



THE INSTITUTION OF FIRE ENGINEERS
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Examination Committee's Report on IFE Examinations held in March 2008.

This report on the IFE's examinations held in March 2008 was compiled by the Institution's Chief Examiner, Dr. J. A. Marsden, based upon individual reports submitted by the members of the Examinations Committee.

As the Institution's Chief Examiner I am pleased to present the report for the IFE's International Examinations which were held in March 2008. The report is compiled by the Examination Committee as a whole, and this year we have decided to name it accordingly.

In 2008 we organised a second session of examinations in mid-April for three UK fire and rescue services. This report does not cover the question papers and candidates' answers for that session.

This year saw another increase in the number of candidates registering for the Institution's examinations in March as well as an increase in the number of papers they took. Examiners were delighted to see new examination centres established in the Caribbean, West Africa and Europe.

Traditionally, the purpose of the Chief Examiner's Report is twofold:-

1. To provide a concise yet general summary of candidates' responses to the questions they answered across the range of papers offered. There is not space to report in detail on the different variations in knowledge and understanding evident in individual answer scripts during the marking process.
2. To help prepare future candidates for their attempts at the Institution's examinations. Although this report does contain details of examiners' "suggested answers", they do not represent full or complete answers and are intended primarily to illustrate the comments being made about the type and quality of answers submitted by candidates.

Candidates for IFE Examinations in 2009 should bear in mind the following points:-

1. Every examination answer is considered on its merits. In fulfilling their professional role, examiners must provide a series of projected answers to the examination questions they set. However, these answers do not preclude credit being awarded for other accurate, relevant knowledge and comment given by candidates, and they are revised as necessary when the marking of "live" scripts begins.
2. For the examinations in 2008, we included information and advice on preparing for examinations. This document is entitled **Study Skills** and it has been revised and amended for 2009.
(To download this document on the IFE website, please use the following hyperlink:- http://www.ife.org.uk/docs/Study_Skills.doc.)

This document gives advice on methods by which candidates can maximise their marks in future examinations. As in previous years, candidates lost marks in the examinations of 2008 in one or more of the following ways:-

- **Lack of preparation.** A number of candidates wrote several answers that merited pass marks, but as they had not covered the syllabus thoroughly enough, the rest of their answers did not reach the same standard. It was disappointing to see many candidates start their scripts with several good answers only to fail the exam paper because their remaining answers were very brief and lacking in detail or depth of understanding.
- **Lack of relevance.** Many candidates wrote down a good deal of information on a particular topic without applying this information to the wording of the question. The guidance advises candidates to ensure the information they write down is relevant as well as accurate, and that their knowledge must be applied in the way that the phrasing of the question demands. In particular, every question contains key **command words** such as “discuss”, “explain” and “describe”: these key words tell candidates what examiners are looking for in an answer. Even when candidates write long detailed essays, if they are not answering the question directly, they cannot be awarded high marks.
- **Lack of planning.** It is important to organise thoughts and structure answers before writing essays in an examination. Even a brief plan will help achieve this. As with many tasks or projects, the more methodical and systematic candidates are when approaching examinations, the more likely it is that they will be successful.
- **Poor time management.** Candidates should manage their time properly by dividing the time available for the examination evenly among the questions so that each one can be answered carefully and thoroughly. This is especially important where candidates find one examination paper particularly difficult. Then it is all too easy to take too long on the first four or five questions, leaving little or no time for the final answers. It was noticeable that many candidates who completed only five answers ended as borderline failures. Better time management which allowed them to complete a final answer would almost certainly have resulted in a pass grade.

Once again I would like to state that in setting and marking the Institution's examinations in 2008, (as in previous years,) the Institution's examiners follow a code of practice that is similar to that applied by other examining bodies. Examination question papers go through a rigorous process of drafting, evaluation and validation before they are printed and sent out to the examination centres. Our examiners are growing in numbers yet they remain unpaid volunteers who conduct themselves in a professional manner, paying due regard to achieving consistency when standardising their marking and to accuracy and objectivity when assessing scripts. I extend very warm thanks to them for contributing their expertise and energy generously and tirelessly on behalf of the Institution's examination candidates.

Eur Ing Dr J. A. Marsden BEng CEng MinstE FIFireE. Chief Examiner.

Membership Examinations.

Paper 1: Fire Engineering Science.

Question 1.

A Venturi meter is to be fitted in a horizontal pipe of 0.25m diameter to measure a flow of water which may be anything up to 300m³/hour. The pressure head at the inlet for this flow is 20m above atmospheric and the pressure head at the throat must not be less than 7m below atmospheric. Between the inlet and the throat there is an estimated frictional loss of 10% of the difference in pressure head between these points.

Calculate the minimum allowable diameter for the throat.

This question was only attempted by a small number of candidates, with the standard of answers varying from very good to very poor. It was clear from the majority of answers that the Bernoulli theorem was not fully understood.

Question 2.

a) Describe fully the following terms:

- i. Spontaneous heating.*
- ii. Spontaneous ignition.*
- iii. Spontaneous combustion.*

b) For each of the terms listed give specific examples of substances or occurrences.

