

Hearing Aid Council
Examinations 2007 (2) Theory
EXAMINERS' REPORT

There were 101 regular candidates and 12 aptitude candidates who took the theory papers in October 2007.

The average mark for the 101 candidates was 54.6%. Of the 101 candidates, 72 passed the examination with an average pass mark of 59.4%. The 29 that failed the examination had performed poorly averaging a mark of only 42.8%.

Of the 12 aptitude candidates, only 3 passed both (parts A – Hearing Aid Technology and Part B – Code of Practice) of paper 3 to pass overall. Of the 12, 9 had failed part A although 11 had passed part B.

As can be seen from Table 1 below, the spread of marks for each question was quite considerable ranging from 4-16 to 1- 20 across aspects of the examination from medical aspects, acoustics, audiometry and hearing aids, the only exception being the Code of Practice questions.

The striking finding is that a number of candidates failed to show an understanding of the basic and essential information even in areas such as audiometry and hearing aids.

Another issue of concern is that a number of candidates failed to answer the required number of questions in a paper. Five people answered fewer than the required 12 questions to be answered in total from the two papers. Two of the five had answered only 10 questions and 3 had answered only 11 questions, however, one of the three was a borderline fail. Consideration was given to those with special requirements during the examinations.

TABLE 1

Question	1A1	1A2	1A3	1A4	1B1	1B2	1B3	1B4	2A1	2A2	2A3	2A4	2B1	2B2	2B3	2B4
No. Answered	99	59	64	84	94	78	80	53	69	69	87	80	101	41	64	98
Min Mark	5	2	3	6	1	5	1	3	3	3	2	1	6	3	4	5
Max Mark	17	18	15	20	20	19	17	15	18	18	15	17	20	16	16	18
Mean Mark	10.6	12.1	9.1	13.9	10.5	13.2	10.8	9.6	10.6	9.8	9.3	8.2	14.6	9.2	11.1	11.0
Standard Deviation of Mean	2.5	3.5	2.9	2.7	3.9	3.5	3.3	2.9	3.2	3.2	3.1	3.6	2.6	3.1	2.5	2.7
% Pass	63	78	44	90	63	83	61	50	72	54	57	34	92	39	81	73

It is clear that in Paper 1, questions 1A3 and 1B4 had lower average mark than the pass mark and the percentage of candidates passing was 50% or below for these questions. In Paper 2 questions 2A2, 2A3, 2A4, 2B2 again had lower average marks and the pass rate ranged from 34% to 57% for these questions.

However the spread of the marks as indicated by the range from minimum to maximum and the Mean \pm SD shows little variation across questions. A good spread of the marks indicates that the questions were of reasonable difficulty to allow some candidates to achieve close to the top marks. The average mark was clearly dragged down by some candidates answering particularly badly. The absence of high end bunching or low end bunching of marks indicates the questions were not particularly difficult or easy.

Overall the performance in 2007(2) has dropped from the level in 2007(1). The Table 2 below provides the details of the average pass mark and the pass rate over the years 2002-2007.

TABLE 2

Examination Results		
Year	Theory	
	Pass rate	Average mark
2002(2)	84%	57%
2003(1)	68%	55%
2003(2)	83%	59%
2004(1)	84%	57%
2004(2)	80%	54%
2005(1)	89%	60%
2005(2)	79%	55%
2006(1)	88%	56%
2006(2)	77%	54%
2007 (1)	88%	54%
2007(2)	71%	55%

The specific comments relating to particular questions are presented below.

Question 1A1

Explain the difference between the following:

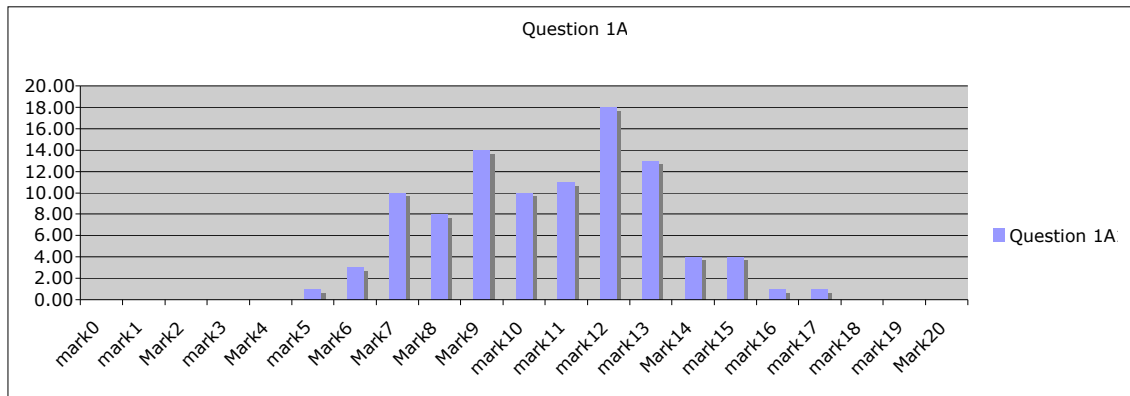
- (i) Outer haircells and Inner haircells (4)
- (ii) Acute otitis media and chronic otitis media (4)
- (iii) Cholestotoma and Schwannoma (4)
- (iv) Vertigo and dizziness (4)
- (v) Sensory and neural hearing loss (4)

Comments:

Many of the candidates failed to read the question properly and gave separate accounts of the two named conditions rather than pointing out the differences. The opportunity of obtaining easy marks was not, therefore, taken up. For example, noting the appearance of the tympanic membrane in AOM but omitting to mention the different appearance in COM, which would have been an obvious omission if they had concentrated on differences. Some similarities were given but these did not attract any marks.

Most candidates could list the differences between outer and inner hair cells but a few were confused as to which they were describing. AOM and COM were generally quite well known but some were not familiar with cholesteatoma and Schwannoma. There was a general awareness of the difference between vertigo and dizziness, and between sensory and neural hearing loss but many could not write as much on these as on the earlier topics.

