EXAMINERS' REPORTS

LEVEL 3 CERTIFICATE/DIPLOMA IN MEDICAL SCIENCE

SUMMER 2023

Introduction

Our Principal examiners' reports offer valuable feedback on the recent assessment series. They are written by our Principal Examiners and Principal Moderators after the completion of marking and moderation, and detail how candidates have performed.

This report offers an overall summary of candidates' performance, including the assessment objectives/skills/topics/themes being tested, and highlights the characteristics of successful performance and where performance could be improved. It goes on to look in detail at each question/section of each unit, pinpointing aspects that proved challenging to some candidates and suggesting some reasons as to why that might be.[i]

The information found in this report can provide invaluable insight for practitioners to support their teaching and learning activity. We would also encourage practitioners to share this document – in its entirety or in part – with their learners to help with exam preparation, to understand how to avoid pitfalls and to add to their revision toolbox.

Further support

Document	Description	Link
Professional Learning / CPD	WJEC offers an extensive annual programme of online and face-to-face Professional Learning events. Access interactive feedback, review example candidate responses, gain practical ideas for the classroom and put questions to our dedicated team by registering for one of our events here.	https://www.wjec.co.uk/home/professional-learning/
Past papers	Access the bank of past papers for this qualification, including the most recent assessments. Please note that we do not make past papers available on the public website until 6 months after the examination.	www.wjecservices.co.uk or on the WJEC subject page
Grade boundary information	Grade boundaries are the minimum number of marks needed to achieve each grade. For unitised specifications grade boundaries are expressed on a Uniform Mark Scale (UMS). UMS grade boundaries remain the same every year as the range of UMS mark percentages allocated to a particular grade does not change. UMS grade boundaries are published at overall subject and unit level. For linear specifications, a single grade is awarded for the overall subject, rather than for each unit that contributes towards the overall grade. Grade boundaries are published on results day.	For unitised specifications click here: Results, Grade Boundaries and PRS (wjec.co.uk)

Exam Results Analysis	WJEC provides information to examination centres via the WJEC secure website. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.	www.wjecservices.co.uk
Classroom Resources	Access our extensive range of FREE classroom resources, including blended learning materials, exam walk-throughs and knowledge organisers to support teaching and learning.	https://resources.wjec.co.uk/
Bank of Professional Learning materials	Access our bank of Professional Learning materials from previous events from our secure website and additional pre-recorded materials available in the public domain.	www.wjecservices.co.uk or on the WJEC subject page.
Become an examiner with WJEC.	We are always looking to recruit new examiners or moderators. These opportunities can provide you with invaluable insight into the assessment process, enhance your skill set, increase your understanding of your subject and inform your teaching.	Become an Examiner | WJEC

Subject Officer's Executive Summary

Certificate: Total entries were comparable to 2022 but are over double that of 2019. The dominant age of the cohort was 17 years old, with fewer resitters compared to 2019. Of the age 17 cohort females remain the majority group with a 68.0% share. The mean mark for unit 1 was slightly higher than in 2022. The mean mark for unit 2 was not comparable to unit 2 due to the unit being adapted in 2022. The mean mark for unit 3 was stable compared to 2019.

Diploma: There was a very large increase in entries from 389 in 2019 to 1,044 in 2023, though this was slightly lower than the 2022 entry (1,150). As in previous years age 18s were the largest age group. There was a higher proportion of age 18 females (73.9%) than males. There was a slight decrease in the means compared to 2019.

Areas for improvement	Classroom resources	Brief description of resource
Unit 1 Blood vessels	THE CIRCULATORY SYSTEM HTTPS://RESOURCE.DOWNLOAD.WJEC.CO.UK/VTC/2021-22/EL21-22_14-21/ENG/THE-CIRCULATORY-SYSTEM.PDF	Knowledge organiser
Unit 1 EEG	NEUROPHYSIOLOGY HTTPS://RESOURCE.DOWNLOAD.WJEC.CO.UK/VTC/2021-22/EL21-22_14-13A/_ENG/2-3-NEUROPHYSIOLOGY.PDF	Knowledge organiser
Unit 1 vision tests	AUDIOLOGY AND OPTHALMIC IMAGING HTTPS://RESOURCE.DOWNLOAD.WJEC.CO.UK/VTC/2021-22/EL21-22_14-13A/_ENG/2-4-AUDIOLOGY-OPHTALMIC-PHYSIOLOGY.PDF	Knowledge organiser
Unit 1 polysaccharides	Chemical elements are joined together to form biological compounds Https://resource.download.wjec.co.uk/vtc/2021-22/el21-22_14-21/eng/biological-molecules_v2.pdf	Knowledge organiser
Unit 1 DNA replication	NUCLEIC ACIDS AND THEIR FUNCTIONS HTTPS://RESOURCE.DOWNLOAD.WJEC.CO.UK/VTC/2021-22/EL21-22_14-21/ENG/NUCLEIC_ACIDS_AND_THEIR_FUNCTIONS_V2.PDF	Knowledge organiser
Unit 1 joints	Musculoskeletal systems Https://resource.download.wjec.co.uk/vtc/2021-22/el21-22_14-21/eng/musculoskeletal-system.pdf	Knowledge organiser