This question was attempted by a large number of candidates and was generally well answered. It dealt with some fundamental issues and most candidates recognised it a good “bread and butter” examination question.

Question 3.

Discuss the development of a fire occurring in the following locations:

- i. Against a vertical surface.*
- ii. Within corners.*
- iii. On an inclined surface.*

The majority of candidates answered this question. However, some of the answers lacked depth and an understanding of what was required. Generally, candidates described the phenomena of flashover and backdraught when they should have been describing flame development.

Question 4.

Describe fully the extinguishing process that occurs when using a dry powder extinguisher on a fire.

This question was generally poorly answered by the majority of candidates who attempted it. The question specifically asked for a description of the extinguishing process, but very few answers included an account of the chemical action of dry powder extinguishers.

Question 5.

Describe the uses, the physical properties and the associated hazards of Liquid Petroleum Gases (LPG).

This question was a popular choice amongst candidates and it was generally well answered. The uses, properties and hazards associated with LPG are known and understood widely. It would have been a matter of concern if candidates had not acquitted themselves well in answering this question.

Question 6.

- a) Define the terms **bonding** and **earthing** as used in electrical installations.
- b) Describe in detail the essential features of an earth fault loop, including the means by which it can be a source of ignition.

In the majority of answers to this question, candidates answered the first part of the question well, but it was apparent there was a complete lack of knowledge about earth fault loops and their significance.

Question 7.

- a) Describe fully the following terms:
 - i) **Fire Load**
 - ii) **Fire Density**Include in your answer typical fire loads for an office and residential apartment
- b) Calculate the fuel load energy in an office that measures 5x5 metres and contains 200kg of dry wood and paper and 100kg of plastic materials.
Assume the following calorific values:-
Wood and paper: 16 MJ/kg.
Plastic: 30 MJ/kg.

This question was attempted by a large number of candidates and was generally well answered. However, some candidates failed to recognise the difference between *Fire Load* and *Fire Density*.

Question 8.

With reference to steel framed buildings and those constructed of concrete:-

- a) Compare the essential structural features of each.
- b) Contrast the relative merits of each when exposed to fire.

In general, this question was well answered by the candidates who attempted it. Some candidates, however, gave descriptions of building types and did not comment upon the elements of construction.

Paper 2: Fire Safety.

Question 1.

You are reviewing a risk assessment where the building manager has included using non-firefighting lifts in the evacuation plan. Discuss the issues that you would expect the manager to have considered.

A large number of candidates gave good quality answers to this question, however too many failed to discuss the use of lifts or to indicate the control measures necessary for their safe use in an evacuation plan.

Question 2.

Discuss the various aspects of a contingency plan for a sports stadium.

This question was generally answered well by candidates, although some did not understand the term *contingency plan*.

Question 3.

In recent times there have been environmental concerns over some of the traditional extinguishing media used in fixed installations. Explain these environmental concerns and discuss the alternatives that are available.

This question was popular with candidates and generally they answered it well. However, many candidates wasted time on environmental issues and would have achieved higher marks by demonstrating knowledge of more modern extinguishing media.

Question 4.

- a) *Using an annotated diagram, illustrate a typical fire resisting door and label the essential parts.*
- b) *Specify where vision panels would be required in fire resisting doors.*

This was another popular question. There were some good diagrams as well as many poor ones, where the labelling lacked sufficient detail.

Question 5.

- a) *In relation to **occupancy**; when considering escape from a building, discuss the following factors:*
 - i. *Sleeping risk*
 - ii. *Mobility*
 - iii. *Response to the fire alarm*
- b) *The escape process from buildings can be expressed in four distinct stages. Identify the four stages and fully describe each one.*

Candidates who had done the required reading scored high marks on this question. However, some candidates proceeded to give extended answers that omitted the salient points, gaining no extra marks.

Question 6.

Discuss the benefits of incorporating sprinklers in buildings and other structures.

Many candidates answered this question well, however some misread the question and spent too long describing how a sprinkler system works. No candidate mentioned the benefits of sprinkler systems in heritage buildings.

Question 7.

You have been tasked with producing a strategy for dealing with an increasing number of false alarms from premises protected by fire detection and alarm systems. Outline what you would include.

Many candidates failed to gain high marks for their answers to this question. While providing remedies for individual buildings, generally they did not include a strategy.

Question 8.

As a fire safety adviser you have been asked to provide fire safety advice on a new bulk spirit storage facility in your district. Describe in detail the points you would cover as part of your advice.

While some candidates had clearly read the appropriate sources and provided good answers, a number gave general fire safety advice rather than focusing on a bulk spirit storage facility.

Paper 5: Strategic Human Resource Management.

Question 1.

*Your director of Human Resources has asked you to produce a paper entitled **Diversity in the Workplace** concentrating particularly on the stages involved in developing an effective diversity policy. Your paper should address the following issues:*

- a) *Write a paragraph to define **diversity**.*
- b) *Briefly describe 4 barriers to diversity in the workplace.*
- c) *Outline the stages in developing an effective diversity policy.*

This question was popular with candidates, although generally they did not answer part b) well. Here they lost marks by not mentioning political correctness and mistaken identity.

