

# **INSTITUTE AND FACULTY OF ACTUARIES**

## **EXAMINERS' REPORT**

September 2020 Examinations

### **Subject SP1 - Health and Care Specialist Principles**

#### **Introduction**

The Examiners' Report is written by the Chief Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

Mike Hammer

Chair of the Board of Examiners

December 2020

**A. General comments on the *aims of this subject and how it is marked***

1. The aim of the Health and Care Specialist Principles subject is to instil in successful candidates the ability to apply, in simple situations, the principles of actuarial planning and control needed in health and care matters on sound financial lines.
2. Candidates who approach the questions, especially the more substantial elements of each question, in a methodical and detailed manner are far more likely to satisfy the examiners and receive a pass in the subject. Candidates will gain few marks if they do not address the question asked but merely write around the topic of the question.
3. The mark allocation for each question part gives an indication of the relative length of answer or number of points to be made to gain full marks. The Examiners' Report covers more points than would be expected to get full marks. This is so that alternative approaches to questions by different candidates can be accommodated.
4. It is often helpful to structure and use subheadings when answering long part questions.

**B. Comments on *candidates' performance in this diet of the examination.***

The paper was a relatively straightforward one and well-prepared candidates scored well across most of the questions.

Questions that focussed on knowledge of the Core Reading were well answered by those who had prepared thoroughly. However, the paper included several part questions requiring wider thinking or application of core reading to specific circumstances, such as questions 2(ii), 3, 5(i), 5(ii), 6(ii), 7(ii) and 7(iii). Candidates should recognise that these are generally the questions which differentiate those candidates with a good grasp and understanding of the subject.

It is pleasing to see many candidates providing their answers under subheadings, making them easier to follow and mark. This also helps show that they have applied their knowledge to the specific scenarios described.

The comments that follow the questions concentrate on areas where the candidates could have improved their performance. Candidates approaching the subject for the first time are advised to include these areas in their revision.

**C. Pass Mark**

The pass mark for this exam was 60.

276 candidates presented themselves and 128 passed.

## Solutions

### Question 1

(i)

Type of reserves for IP

Active lives: Reserves for future claims

Reserve for expected future claims. [½]

Reserve for future expenses. [½]

Option reserves. [½]

Unearned premium reserves for group risk. [*Note – no credit should be awarded if there is no mention of group risk*] [½]

Unexpired risk reserve for group risk. [*Note – no credit should be awarded if there is no mention of group risk*] [½]

Claims equalisation or Catastrophe reserve. [½]

Investment mismatch reserve. [½]

Reinsurance default reserve. [½]

In-claims lives: Claims reserves

Reserve for claims notified but awaiting approval / Claims in Transit. [½]

Reserve for claims approved but still within deferred period. [½]

Reserve for claims in payment. [½]

Reserve for claims expenses. [½]

Reserve for claims that have been incurred but not reported (IBNR). [½]

**[Total marks available 6 ½, maximum 3]**

(ii)

Methodologies for statutory reserve calculation for IP

Active lives: Reserves for future claims

Reserve for expected future claims and Reserve for future expenses:

Discounted value of future expected claims. [½]

For example, using incidence rates multiplied by disability annuity to estimate expected cost of claims. [½]

Plus, discounted value of future expenses (both administrative / maintenance as well claims handling) allowing for inflation. [½]

Plus, allowance for increased future benefits / benefit escalation. [½]

and taxes, if any. [½]

Less, discounted value of expected future premiums, [½]  
allowing for future review of premiums if applicable. [½]  
The calculation can be carried out on a policy by policy basis, [½]  
or using model points. [½]

Option reserve:

The additional costs that need to be set aside for the eventualities that a particular option  
“comes into the money” i.e. becomes more valuable in its exercise than in its discard. [½]  
May use a deterministic modeling approach, [½]  
or a stochastic modelling approach. [½]  
Need to make assumption on take up rates. [½]

Unearned premium reserve for group risk:

The balance of premium received in respect of periods of insurance not yet expired. [½]  
It may be determined as a percentage / proportion of premiums in relation to the unexpired  
period. [½]

Unexpired risk reserve for group risk:

In respect of unearned premium reserve mentioned above, where the premium basis is  
assessed to be inadequate to meet future claims and expenses. [½]  
It may be determined using a deterministic approach, [½]  
or a stochastic approach. [½]

Claims equalisation or Catastrophe reserve:

This may be assessed to compare the current year's actual claims against what is considered  
to be atypical and amounts will be held back for abnormal events. [½]  
The assessment may be carried out based on company's own experience or industry  
experience. [½]  
It may also be assessed using a catastrophe model. [½]

Investment mismatch reserve:

Assess the matching position between assets and liabilities under stress scenarios. [½]  
Additional reserve may be held if the value of liabilities exceeds the value of assets under  
these scenarios. [½]

Reinsurance default reserve:

Need to take into consideration of the reinsurer's credit rating. [½]  
The probability of default may be based on market data of credit default risk. [½]

In-claims lives: Claims reserves

Reserve for claims notified but awaiting approval / Claims in Transit:

It may be assessed using the company's own experience over the time it takes for claims approval [1/2]  
and expressed as a percentage of notified claims. [1/2]

Reserve for claims approved but still within deferred period, Reserve for claims in payment, Reserve for claims expenses:

These reserves are likely to be determined together using a cash flow projections approach. [1/2]

Assumptions are required for (mortality, recovery / termination, expense, expense inflation, discount rate, tax). [1/2 mark for at least two examples, 1 mark for at least 4 examples] [1]