Unit 2 Principals of ECG, Blood pressure monitoring and peak flow	PHYSIOLOGICAL MEASUREMENT:CARDIAC PHYSIOLOGY HTTPS://RESOURCE.DOWNLOAD.WJEC.CO.UK/VTC/2021-22/EL21-22_14-13A/_ENG/2-1-CARDIAC-PHYSIOLOGY.PDF PHYSIOLOGICAL MEASUREMENT: RESPIRATORY PHYSIOLOY HTTPS://RESOURCE.DOWNLOAD.WJEC.CO.UK/VTC/2021-22/EL21-22_14-13A/_ENG/2-2-RESPIRATORY-PHYSIOLOGY.PDF	Knowledge organiser
Unit 2 Teacher guidance notes	Https://www.cbac.co.uk/media/30onzjva/medical-science-guidance-for-teaching-e.pdf	Guidance notes for teachers
Unit 3 variables	Understanding research methods Https://resource.download.wjec.co.uk/vtc/2021-22/el21-22_14-13b/pdf/_eng/3-1-research-methods.pdf	Knowledge organiser
Unit 4 Treatments for cancer	Treatment of cancer Https://resource.download.wjec.co.uk/vtc/2021-22/el21-22_14-13b/pdf/_eng/4-3-treatment-of-cancer.pdf	Knowledge organiser
Unit 6 – gram staining	Structure and growth of microbes https://resource.download.wjec.co.uk/vtc/2021-22/el21-22_14-13c/pdf/_eng/5-5-structure-growth-microbes.pdf	Knowledge organiser

MEDICAL SCIENCE

Level 3 UNIT 1

Summer 2023

HUMAN HEALTH AND DISEASE

Overview of the Unit

- Unit 1 is the externally assessed examination unit for the Medical Science Certificate. It is worth 50% of the overall marks for this qualification. Candidates are provided with a pre-release article four weeks before the exam to work through.
- Section A of the exam paper has questions based around the pre-release article. These questions could ask for content directly found in the article, could ask candidates to apply their knowledge or could bring in another unit of work connected to that which is in the pre-release. The maximum mark for this section is up to 25. This year there were 24 marks available from Section A. It can contain content from Units 1, 2 or 3.
- Section B is made up of questions based on the specification for units 1, 2 and 3. The questions test a range of skills including direct recall, analysis, evaluation and other mathematical skills. This year section B was worth 66 marks.
- Only a small number of candidates did not attempt all questions and it was apparent that all candidates had sufficient time to complete the paper. Many candidates failed to express themselves clearly and responses lacked the use of appropriate terminology or specificity, this was a problem in both Welsh and English medium scripts again this year. Candidates are reminded of the necessity for good English/ Welsh on the front of the examination paper. There was a lack of scientific detail and use of suitable scientific terminology for the extended answer questions, this limited the number of marks that were available for some candidates.
- It was clear that many candidates had difficulty with simple mathematical problems again this year.
- It was refreshing to see that most candidates had appropriate equipment i.e., pencil and ruler for use with drawing the graph although the type of graph selected by a large percentage of candidates was again, incorrect.

Comments on individual questions/sections

Section A

- Candidates were provided with a pre-release article about Migraines this year.
- Questions 1, 2, 4a, 5a and 7 required candidates to use the pre-release article to extract information for their answers. This was generally done very well with candidates accessing many marks for all except question 7 where it was required that they applied the knowledge they had taken from the article.
  Candidates are able to find information and select correct information from the article when answering which showed that centres and candidates had spent time working through the article before the exam. This was encouraging.
- Question 7 was not answered as well and many candidates struggled to apply their knowledge from the article to articulate a correct response. An example of this was with 7a where large numbers of candidates stated that patients would be reluctant to use medication or triptans because they cause the blood vessels in the brain to narrow which could cause a stroke. Here, candidates had missed that the narrowing of the blood vessels simply allows the blood vessels to return to their usual state after a migraine, there is no extra narrowing. With TMS (7c) they failed to associate this type of treatment with it being unknown or due to the electrical impulse could cause fear amongst patients.

- Questions 3, 4bi and 4bii made a link to unit 2/3. The pre-release contained information about different physiological tests carried out that help to diagnose migraines. Candidates could recall a test that measure brain activity (EEG) for 3a but were then unable to give full descriptions on how this test is performed. Candidates failed to note that 'sensors' were placed on the head or scalp, instead giving very basic descriptions of 'probes/ nodes being placed on the brain'. They also were unable to describe the principle of the test with regards to recording and analysis of the information collected during the test. When it came to naming another condition that could be diagnosed by EEG their answers were vague e.g., cancer (no qualification for brain) or simply a stock answer e.g., stroke/ dementia. Epilepsy is listed in the specification which would have gained credit along with many other examples.
- Answers to 4bi and 4bii were even more disappointing with the vast majority of candidates being unable to name a test that tests vision e.g., reading chart, tonometry (see the extensive list that is in the specification for unit 2). Describing the test named was also a challenge, the pre-release had keyed candidates in to potential unit 2 link themes but it was the minority that were able to gain any marks on this question.
- Mathematical skills were tested in question 6a where candidates were asked to calculate the number of people that were suffering from migraine in the UK. The majority of candidates attempted this question with varying degrees of success. Credit was awarded for finding the correct percentage within the pre-release and many candidates gained 1 mark for 23.3 or 23%. Some were then able to calculate a figure with either of these percentages gaining credit. It was only a minority that were then able to give the answer in standard form. This is not a new requirement and has been tested in previous series. It is clear that candidates need to practise with this style of question for future series.
- Questions 5b, 5c and 6b required candidates to apply knowledge. These questions were handled with varying degrees of success. Many candidates correctly suggested an advantage/ disadvantage to plant-based diets which was encouraging, however, a large number of candidates failed to gain full credit here as their answers lacked detail. They failed to name particular foods e.g., **citrus** fruit, **processed** meats and so did not gain any marks here.