Question 2.

“Organisations face current and future challenges which demand clear leadership.” Briefly discuss this statement and produce a clear leadership model that you are familiar with, outlining the key strategic imperatives of your model.

This was not a popular question and few candidates answered it well. Too many answers consisted of lists of points: at Membership level, examiners expect candidates to discuss issue and use critical analysis in their answers.

Question 3.

As a manager it is often necessary to delegate some of your work. Write a memorandum to your line manager outlining the following:

- a) *What is **delegation**? Why is it necessary? Give examples of some benefits.*
- b) *Outline the stages of a delegation process.*
- c) *Outline the points to consider in a delegation brief.*

This question was generally well answered, although candidates lost marks for not producing a memorandum, which was what the question asked for.

Question 4.

As a manager you have to make decisions on a daily basis. Design a simple model for decision making for use by a junior manager, and briefly comment on the importance of accurate relevant and sufficient information in establishing an effective decision making process.

Many candidates who attempted this question lost marks by not designing a decision-making model.

Question 5.

*You are asked to give a lecture on your organisation’s **grievance procedure** to a group of new employees. Write out your lecture, which should include answers to the following points:*

- a) *What are grievance procedures?*

- b) *Why are grievance procedures important?*
- c) *What are the steps in raising a grievance?*
- d) *How should grievance procedures operate?*
- e) *What records should be kept in a grievance procedure?*

Many candidates attempted this straightforward question: it was generally answered well. Those who understood the importance of systematic procedures and record keeping and who articulated the rationale behind the three stages were rewarded with high marks.

Question 6.

*Specify the information required to write a **job description** and a **person specification**.*

This was a popular question, attempted by many candidates. Although generally well answered, some candidates produced lists of items without any description and consequently they lost marks.

Question 7.

*You have been asked to give a presentation on **job evaluation**. Write out your presentation, which should include answers to the following points:*

- a) *What is a job evaluation?*
- b) *What is the purpose of job evaluation?*
- c) *What aspects of jobs are evaluated?*
- d) *Briefly explain 2 methods of conducting a job evaluation.*

Parts c) and d) of this question were not answered well by the majority of candidates who attempted this question. Duties, tasks and environments should have been covered in part c), while analytical and non-analytical methods should have been discussed in part d).

Question 8.

Describe how the leadership of individuals and team members can influence control.

This was not a popular question, and very few candidates attempted it. Marks were awarded for outlining the purpose, scope and direction of leadership, as well as for considering the aspects of leading a team and leading individuals.

Paper 6: Fire Service Operations.

Question 1.

- a) *In connection with a floating vessel, define the following terms:*
 - i) **centre of buoyancy.**
 - ii) **centre of gravity.**
 - iii) **freeboard.**
 - iv) **tons per inch.**
 - v) **metacentric height.**
 - vi) **righting lever.**
- b) *Explain the interrelationship between these terms.*

Few candidates attempted this question. The answers of those that did ranged from very good indeed to very poor. Those candidates who understood the terms and drew clear diagrams scored high marks. No candidate discussed the importance of freeboard or tons per inch.

Question 2.

*You have been asked to develop a **standard operating procedure** to deal with acetylene cylinders that have been exposed to fire. Discuss the relative merits of the different options, explaining the advantages and disadvantages of each.*

Answers to this question required a discussion of the relative merits of different approaches to this matter. Many candidates focused on standard operating procedure.

Question 3.

*You are the Officer in Charge at a fire involving an electrical transformer. Summarise the factors you will need to consider in fighting the fire.
(Your answer should cover **hazards, automatic protection and firefighting.**)*

Generally, answers to this question failed to cover the three areas specified in sufficient detail. Some candidates wrote very brief answers which were not substantial enough to gain high marks at this level of examination.

Question 4.

Explain the procedures and techniques that should be used in dealing with a large oil tank fire with adjacent tanks which are not yet ignited.

Overall, this question was well answered by those that attempted it. Candidates who covered the necessary operations to protect adjacent tanks scored high marks. Few candidates explained the difficulties involved in getting foam to form a blanket on tanks that were already alight and creating thermal updraughts.

Question 5.

You have been called to a fire in premises containing radioactive materials.

- a) *Explain the hazards to personnel which this incident presents.*
- b) *Describe the protective measures that can be adopted.*

To answer this question well, candidates were required to explain the nature of radioactive materials and how these properties cause hazards for people nearby. Candidates also needed to describe the protective measures necessary and explain the importance of record keeping and on-going health monitoring.

Question 6.

You are called to an incident where a teenager has gone missing whilst trying to build a raft on a river with some friends. Identify and explain the criteria you would take into consideration when assessing this incident.

Very few candidates attempted this question and not many identified the important criteria used to assess the requirements for resolving this type of incident.

Question 7.

*You have been asked to write a set of procedures for use by the emergency services at incidents on motorways (or other high speed roads with multi-lane carriageways). **Summarise the essential elements of these procedures**, which should cover the following:*

- a) *The positioning of fire appliances and other emergency vehicles.*
- b) *The measures to ensure that on-coming traffic avoids the accident.*

This was a popular question and it was answered well, with several candidates scoring more than 15 marks. Most answers were supported by good quality diagrams and all covered the safety critical points with no dangerous practices suggested.