Projecting forward future claims (expected claims duration\*IP benefit amount), expense, tax and discounted back at the valuation rate of interest. [1/2]

Reserve for claims that have been incurred but not reported (IBNR):

Statistical methods may be used to determine IBNR. [1/2]

e.g. chain ladder. [1/2]

Historical data is used to determine the development factors. [1/2]

Short delay and long delay may be analysed separately. [1/2]

A statistical approach is likely to be suitable for homogenous, stable large portfolio. [1/2]

For portfolios with insufficient claims delay data, it may be determined using a simplified approach, [1/2]

e.g. as a percentage of ultimate / notified claims or claims reserve based on the company's own experience supplemented by industry data. [1/2]

Other general points

Regulation may prescribe valuation methodology for how statutory reserves are to be calculated, [1/2]

and assumptions used in the calculation. [1/2]

For example, the level of prudence margin for adverse deviation to be incorporated. [1/2]

**[Total marks available 18, maximum 10]**

**[Total 13]**

*In general, most candidates scored reasonably well on both parts of this question. The better candidates were able to distinguish the different reserving approaches for individual and group products.*

*Part (i) which is knowledge based was well answered.*

*Part (ii) was well answered by those who had prepared thoroughly and covered details of the reserving approach for each type of reserves applicable for individual & group products.*

## Question 2

(i)

The information gathered should relate to an appropriate period (i.e. volumes of data is adequate) [1/2]

but does not include heterogeneity or irrelevant data [1/2]

The term chosen for the analysis will therefore need to balance relevance of data against the credibility of the data. [1/2]

The demographic assumptions should reflect the expected future experience of the lives to be insured. [1/2]

Care will be required in considering any major changes (e.g. changes in terms and conditions) or unusual events over the period assessed which could mean past data may not represent future experience [1/2]

Given the purpose of the investigation is to determine premium rates then potentially best estimate assumptions should be determined [1/2]

However, there could be reasons for the insurer's assumptions deviating from best estimate:

Insurer may prefer to have a margin for prudence in its assumptions [1/2]

Insurer may prefer to be less prudent than best estimate to have competitive premium rates [1/2]

In the analysis, the insurer is likely to break down the data into broadly homogeneous groups to determine premiums for those groups [1/2]

There will need to be a balance between credibility of data and the need to have reasonably homogenous groupings [1/2]

It may be necessary to combine some cells to get sufficient credibility, [1/2]

or consider smoothing of rates for ages where the data may be sparse [1/2]

The insurer may have credible data as it has been writing this business for many years [1/2]

However, the credibility of data is more dependent on the volume of business written rather than the length of time [1/2]

For example, the volume of data may still be insufficient even though the company has been writing the business for many years if LTCI is not a popular insurance product in that market. [1/2]

In which case, the company's own experience will need to be supplemented by industry data [1/2]

or reinsurer's data [1/2]

The following information may be derived from own recent experience to estimate the demographic parameters to set pricing assumptions.

(a) Morbidity

Claims data and exposure data to arrive at long term care transition probabilities [1/2]

Long term care incidences tend to be derived as single rates [1/2]

For the claims incidence rates, the data may be subdivided into following categories: [1]

- Age
- Gender
- Smoker/ Non-smoker
- Sales and target market

[1/2 mark for at least two examples, 1 mark for at least four examples]

Allowance for trends, both improving and worsening long term transition probability [1/2]

Under LTCI, recovery from disability is generally ignored in pricing given the age profile of the beneficiary [1/2]

Adjustments in incidence rates where differential pricing might be prohibited in respect of one or more of these factors. E.g. gender [1/2]

Adjustments for medical advancements on incidence rates.

Adjustments for selective lapses of healthier lives worsening propensity to claim among continuing due to ongoing competition [1/2]

Adjustments for: [1]

- change in the target market
- underwriting conditions
- Social and economic factors which influence the propensity of claims
- e.g. Govt. promises in welfare provision in relation to long term disability support

[½ mark for at least two examples, 1 mark for at least four examples]

Insurers own data may not be sufficiently credible at older ages due to insufficient number of claims [½]

Insurer may need to use external data sources to determine assumptions at very older ages [½]

Compare Actual against Expected experience (A/E analysis) [½]

(b) Mortality

Deaths and exposure data for non-claiming lives to arrive pre-disability mortality rates [½]

Deaths and exposure data for lives in claiming to arrive at post disability mortality rates [½]

The data (both claims/deaths and exposed to risk) would ideally be analysed by: [1]

- age
- gender
- Smoker/ non- smoker
- Underwriting status
- Sales channel
- Occupation
- Benefit conditions
- Geographical locations
- Cause of claims

[½ mark for at least two examples, 1 mark for at least four examples]

Allowance for rated lives [½]

Neither mortality rates (i.e. non-claiming & lives in claiming) should be over-estimated as there is no death benefits [½]

Adjustment for any mortality improvement trends [½]

due to change in social and economic conditions for both non-claiming as well lives in claiming [½]

Adjustments for change/revision in the standard mortality table (e.g. the release of new published standard tables), especially for non-claiming healthy lives [½]

Adjustment possibly required for any unusual events not expected to occur in the future – e.g. pandemic [½]

Adjustments for medical advancements extending life in disability [½]

Other Adjustments for example change in: [1]

- target market
- sales channel
- underwriting conditions
- benefit conditions

[½ mark for at least two examples, 1 mark for at least four examples]