Val Newton



Question 1A2

- a) Explain what is meant by the lever ratio with respect to the ossicles. (4)
- b) What are the effects of (i) an ossicular discontinuity and (ii) ossicular fixation on the following:
 - (i) the tympanogram (4)
 - (ii) ipsilateral and contralateral stapedial reflexes (4)
 - (iii) the pure tone audiogram (4)
- c) Name TWO causes Each of ossicular discontinuity and ossicular fixation. (4)

Comments:

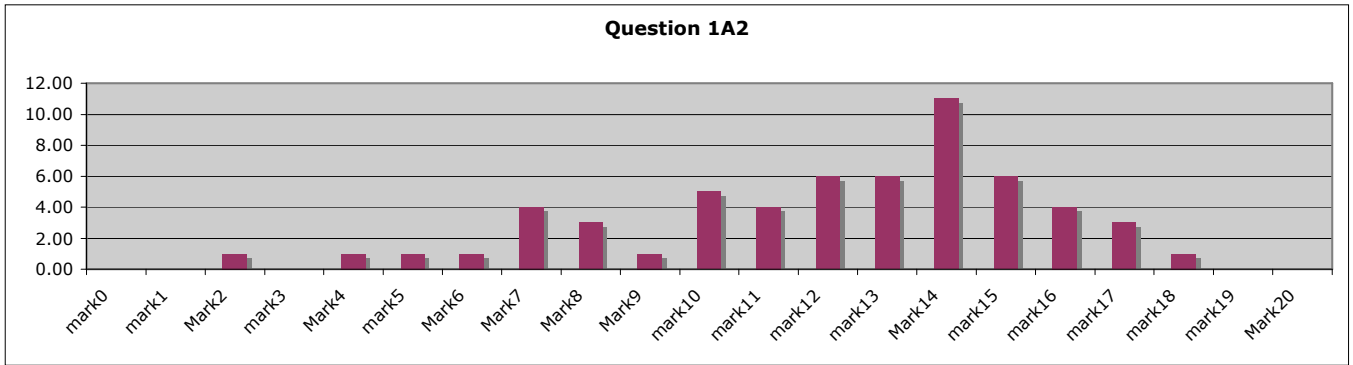
The majority of candidates knew about the “lever ratio”. Some having written about this went on to describe the role of the tympanic membrane which was not asked for and which did not attract any marks.

Most knew the types of tympanogram that would be expected in these two conditions. The question about reflexes was avoided by a significant number of the candidates. Some answering the question gave good reasoned answers. Others were clearly confused by the idea of contralateral stimulation.

The audiogram section was reasonably well answered in that the type of loss was correct in almost all cases where this question was answered. The degree of hearing loss expected with an ossicular discontinuity wasn't well known

The question about causation was generally well answered.

Val Newton



Question 1A3

- (i) What is the difference between localisation and lateralisation? (4)
- (ii) What acoustic cues are used to localise: (4)
 - (a) Low frequency sounds.
 - (b) High frequency sounds.
- (iii) Explain the head shadow effect in relation to sounds of both high and low frequency. (4)
- (iv) What is the role of the pinna in localising sounds? (4)
- (v) What advice should be given to a client with unilateral hearing loss who is experiencing localisation problems? (4)

Comments:

Part (i)

In unilateral hearing loss Weber's test is lateralised to the better ear in Sensory or Neural loss and to the worse ear in a conductive loss. Lateralisation is the placing of a sound to Left or Right within the head. Localisation is the ability to pinpoint the source of an external sound in all directions.

The concept of lateralisation caused some confusion.

Part (ii)

Candidates either knew this and scored good marks or they did not. In the horizontal plane low frequency sounds are localised mainly on phase and time differences with a small intensity difference, whereas high frequency sound are localised by intensity and time differences.

Part (iii)

This is again mainly the intensity difference in high frequency sounds. A definition of the head shadow effect was omitted by a lot of candidates.

Part (iv)

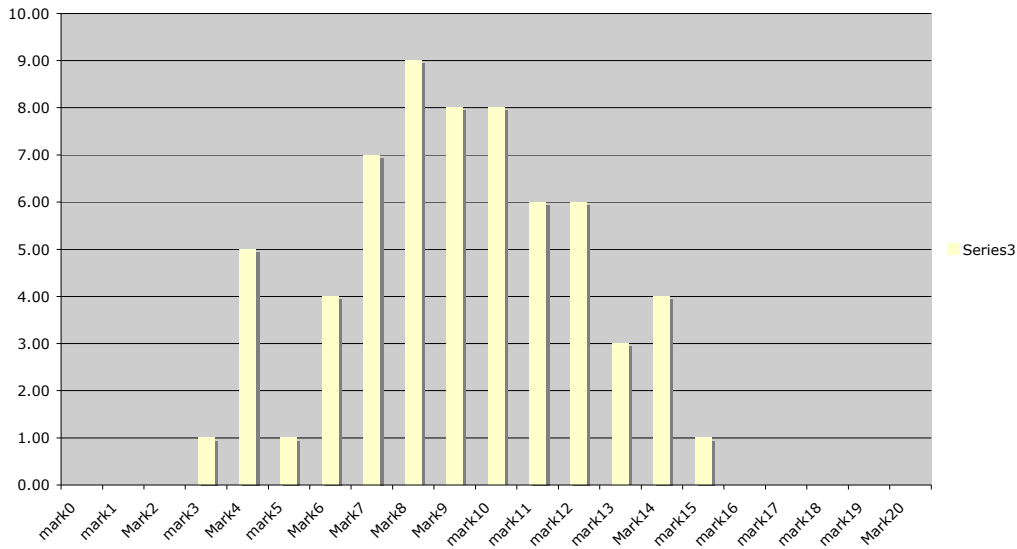
There were no real issues with this part of the question.

Part (v)

The advice given should include hearing tactics and safety advice as well as amplification options.

John Irwin

Question 1A3



Question 1A4

- (i) Define tinnitus and explain the difference between subjective and objective tinnitus. (4)
- (ii) List 4 causes of tinnitus. (4)
- (iii) Explain how the severity of tinnitus may be assessed. (4)
- (iv) What advice can a dispenser offer a client with tinnitus? (4)
- (v) Briefly explain what treatment options are available for tinnitus (4)

Comments:

Part (i)

Some candidates did not understand objective versus subjective tinnitus. Subjective is only able to be heard by the sufferer whereas objective can be heard by others and/or measured.

Part (ii)

The question clearly says "list 4". All that is needed is a list of 4. Any writing beyond a list is a waste of valuable time as is listing more than 4. In both of these situations the extras will not be marked and 4 is the maximum mark for this part of the question.

Part (iii)

Some candidates did not discuss the information that can be obtained by talking to clients. The history can give you an idea of the severity. There are also specific questionnaires that can do this.