Question 8.

*You are to produce a training note for operational staff on **backdraughts**. The note has to follow the instructions below:*

- a) *Define the phenomenon of **backdraught**.*
- b) *Explain its causes.*
- c) *Detail the signs and symptoms of a **backdraught**.*
- d) *Describe the actions to be taken by firefighters in this situation.*

Most candidates who attempted this question understood the term *backdraught* and its associated dangers. However, many were uncertain about its causes, the mechanisms that could result in the ignition of flammable gases and how the flame behaves in the gas cloud.

Paper 7: Aero Fire Studies.

Question 1.

Discuss the potential problems which airport rescue and fire-fighting services may face when attending an incident involving one of the new generation of large passenger aircraft such as the A 380.

Although this was a straightforward question, it was poorly answered by the majority of candidates who attempted it and who failed to achieve a pass mark. Candidates at Membership level should understand the need to anticipate future developments and discuss potential problems before they actually occur.

Question 2.

Describe in detail the considerations that should be taken into account when preparing an emergency plan and emergency procedures to deal with an aircraft accident.

This was the most popular question with candidates, who generally answered it well. The question asked candidates to “*Describe in detail...*”: those who wrote down lists of items tended to score low marks.

Question 3.

With specific reference to an aircraft crash in a populated urban area, discuss the problems that may be encountered in liaising with the local responding agencies.

This was another popular question, which unfortunately, was poorly answered. The question asked candidates to discuss the problems of liaison. Unfortunately some described the actions taken by airport fire services instead.

Question 4.

You have just been appointed as a senior airport fire officer and you have been given the task of formalising the co-operation and co-ordination of operations with the local civil fire department.

- a) *Prepare an itemised agenda for the first co-ordination meeting. What would you aim to achieve from this first meeting?*

- b) *Explain how you could develop these original agenda items into an eventual action plan for the co-ordination of the responding fire fighting forces.*

This question was generally answered well, with the majority of candidates producing structured and thoughtful answers. Those who were awarded the highest marks included strategic and tactical considerations in drawing up plans for concerted action by the two groups.

Question 5.

- a) *Discuss the location of airport fire stations in relation to the statistically established pattern of accident sites on airfields.*
b) *Explain the reasons for and against locating airport fire stations at these sites.*

Generally, candidates who attempted this question answered it rather poorly. Those who had read and retained information on this topic in the recommended study material produced good detailed scripts.

Question 6.

You have been asked to deal with the press and world media at an aircraft accident at your airport where there has been a large number of fatalities. Describe in detail the information that would be required to enable you to complete this task.

This question was neither popular with nor answered well by candidates and less than 50% of those who attempted it achieved a pass mark. Candidates at Member level should be able to anticipate a range of difficult or sensitive situations where thoughtful leadership is required.

Question 7.

'All airport terminal buildings should be fitted with sprinklers and smoke control'. Discuss this statement.

This fairly popular question was generally poorly answered. Some candidates attempted descriptions of fire alarm systems, which did not attract marks. The question specifically asked for a discussion about the statement given.

Question 8.

Explain in detail the reasons for carrying out post-incident debriefs. Discuss the necessity for sharing the results of debriefing across the other emergency services.

Many candidates attempted this question but unfortunately few answered it well. The key phrases in the question were "Explain in detail the reasons for..." and "Discuss the necessity for sharing...". Candidates must read examination questions carefully and work out what they are being asked to do in writing their answers.

Paper 8: Fire Investigation.

Question 1.

- a) *Using an item of upholstered furniture as an example, describe in detail the following:-*
i) *The initiation of smouldering combustion;*
ii) *The transition from smouldering to flaming combustion.*
- b) *What evidence would you look for if you wanted to confirm that a fire had commenced with a period of smouldering in an item of upholstered furniture?*

This was intended to be a relatively straightforward question that most candidates could attempt. It was generally well answered with most candidates covering all sections of the question in detail.

Question 2.

*Compare and contrast the conditions required for **flashover** and **backdraught** to occur.*

This was another question that most candidates attempted successfully. Extra marks were given for good diagrams and figures such as heat flux and temperature requirements.

Question 3.

In respect of a fatal fire, the coroner will require answers to a number of specific questions. Give six example questions and indicate how Fire Investigators can provide the answers.

This question was poorly answered. Candidates did not understand what was required and did not answer the question directly. It was clear that many had not read the bibliography for this paper.

Question 4.

*Discuss how and why burn patterns may lead an investigator to **wrongly determine** a fire as having had multiple areas of origin.*

In general this was another poorly answered question with many candidates submitting long but irrelevant essays. There were however some well thought out answers among the scripts and they were awarded high marks.

Question 5.

Glass is a material often found at fire scenes and one that can provide the investigator with valuable information and evidence of events prior to and during a fire.