Insurers own data may not be sufficiently credible at older ages due to insufficient number of policies [½]

Insurer may need to use external data sources to determine assumptions at very older ages [½]

Compare Actual against Expected experience (A/E analysis) [½]

(c) Lapse experience

Data on total number of policies in force [½]

Data on total number of lapses [½]

The risk factors to be considered / analysed may include [1]

- Duration in force
- Sales method
- Target market
- Frequency and size of premium
- Premium payment method
- Original term of contract
- Age and gender

[½ mark for at least two examples, 1 mark for at least four examples]

If lapses / in-force are split into various sub-groupings – need to consider credibility of sub-groups [½]

Special attention to the lapse rates just after review of premiums i.e. 6th year, 11th year etc [½]

Upside adjustments in early lapses as it may cause financial loss due to NB strain [½]

Downside adjustments in later durations lapse rates where no surrender value is payable [½]

Adjustments in the lapse rates allowing for ongoing premium review process i.e. selective lapse just after review of premium (upside) [½]

Adjustments in lapse rates for any change in surrender benefits e.g. new regulations [½]

Changes in social and economic conditions [½]

Government promises in welfare provision, or pessimism in economy [½]

Adjustment for changes in the mix of business, e.g. due to a change in sales methods [½]

Consideration if there has been any factors that would suggest that recent experience is not likely to be representative of likely future experience, e.g. pandemic [½]

**[Total marks available 30, maximum 12]**

(ii)

Random fluctuation risks with regards to demographic assumptions:

The more data that the insurer has available to analyse then potentially the less likelihood of random fluctuations [½]

The product has been established for many years so the insurer is likely to have a reasonable amount of data [½]

There may be much less data available at older ages so potentially more risk of random fluctuations for these ages [½]

There may also be random fluctuations in individual sub-groups if the data has been broken down into relatively small sub-groups [½]

However, if there are only a few thousand policies in force over different age groups and/or rating groups, especially for lives in claiming, the statistical risk will be significant for morbidity and mortality (longevity) [1]

The risk is also significant because of the general lack of statistical credibility of lives in claim for both morbidity and mortality [½]

There may be unforeseen and random events that influence these assumptions [½]

e.g. mortality improvements for lives in claims due to medical advancements [½]

or early lapses due to government promises for long term care [½]

or changes in economic trends [½]

or the occurrence of pandemics [½]

Additionally, there may be stochastic uncertainty within the relationships between factors that affect experience [½]

Random fluctuations can impact assumptions so that they do not reflect future morbidity/mortality/lapse rates [½]

There may be random fluctuations in the past data or the future experience, either of which may cause assumptions unreflective of future experience [½]

**[Total marks available 7½, maximum 3]**

**[Total 15]**

*Part (i) was well answered by most candidates. The better candidates were able to provide answers specific to LTIC pricing assumptions and address the requirements of parts (a), (b) and (c) specifically, rather than repeating the same points between these parts such as considerations relating to credibility, relevance of data and homogeneous risk groups.*

*Part (ii) was not well answered. Most candidates failed to demonstrate an understanding of credibility theory, and were unable to cover the factors affecting credibility such as homogeneous groupings and uncertainty of relationships between factors.*

*Parts (ii) of this question differentiated the better prepared candidates.*

### Question 3

#### Overall

The assets held by the insurer should match the liabilities in terms of nature, term and currency [½]

The level of free assets should be considered, as the higher the level of free assets the more freedom the insurer will have in terms of its investment strategy [½]

#### Nature, term and currency

The PMI claim amounts are likely to be the same as the medical cost incurred by the hospital, where an arrangement with a third party provider will inevitably include profit margin (and expenses) being built into the overall PMI claim amount [1]

It is therefore a good match against medical inflation [½]

Liability profile of PMI products tends to be short term, so cash or short-term bonds are likely to be a good match [½]

Assuming the private hospital is in the same country as Company A there should be no issues with currency risk [½]

#### Expertise

Hospital is a highly specialised organisation which requires expertise to manage [½]

The insurer may not currently have such expertise in house [½]

It may need to employ new staff with such expertise. [½]

Alternatively, it could outsource the management to an external management firm, which would add to its maintenance costs. [½]

#### Upfront and Ongoing Costs

The upfront cost to purchase a hospital could be substantial. [½]

The dealing costs could also be much higher than those associated with other asset classes such as equities and bonds. [½]

If the hospital investment is going to represent a significant proportion of the insurer's portfolio, liquidity could be an issue. [½]

The ongoing costs of managing a hospital could be high.

Investing in a hospital may help the claims management process as the insurer will have direct control over the services and procedures provided by the hospital. [½]

This will help keeping the medical costs under control. [½]

#### Liquidity

Investment in a hospital is likely to be illiquid. [½]

The insurer will need sufficient liquidity to meet PMI claims as they arise so will generally want to invest in assets that are reasonably liquid. [½]

### Returns

- The potential profits from the hospital could also be substantial. [½]
- It could also provide medical services to people other than its policyholders. [½]
- The return is likely to be a good match to medical inflation. [½]
- The availability of such investment could be limited. [½]
- The ones that are currently available may not be profit making. [½]
- Consider the volatility of income. [½]

### Valuation

- The valuation of a hospital could be a challenge, in particular the value the insurer can put on its statutory accounts. [½]

### Diversification

- Individual hospital is likely to be a significant investment so each hospital could represent a significant proportion of the assets held by the insurer. [½]
- This could mean that there is limited opportunity for insurer to diversify investment. [½]
- On the other hand, a hospital investment could provide good diversification from other assets such as bonds and cash. [½]