  Nearly all candidates attempted an answer for 5c, listing three life-style changes a person could make to reduce migraines. However, all three needed to be correct for one mark and again this year candidates are still giving 'exercise, regular exercise and diet' as answers to these types of questions. As previously stated in past series candidates need to be more specific with their answers e.g., exercise **more**, diet low in **processed meats** etc instead of a stock answer that they think they can apply to any lifestyle choices question.

Section B

- Questions 8 and 9 were both based on content from LO1. All sections of both apart from 8b were not answered well by candidates.
  Even though there is only one type of polysaccharide named on the specification, the majority of candidates failed to recognise it as glycogen for 8a. This was highly disappointing and showed a basic lack of learning for the direct recall questions.
  The number of candidates that successfully recognised glucose for 8b was much higher. Unfortunately, for 8c many were unable to correctly identify the glycosidic bond. These questions were all very basic direct recall from LO1. Similar questions have been set in the past so centres should be sure to use the previous papers when revising to help improve the candidate's exam technique.
- Question 9 was attempted by less candidates than expected this year with almost 18% not attempting 9b- this is significantly higher than usual when answering questions for section B.

Candidates struggled to describe the structure of a nucleotide of DNA- something that they very often study at GCSE level. Giving an explanation for 9b was even more of a challenge and very few scored two marks here. Candidates failed to state whether the DNA strands were copy/ template/ original strands and then failed to state the formation of the new strands. Here it was their method of communication that let them down with many understanding the concept of semi-conservative replication but then not being able to express themselves in a scientific way to allow for any marks to be credited.

- Question 10 was based on content from LO2. This content has not been examined in this way before and considering most of this work is also at GCSE level it was expected that candidates would score well here. A large number of candidates didn't attempt 10a and of those that did only small numbers were able to correctly identify the type of joints present in the spinal column as cartilaginous.
  More attempted 10b here, many were unable to name the structure found between the vertebrae for the first mark but did gain a mark for the function. These two points were marked independently which allowed for those that did not give a name to gain some credit.
  The standard for 10c was much improved with more candidates being credited for one of the two joint types. It was seen many times that candidates simply re-stated the stem of the question and wrote 'skull' or 'knee' for the name of the joints however, the question was asking them to give the type of joints at these locations.
- Question 11 was a combination of content from LO3 and LO4. Here, candidates were expected to draw on their prior knowledge of a disease named on the specification i.e., HIV. Candidates were expected to recall work done in lessons and to apply this to 11a. It was disappointing to see that many candidates struggled here. Good answers gave details of the mode of transmission including unprotected sexual intercourse, transferred from mother to child and being in contact with bodily fluids such as blood with a relevant method of reducing the risk of infection. Answers that were not credited either did not give enough detail or were very obviously wrong with it being quite apparent that many candidates either did not learn this work or had not studied the disease in any detail. Centres should ensure that they work through each of the named diseases following detail requirements from the specification and teacher guidance.
- Question 11b was the question that was the most challenging for candidates. Very few candidates scored any marks here. Candidates failed to connect the system with the effect of the HIV e.g., the immune system becomes compromised **and** this results in the sufferer being more prone to illness. Instead, candidates simply stated the name of the body system that was affected.
- Questions 11c- 11e(ii) were based on content from LO3 but also tested skills from LO4. Candidates were more successful in suggesting trends in data this year and their graph skills seemed to have improved for 11e(i). It was still the case this year that many were unable to select the correct type of graph, a skill they should most definitely have developed by this stage in their education. Some struggled with selecting the most appropriate scale even though the size of the graph paper was such that the graph scale should have filled the page.
  Calculations were done reasonably well this year. It was the case that candidates either could or couldn't do this with very few gaining two marks. Centres should encourage candidates to write down they workings for all mathematical calculations.
- Question 12 examined content from LO2, blood and the circulatory system. Yet again, candidates failed to score marks for 12(i) as they did not use the specified terminology set out in the teacher guidance and specification; erythrocytes and leucocytes. This is a common trend every time this content is examined and a comment is made each time reminding centres that they should be telling candidates that they do not gain credit for stating red blood cells or white blood cells.

- Parts 12(b)(i)- (v) asked candidates to draw on recall for the most part for content that is found at GCSE level. Candidates did well for some of the questions however, the majority could not explain the term 'myogenic' or state the name of the blood vessel that supplies the heart muscle with oxygen and glucose. When asked to describe how heartbeat is controlled and coordinated only a very small number of candidates gained the full four marks. Answers lacked detail and scientific content. Good answers had included descriptions of the SAN, AVN and Bundle of His which was encouraging.
- 12(c) examined content about the lymphatic system. This is the first time that this content has been examined and it was disappointing to see that the majority of candidates really struggled to score any marks. This question was direct recall yet only a limited number of times was 'spleen' and 'lymph nodes' seen as an answer. The final part of the question was very poorly answered, over 20% of candidates did not even attempt the question and of those that did, answers lacked any detail at all. Instead, candidates had used the diagram and tried to describe what was happening from this. There was a requirement for candidates to use their knowledge of the formation of tissue fluid and apply it to this question not simply restating phrases from the diagram.
- Question 13 examined content from LO1. It was refreshing to see that almost all candidates had attempted 13(a) and most scored some marks here.
  Part (b)(i) required candidates to apply their knowledge of the plasma membrane and make a sketch drawing. Marks were awarded for the correct positioning and labelling of the phospholipid bilayer and at least one protein. Less than 75% of candidates attempted this question, many failed to label their diagram which meant they couldn't access any marks. Good answers had simple diagrams that were clearly labelled.
  With part b(ii) many candidates had no problem naming another method that molecules use to move across the plasma membrane but then failed to give enough scientific detail to gain the second mark, e.g., active transport (1 mark) movement of molecules from a low concentration to a high concentration (0 marks), here there was no mention of using ATP/ energy so no mark awarded.
- The final question on the paper, question 14, was a link with unit 3. Most candidates attempted both sections of this question however, a lack of detail and poor communication meant that many were unable to access many marks. For 14(a) candidates should have drawn on their experience with carrying out a research project and should have listed any of the ethical considerations they used during their ethical evaluations. Good answers stated informed consent, value of research, protection from harm etc. Part (b) asked candidates to draw on their statistical experience and answers such as calculating a mean, mode or median, using statistical tests such as Spearman Rank, Student T- test, Chi squared to name a few would have gained marks. Where candidates became confused, they simply stated drawing graphs or pie charts which were not correct.
- Overall, the standard of answers this year was on par with that of previous series. Candidates are still making basic errors with mathematical calculations and graphs as well as struggling to communicate effectively.