Part (iv)

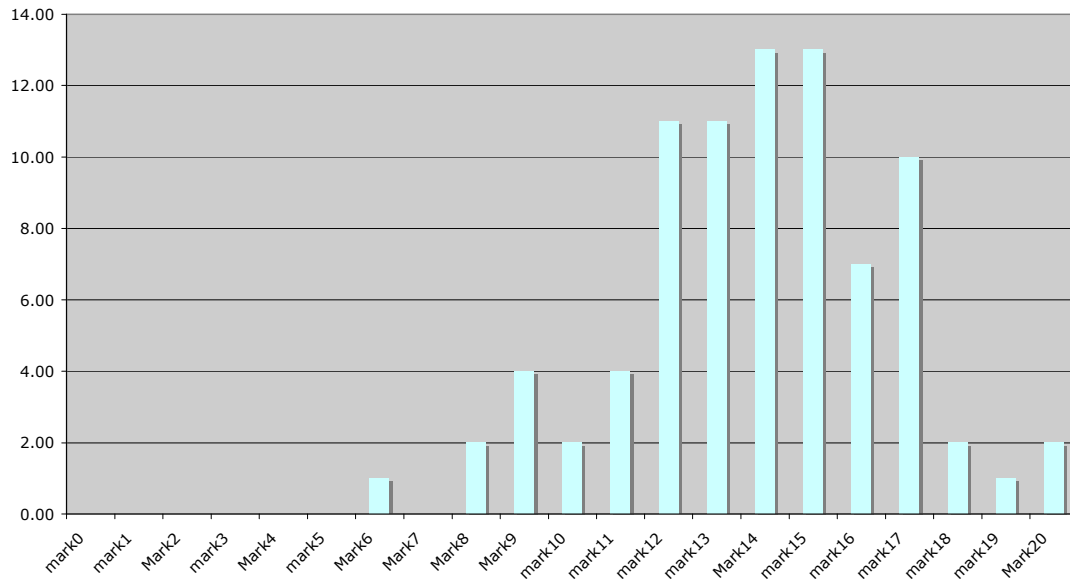
Some candidates discussed fine details of hearing aid tuning and earmould plumbing. I am not sure that this is advice to a client.

Part (v)

There were no problems with this part of the question.

John Irwin

Question 1A4



1B1

Answer the following:

(2 marks each)

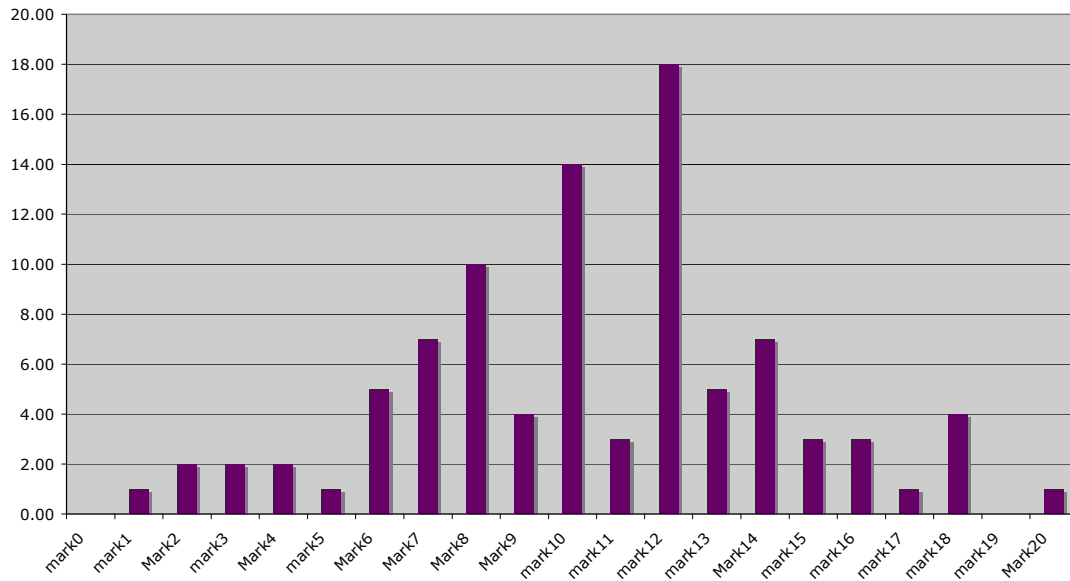
- (i) Define dB in terms of Sound Pressure
- (ii) What is the period for a 1kHz tone?
- (iii) How many octaves in the range 500Hz to 16kHz?
- (iv) How are frequency and wavelength related?
- (v) What is the inverse square law?
- (vi) What is the difference between intensity and loudness?
- (vii) Define gain of an amplifier.
- (viii) Given a gain of 100 times, what is this in dB?
- (ix) What is the fundamental frequency of a complex periodic waveform with frequencies of 120Hz, 240Hz, 480Hz?
- (x) What is the fundamental frequency of a complex periodic waveform with periods of 1ms, 3ms and 9ms?

Comments:

- (i) A number of candidates were unable to define dB in terms of the formula or show that it is with reference to particular level.
- (ii) It is surprising to find that some individuals still have difficulties with units.
- (iii) Most people got this correct but some had difficulty with counting intervals
- (iv) This was answered well.
- (v) Some confusion over what is meant by halving and squaring
- (vi) This was answered well.
- (vii) Gain mostly given in the format of output-input but this is only correct if gain in dB, normally given as output divided by input.
- (viii) This was answered reasonably well.
- (ix) Most people understood this and answered correctly.
- (x) Very few were right with this and as it required an additional conversion from time to frequency.

Deepak Prasher

Question 1B1



1B2 Explain the differences between the following:

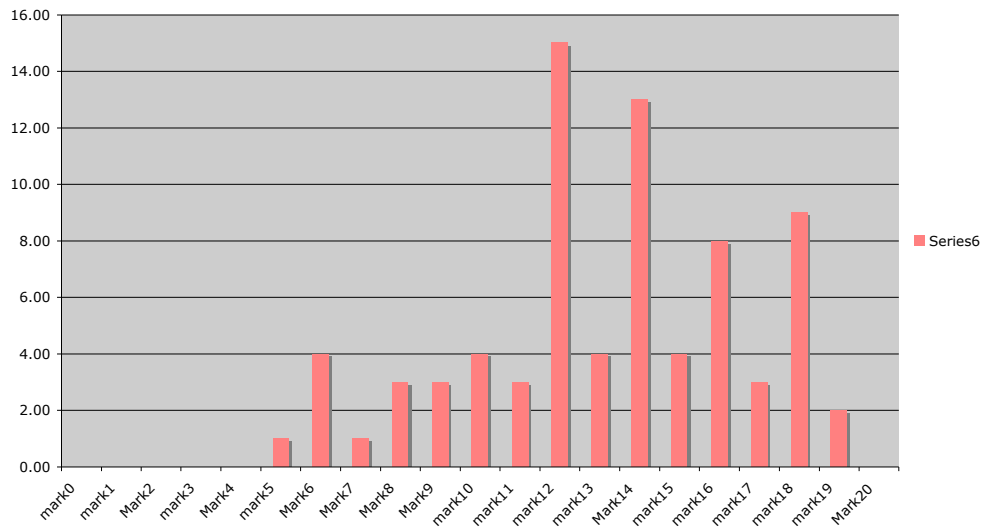
- (i) standing wave and travelling wave (4)
- (ii) transverse and longitudinal wave (4)
- (iii) diffraction and distortion of sounds (4)
- (iv) recruitment of loudness and dynamic range(4)
- (v) peripheral and central masking (4)

Comments:

- (i) This was answered well with most people understanding the difference.
- (ii) Some confusion as to which is which so some reversal of definitions and with examples given.
- (iii) Mostly well answered although very few mentioned wavelength with regards to diffraction.
- (iv) Well answered on the whole.
- (v) Much confusion over the central masking and mainly referred to masking chart. There is very little understanding that central masking occurs within the brainstem with input from the two ears.