### Other

- The insurer should consider whether such an investment is in line with its internal risk appetite and policy. [½]
- The insurer need to weigh up the potential profits against the additional risk associated with such investment. [½]
- The insurer needs to consider the implications on capital requirements. [½]
- This will involve what methodology the insurer would use to calculate the risk charge, as well as the financial impact on the level of capital requirement and hence free assets. [½]
- The insurer also needs to consider whether there are any regulatory restrictions on such investments. [½]
- Even if the regulatory restrictions do not directly prohibit the insurer from investing in a hospital, indirect restrictions such as minimum liquidity requirement or asset liability matching requirement could prevent the insurer from investing in such an investment if it is going to represent a significant proportion of the assets held by the insurer. [½]
- Consider what alternative investments the insurer could invest its cash instead, either higher yielding assets or assets with lower level of investment risk. [½]
- Consider whether any of its competitors have investment in hospitals, if so, whether such investments proved to be successful. [½]
- Consider any potential implications on the insurer's image and reputation. [½]
- Consider the reactions of key stakeholders (e.g. shareholders, credit rating agencies and market analysts) in respect of such investment. [½]

Consider the control over the quality of care provided by the hospital,	[½]
as there could potentially be reputational damage if it is not run well.	[½]
Consider any tax implications.	[½]
ESG (Environmental, Social and Governance) investment considerations.	[½]
Consider any potential conflict of interest as the insurer will aim to keep the claims costs down but the policyholder will expect high quality medical treatments.	[½]
Consider the level of synergy of new investment/ purchase with existing PMI business.	[½]
Ease of access to the network hospitals for the policyholders.	[½]
The potential demand from non-policyholders of the insurer,	[½]
in particular, will the insurer's competitors allow their policyholder to use hospitals owned by the insurer.	[½]
Potential risk of government commandeering asset in times of emergency.	[½]
here is a risk that the insurer may lose its focus on its core business. i.e. insurance.	[½]

**[Total marks available 25½ maximum 11]**

**[Total 11]**

*This question was well answered by those candidates who addressed the factors relating to PMI and private hospital investment specifically. The better candidates were able to consider a broad range of factors and their corresponding impacts including areas such as the nature of returns, liquidity, expenses and valuation issues.*

*Candidates who provided narrow answers focussing only on investment returns and failed to cover the wider operational factors scored poorly on this question.*

*This question differentiated those candidates with a good grasp and understanding of the subject.*

#### **Question 4**

(i)

(a)

Low income, young family where both husband and wife are aged 25, and have no dependents:

Cover for rent/mortgage should one die, get sick or serious illness. [½]

Loss of income should either of them get sick. [½]

Medical costs and medical care should either of them get sick. [½]

(b)

Wealthy single woman aged 53 with no children:

- Medical costs and medical care should she suffer serious illness. [1/2]  
Perhaps long term care a concern given no direct family members. [1/2]  
Loss of income might still be a concern as pensions may not start until pension age and early retirement may have significant deterioration in future pension. [1/2]  
No immediate dependents and no immediate losses if she dies. Any debts can be repaid from her estate. [1/2]

(c)

Medium to high income Family, one main earner and one house person looking after 2 children. Both adults aged 42, with one in full-time employment and the other a full-time parent:

- Cover for rent/mortgage should earner die, get sick or serious illness. [1/2]  
Cover for loss of income should earner get sick. [1/2]  
Healthcare should any of the family get sick or need medical care. [1/2]  
Education fees for children should earner die, get sick or serious illness. [1/2]  
Income to cover childcare costs should the full-time parent die, get sick or serious illness. [1/2]

For all (a), (b) and (c)

- Dental insurance [1/2]  
Optical insurance [1/2]

**[Total marks available 7, maximum 3]**

(ii)

(a)

- Affordability is a key concern and directly influence the products and size and scale of benefits that can be bought. [1]  
Income protection (IP) for both family members, so that rent / mortgage costs and share of expenses covered in the event of illness. [1/2]  
Term of IP should be to normal retirement age / state pension age. [1/2]  
Cover should be set to meet regular outgo. [1/2]  
Index benefit so that it keeps real purchasing power. [1/2]  
Budget health insurance products as low disposable income. [1/2]  
For example:  
Health cash plan. [1/2]  
Budget PMI which provides in-patient cover only, [1/2]  
or capping of benefits, [1/2]

or insured pays the first amount / proportion / excess of the claim, [1/2]  
where the first amount / proportion / excess should be set at a level that will not cause financial hardship to the insured when a claim is made. [1/2]  
Major Medical Expense. [1/2]  
Death or critical illness (CI) leave mortgage uncovered so term assurance or accelerated critical illness. [1/2]  
However, Pension scheme could provide lump sum benefits on death. [1/2]  
CI cover could be bought on a stand-alone basis or as a rider for example to a mortgage. [1/2]  
The conditions that the adults are expected to suffer, for example stress-related illnesses might lead to IP claims rather than CI claims. [1/2]  
Serious illnesses e.g. cancer will lead to long periods off work and so lead to IP claims. [1/2]  
The lump sum under CI policy gives greater flexibility e.g. it can be used on home modifications, deal with life style changes. [1/2]

(b)