MEDICAL SCIENCE

Level 3 UNIT 2

Summer 2023

PHYSIOLOGICAL MEASUREMENT TECHNIQUES

Overview of the Unit

Many centres submitted work of a very good standard and the assessment decisions were generally valid and agreed with the moderator's decisions. Some centres appear unsure of what is required for some of the assessment criteria. Please do look at all the on-line information – the specification and exemplar candidate's material is on the Medical Science webpage and the teacher's guidance notes are to be found on the subject webpage.

The unit 2: Physiological Measurement Techniques Internal Assessment is on the secure website.

Yet again there has been a high level of copying directly from NHS webpages and American lung/asthma websites and each other. As stated last year it is important to stop such blatant copying because candidates will not be able to do this in HE/university. Centres should discourage candidates from using text directly from medical websites, but to interpret the information they have read and demonstrate their knowledge and understanding in their own words.

The inclusion of detailed annotation on candidate's work is extremely helpful. Work was often submitted in multiple documents, many candidates with eight or nine; please could this be reduced to one document if possible.

Comments on individual questions/sections

Task 1

The question they need to answer for AC1.1 is 'Why can I use this piece of equipment to measure this physiological parameter?' In order for candidates to be awarded top band we would expect an explanation of the physiology behind the test e.g. reference to the brachial artery in the blood pressure leaflet, bronchi and bronchioles in the peak flow, heart muscle depolarisation in the ECG. There was little reference to how the tests work i.e. answering a patient's questions "Why are you inflating the cuff? What is it doing?" This needs to be in the leaflet in a brief format suitable for a patient.

For AC1.2 Candidates awarded top band in this AC should discuss, in detail, normal and extreme values for each of the physiological measurements and link each of these to related diseases. For example for the ECG, candidates should discuss normal resting heart rate and discuss the significance of abnormal values to the health of the patient. Candidates are expected to give an explanation themselves in order to award marks, it is not enough for them to include a table/diagram from the internet, without an explanation, to obtain marks in this AC.

For AC 1.3 Limitations need to focus not only on the patient but also on the methods. For example with blood pressure the tightness of the cuff, correct size and how this could affect the results, the ECG may require shaving of chest hair to make sure there is good contact between electrodes and skin. A list of limitations does not equal a description. Repetition of the same limitations for each of the patients and each of the tests is not acceptable for top band. Each patient is different and circumstances are not the same, so it would be expected that there would be some considered differences between them; too many are copying and pasting the limitations form one patient to the next. There is another opportunity to expand on these limitations in task 4 and do encourage candidates to do so.

Task 2

AC2.1 and 2.2. Both these AC need to be **fully** and accurately **explained** in the plan and then witnessed for top band.

AC2.1 Candidates must explain in detail the importance of protecting information, informing patients and providing correct information to them as well as the importance of disclosure of information to obtain top bands.

AC2.2 asks them to **describe** conduct towards patients. Written descriptions of conduct must be clear and detailed to obtain the top band and should include detailed references to conduct, empathy, tone and use of language. In real life, they will not necessarily know who is going to walk through the door and need to be aware of all possible types of patients.

AC3.1 – To obtain top band for the plan, it must be possible for a third party to follow the procedures exactly and there must be clear reference to the key aspects as listed in the specification e.g. location, timing, informing individuals and technicians. It would be advisable for candidates to write the plan in a step-by-step guide rather than continuous prose. This would also be easier for the assessor to mark and for a third party to follow. Candidates would be advised to include a patient questionnaire e.g., weight, age, sex, smoker etc., which can be completed by the patient and a photocopy/scan provided as evidence. Candidates need to also give details of how they are going to inform the patient of the time, date, location of appointment. They need to also include what they need to book with the technician e.g., equipment, private room. (Perhaps encourage them to think of the plan as a recipe – with ingredients and a method.)

AC 3.2 is the only AC which is taken on solely on the assessors marks, since only the assessor is present; all other AC must have evidence generated by the candidate in the relevant task, which is then supported by assessor comments. Observation sheets were sometimes identical for all candidates. It would be expected that some comments would be specific to a candidate's handling of the tests.

Often the candidates had recorded results in AC3.3, according to the observation sheet, but there was very little/no evidence of any recording of results and most candidates were awarded top band despite no evidence of a table of results, no units or using the wrong units for their measurements in their testing. There were few copies of results sheets drawn up during testing, either on paper or on-line. There should be a copy of the results sheet included in the submission so the moderator can see the evidence.

Tasks 3 and 4
AC4.1 takes care of all the data processing, not task 4.

