



EMTA Awards Limited



Founded 1858

British Horological Institute

Examiner's Report, May 2010

Certificate in the Repair, Restoration and Conservation of Clocks/Watches (Final Grade Part I)

Unit 1 : Final Grade Part I : The Theory of Clocks and Watches and their Repair

Fifteen candidates submitted scripts for assessment. They were required to answer four long questions from eight in Section A, and twenty 'short answer' questions from thirty in Section B. Candidates should note the importance of reading instructions carefully – contrary to the instructions, one candidate answered five questions from Section A, and five candidates answered twenty-one questions from Section B. Answers submitted in excess of those required were not marked. Although the overall standard of *written* answers was good, the scores for many candidates were lower than anticipated because of the generally poor standard of accompanying drawings or sketches.

Section A

Q1. Anchor / Recoil Escapement. Few candidates identified the simple reversal of the escape wheel; two candidates noted the short tooth. Many students clearly understood the action of the escapement, but the very poor supporting diagrams for this question led to only average results.

Q2. Club Tooth Lever Escapement. Candidates were asked to describe just the *impulse period*, not the whole action. Giving details of the whole action did not detract from the marks awarded but it did mean that time was wasted. The overall level of knowledge was good, apart from a limited understanding of the impulse provided by the wheel tooth itself. With the bi-metallic balance, the effects of temperature change were poorly explained – it is insufficient to say just that two metals have different expansion rates. No candidate included the balance spring in their sketch of its construction.

Q3. Clock Wheels & Pinions, Striking Mechanism. Many candidates had difficulty with the calculation of the module of the wheel and pinion. The striking mechanism was well understood, and the warning action reasonably well explained, but it is important to mention the danger of re-locking.

Q4. Keyless Work, Breguet Overcoil. The overall action of the keyless work was well understood. A number of candidates used alternative names for the numbered parts; this was, of course, acceptable but several candidates used incorrect names or mixed up the numbers. In many of the sketches the setting lever/pull-up piece was shown *not* bearing on the return bar. Sketches of the Breguet overcoil were generally poor.

Q5. Jewelled Lever Escapement. A very popular question answered well by most candidates, although the significance of the loss of the guard pin was not always fully thought through. Sketches of the double roller tended to show the two rollers too far apart. The proportion of the escape wheel tooth to the pallet stone was inaccurate in the oiling sketches.

Q6. Shock Resistant Settings, Watch Centre Arbor & Motion Work. The principle of the shock resistant setting was reasonably well understood, although the supporting sketches were poor. The cannon pinion/centre arbor relationship was well explained, but candidates generally had a poor understanding of the layout and connectivity of the cannon pinion, minute wheel and hour wheel. The 12:1 ratio of two-stage reduction was not well understood.

Q7. Chiming Clock Self-Correction, Carriage Clock Pivots, Mainspring. The chiming clock section was well answered and pivots were generally well drawn. The mainspring section was poorly understood.

Q8. Quartz Watch Tests, Automatic Calendar Work. The quartz watch tests were not fully understood, leading to incorrect diagnoses. In the question about automatic calendar work, the numbered components were correctly identified, but the missing components were not.

Section B, Short Answers.

The range of results reflected the fairly broad spectrum of ability shown in the 'long' questions. The relationship between length and strength in a mainspring was poorly expressed. The pulse train for an analogue quartz stepping motor was not well understood.

Summary

The key feature of this paper has been the generally poor standard of sketches and drawings, clear diagrams contribute to a complete answer. The relationship between components was inaccurate, relative size and proportions were poor, and overall clarity was lacking. With very few exceptions, the standard of written answers, and corresponding level of understanding by the candidates was good. A number of students failed to attempt the correct number of questions. If candidates answer too many questions, only those up to the required number are assessed. Attention too should be paid to details such as decimal places – where a question is specific, an answer giving too many or too few decimal places will lose marks. Units of measurement should be clearly stated in answers.