Loss of income is still a concern, so there is a need for IP. [1/2]  
Term of IP should be to her normal retirement age / stat pension age. [1/2]  
Cover should be set at a reasonable (e.g. 2/3rd) level of her salary. [1/2]  
Index benefit so that it keeps real purchasing power. [1/2]  
PMI for better medical care. [1/2]  
For example, private rooms, extended nursing care, no waiting times, choice of location, choice of hospitals, choice of consultants. [1]

[1/2 mark for at least two examples, 1 mark for at least four examples]

PMI cover is likely to be comprehensive, [1/2]  
and may cover extras such as dental and optical treatments. [1/2]  
A higher level of excess may be appropriate. [1/2]  
Long Term Care Insurance (LTCI). [1/2]  
This will address concerns over long-term care as she has no family support. [1/2]  
LTCI cover will be pre-funded at this stage as she is still in good health. [1/2]  
Alternatively, she may purchase immediate needs LTCI when she falls ill. [1/2]  
Indemnity cover may be preferable and affordable by her, [1/2]  
as it reduces / mitigates the risk of care cost inflation being higher than expected. [1/2]  
Although she can also use her pension provision to cover part of her long-term care costs. [1/2]  
If she chooses non-indemnity cover, benefit payouts could be index linked or at a fixed rate [1/2]

(c)

Income protection for both family members, so rent / mortgage costs, share of expenses, and childcare duties covered in the event of illness. [1/2]  
If house person becomes ill, then may impact ability of the other to work. [1/2]

Term of IP should be to the earner's normal retirement age / state pension age.	[½]
Cover should be set at a reasonable (e.g. 2/3rd) level of the earner's salary,	[½]
or cost to hire childcare should the full-time parent becomes ill.	[½]
Index benefit so that it keeps real purchasing power.	[½]
Critical illness cover for both adults,	[½]
or family cover including both children.	[½]
Critical illness is likely to impact lifestyle, and home modifications may be needed.	[½]
The lump sum under CI policy gives greater flexibility,	[½]
e.g. it can be used for home modifications, deal with lifestyle changes.	[½]
	[½ mark for at least two examples]
PMI to cover medical costs in the event one of the members and family falls ill.	[½]
PMI cover is likely to be comprehensive,	[½]
and may cover full in-patient and out-patient treatments,	[½]
may also include accommodation for parent(s) should the children require in-patient treatments.	[½]
Additional treatments e.g. private ambulance, physiotherapy, dental, optical.	[1]
	[½ mark for at least two examples, 1 mark for at least four examples]

**[Total marks available 26 ½, maximum 9]**

**[Total 12]**

*In general, this question was well answered by most candidates.*

*Part (i) was well answered by most candidates, demonstrating a good understanding of the insurance needs for each individual case.*

*Part (ii) was reasonably answered by most candidates, with the better candidates being able to explain how the different health and care products recommended are able to meet the specific needs for each individual case.*

## Question 5

(i)

### Investigations

Consider arrangements with each external reinsurer separately.	[½]
Carry out claims experience investigations.	[½]
Investigation should cover all the policies covered under the reinsurance arrangements.	[½]
Set best estimate assumptions based on latest experience investigations.	[½]
Carry out profit testing gross of reinsurance.	[½]
Carry out profit testing allowing for reinsurance.	[½]

Consider policies covered under different treaties separately.	[½]
Make appropriate allowance for reinsurance premiums,	[½]
reinsurance claims,	[½]
expense of negotiating reinsurance arrangements,	[½]
additional maintenance / admin costs on reinsurance management,	[½]
investment returns.	[½]
Project forward cashflows and discount back.	[½]
With suitable allowance for the reinsurance effect on reserves and capital requirements.	[½]
Reinsurance mitigates the morbidity risk, so the capital requirements go down,	[½]
but it also increases reinsurance / counterparty default risk, so capital requirements go up.	[½]
If the former of these exceeds the latter, then overall capital requirements will go down.	[½]
Need to choose suitable measures of profitability.	[½]
May use Present Value of Future Profits (PVFP) as a percentage of Premiums,	[½]
or Internal Rate of Return (IRR).	[½]
Compare the profit criteria gross and net of reinsurance.	[½]
In addition to the base scenario, the company should also carry out scenario / stress testing of the impact of reinsurance on the profitability of the business in different plausible scenarios and compare that with the equivalent position if they did not reinsure.	[1]

**[Total marks available 11 ½, maximum 7]**

(ii)

Other factors to consider

Consider the effects of reinsurance on balance sheets.	[½]
Consider the net Capital benefits,	[½]
taking into consideration the trade-off between the reduction in morbidity / insurance risk and the increase in reinsurance / counterparty default risk.	[½]
The impact on the reinsurance / counterparty default risk capital requirements is dependent on the credit rating of the reinsurers.	[½]
Consider the volatility of claims experience,	[½]
the exposure to concentration risk,	[½]
and catastrophe risk.	[½]
Level of technical assistance provided by the reinsurers,	[½]
such as underwriting, claims management, product development, pricing, staff training.	[1]

[½ mark for at least two examples, 1 mark for at least four examples]