- a) *Outline in detail the various types of damage that can be found in glass collected at fire scenes and describe how this may have been caused.*
 - b) *Explain what inferences the investigator can draw from each type of damage.*
 - c) *How would you differentiate between:*
 - i) *The fragments of shattered, toughened glass?*
 - ii) *The fragments of glass subjected to an explosion?*
- (N.B. Use diagrams to illustrate your answer where you can.)**

Most candidates attempted this question by relying on common sense and experience. In general the question was well answered and candidates picked up marks with accurate and labelled diagrams.

Question 6.

Describe the effect that the location of the fire within a compartment can have on plume development.

The majority of candidates gave the wrong answer as they had not read and understood the question. Rather than describing the effect of the location of the fire in relation to its development, most candidates went on to describe smoke and burn patterns produced by the fire in relation to its location.

Question 7.

*In general terms, fatalities in fires die **either** through asphyxiation, poisoning and burning, **or** through non fire related causes such as murder and natural illness.*

Explain how the work of the pathologist and the results of a post mortem examination can assist the fire investigator.

This was not a popular choice of question and it was poorly answered by those who attempted it. Candidates appeared to be guessing at what was required rather than relying on knowledge and understanding gained through study.

Question 8.

- a) *Describe the difference between an electrical fire and an appliance fire.*
- b) *Analyse in detail one circumstance in which an electrical fault can develop into a fire.*

This question was answered by those who attempted it either relatively well or extremely poorly. The question calls for a level of technical knowledge and understanding; the poor answers submitted appeared to originate from candidates' general knowledge only.

Paper 11: Civil Emergency and Disaster Management.

This was very much a minority examination paper, taken by a very small number of candidates. With such a small sample, it is not possible to generalise about the standard of the answers or about the questions candidates found straightforward or difficult. The questions are reproduced below:-

Question 1.

*Explain the benefits of planning in relation to disasters and give the general principles involved in building a **planning framework**.*

Question 2.

Discuss the safety considerations of the emergency services in dealing with the hazards associated with a major incident.

Question 3.

*Explain the purposes of a **Survivor Reception** or **Rest Centre** in the proactive and reactive stages of a major incident.*

Question 4.

Describe and explain the considerations to be taken into account when making plans for a temporary mortuary.

Question 5.

*Explain the purposes of a **Police Casualty Bureau** and describe how it should operate following an incident involving mass casualties.*

Question 6.

Discuss the problems of site management during the recovery of bodies from a major disaster and how health and safety risks could be minimised.

Question 7.

*Explain the term **Post Traumatic Stress Disorder (PTSD)**. Who may be affected by it and what are its symptoms?*

Question 8.

From an incident management perspective, discuss the facilities that should be made available to the media when dealing with a disaster on an international scale.

Graduateship Examinations.

Paper 1: Fire Safety.

Question 1.

- a) *Describe the behaviour of structural steelwork in buildings when subjected to fire.*
- b) *Describe, in detail, the methods of providing solid and hollow fire protection for steel columns.*

This question was popular with candidates and generally they answered it well. Some candidates failed to answer part b) adequately and they lost marks.

Question 2.

- a) *State the purpose for which a firefighting shaft is provided.*
- b) *Detail the criteria which would determine the need for a firefighting shaft.*
- c) *Detail the features which should be incorporated into the design and construction of a firefighting shaft.*

There were a number of disappointing answers to this straightforward question. Many candidates did not read the question properly and so failed to provide the information required by the question.

Question 3.

Fixed installations utilising carbon dioxide are advantageous in extinguishing fires in a variety of situations and manufacturing processes.

- a) *List the limitations of carbon dioxide as an extinguishing agent.*
- b) *What are the main factors which determine the type of installation and the amount of carbon dioxide for the installation?*
- c) *List THREE examples of the type of risk where a carbon dioxide fixed installation can be used satisfactorily.*

This was a popular question with candidates from around the world, and most of those who attempted it answered in depth, scoring good marks. Those who relied on their own experience instead of supplementing that with study produced rather superficial answers that did not attract such high marks.

Question 4.

- a) *By means of an annotated drawing, illustrate a typical ionisation smoke detector and label its main parts.*
- b) *List two other types of smoke detectors and provide one example where each type would be the preferred choice, explaining why that would be the case.*

Many candidates attempted this question, and for the main part it was answered well. The diagrams which accompanied answers were generally accurate and detailed.

Question 5.

Indoor play areas present a number of fire safety hazards. Discuss these hazards and how they can be managed.

Unfortunately this question was not well answered by the majority of candidates who attempted it. Many answers failed to discuss children's indoor play areas and focused on sports halls instead.

Question 6.

You are the head of a local authority fire safety department and are required to develop a matrix of fire safety inspections so that the department's resources can be allocated on a risk basis to undertake inspections. Produce a simple one sheet risk matrix for inspection priorities and explain the level of risk and frequency allotted to each building type.

There was a disappointing response to this question with few candidates achieving a pass grade. Candidates did not produce a matrix in their answers and did not seem to understand that a risk assessment model was required as part of the answer to this question.

Question 7.

Discuss the design freedoms that can be permitted in houses of multiple occupation (HMO) if residential sprinklers are installed.

This question was poorly answered. Candidates failed to read the question properly, giving general descriptions of sprinkler systems rather than discussing design freedoms as the wording of the question required of them.