Unit 2 : Final Grade Part I : Practical Clock and Watchmaking Techniques

Nine candidates produced the small cock and plate from a working drawing provided by the Institute. A squared arbor turns with one pivot in a jewel pressed into the plate and the other in the pivot hole in the cock.

The test piece is assessed by considering accuracy, workmanship and surface finish.

Accuracy:

The general tolerance of + or – 0.5 is stated on the drawing but fits and clearances are determined by the candidate according to good practice. A number of dimensions are checked against the tolerance, full marks are awarded for each that is within the range permitted, a lower mark is awarded for each dimension within a broader tolerance. Measurements that are less accurate receive zero marks. Many candidates scored well for the accuracy element of the assessment. The square was generally within tolerance but the height of the cock and the width of the cock foot were often inaccurate; sometimes there was a considerable error. It is important for candidates to check at intervals, for example, along the width of the plate. Some were correct at the ends but less precise at the centre.

The working clearances – end shake and side shake presented greater problems with only one candidate gaining the maximum marks. In one instance, the arbor was too stiff to turn because of a complete lack of endshake.

Workmanship:

The overall standard was disappointing; the finishing of pivots, often a routine repair exercise, was inadequate. The fundamental requirements for a pivot are:

1. It should be parallel.
2. There must be a sharp corner between the pivot itself and the pivot shoulder.
3. The shoulder should be flat and square to the pivot.
4. The pivot and the shoulder should be well finished and without blemishes.
5. The end of the pivot should be rounded and polished.
6. The corner between the shoulder and the arbor should be chamfered.

There can be no doubt about these points, the drawing shows the chamfer and the rounded end; theory and practical servicing should have taught candidates how to finish pivots but no candidate achieved perfect pivots.

Workmanship includes many aspects of the work which are assessed separately, the fitting of the jewel, the screw with its head and slot. Throughout the standard was disappointing.

Quality of Finish:

Unfortunately no candidate achieved a good standard of finish. The cock is a demanding component to finish and many of the obvious pitfalls were present – rounded corners, the chamfer at the top edge was irregular and did not blend into the curve and machining marks remained. One of the most difficult surfaces to finish is the machined underside of the cock. To simplify the process it is essential that the finish from the cutting tool is as good as can be achieved. A sharp tool, a slight flat parallel to the surface that is to be cut and a very light finishing cut would have eased the process for most of the candidates – some candidates did not attempt to finish this part of the cock with a resultant loss of marks.

Overall:

A disappointing result, out of nine candidates only one gained more than 50%; no candidate achieved a Pass with Merit and four failed. The standard required has been achieved in previous years; it is important that students practise the skills in preparation for the examination. Examination papers from previous years are available on the Institute website; there can be little real excuse for the mediocre results.

Unit 4 : Final Grade Part I : The Practical Repair of Clocks

The examination requires candidates to:-

1. Submit a Record of Repairs giving details of eight clock repairs.
2. Produce a detailed drawing showing the construction of a recoil anchor escapement.
3. Design and make recoil pallets to work with an escape wheel and plate with two studs which are provided by the Institute; a maximum of eight hours is allocated for this task.

1 Record of Repairs

Three candidates submitted a Record of Repairs; these met the requirements fully and passes were consequently awarded.

2 Drawing of a recoil anchor escapement

Four drawings were submitted. All drawings were of a good or high standard and all passed.

The drawings correctly followed PP7308 standards. The quality of lettering, line styles and dimensioning were good to excellent. However, all drawings omitted some (and one most) of the necessary construction lines, making it impossible to award marks for correct construction. Unlike general technical drawings, it is essential with escapement drawings to leave the construction lines visible, so that the Examiners can see that the correct constructional methods have been used for pallet faces and discharge corners. The syllabus does clearly state “submit a drawing to an enlarged scale showing the geometrical construction of an anchor recoil escapement”.