If the insurer relies heavily on the technical assistance provided by the reinsurers, there may be limited scope to reduce reinsurance.	[½]
Reliability of the insurer's most recent experience,	[½]

and the credibility of its own data.	[½]
Consider other benefits provided by the reinsurance arrangements, e.g. solvency arbitrage, tax arbitrage, avoidance of large single losses, opportunity to increase business volumes, opportunity to enter different markets	[1]
[½ mark for at least two examples, 1 mark for at least four examples]	
The reinsurance arrangement may include related Financial Reinsurance (Fin Re) arrangements.	[½]
The high reinsurance premiums could be a result of the structure of the reinsurance arrangements,	[½]
For example, the arrangement may include reinsurance premium holiday / lower premiums in initial years, which helps alleviate initial strain but compensated by higher subsequent reinsurance premiums.	[½]
Regulatory requirements on reinsurance.	[½]
Company's risk appetite and policy.	[½]
Consider alternatives to external reinsurance. E.g. internal reinsurance.	[½]
Ability of the insurer to absorb adverse experience,	[½]
e.g. level of free assets of insurer.	[½]
The extent to which sufficient reinsurance cover is available in the market,	[½]
and the cost of reinsurance in the market.	[½]
Consider the maximum size of individual claim,	[½]
if the maximum claims size is high, may consider moving from a Quota Share (QS) arrangement to an Excess of Loss (XoL) arrangement.	[½]
What competitors are doing.	[½]
Any tax implications will be caused by changing the reinsurance arrangements.	[½]
The relationship between the insurer and its reinsurer(s).	[½]
Any other reinsurance arrangements with the reinsurer(s),	[½]
and the performance of these other reinsurance arrangements.	[½]

**[Total marks available 16, maximum 7]**

(iii)

Suggested possible actions for cost effectiveness:

Frequent reviews of reinsurance rates e.g. yearly.	[½]
Profit sharing reinsurance arrangement,	[½]
or reinsurance commission.	[½]
Automation of reinsurance treaty to reduce maintenance / admin costs, e.g. claims and reinsurance premium settlements.	[½]

More technical assistance from the reinsurer(s), [½]  
such as underwriting, claims management, product development, pricing, staff training [1]  
. [½ mark for at least two examples, 1 mark for at least four examples]

Making more use of technical assistance from the reinsurer(s) may also reduce costs paid to other external consultants / advisors. [½]

Introduce maximum caps on upside review of reinsurance rates. [½]

Increase in auto acceptance limits of maximum sum insured to reduce the completion time of proposals. [½]

Increase in auto claims settlement limits of maximum sum insured. [½]

Technical assistance from reinsurer in review of premium rates e.g. providing claims experience at premium rates reviews. [½]

Reinsurer's support on reducing the capital cost of insurer and primary policy premium, in order to improve competitiveness of premium rates and increase volumes of new business. [½]

Update lists of critical illnesses/ definitions to align it with market practice, medical improvements to avoid claims disputes. [½]

Change the retention level to retain higher proportion of the more profitable business, and lower proportion of the less profitable business. [½]

The reinsurer may further introduce dynamic retention limit so that the level of reinsurance automatically moves in line with increasing level of experience gained over time. [½]

Change the arrangements from a Quota Share (QS) arrangement to an Excess of Loss (XoL) arrangement or vice versa, [½]

and opts for the arrangements that provide the best value for money either in terms of profitability or capital efficiency. [½]

The insurer could negotiate with the reinsurer(s) to allow more illnesses to be covered by existing treaties at the same cost to make insurer's product more attractive in the market. [½]

Other changes may also be negotiated, e.g. deposit back arrangement, parent guarantee, custodian / escrow account of reinsurance assets, stability clause, exclusions. [1]

[½ mark for at least two examples, 1 mark for at least four examples]

The insurer could shop around different reinsurers to get best deal. [½]

The insurer could look to renegotiate contracts / treaties more frequently. [½]

The insurer could also try to remove terms in the reinsurance treaty that are loss-making based on their earlier analysis. [½]

The insurer could ensure that it is using the most cost effective reinsurance for the business it writes. [½]

Consolidates reinsurance arrangements to benefit from diversification benefits if possible. [½]

Switch reinsurer(s), [½]

or recapture and reinsure internally. [½]

**[Total marks available 14 ½, maximum 6]**

**[Total 20]**

*Part (i) was poorly answered by most candidates. The better candidates were able to demonstrate an understanding of the modelling steps involved in the investigation and how reinsurance would impact the profits, particularly the consideration of company profits with and without reinsurance. The weaker candidates failed to understand the requirements of the question asked which was on pricing and profit-testing. Those who provided general points on the benefits of reinsurance and limited their answer to a simple discussion of reinsurance premiums and recoveries and the reasons why they may be higher or lower, scored poorly in this part.*

*Part (ii) which is knowledge based was reasonably answered by most candidates.*

*Part (iii) was poorly answered by most candidates. The better candidates were able to cover a broad range of ideas such as improvement on technical services provided by reinsurers, renegotiation of treaty terms, consideration of reinsurance structures and retention levels. The weaker candidates failed to demonstrate an understanding of the question asked and repeated the answers they have already provided in part (ii). Some candidates went into too much detail on a limited number of factors, restricting the breadth of their answers and resulted in scoring less marks.*

*Parts (i) and (iii) of this question differentiated the well prepared candidates from the weaker candidates.*

## **Question 6**

(i)

For each no claims year under PMI, an NCD system refers to an increasing discount. [½]

The discount may be referred as a percentage of premiums subject to a maximum limit [½]

For each claim made, the level of discount reduces, and [½]

this could result in a premium higher than the reference premium. [½]

This is used as an own-experience proxy for more accurate risk segmentation. [½]

**[Total marks available 2 ½, maximum 2]**

(ii)

Underwriting and Claims management process:

A NCD system could mean less pressure on upfront underwriting process as the system provides incentives to the policyholders not to make unnecessary claims. [½]