For AC4.1 the expected requirement is for blood pressure measurement to be repeated three times. This provides opportunities for data processing through the calculation of a mean. The full working out should be shown along with the correct use of significant figures. Three readings also provide data for students to then discuss repeatability and outliers in their evaluations and suggest explanations for them (AC4.3). Candidates need to label both ECG traces with PQRST and calculate BPM, using numbers of boxes in 1 second, using the 1 second scale. The traces should be included in the submission. A mean of the two traces can then be calculated. The calculations should be produced separately in Task 3 and only the results need entering in the GP form (task 4). The data can be analysed for AC4.3. They should ensure that they make clear that they find the highest value for the peak flow. Some candidates were awarded top bands despite incorrect calculations or lack of labelling of the ECG and calculating the mean for the peak flow. Some scanned ECG calculations were not visible due to the poor quality resolution. All the maths can be presented separately in task 3 and the final figures transferred to the pro forma for task 4.

In AC 4.2 candidates need to make valid and detailed conclusions based upon evidence, for example, they could mention that their patient is not suffering from hypotension or hypertension. It is not necessary for the candidates to provide cardiac consultant level analysis of the ECG traces, a simple description with the labelled diagram will suffice, plus the BPM calculations (not guestimates) and analysis.

For AC 4.3 there needs to be an evaluation of the information from the physiological tests. The three sets of data for BP and PF and two ECG's allow them to look at the repeats and question how close together the data is; if not, why not? Candidates need to be discussing how to improve readings with better technique, identifying anomalies, and linking these to limitations in the method as well as possibly suggesting further testing. This AC is not repeating all that they have put in 4.2 (conclusions about the health of patients based on test results) but worded differently.

AC 4.4 is really assessed throughout the entire assignment. Candidates need to be much more conscious of the fact that the language they use for the patient leaflets and their contact with patients is very different to that which they would use for presenting work to a consultant/head of department/GP. They can use much more scientific terminology in the pro forma, knowing that it would be fully understood.

There is no need to explain all the maths again (that is done in task 3, AC 4.1); the consultant/eq simply needs to know the results. In the reports candidates did not consistently use scientific and technical language. They can still use the technical terms in their conclusions and evaluations even if the patient is not suffering from a condition. For example, they could mention that their patient is not suffering from hypotension or hypertension. At no point should candidates be comparing the results of patients A and B or putting them both on the same pro-forma.

MEDICAL SCIENCE

Level 3 UNIT 3

Summer 2023

RESEARCH METHODS

Overview of the Unit

The quality of the work submitted was generally good and assessments by the centres were in the main accurate and in agreement with the moderators. It was pleasing to see that many centres had acted upon comments made in previous moderator reports.

Administrative work was generally correct, with authentication sheets signed by candidates. Some centres did not use the revised version of the Ethical Evaluation proforma. Most centres had clear annotations on the candidate work indicating why certain bands and marks were awarded for the individual assessment criteria and these marks were then correctly transferred to the Mark Record Sheet.

The moderation process involves using the Mark Record Sheet to check against candidate work and any annotations written on the investigations. It involves a lot of scrolling. It makes the process much easier if candidate work is uploaded as one document, with no blank pages and no upside-down pages.

Comments on individual questions/sections

AC1.1: Better candidates achieve Band 3 here giving clear descriptions of the variables along with how they will be measured or, for the extraneous variables, how they may be taken account of in their investigation. Weaker candidates often struggle to express measurable variables or have more than one independent variable. It is better to restrict the number of groups in the independent variable to two as this makes the subsequent analysis more straightforward. To quote ‘attitudes’ as the dependent variable is too vague and there needs to be further description of what is being investigated.

AC1.2: Whilst it is essential to quote the hypothesis for the investigation the marks are awarded for its justification. Candidates should consider why they have chosen to investigate this hypothesis and why the information produced might be valuable. Better candidates might refer to a research paper or newspaper article. Many candidates lost marks here by only referring to a one tailed or two tailed hypothesis.

AC1.3 and 1.4: These were generally well answered by most candidates. The better responses referred to how the data might be analysed, for example, by giving examples of questions which will generate data for graph drawing or may be used for a named statistical test. There is no requirement to discuss all the sampling techniques to achieve Band 3 for AC 1.3, just the reason for selecting the technique including the advantages and disadvantages of the sampling method. Candidates should avoid giving generic descriptions of their sampling method without setting it in the context of their investigation.

Task 2: Collecting information

AC2.1: To award Band 3 the plan needs to be sufficiently detailed for it to be followed by a third party. For example, it is insufficient to say that the questionnaire will be handed out. How will it be handed out? A few candidates lost all the available marks here for not including a plan.

AC2.2: The majority of candidates were able to produce good documentation for the collection of data. It is better if a blank copy of the questionnaire is included in the report for the moderation of this AC. Better candidates included a question which split the responses into the groups being considered in the independent variable along with a few questions linking to the extraneous variables mentioned in their Task 1. However, some still contain too many irrelevant questions which do not link to attitudes to the flu jab. Consequently, far too much data was generated which did not link to the hypothesis making analysis difficult. It also resulted in investigations which were far too lengthy. At the other extreme some very short questionnaires were seen which limited the possibilities of drawing conclusions from the data.

AC2.3: Candidates should be encouraged to collate their raw data and present it in suitably labelled tables. This will also contribute towards AC5.1.