Deepak Prasher

Question 1B2



Question 1B3

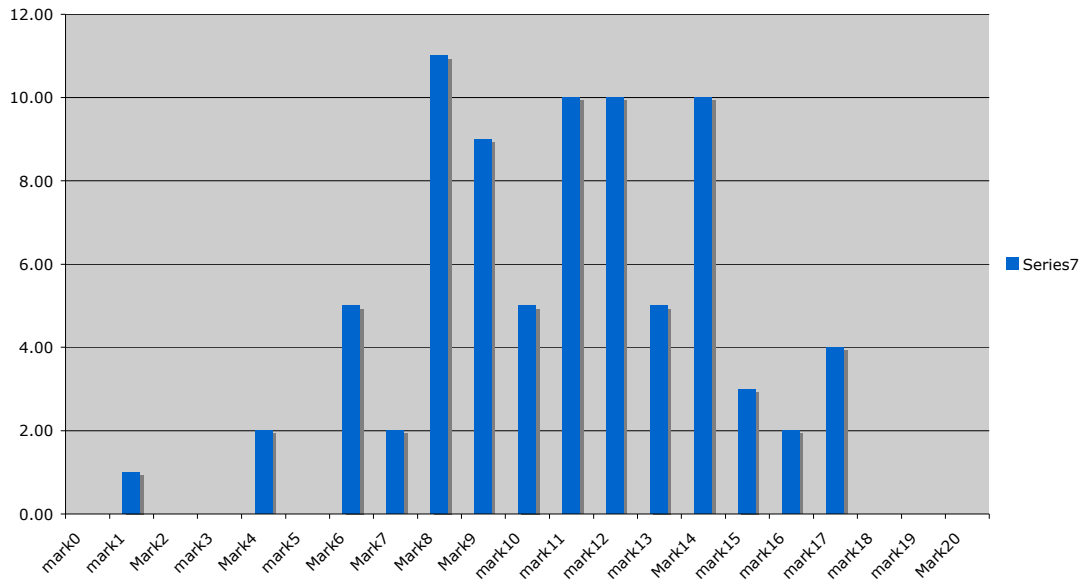
- (1) Over masking is the greatest problem in which type of hearing loss?
- (2) Not-masked results of a patient with one normal hearing ear and one with total sensori-neural loss show the worse ear to have what degree of loss?
- (3) During Audiometry, inter-aural attenuation may be increased by using what?
- (4) What is the third rule of masking?
- (5) What tests can indicate the presence of loudness recruitment?

Comments:

This is a question that should have been better attempted by many candidates as it requires answers directly from BSA procedure for Audiometry which is required knowledge under clause 9 of the HAC code of practise. Candidates would benefit from wider reading of currently utilised test procedures.

Tony Gunnell

Question 1B3



Question 1B4

Explain how the following conditions could be handled by the Audiologist and the implications for the hearing aid fitting.

- (1) Fluctuating low frequency hearing loss.
- (2) Unilateral tinnitus and high frequency loss
- (3) Acoustic trauma induced loss
- (4) Asymmetrical bilateral high frequency loss with unsteadiness and veering to one side on walking
- (5) Mixed conductive and sensory hearing loss bilaterally

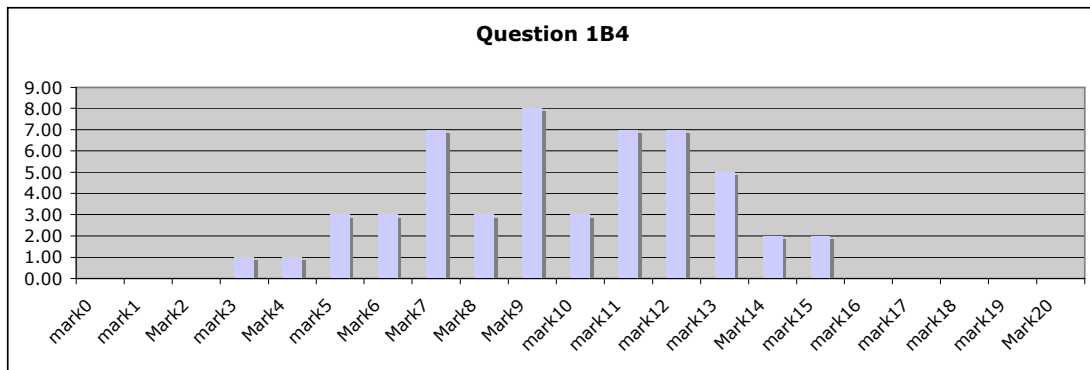
Comments:

It is rare that a client with a fluctuating loss would want hourly/ daily even weekly visits to the HAD, think simply – volume control etc. Regular and repeated reprogramming of an aid is impractical.

Candidates must fully understand the requirements of referral and apply common sense, I refer to the symptoms in part 4 which are not necessarily referable under COP but obviously is, it is clearly not a solution of balancing the hearing levels with hearing aids as some candidates tried. HADs must also understand that referral does not mean 'no action can be taken', where it is safe and appropriate to proceed with a hearing aid fitting HADs can at the request of the client - referral must be properly carried out alongside this.

Also do not make assumptions without the proper information regarding diagnosis, presenting symptoms can be applied to a number of conditions, not just the worst possible scenario.

Counselling must be an important part of any fitting process with advice on aid usage appropriate to the condition.



Questions 2A1 and 3A1

Explain the following:-

- (i) Peak clipping. (max 4 marks)
- (ii) Output limiting compression. (max 4 marks)
- (iii) Wide dynamic range compression. (max 4 marks)
- (iv) Syllabic compression. (max 4 marks)
- (v) Discuss the difference between Fixed Frequency Response (FFR) and Level Dependent Frequency Response (LDFR) in compression systems. (max 4 marks)

Part (i) A number of input-output graphs showing the effect of peak clipping failed to show output as not increasing with input once the peak clipping threshold had been reached. These graphs did not show output beyond the peak clipping threshold as being horizontal and appeared to illustrate the effect of exceeding an AGCo threshold rather than a peak clipping threshold.