Introducing a NCD system may help to reduce small claims, [½]  
as policyholders are more likely to be more careful to weigh up the costs between losing the NCD and trivial medical treatments. [½]

It could also help reduce unnecessary utilisation of medical treatments. [½]

As the NCD system serves to discourage unnecessary claims, this could in turn lead to better claims experience. [½]

If it helps to change the policyholders' propensity to make a claim, this could help accelerate the claims payment process, [½]  
which in turn would improve the efficiency of the claims management process. [½]

The improvement in efficiency of the claims management could lead to reduced cost of claims management. [½]

Better experience could leads to lower risk premiums. [½]

Lower risk premium could be factored into pricing which could improve competitiveness. [½]

Improved competitiveness could lead to higher volume of future new business, and profitability. [½]

Introducing the NCD system would require changes to the administration system, [½]  
so that the claims record for each policy could be tracked. [½]

#### Development and Maintenance costs:

Operational implications of running a NCD system need to be considered. [½]

Various operational costs will be incurred, such as changing policy literature, terms and conditions, quotation system upgrade, admin system upgrade, pricing system upgrade, valuation system upgrade. [1]

[½ mark for at least two examples, 1 mark for at least four examples]

Resources will be needed for the development of this new process. [½]

This could cause strain on the company's business as usual (BAU) operation if BAU resources are utilised to work on these developments. [½]

This would incur upfront development costs and needs to be recouped. [½]

The company will need to decide the time horizon over which these development costs to be recouped, [½]  
as this will increase premium rates and hence have implications on competitiveness. [½]

Staff will need to be trained to operate the new process. [½]

Maintenance expenses are also likely to increase due to increased burden on administration. [½]

#### Policyholders' reasonable expectations (PREs):

The company needs to consider the likely reactions from its brokers and existing policyholders relating to this change. [½]

The company will need to consider policyholders' reasonable expectation in terms of introducing this NCD system for the first time. [½]

For example, the implications of starting all policies on zero NCD. [½]

For policyholders who have not made a claim for a number of years, they are likely to expect some levels of NCD from the new system and are likely to be disappointed if not. [½]

Need to consider policyholder's expectation to transfer NCD years from another company, [½]

or to have evidence to provide another company. [½]

If potential policyholders cannot transfer their existing NCD, this may have an adverse impact on new business volume, [½]

which may also damage the reputation of the insurer. [½]

If existing policyholders are not able to transfer their existing NCD to other providers in the future, this may also cause reputational damage to the insurer. [½]

This could also have adverse impact on renewal experience, in particular the better risks. [½]

NCD structure / Pricing / Marketing issues:

Need to design an appropriate NCD system in terms of level of discounts, [½]  
and other features, such as protected NCDs. [½]

Consider the rates and NCD structure used by competitors. [½]

Conduct market research or customer survey to aid the design of an appropriate NCD system. [½]

Need to consider implications on reinsurance, e.g. the impact on reinsurance terms. [½]

The reinsurer may be able to provide technical assistance on pricing. [½]

As there are already a number of other competitors offering NCD in the market, it is necessary to consider their experience and popularity of their products. [½]

Taking in consideration of all the potential implication of NCD on pricing assumptions such as on [1]

- development costs
- maintenance costs
- claims experience
- renewal rates
- conversion (brand new business) rates

[½ mark for at least two examples, 1 mark for at least four examples]

the company needs to consider how to factor all these into its premium pricing. [½]

Need to consider what data is available for pricing. [½]

Company's own data could be a start, but needs to consider the potential change in policyholders' behaviour and profile as a result of introducing the NCD system. [½]

The product without NCD would have to be cheaper than the product with NCD at a "no discount" level, [½]

which may mean that worse risks (those who are more likely to claim) may go for the product without NCD (exacerbated by the fact that competitors also have NCD products). [½]  
On the plus side, the better risks will be attracted to the NCD product and hence reduce risk of anti-selection. [½]

Other considerations:

The company will also need to consider whether it will continue to offer policies without NCD. [½]

Consider any implications on reserving. [½]

Consider any implications on capital requirement. [½]

Consider any implications on risk management, in particular whether the new product features and pricing are in line with the company's risk appetite and risk policy. [½]

Any additional regulatory issues to consider as a result of offering NCD, e.g. surrounding Treating Customers Fairly (TCF). [½]

Conducting market research / customer survey may provide an evidence base as part of the investigation. [½]

Ethical considerations on whether a NCD system is in the best interest of the policyholders, [½]

as it could discourage a person from seeking medical care through fear of losing his/her NCD. [½]

Will this fit in with the insurer's culture / brand? [½]

Practical considerations on how a NCD system may be applied in terms of group business which may already be on an experience rating system. [½]

**[Total marks available 29, maximum 12]**

**[Total 14]**

*Part (i) which is knowledge based was well answered by most candidates.*

*Part (ii) was well answered by those candidates who structured the answer well and generated a broad range of ideas through applying general actuarial principles. For example, a detailed discussion on operational issues such as how the introduction of a NCD rating structure would impact on claims experience and the claims and underwriting processes. The weaker candidates failed to consider the wider impacts of introducing a NCD rating structure and the broader issues associating with a new product launch.*

*Parts (ii) of this question differentiated the better candidates from the weaker ones.*

## Question 7

(i)

The principles of investment:

(a) A company should select investments that are appropriate to the nature, term and currency of the liabilities. [½]

(b) The investments should also be selected to maximise the overall return on the assets, where overall return includes both investment income and capital gains. [½]