Task 3: Analyse the data

Throughout this task there should be evidence that the candidates understand and apply the terms used in data analysis. If a statistical test is used then terms such as degree of freedom, probability, critical value and parametric should be used and explained in the correct context. Many candidates use the correct terminology but fail to explain it, or just list and give definitions of the terms. This will not access any marks unless used in the context of the analysis. Evidence for AC 3.1 and AC 3.2 might be found in the presentation.

Candidates should explain why they have chosen a statistical test using terms such as nominal, categoric or ordinal to describe their data. Other terms might include correlation, statistical difference, trend and normal distribution. If necessary, the null hypothesis should be stated before carrying out the test. Note that the null hypothesis should contain the phrase ‘there is no significant difference between …’ ; or in the case of the Chi Square test, ‘There is no significant difference between the observed and he expected value …’Candidates who do not carry out a statistical test can be credited here for explaining any statistical methods they may have used e.g. the calculation of a mean or a percentage.

A well set out and analysed statistical test will meet many of the assessment criteria including AC3.1, AC4.2 and AC4.4. It is acceptable to analyse the data by using an excel spread sheet, but if candidates show the stages of the calculation of the statistical test it will help them to access marks for both AC4.1 and AC4.2.

AC4.1: It is pleasing that more candidates are now correctly using a statistical test such as Chi Square or Mann Whitney to analyse data. Many candidates still forget to say why they have chosen a specific test, losing marks for AC3.2. Some candidates are struggling to find suitable data for analysis. A Chi Square test can be used to analyse simple yes/no answers to questions. If a Chi Square test is used it is essential to include a contingency table to show how the expected value is calculated. It is not just the mean of the input data. Standard deviation used to measure the age range of the participants (the independent variable) is not a valid test in this context.

Many candidates use an app or website to generate a result for Chi square but it needs to be clear what data they are inputting to get the result. The candidates that demonstrate all aspects of the calculation of the statistical methods have ample opportunity to present relevant notation (AC 4.4) and those were the candidates that showed most understanding of why they were completing the analysis.

AC4.2: The best answers here are where the conclusions are clearly and logically linked to the evidence and to the null hypothesis. Many candidates state they are going to accept/reject their hypothesis leaving the moderator to guess what their hypothesis is. Better candidates clearly link the data to the groups in their independent variable.

AC4.3 requires candidates to evaluate their data and/or their procedures. Reference could be made here to the number of people in the sample, bias, reliability of the data collected along with any possible improvements.

AC4.4: The improved use of statistical tests has made this AC more accessible with many candidates using mathematical notation and significant figures correctly.

Task 5: Prepare a presentation

AC5.1 requires candidates to present their data visually and suitable for an audience of scientists and non-scientists. All tables and graphs need to be correctly set out. Tables need to have clear column headings (link to AC2.3 and AC4.4) and graphs need to be fully labelled. Many graphs generated using excel spreadsheets did not have labelled axes. It is better to present categoric data as a bar chart rather than copying and pasting a pie chart from a google document.

AC5.2. Most candidates are submitting good quality presentations, usually using PowerPoint.

Centres are reminded that exemplar work for this unit is available to view on the secure WJEC website along with additional marking guidance. Please note that the e-cigarette assignment has been retired and will no longer be accepted. The ‘Flu Jab’ assignment has a revised copy of the Ethical Evaluation proforma. Any alterations to this assignment must be after consultation with the Subject Officer.

MEDICAL SCIENCE

Level 3 UNIT 4

Summer 2023

MEDICINES AND TREATMENT OF DISEASE

Overview of the Unit

Overview of the Unit

Unit 4 develops knowledge and understanding of the science of medicines, and how they interact with body systems. It also introduces cancer and its genetics as well as suitable treatment and new treatment options for cancer. Learners will develop collaboration and presentation skills as well as working independently to research and produce medicine information and cancer information.
The unit is worth 25% of the Diploma for the qualification and it is split into three tasks.

Comments on individual questions/sections

Please refer to the model assignment for Unit 4 which can be found on the WJEC secure website for full details of the assessment requirements for each task.

Task 1: Presentations to Nursing Staff

- Evidence for this task includes a copy of the presentation slides for each presentation (one for each group is sufficient providing it is clear who worked together), speaker's notes from each candidate clearly showing their contribution to the presentation, observation record completed fully by the assessor and a reflective account completed by the candidate.
- Candidates are expected to work in groups, where possible, to complete two presentations to nursing staff.
- The presentation materials that were submitted this year were to a high standard and it was clear where candidates had gained marks. Assessors had annotated where appropriate and completed the observation record in the vast majority of cases. Speaker's notes were also provided so that it was obvious which part each candidate had presented. This is good practise.
- In the event that a candidate has not provided a detailed presentation or comment on the speakers notes for an AC then it is acceptable for the assessor to question the candidate for further information/ clarification and to then note this as evidence on the observation record.
- In completing their presentations, candidates are specifically asked to provide a reflective account of their contribution to teamwork (AC4.3). Whilst the assessor can, and should comment on this in the observation record, the reflection is a specified piece of evidence as listed in the model assignment. It is expected, therefore that these reflective accounts are included with the candidate's presentation and speaker materials along with the observation record. Assessors should not credit any marks when the reflective account is absent.
- It was found that many centres had omitted these reflective accounts this year but had still credited their candidates for their contributions. This resulted in this assessment criterion being overmarked by some centres.

- A small number of centres had included a blank observation record, which is not acceptable. The observation record should be completed fully with information about the attainment of the candidate for each AC.

Task 2: Information on Four Medicines.

