two- or three-dimensional drawings. Higher-scoring answers included reference to the identification and annotation of key features

such as areas of fire damage, burn patterns, and indicators of fire development, including the area of origin and direction of travel.
More comprehensive responses also included the recording of items of evidential significance, such as the location of fatalities, appliances, or points of interest, as well as structural features including openings, penetrations, and routes for fire and smoke spread. Candidates who achieved higher marks also demonstrated an understanding of good practice in sketch preparation, including the use of scale (or clear indication if not to scale), compass direction, and clarity of presentation. Additional relevant details included the annotation of excavation areas, individual item sketches where necessary, and contextual information such as CCTV positions, escape routes, or environmental factors where relevant.
Overall, while part (b) was generally better understood, both parts of the question would benefit from a more structured and detailed approach. Candidates are encouraged to ensure that their knowledge of evidential recording practices is both accurate and sufficiently developed.
For clarity candidates are directed to IFE – A Guide to Fire Investigation, Chapter 16 page 159 - 165.

<u>Question 7</u>

a) *Using a diagram, describe the stages of an investigation following the scientific method. (11 Marks)*

b) *Identify the wide spectrum of factors that a working hypothesis must rely on. (7 Marks)*

c) *Explain the difference between 'inductive' and 'deductive' reasoning. (2 Marks)*

Examiner Feedback
In part (a), most candidates performed well and achieved near full marks. The stages of the scientific method were generally well understood and clearly presented. Higher-scoring answers also incorporated the review stage, recognising the importance of identifying missing information, anomalies, or aspects of the investigation that do not align with the proposed hypothesis.
Part (b) produced a more varied standard of response. Stronger answers demonstrated an understanding that a working hypothesis must be based on a wide range of factors rather than a single line of enquiry. These included fire dynamics and modelling, fire testing, professional guidance and standards, fire pattern analysis, and detailed fire scene assessment. Candidates who achieved higher marks also recognised the importance of forensic evidence, human behaviour, witness testimony, environmental conditions, and the use of historical data.
Part (c) was generally answered adequately, although some candidates lacked precision in distinguishing between inductive and deductive reasoning. Stronger responses identified that inductive reasoning involves forming conclusions or developing theories based on observations, patterns, and experience, whereas deductive reasoning involves testing those theories against established facts, principles, or known data. Higher-quality answers also recognised the importance of developing and eliminating alternative hypotheses as part of a structured and objective investigative process.
Overall, while part (a) was well understood, parts (b) and (c) would benefit from greater depth, clarity, and application of investigative principles.
Candidates are directed to IFE – A Guide to Fire Investigation, Chapter 2, pages 8-9, along with Kirks Fire Investigation, Chapter 1, pages 12-16.

Question 8

With regards to scene examination and excavation techniques, explain the following terms:

a) Annealing. (5 Marks)

b) Spalling. (10 Marks)

c) Calcination (5 Marks)

Examiner Feedback

This question was both unpopular and poorly answered. A number of responses demonstrated a fundamental misunderstanding of these concepts.

In part (a), stronger responses correctly identified annealing as the process by which metal—particularly spring steel—loses its temper or elasticity when exposed to elevated temperatures, typically in the region of 600°C to 650°C. Candidates who achieved higher marks recognised that this can result in deformation or collapse under load. More developed answers also demonstrated an understanding that such damage must be interpreted with caution, as deformation may also result from mechanical factors such as falling debris or firefighting activities. Stronger responses further considered the evidential value of annealing in indicating fire development, including potential directionality or whether heating was localised or more widespread, such as in post-flashover conditions.

Part (b) was generally poorly answered. Of particular concern was that some candidates incorrectly identified spalling as evidence of the use of accelerants or as proof of deliberate ignition. Stronger responses identified spalling as the breaking, flaking, or crumbling of concrete, masonry, or similar materials as a result of thermal and/or mechanical stresses. Higher-scoring candidates explained that this occurs due to the release of water from the cement matrix when heated, combined with differential expansion between aggregates and surrounding material. More developed answers also recognised the role of steam generation within the material, particularly in "green" concrete, and the potential for pressure build-up leading to explosive spalling. Additional credit was awarded where candidates identified other contributing factors, such as the expansion of reinforcing steel or rapid cooling from firefighting jets. Importantly, stronger responses made clear that while spalling may indicate intense heating and significant fuel involvement, it is not, in itself, an indicator of the use of ignitable liquids.

In part (c), better responses demonstrated an understanding of calcination as the loss of chemically bound water from materials such as gypsum when subjected to heat. Candidates who achieved higher marks explained that gypsum-based products, such as plasterboard, will undergo dehydration, leading to shrinkage, cracking, and a loss of structural integrity. More developed answers also noted the progressive change in appearance, including colour changes from grey to white, and the potential to use patterns of calcination as an indicator of relative heat exposure within a compartment. Stronger responses recognised that such indicators can assist in mapping areas of more intense heating, although care must be taken in their interpretation.

Overall, candidates would benefit from a clearer understanding of these commonly encountered fire effects and their evidential significance. Misinterpretation—particularly attributing such effects to accelerants or deliberate ignition without supporting evidence—should be avoided. Candidates are advised to consult Kirk's Fire Investigation (Chapter 7, pages 183–184 and 288–289) to support their understanding in this area.