The extent to which (a) may be departed from in order to meet (b) will depend, among other things, on the extent of the company's free assets, [½]  
and the company's appetite for risk. [½]

Alternatively these principles can be expressed also as: 'The company should invest to maximise the overall return on the assets, subject to the risk taken on being within the financial resources available to it.' [1]

**[Total marks available 3, maximum 2]**

(ii)

Modelling steps:

Using a model of the business in force, a model investment portfolio can be built up using the company's proposed investment strategy and incorporating an appropriate proportion of the free assets. [½]

What is appropriate here will be determined to some extent from the results of the investigations below. [½]

The liabilities and assets would then be projected forward on assumptions that represent expected future experience, [½]

although the company will want also to consider the effect of variations from these (scenario and stress testing). [½]

For assets, stochastic investment model can be incorporated in order to project future investment income and changes in capital values. [½]

Inflation rate models can also be used to project future expenses on the liabilities side. [½]

The projected liabilities and assets can then be valued at the end of each year of the projection on the company's supervisory basis. [½]

The item of interest will be the excess of the value of the assets over the value of the liabilities. [½]

This will need to be sufficient to cover comfortably the level of solvency capital required by the company, which may itself depend on the investment strategy being investigated. [½]

What is “comfortable” will depend on any regulatory requirements,	[½]
the nature of the business,	[½]
and the level of cover provided in other companies.	[½]
Using a stochastic investment model and simulation techniques, the investigations can be extended to produce a statistical distribution of the amounts available each year to cover the level of solvency capital required.	[½]
From this, the probability of potential future insolvency can be estimated given a particular investment strategy.	[½]
For valuing the liabilities the company’s current basis will most likely be chosen,	[½]
but it could incorporate into the simulation exercise dynamic assumptions that take into account the simulated investment conditions.	[½]
The simulations could also be used to determine the level of free assets that the company needs in order to support a particular investment strategy,	[½]
and keep the probability of insolvency below an acceptably low figure.	[½]
Need to decide criteria for assessing which strategy is optimal – for example balancing risk versus return.	[½]
For a proprietary company, the process can be extended further and the effect of the investment strategy on future shareholder earnings can be considered.	[½]
In particular, an investment strategy can be determined that maximises shareholder income whilst keeping the risk of insolvency sufficiently low, bearing in mind the available level of free assets,	[½]
and the company’s risk appetite and policy.	[½]

**[Total marks available 11, maximum 7]**

(iii)

Proposed investment strategy:

Consider asset and liability matching requirements.	[½]
Likely to be a range of possible strategies that may be suitable.	[½]
Need to decide criteria for assessing which strategy is optimal, for example balancing risk versus return.	[½]
Speak to investment managers / committee.	[½]
Consider company’s risk appetite and policy, and level of free assets	[½]

Assets

Identify assets that are potentially the best match for liabilities.	[½]
Split the assets to broadly match liabilities by nature, term and currency.	[½]

Need to consider what form assets could take – e.g. direct investment in shares, investment via a collective, direct investment in property or investment via a collective. [1]

[½ mark for at least two examples, 1 mark for at least four examples]

### Liability matching

Liability outgo consists of benefit payments plus expense outgo less premium income: [½]

#### Benefit payments

Guaranteed in monetary terms where the amount payable is specified in the monetary term fixed interest securities are used with matching term. [½]

These securities are often short term and hence technique of immunisation may be used for this purpose. [½]

Guaranteed in terms of an index of prices, earning or similar whose amount is directly linked to such an index. [½]

A suitable match would be securities that are linked to the same index in which the guarantee is denominated, if available, ideally chosen to match also the expected term of the liability outgo. [½]

In their absence, a substitute would be assets that are expected to provide a 'real' return. [½]

Indemnity type where the payouts depends on the costs incurred in receiving care. [½]

The assets recommended in these circumstances should be those that are expected to provide a 'real' return until the case goes off the books. [½]

Investment-linked where the amount is determined directly by the value of the investments underlying the contracts. [½]

Invest in the same asset as used to determine the benefits. [½]

#### Expense outgo

Expense payments tend to increase over time. [½]

The rate of increase is not strictly comparable to the rate of change in a price (or earnings) index, but can be treated as such for investment purposes. [½]

Hence they can be included with benefit payments guaranteed in terms of an index of prices or similar. [½]

#### Premium income

Immediate needs LTCI would be paid for by a single premium, [½]

whereas pre-funded LTCI might be regular premiums. [½]

Premium payments are usually fixed in monetary terms (or may be linked to an index) and can be thought of as negative benefit payments guaranteed in monetary terms (or in terms of a price index or similar). [½]

### Other consideration

The availability of different types of assets. [½]

The marketability of the assets held. [½]

Liabilities denominated in a particular currency should be matched by assets in the same currency, so as to reduce any currency risk. [½]

**[Total marks available 15, maximum 6]**

**[Total 15]**

*Part (i) which is knowledge based was well answered by most candidates.*

*Part (ii) was poorly answered. Candidates who were able to demonstrate a good understanding of modelling steps involved in investment strategy scored well in this part. Some candidates failed to interpret the question correctly that this part of the question is to discuss the process and rather than the detail of the components of an appropriate investment strategy and scored poorly as a result.*

*Part (iii) was not well answered. Candidates who structured their answers into different liability types and demonstrated the understanding of the matching requirements of the assets scored well in this part.*

*Parts (ii) and (iii) of this question differentiated the better candidates from the weaker ones.*

**END OF EXAMINERS' REPORT**