- Candidates are asked to produce information on four different medicines for task 2. These medicines should target three diseases/ conditions which affect three of the body systems listed in the teacher guidance and the fourth medicine should be one that targets a causative agent e.g. bacteria, virus or fungi.
- Medicines selected should be used to treat a condition and not medication that is preventative e.g., contraceptive pill or vaccine. It was seen in a small number of centres again this year that preventative medicines were chosen, these do not allow candidates to access all of the assessment criteria and candidates should be discouraged from using them for this task.
- It is perfectly acceptable for centres to provide a list of medications that would be suitable and allow candidates to use those, this way candidates have the potential to access all marking points. It would also be perfectly acceptable for all candidates from a centre to have medical information about the same drugs.
- Many thanks to a large number of centres that consistently and fairly applied the marking guidance when assessing this task. Some centres however clearly struggled with the assessing of task 2. This resulted in many of these centres over marking this task. Evidence of a particular AC should be seen across all leaflets (except AC2.3) to award top band marks. Centres are encouraged to produce a marking grid when assessing to note that each AC has been seen and to which level of detail before awarding a band mark.
- Marks were awarded in many instances for AC4.2, the justification of communication method but there was no evidence. As with AC4.3 if the candidate has not produced a justification no marks can be awarded. The level of detail in this justification also needs to include reasoning as to why the candidate selected this method and not another. A maximum of four marks can be awarded if candidates do not explain why they have not selected a podcast for example instead of a leaflet.
- A.C 2.1: There was often a lack of detail in the explanations provided regarding the molecular basis of the action of a medicine - candidates must provide information about the drug-receptor interactions for each medicine and the possible ways in which the medicine works. These must be evident for all medicine information to award the top band. Marks should be reduced accordingly when parts have been omitted.
- A.C 2.2: Candidates should directly reference the body systems that the medication effects, and not just discuss an individual organ affected by the medicine. A comprehensive list of the body systems can be found in the specification and candidates would need to select three different body systems in order to access the top band marks.
- A.C 2.4: Often candidates did not provide a suitable or detailed enough explanation of why medicines can lose their effectiveness across **all** of the medicines discussed. If the medicine that the candidate is studying does not lose effectiveness then it is appropriate to state this on their medical information.
- AC 2.5: Assessors awarded high marks this year again for lists of drugs that interact with the medicine. This is not sufficient. There must be a comparison of the interaction of the medicines together, be that positive or negative effects.
- A.C 2.7: Candidates often failed to explain clearly **how** adverse reactions to medicines occur; instead, they only provided a list of possible adverse reactions. If only a list of adverse reactions/ side effects is provided then candidates are limited to band 1 for this assessment criterion.
- Centres are directed to the exemplar materials that are found on the WJEC secure website for examples of this unit.

Task 3

- Candidates are required to produce information about cancer for task 3. The quality of this task was mostly very good again this year with the majority of centres understanding the brief well and candidates producing work of a good standard. However, some centres did mark this task generously and they should exercise caution in future when awarding higher band marks for lack of detail.
- AC 3.1: This was the first time that AC 3.1 was seen to be overmarked by some centres. In order to access the top band mark here, candidates must have included information in sufficient detail for all of the points stated in the specification/ marking guidance. Any omissions from this list should be penalised and the candidate would not be able to access 4 marks.
- AC 3.3: If candidates are to be award top band marks, then they must describe all five treatment options that are listed in the specification. When candidates have not described the full range to sufficient detail then they should be credited accordingly. Many centres were awarding 6 marks for information that lacked detail and that did not cover the full range of treatment options available. It would be reasonable that three well described treatment options could access four marks but would not be able to access any more than this.
- AC 3.4: This assessment criterion was by far the most generously marked for this task again this year. Many assessors awarded marks for descriptions of the different new treatment options for cancer. This is not what is required for this assessment criterion. Candidates must assess the impact of the new treatment as well as provide some information about each new treatment that is listed in the specification. When no assessment has been made, candidates should not be credited high marks. Good examples for this AC included comparisons of advantages/ disadvantages or pros/ cons for each of the new treatment options. Candidates should also be encouraged to only include assessments for the treatments listed in the specification for this AC.
- AC 4.1: Marks are awarded here for the method of communication of the cancer information. Some centres award very high marks for work that would not be considered the most appropriate. As stated in the principal moderator report last year any centres that have overmarked this AC will be penalised this year. It was found that some assessors were awarding the full 9 marks for work which was not communicated effectively. It was seen that power point presentations were awarded 8/9 marks; however, these would not be deemed the most appropriate means of providing patient information and as such the moderators changed these marks.

Task marking
Comments on approaches to internal marking

- The majority of centres marked consistently and applied the marking guidance fairly for their candidates. This was encouraging.
- For a small number of centres, the internal marking was generous, assessors should be sure to refer to exemplar materials and to ask exams officers for access to the individual centre report for centre specific comments for improvement.
- Annotation on the work varied. Centres are encouraged to annotate the work at the point where the assessment criterion is seen. Assessors should note the AC and then write a comment if necessary. Good examples included underlining or highlighting the work that showed the assessment criteria had been met. The best examples also included annotations that were handwritten, it is good practise to print the candidate work, annotate by hand then scan in to send.

- Organisation of the work was generally good, however, a small number of centres did not arrange the work appropriately for scanning. Please ensure work is in task order with AC 4.2 and 4.3 positioned with the correct task for scanning. When scanning please ensure the orientation of the work is the same and ensure the scanner is not set to scan both sides of the page if single sided sheets have been used.
- There was little evidence of internal moderation on the work. It was seen that some centres where internal moderation had taken place resulted in marks being changed for candidates when the original mark awarded by the assessor was more suitable.
- There were a small number of centres that did not provide the authenticated sheets at the start of the work. It is a JCQ requirement that all work is authenticated by the candidate and the assessor.