Some candidates stated incorrectly that that peak clipping is a form of compression. Peak clipping was often stated incorrectly as only being available with analogue hearing aids. Part (ii) Few candidates stated that the compression limiting threshold should be slightly below ULLs. As output increases slightly above the limiting threshold, this threshold should allow for the effect of the typically high compression ratios and high kneepoint of compression limiting.

Many candidates stated that compression limiting was not a desirable form of non-linear amplification because it produced much higher levels of distortion as the output signal is processed twice. This statement was used to justify the more appropriate use of AGCi even though AGCi and AGCo normally serve quite different purposes.

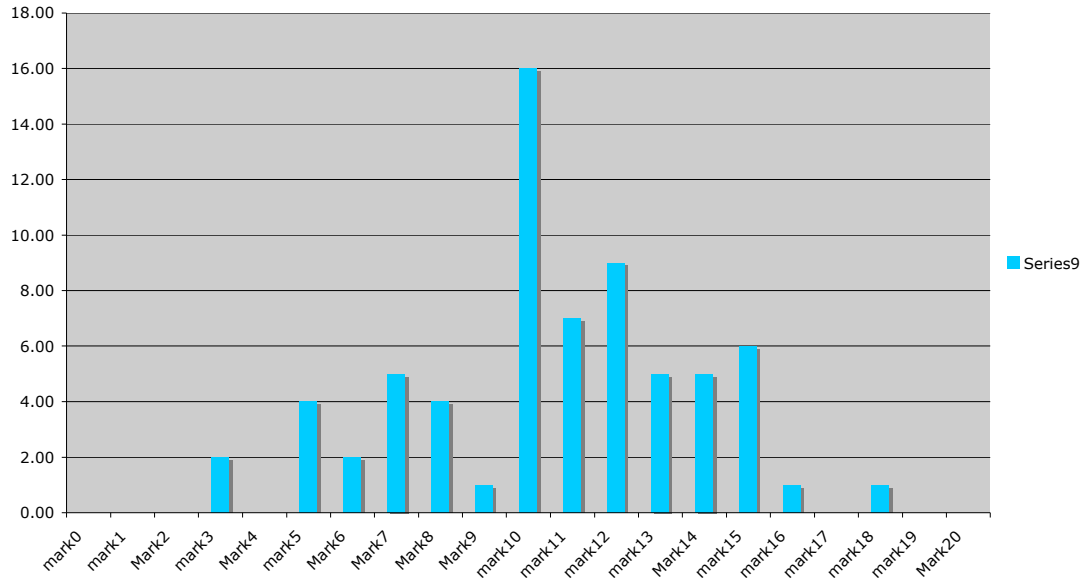
Part (iii) Generally, answered rather superficially with surprisingly few references to typically low kneepoint and low compression threshold for WDRC. When making statements about when WDRC is appropriate in relation to type and degree of hearing loss, dynamic range should be described in dB and not dBSPL or dBHL.

Part (iv) Syllabic compression was, generally, not well described. Only a minority of candidates related syllabic compression to short release time and even fewer explained why this may be beneficial.

Part (v) The distinction between FFR and LDFR was generally not well described with very few accurately drawn diagrams to illustrate the difference. For LDFR, there were many references to so called 'BILL' and 'TILL' responses but without adequate explanation of what these meant and how they could be representative of a LDFR.

Helen Belcher

Question 2A1



2A2/3A2

What are the psycho-social consequences of acquiring a hearing loss? (6)

What Personal Factors affect an individual's rehabilitation process? (6)

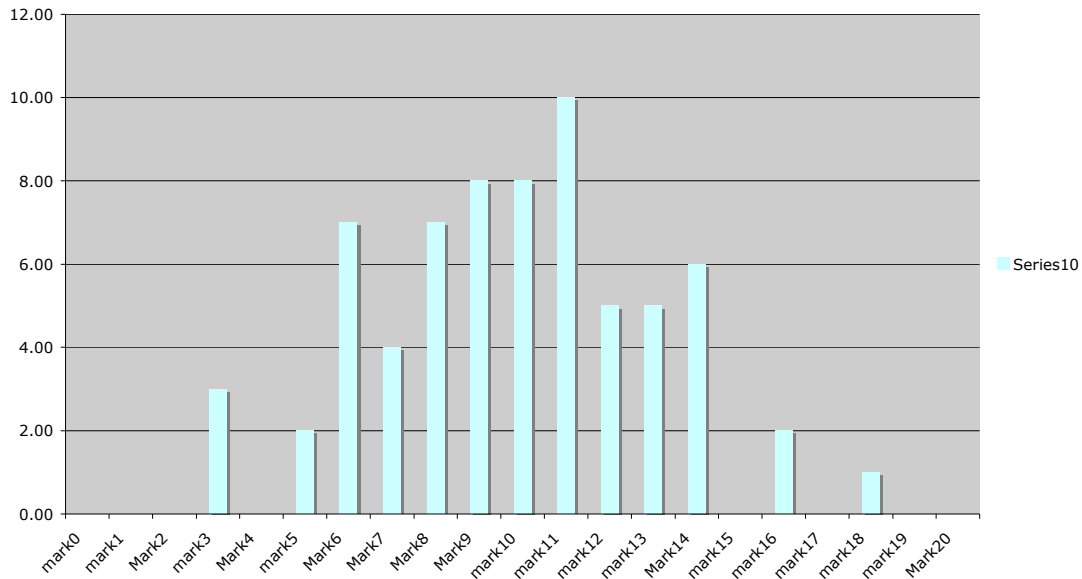
What effect do these personal factors have on the choice of hearing instruments? (8)

It was good to find a few excellent answers to this question.

Unfortunately, many of answers were very poor. Candidates lost marks by writing vague and brief answers to each section of the question. There appeared to be a very poor understanding of the psycho-social consequences of acquiring a hearing loss and how to apply a hearing impaired person's personal factors to the choice of hearing instruments.

Helen Belcher

Question 2A2



Questions 2A3 and 3A3

Explain FIVE features of a digital hearing aid system and the ways in which these features could benefit the client. (Max 4 marks each).

As a general comment, the standard of answers for this question was disturbingly low. The average mark for the answers to this question is amongst the lowest ever for a question on hearing aid technology. When considering the importance and relevance of the features and potential benefits of current DSP technology, a much higher standard is expected. Trainers are asked to review their coverage of this subject area as it is clear that far too many candidates were unable to answer this question to an acceptable standard.

