

L4C6



THE INSTITUTION OF FIRE ENGINEERS
Founded 1918 • Incorporated 1924

IFE Level 4 Certificate in Fire Science and Fire Safety

Unit 6: Fire Investigation (T/505/5936)

Friday 13 March 2020

10.30 – 13.30

Instructions to Candidates

1. The time allowed for this examination is **THREE** hours.
2. Candidates must answer **SIX** questions from the total of **EIGHT** questions set for this examination.
3. All questions carry equal marks and may be answered in any order. Candidates should follow the instructions provided in the question when composing their responses.
4. Candidates should record all of their answers in the answer book provided.
5. The question paper must be handed in with the answer book.

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)

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)

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)

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)

Question 5

An electrical circuit provides power to eight 500 watt 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)
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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)
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[Please turn over]

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)

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)