3 Design and make pallets for a recoil anchor escapement

Nine candidates submitted pallets for assessments. Two of the escapements did not work. This was due to faults in the candidate's design drawings. One used a span of 8 spaces instead of 7½; this resulted in the wheel being unable to escape from the pallets. The other drew the pallets with both corners on the tip circle of the wheel at the same time; this resulted in the wheel being able to rotate freely without touching the pallets. Several others had minor errors in the design drawings but were still able to achieve a working escapement. However, inside drop and outside drop were generally larger and impulse and recoil angles smaller than specified; they were often different on entry and exit pallets.

It would appear that difficulties in the manufacture left some candidates with insufficient time to adequately finish the pallets. Many had rounded corners and edges and scratched faces; some pallets were not hardened and poorly polished. Only one candidate's work was polished to a reasonable standard. Four failed to achieve the required pass standard and one achieved Pass-with-Merit.

Note, the Institute can provide escapement models and guidance for students to practise making recoil escapement pallets.

Unit 9 : Final Grade Part I : The Practical Repair of Watches

The examination requires candidates to:-

1. Submit a Record of Repairs giving details of ten watch repairs
2. Service a quartz watch and mechanical watch movement; candidates are required to achieve a pass on each watch in order to pass this Unit.

1 Record of Repairs

Six candidates submitted a Record of Repairs. Five fully met the requirements and were awarded passes. One was returned to the candidate for completion.

2 Service a quartz watch and a mechanical watch movement

Seven candidates entered this part of the assessment. Five achieved a pass standard on the quartz watch and all but one passed the mechanical. Three candidates achieved the Pass-with-Merit level on aggregate.

Quartz Watch:

The actual cleaning, re-assembly and lubrication of the movement was generally satisfactory but the fitting of the new stem and crown was very poor in two instances. Two were loose and unscrewed during assessment; the third candidate had cut the stem too short so that the stem was always in the position for adjusting the date. This is a very serious shortcoming, particularly considering that work with these failings would quickly be returned by a customer. Exercises such as fitting a new stem and securing the button should be practised by every candidate to ensure the work can be undertaken to a high standard. Two watches stood out as being serviced to a higher standard than the rest. In some cases screws were found not to be tight enough and in a number of instances Examiners reported minor damage caused when removing or re-fitting the case back. In three cases the hands did not align exactly at 12 o'clock and the date did not change sufficiently close to midnight.

In some watches, the batteries were not replaced. Candidates should be aware that they are expected to fit a new battery at every service, even if the existing battery gives a good test result. In most cases, the Examiners' electrical tests agreed with those of the candidates there being three that differed in one or two of the five tests.

Four faults are deliberately introduced for the candidates to find and correct. In some instances, candidates did not identify all of the faults. A systematic approach should be adopted for oiling in order to ensure that every pivot is lubricated. Practice is required to apply the correct quantity of oil; too much oil is almost as serious a fault as no oil at all.

Mechanical movement:

Cleanliness was generally good with few fingerprints or oil smears noted. As with the quartz, some screws were not tight enough and two movements were submitted with screws missing. Train pivots were generally well oiled but in some instances one pivot had not been oiled. The pallet stones and

balance staff pivots were generally well oiled; some had slightly too much oil, but not excessively so.

One movement was not in working order; the balance spring was not flat and had not been fitted between the curb pin and boot; otherwise, all but one had a good action and were correctly in beat. Several movements showed a losing rate when timed and consequently lost marks. Candidates should be aware that a small gain, of no more than five seconds a day, is required to score maximum marks for timing.

Fault finding was more successful than in the quartz with four candidates successfully identifying and correcting all four faults. The other candidates mostly found three, but in one instance only two were identified

The Examiners exercise considerable care to ensure that there can be no error in the final mark awarded. If, however, you believe that a mistake has occurred then you may request that your paper be assessed again. The charge for remarking is £45.00 per unit, which must accompany the request. This should be received on or before 31st August 2010. The fee will be returned if it is found that as a result of the appeal process the outcome of the examination (i.e. Pass / Fail or Pass / Pass with Merit) is changed.