Question 8.

- a) *What are the two functions which a fire door may have to perform should a fire occur?*
- b) *State the three qualities of fire doors for which performance standards are specified.*
- c) *Explain the identification marks which should be found on doors to indicate their fire resisting qualities.*

This was a very popular question, and those candidates who had studied the recommended sources achieved high marks.

Question 9.

- a) Explain fully what is meant by the terms **inherent** and **added** in relation to the fire qualities of building materials.
- b) Specify the **FOUR** principal factors upon which the stability of a brick wall depends.
- c) Explain, in detail, the **SIX** principal reasons for the collapse of walls at fires.

This question dealt with a subject that is generally well known to firefighters. Many candidates attempted this question and achieved good marks, correctly differentiating between the terms in section a) and identifying the factors required in sections b) and c).

Question 10.

Modern buildings provide the means of escape for disabled people. In this context, explain what is meant by the following:-

- a) *Escape routes*
- b) *Refuges*
- c) *Ramps*
- d) *Lifts*

Answers to this question were generally disappointing. Many candidates had difficulty defining the terms used and very few demonstrated knowledge and understanding of the requirements of disabled people.

Paper 2a: Operations.

Question 1.

You are the safety officer at a severe fire in a four storey building with brick walls, a slate roof and wooden floors:

- a) *Describe the signs of collapse.*
- b) *Explain the causes of collapse in a building affected by fire.*

Although this traditional question was answered by many candidates, overall it was not answered well. This was disappointing, given the importance of this topic in general firefighting duties.

Question 2.

With regard to a storage tank fire at an oil refinery:

- a) *Define **slop over** and **boil over**.*
- b) *Explain the causes of both.*
- c) *Describe the actions to be taken to deal with a fire involving the surface of a storage tank.*

This question was popular with candidates, many of whom answered it well and scored a pass mark. Some candidates confused "slop over" with "boil over" with regard to the definitions and the causes.

Question 3.

In relation to shipping:

- a) *Define the following terms: **heel**, **list** and **loll**.*
- b) *Describe the actions necessary to correct **list** and **loll** safely.*

This question was answered by few candidates. Those that attempted it submitted good answers and scored pass marks. The terms used required clear definition and a good level of understanding.

Question 4.

You are the Officer in Charge at a fire in a shopping mall. You decide it is necessary to commit more than 15 breathing apparatus wearers over a prolonged period. Describe in detail the control and support measures you would put in place in order to:

- a) *Ensure the safety of the B.A. wearers.*
- b) *Provide them with effective support.*

This question was attempted by the majority of candidates, most of whom answered it well with some scoring almost full marks. Several scripts discussed incident command systems, and whilst some marks were awarded for safe procedures, they did not directly answer the question asked.

Question 5.

- a) *Outline the methods of producing low expansion foam.*
- b) *Describe the operational uses of low expansion foam.*
- c) *Explain the factors which affect the effectiveness of low expansion foam.*

The majority of candidates who attempted this question made the error of describing how low expansion foam is produced from pump to branch. Although the second part of the question asked for operational uses, many candidates omitted to do this and lost valuable marks.

Question 6.

You have been called to an incident in which a vehicle has collided with a wooden pole carrying an overhead electrical supply. One of the transmission lines has fallen onto the vehicle.

- a) *Outline the actions you will undertake to rescue the occupants of this particular vehicle.*
- b) *Produce a flowchart which provides general guidance on the rescue of a person in the vicinity of electricity.*

This question focused on actions to be taken where the risks involved high voltage electricity rather than road traffic collisions or accidents. Many candidates concentrated on the road traffic aspect of the scenario and lost valuable marks by not answering the question posed. The question specifically asked for a flowchart: this instruction was ignored by many candidates, to the detriment of their marks for this question.

Question 7.

*With reference to hydrology and river dynamics, explain **five** of the following terms:*

- a) **Standing wave or haystack.**
- b) **Eddy and eddy fence.**
- c) **Strainer.**
- d) **Smiling hole.**
- e) **Frowning hole.**
- f) **Downstream V.**

This was not a popular question, but those candidates that attempted it generally gained a pass mark. Although the question asked for explanations, many candidates offered diagrams. These were acceptable and helped these candidates score well.

Question 8.

*You are the Officer in Charge of the initial attendance at a collision involving two cars. Explain how you will deal with the glass in the vehicle windows. Your answer should **describe the options** and **explain the different techniques required** for dealing with toughened and laminated glass.*

Although this was a popular question with candidates, generally it was answered poorly. Some candidates failed to mention “*respiratory protection*” as part of their personal protective equipment and others were confused in differentiating between toughened and laminated glass, losing marks as a result. Many candidates stated that they would use their hands to clear broken glass. This is an unsafe practice and tools should be used for this purpose.

Question 9.

You are in charge of an operation that requires water to be brought to the incident ground from a distant source.

- a) Outline the options available to you.*
- b) Describe how these options may be carried out.*
- c) Explain the advantages and disadvantages of each option.*

This question was chosen by many candidates who recognised it as an important element in fire service operations. The principles of water relaying were generally well understood, as were the advantages and disadvantages of the different options available.