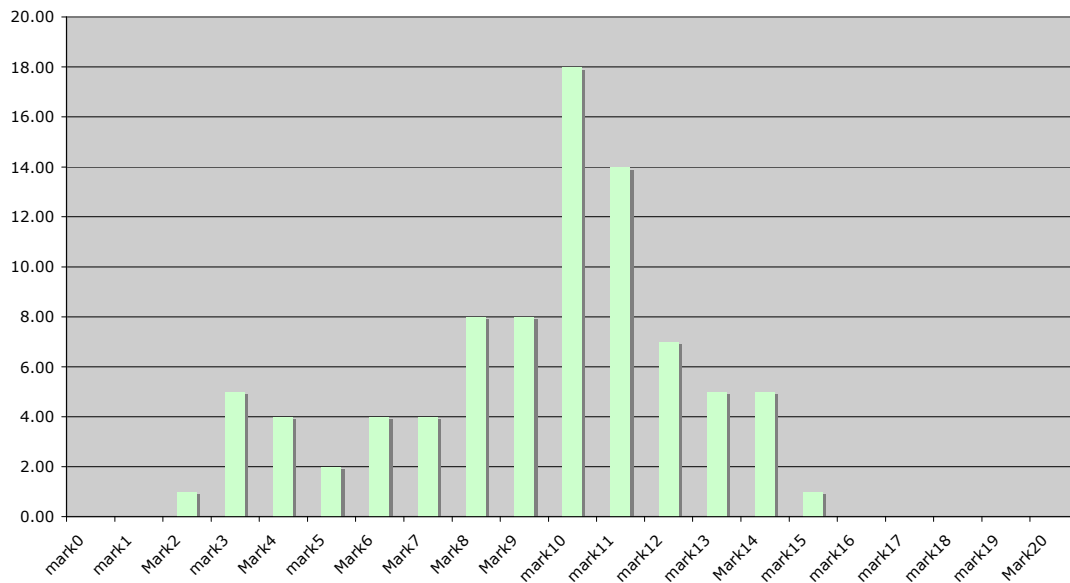
The following are the main points of criticism:-

1. A significant minority of candidates chose to describe minor features of current DSP technology. When this was the case, the particular feature selected was not described in the context of digital signal processing. Examples of such chosen features were a volume control and a telecoil. Such more basic features can form part of the answer to this question but it is not acceptable to limit the description to what would be equally applicable to basic, analogue technology.
2. As should certainly be the case, the majority of candidates included directional microphone technologies in their answer. Very disappointingly, a number of candidates described the type of single microphone directional technology which is rarely found in DSP hearing aids. There were far too few descriptions of twin/dual microphone technologies. Adequate descriptions of current directional microphone technologies were almost non-existent. In this same context, a number of candidates erroneously stated that directional microphones helped to improve localisation.
3. Noise reduction features were often included but almost all descriptions were either totally wrong or extremely superficial. A number of candidates referred to "noise cancellation" which, it is believed, is a description not adopted by any manufacturer. A sufficient number of candidates used the same description which indicates that this is being used in training material. A number of candidates described noise reduction as if it employed the same technology as acoustic feedback cancellation.
4. A minority of candidates chose to answer this question by describing variations in non-linear amplification. This was not an expected interpretation of the question but marks were allocated based on the quality of the description and justification for its being considered a feature of DSP hearing aids.

5. The general standard of statements about the potential benefits to clients of the chosen DSP hearing aid features was very poor.

B S Downes

Question 2A3



2A4/3A4

Explain the effects of each of the following on hearing aids:

Vents (4)

Tubing Dimensions (4)

Horn Effects (4)

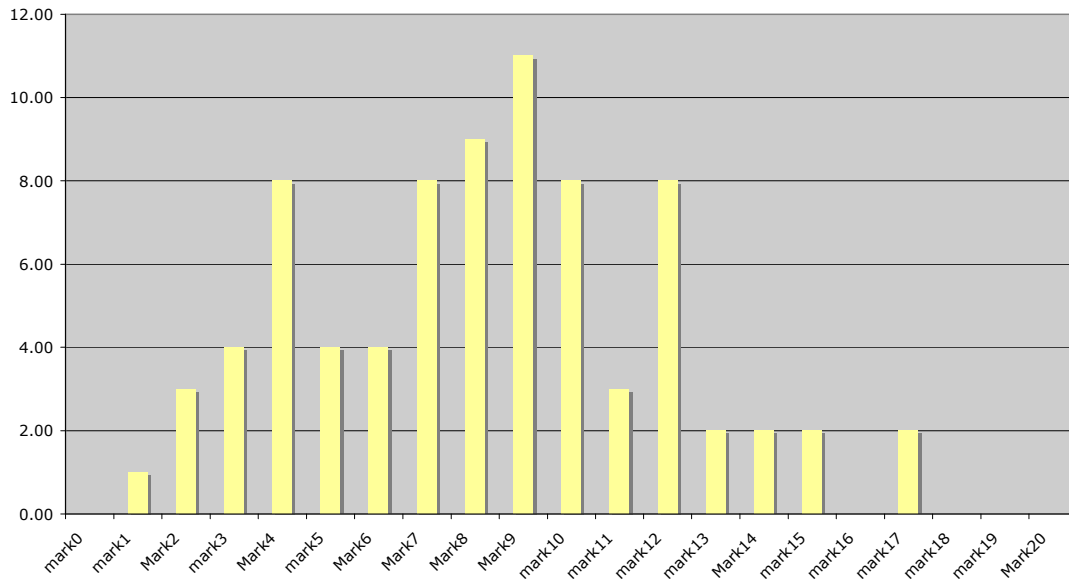
Filters (4)

Meatal Depth (4)

Generally the answers to this question were quite vague and inaccurate; the candidates' knowledge of acoustic modifications was very poor. In many cases the answer to a section consisted of one sentence or just a few words, which was totally inadequate. Some candidates seemed to be completely confused by high frequency and low frequency and which would be changed by meatal depth or other acoustic modifications. Candidates must read the questions carefully and realise that marks are awarded only for answers which relate directly to the question posed.