Question 10.

- a) Describe what you would take into account when carrying out positive pressure ventilation (PPV) at an incident.*
- b) Produce a simple aide-memoire which explains the basic principles of tactical ventilation.*

This was not a popular choice of question among those who took this paper. Candidates attempting this question showed a good understanding of the operational requirements of PPV in section a). On the whole, section b) was poorly answered, with most candidates submitting either irrelevant or very generalised answers that were not sufficiently detailed.

Paper 2c: Aero Fire Studies.**Question 1.**

- a) Explain in detail the term **Full Emergency** in relation to aircraft.*
- b) List and define the other categories of aircraft emergency.*

This was by far the most popular question, in which many candidates were unsurprisingly well versed. Those who attempted it achieved a good pass mark.

Question 2.

- a) Describe the rescue procedures for the release and rescue of aircrew from fixed wing military aircraft.*
- b) Describe two other hazards that may be found on military aircraft.*

The majority of candidates attempting this question produced good scripts. However, a number of candidates lost marks by using some of the answer to part a) to answer part b).

Question 3.

Explain the hazards presented to rescue personnel by wheel fires and hot brakes, and the techniques used to deal with such incidents.

This proved to be a popular question, with many candidates achieving a good pass. Those who failed gave answers which contained dangerous practices.

Question 4.

- a) *List the types of aviation fuels in use and state their physical properties.*
- b) *Compare and contrast the fire hazards of aviation fuels.*

This was another popular question with a high pass rate. Additional marks were awarded to those candidates who included in their answers the comparison chart which can be found in the manual.

Question 5.

Outline the specifications, characteristics and requirements for a major airport fire fighting vehicle, in optimum conditions.

Generally, this question was not well answered by those candidates who attempted it. The most common fault was digression: candidates simply did not provide the information that was requested.

Question 6.

Describe the procedures for the removal of bodies from an aircraft accident site.

The majority of candidates attempted this question, with most of them achieving passes. No marks were given for describing first aid procedures

Question 7.

- a) *Describe the general purposes for which hangars are used.*
- b) *Define the different classifications of aircraft hangar.*

This question was answered well and showed that the candidates who attempted it had worked their way through the syllabus thoroughly.

Question 8.

- a) *Define the different categories of helicopter.*
- b) *List the materials used in helicopter construction.*
- c) *Describe the hazards likely to be encountered in helicopter accidents.*

This question was popular with candidates. In the majority of cases, answers to this question showed good levels of knowledge and understanding.

Question 9.

*Describe in detail the provision and use of **Rendezvous Points, Standby Points and Staging Areas.***

Generally, this question was answered well by those who attempted it. Surprisingly, a number of candidates had little real understanding of the three areas specified in the question, yet still they proceeded to answer it.

Question 10.

Cutting operations involving the materials of construction can present significant hazards to rescue personnel. Describe the hazards involved and outline suitable protection measures.

This question was poorly answered on the whole, with a number of scripts advocating dangerous practices where a common sense approach was vital.

Paper 3: Fire Engineering Science.**Question 1.**

- a) *Define the term **combustion**.*
- b) *Explain the principles involved in the extinction of fire by referring to the chemical reactions that occur.*

This question was attempted by a large number of candidates, who in general answered it well. However part b) required a substantial amount of detail and this was lacking from some answers.

Question 2.

- a) *Define the terms Boyle's Law, Charles' Law and the general gas laws.*
- b) *A thick walled steel cylinder is used to store compressed air. This cylinder is fitted with a safety valve which opens at a pressure of 1×10^6 N/m. It contains air at 19°C with a pressure of 0.7×10^6 N/m. At what temperature will the valve open?*

This was a popular choice of question with candidates, and it was generally well answered. Some candidates neglected to convert the temperature into Kelvin and this resulted in an incorrect answer.

Question 3.

- a) *If the chemical formula of Heptane is C_7H_{16} calculate the quantity of carbon dioxide produced from 18kg of Heptane.*
- b) *A circular pool of Heptane measures 2.0 metres in diameter and is burning freely in air. The mass loss rate from the fuel surface is $0.050\text{kg m}^2 \text{sec}$. What is the fire size? The heat of combustion of Heptane is 44MJ/kg . Atomic weights are as follows: $\text{C}=12$, $\text{O}=16$, $\text{H}=1$.*

Although few candidates were attracted to this question, the answers that were submitted were of a very high standard. Success in this question hinged on candidates' ability to balance equations and make calculations from the result.

Question 4.

At an incident the only source of water is a private swimming pool which measures $25\text{m} \times 5\text{m}$ with a bottom sloping uniformly from 4m to 1m . The incident commander requires four 20mm jets, operating from 70mm hose and working at a nozzle pressure of 8 bars from a pump set into the swimming pool. Assuming the pool can be completely emptied, how long will the water last?

This question was attempted by the large majority of candidates who answered it very well and achieved high marks. The correct formulae were generally well remembered and the calculations were relatively straightforward.

Question 5.

Explain why plastics are a special hazard when involved in fire. Provide suitable examples to illustrate your answer.