Helen Belcher

Question 2A4



Question 2B1

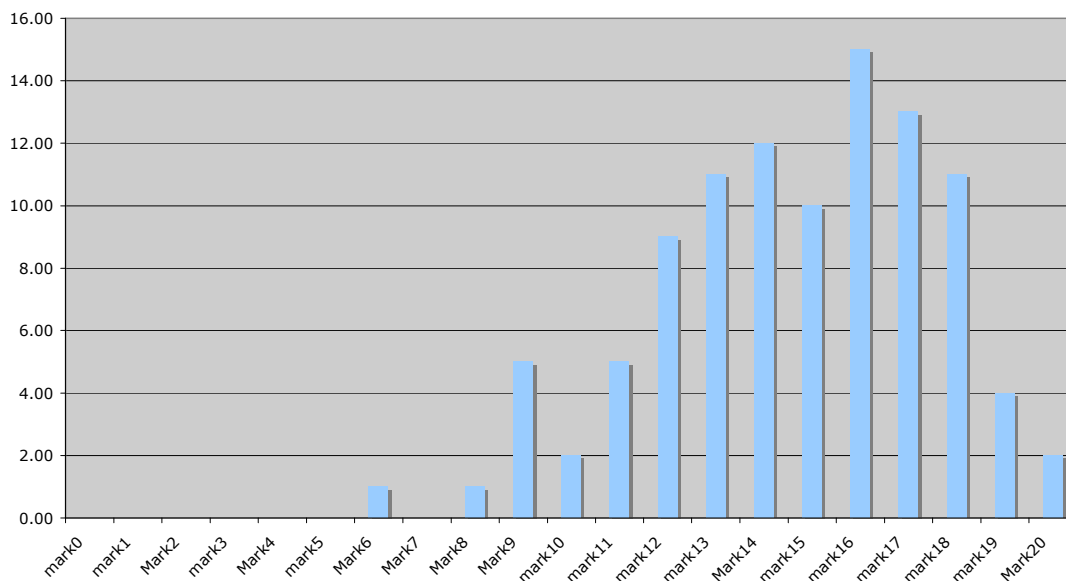
- (i) List TEN conditions for which a client must be referred to Registered Medical Practitioner (5)
- (ii) What equipment must a registered hearing dispenser have with them at every consultation? (5)
- (iii) When must audiometry be carried out by a registered hearing dispenser? (5)
- (iv) List the requirements for a visit to a potential client by a registered hearing dispenser (5)

Comments

This was a straight forward question and many candidates scored high marks. In part (i) candidates needed to give complete answers to gain all the marks available, so whereas an answer "discharge, not wax, within 90 days" would earn the full allocation, an answer "discharge" would earn less. Parts (ii) & (iii) were done well, but part (iv) showed there is still confusion over clause 10, in particular in relation to the 10-day rule.

Robert Rendell

Question 2B1



Question 2B2

A client attends for their clause 11 review complaining that certain sounds are too loud including their own voice. The client's loss is sensorineural and R=L, the AC readings for both ears are as follows:

kHz	0.25	0.5	1	2	4	8
dBHL	30	30	35	50	65	70

The client has been fitted with bilateral single channel digital half shell aids without gain/volume control and both have large vents.

- i) Discuss the possible reasons for this complaint. (5)
- ii) Explain the steps you would take to resolve the situation. (11)
- iii) Explain the counselling you would give to this client. (4)

Comments

This question was depressing to mark as it was really poorly answered and included, for example, answers which concentrated only on tests for recruitment and others which consisted of very detailed discussions of types of compression.

Many candidates did not understand what a single channel aid can and cannot do and gave information about gain and compression in single channel aids which was totally incorrect. A fixed frequency response does not mean that exactly the same amount of amplification is given at every frequency. The majority think this is the case. Others had a strange idea of what a volume control can do to the gain.

The question does not suggest that the client is suffering from feedback. Spending time discussing feedback is not going to add marks.

It was not heartening to see audiograms drawn with BC at 8kHz. (There was no need to draw an audiogram and no marks available for one if drawn – though, luckily for the candidates, no marks were taken off either).

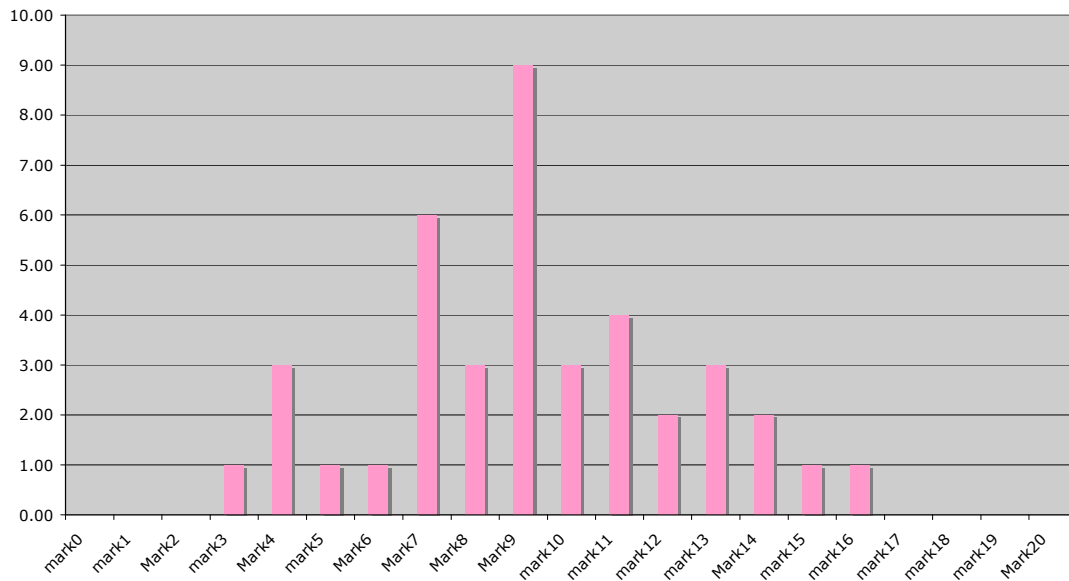
Counselling will probably not be helpful where the client is only being told to get others to speak more quietly, turn TV down etc.

Some candidates went into great detail about channels and compression but they could only obtain the number of marks allocated to those points. They then missed other points including some very simple ones (e.g. was the vent blocked with wax) for which marks were also allocated. A step by step initial consultation also did not add marks (e.g. description of how to do audiometry, otoscopy etc). Similarly long-winded explanations of general tactics were not called for here.

Overall marking this question was extremely disappointing and rather worrying.

Maryanne Maltby

Question 2B2



Question 3B2

- i) What information must a registered hearing (aid) dispenser provide a client in writing before supplying or effecting the supply of a hearing aid? (6)
- ii) What must the notified dispenser ensure in the case of a trainee who is an applicant for registration undergoing an adaptation period? (8)
- iii) With respect to the Code of practice what are the employers' responsibilities towards trainees? (6)

Comments

A fairly straight forward question, answered reasonably well.

Question 2B3

A client with a bilateral loss (analogue user right ear) requests a hearing test. They would like advice on replacing the existing aid with a digital instrument. The client has worn the analogue aid consistently for many years. The main complaint has always been noise in groups and the client has read that a digital aid will solve this problem.

- i) Explain the procedure you would take (8)
- ii) What advice would you give to this client? (8)
- iii) What counselling would this client receive. (4)
 - o Explain differences between analogue and digital & change from analogue to digital. Limits of digital. Explain binaural advantage, counsel to wear binaural so left ear can adapt. (Marks for this awarded under previous section)

Comments:

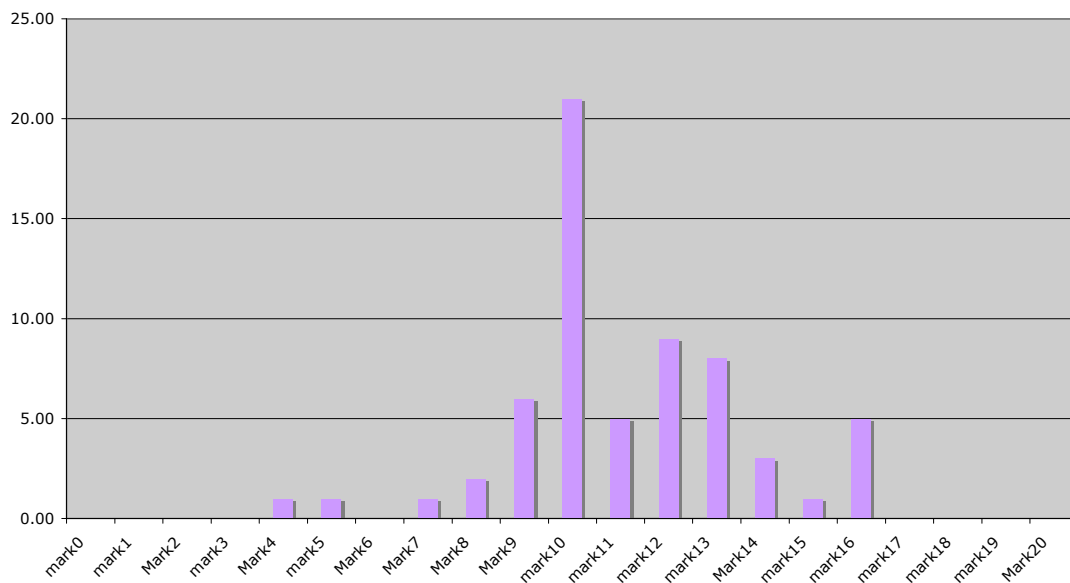
Sometimes candidate seemed to forget the important features of this client and talk more about general rehabilitation. They needed to highlight: bilateral advantages, problems of long term use of one ear and of long term analogue aid use. Digital aids are not a miracle cure. Previous user not first time user.

It was not necessary for the candidate to give the client a specific loss, lifestyle etc.

Analogue v. digital comparison was not very realistic, e.g. analogue aids certainly can have a loop and may even be programmable.

Maryanne Maltby

Question 2B3



Question 2B4

Provide answers to the following questions from a prospective client for a hearing aid.

- (i) What is a hearing aid? (4)
- (ii) Which hearing aid is best for me? (4)
- (iii) Will I be able to hear my friend in the pub where there is background noise? (4)
- (iv) How long will it take for me to adjust to the hearing aid? (4)
- (v) Why do I need two aids? (4)

This question, whilst in the context of client interaction and describing features to a 'lay person', still requires technical knowledge and some degree of technical answer, for example – to simply state that 2 ears make you hear better in noise is not sufficient to score the marks. The question asks how you would respond to a client so simply listing the answer is not sufficient, some context is required.

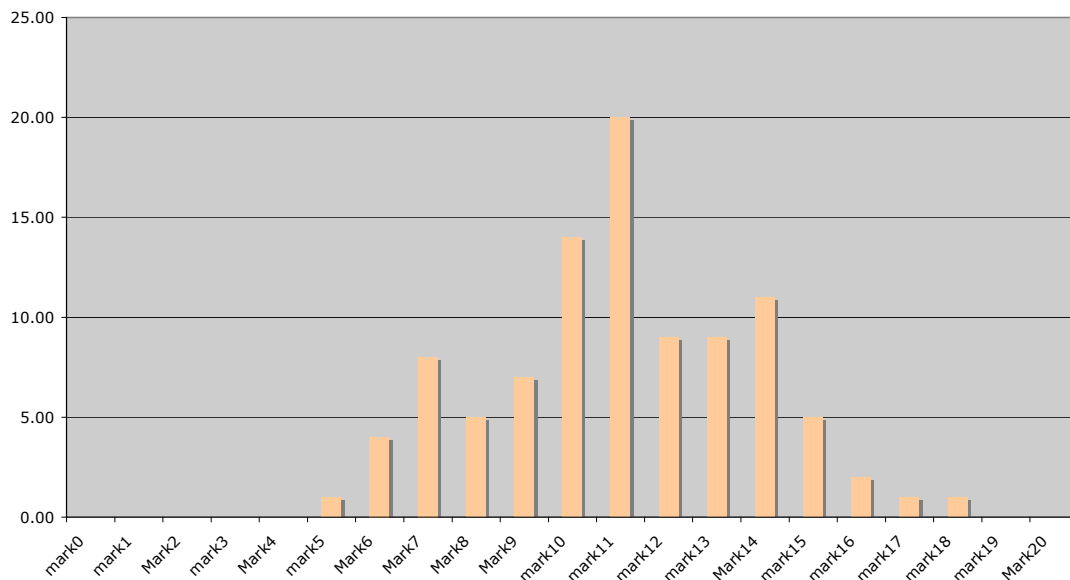
This is not a COP question (Clause 3, 5, 11 etc) and those who chose to answer as such did not score full marks.

Part 3 asked 'how long will it take for me to adjust TO the hearing aid', those candidates that discussed how to adjust the hearing aid (volume control, memories etc) unfortunately did not score any marks for this section.

Whilst not being able to make specific recommendations about which hearing aid is best, to not give any indication as to the considerations and processes required to make this recommendation, scored no marks. Once again, as with my last comments, cost is NOT a consideration in recommending a hearing aid system.

Rory Kewney

Question 2B4



Question 3A5

What action would you take if the client complains that:

- (i) the aid does not work at all (5)
- (ii) sound is weaker than usual (5)
- (iii) aid has a scratchy sound (5)
- (iv) the aid whistles (5)

Generally very well answered with the exception of part 3. The client has described the sound quality as scratchy. Before we launch headlong in performing REM's or running a full diagnostic test on the aid or even sending to the manufacturers for repair if under warranty, it would be best to ask the client what sounds they are finding scratchy and for how long this has been the case.

Rory Kewney