This question was poorly answered by those that attempted it. Very few scripts covered the behaviour of plastics when exposed to fire, and yet the question specifically asked for this.

Question 6.

a) *Define the following terms used in radioactivity:*

- i) *half-life*
- ii) *radio-isotope (disintegration).*

b) *Use the following data with a suitable graphical method to determine the half-life of the element shown:*

| | | | | | | | | | |
|------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| <i>Time (mins)</i> | <i>0</i> | <i>15</i> | <i>30</i> | <i>45</i> | <i>60</i> | <i>75</i> | <i>90</i> | <i>105</i> | <i>120</i> |
| <i>disintegrations</i> | <i>556</i> | <i>472</i> | <i>357</i> | <i>291</i> | <i>257</i> | <i>227</i> | <i>200</i> | <i>175</i> | <i>150</i> |

c) *Give practical examples where the following would be used:*

- i) *an element with a short half-life.*
- ii) *an element with a long half-life.*

Most candidates achieved good marks for this question by submitting accurate definitions and well drawn graphs.

Question 7.

a) *If a 8kW heating element at 220V is used to heat 16 litres of water from an initial temperature of 20°C, what will be the temperature of the water after 7 minutes?*

b) *If the same element is used at a voltage of 110V, how long would it take to heat the same amount of water from the same initial temperature to reach the same final temperature?*

(N.B. The specific heat capacity of water is 4200J/kg °C)

This question was attempted by the majority of candidates whose answers were generally of a high standard. Some candidates however lost marks by failing to calculate the correct values in part b).

Question 8.

a) *Sketch and describe the operation of a step down transformer.*

b) *Give two examples to illustrate the use of a step down transformer.*

In general, answers to this question were unsatisfactory, with poor diagrams lacking in detail accompanied by vague written descriptions.

Question 9.

a) *Describe the properties of Chlorine and the hazards of dealing with a leakage of Chlorine.*

b) *Provide a balanced equation of the reaction of Chlorine with water.*

This question dealt with a subject that is generally well known to firefighters. It was well answered by the large number of candidates who attempted it.

Question 10.

In relation to combustible hydrocarbons:

- a) State the two classes and determine in which class the following compounds belong:
- i. Butane
 - ii. Benzene
 - iii. Propane
 - iv. Toluene
- b) Two of the compounds listed above are known to burn with a smoky flame. Identify these compounds and explain why this is so.

Only a small number of candidates attempted this question. However, those that did submitted accurate and detailed answers.

Paper 4: Human Resource Management.

Question 1.

There are four basic elements in the control process of a management system. Explain the key considerations in each element.

A number of candidates answered this question wrongly by writing about planning and organisation. Marks were gained by outlining the following:-

- Set standards of performance.
- Measure performance.
- Compare results obtained with standards.
- Initiate corrective action where required.

Question 2.

- a) *Explain the difference between an informal and a formal appraisal.*
b) *Summarise the main reasons why appraisals are carried out in organisations.*

This was a popular question and was generally well answered. Most candidates understood that informal appraisal involved the on-going assessment of an individual's performance while formal appraisal was a more formal and systematic process.

Question 3.

As a manager you have taken over a newly-formed group or team.

- a) *What features would you expect to see in an effective group?*
b) *Describe how you would identify any shortfall in the ability of individual team members to undertake their role.*

Although this question was popular with candidates, most of those that attempted it did not realise that the answer to part b) involved undertaking a training needs analysis.

Question 4.

Suggest what steps a manager could take to motivate the workforce.

A number of candidates used Herzberg and Maslow in answering this question, but did not give enough explanation. However, most candidates who attempted this question achieved a pass.

Question 5.

Explain the key aspects of the decision-making process. Include a labelled diagram to illustrate and amplify your answer.

This question was not popular with candidates, but those who did attempt it scored good marks. These candidates included some excellent diagrams, some of which were almost word perfect.

Question 6.

- a) *Detail a method of analysis that an organisation could undertake to assess its current performance and external environment.*
- b) *Explain the term **SMART objectives**.*

Most candidates struggled with part a) of this question. They would have received higher marks had they described a SWOT method of analysis. Part b) was generally well answered.

Question 7.

- a) *List and briefly explain the guide of good practice in undertaking a selection interview.*
- b) *Summarise the difference between **closed** and **open** questions.*

Some very good answers to this question were submitted by a number of candidates. However, some of them did not read the question carefully and covered recruitment and selection in their answers instead of focusing on interviews.

Question 8.

- a) *Outline the various methods by which a manager might gain personal development from experiential learning.*
- b) *Describe the salient features and advantages of each method.*

This was not a popular question and few candidates who attempted it achieved a pass. Marks were lost for not mentioning coaching, delegation, projects and secondments or job rotation.

Question 9.

Identify the various types of leader and consider some practical difficulties associated with each type.

This question was very popular with candidates. Examiners were looking for descriptions of the following

- Charismatic.
- Traditional.
- Situational.
- Appointed.
- Functional.

Question 10.

Explain the principles of confidentiality.

This was not a popular question. While some candidates achieved a pass using their common sense, marks were available for treating information about employees as confidential and only using it for the purposes for which it was given and having user ID to access computerised HR information systems.