MEDICAL SCIENCE

Level 3 UNIT 5

Summer 2023

CLINICAL LABORATORY TECHNIQUES

Overview of the Unit

Activity 1 assesses A.C. 2.1, 2.2, 2.3 and 3.4.

The tasks in this activity are linked. Candidates are expected to plan and carry out the investigation of a sample, collecting and analysing results which they then summarised in a separate report.

Activity 2 assesses A.C. 1.1, 1.2, 3.1, 3.2, 3.3 and 3.4

The tasks here were more discrete. Task 1 required candidates to produce information, which needs to be concise, relating to the principals and limiting factors of the three tests. Task 2 requires candidates to process and analyse data using normative values supplied.

In general most candidates are able to complete the majority of the assessment well, although a few had not completed some sections of the work.

Comments on individual questions/sections

This year the brief was in the context of the infection causing osteomyelitis, although the tasks were very similar to those set previously. Centres who had used the CPD materials or the exemplars tended to have prepared candidates well for the assessment.

Activity 1
Most candidates were able to gain marks in all assessment criteria. The planning was generally good. Successful candidates were able to work with their set of samples and understood what to test for and how to test. Less successful candidates used streak testing for bacterial colonies - this does not allow colony numbers to be calculated. Some les successful candidates also became confused by testing many unnecessary samples.

Recording of data tended to be better than last year in many centres. Successful candidates fully explained their results, those who were less successful, lost marks, mainly due to a lack of explanation of what they needed to do in the calculation, poor use of precision, standard form and units.

Activity 2
Task 1
Many candidates were able to explain how the tests produced results and what these results meant. Successful candidates were able to explain, in their own words, the principals of the tests in the detail required by the specification, as well as how specific limitations affected the results. Less successful candidates did not explain how the test actually works and wrote only a generic paragraph about limitations.

Task 2
Most candidates were able to gain marks in all of the assessment criteria for this data analysis. Successful candidates clearly explained how they had manipulated the data provided to construct well-labelled axes and plotted graphs by hand. They then analysed the patient data using all of the information in the normative information supplied. Less successful candidates did not always show how the data to draw the graph had been generated. Some were disadvantaged by creating electronic graphs which did not allow them to meet all the marking criteria. A few did not use all of the normative data correctly and therefore reported inaccurate information for A.C 3.3.

Candidates who did not generate huge quantities of repeated or additional work, and who lay work out in a clear, organised and concise manner, were the most successful in gaining the A.C 3.4 marks which are assessed throughout the work.

Task marking

Comments on approaches to internal marking

Most centres correctly submitted the required work. The work should not amount to more than a few sheets, so stapling each candidate's work together is sufficient, rather than going to the extra cost of purchasing folders for candidates. Some candidates had done a huge amount of unrequired work and referenced this research. This was a waste of their time and could have impacted on the quality of the required work.

It should be noted that is essential that the completed teacher observation record, an authentication sheet signed by the candidate and the mark record sheet are attached to the candidates' work.

The only section of the work which needs to be marked internally is the teacher observation record for A.C 2.2. This is completed well by most centres and included with each candidate's work.

MEDICAL SCIENCE

Level 3 UNIT 6

Summer 2023

MEDICAL CASE STUDY

Overview of the Unit

This is a synoptic unit and assess content from across the specification. Candidates are expected to identify and use an appropriate selection of skills, techniques, concepts, theories, and knowledge from across the course content.

The questions in this paper were based on pre-release materials which were made available four weeks before the examination. The pre-release resource folder contained information about three medical conditions; Age-Related Macular Degeneration, Kidney Stones and Leptospirosis. Candidates were expected to study and research the information presented in the folder prior to the examination.

It was pleasing to see that most candidates attempted all the questions. Some of the mathematical calculations were carried out particularly well and information provided in the pre-release material was used successfully to answer questions. Candidate knowledge of the immune response has shown improvement over recent years although many still find this topic challenging. A surprising number of candidates found difficulty in answering questions based on experimental techniques such as gram staining and food tests.

Comments on individual questions/sections

Questions 1-5 Case Study 1: Age-Related Macular Degeneration (AMD)

1. This question required candidates to recall knowledge of protein structure which then linked to the effect of VEGF in the eye. Many candidates achieved full marks on the protein structure questions but a significant proportion failed to describe quaternary structure or name two types of bonds found in proteins. Information for answering the VEGF question was on the pre-release material and was well answered by the majority of candidates.

2. This question related to diagnosing AMD using tests mentioned in the pre-release material which candidates had the opportunity to research prior to the examination.

    (a) Many candidates lost marks here as their answers were ambiguous. Tropicamide does not dilate the eye, it dilates the pupil and there were many vague answers referring to examination of the back of the eye.
    (b) Most candidates correctly identified tonometry for measuring eye pressure, although there were a few answers which referred to measuring blood pressure.
    (c) Only the better candidates could give a clear and logical description of an angiographic test.

3. This question was about the treatment of AMD and similarly to question 2, was based on drugs and tests mentioned in the pre-release material.

   (a) The majority of candidates could describe the role of ranibizumab as an anti-VEGF drug. However, many failed to give an advantage of administering this drug by intraocular injection referring instead to an injection into the vein bypassing the digestive system before reaching its destination. They had the correct knowledge but did not apply it correctly to this situation.
   (b) The principle of photodynamic therapy was less well known with many candidates referring to its use in cancer treatment rather than in the treatment of AMD.

4. Many candidates were able to gain full credit in parts a. and b. for calculating percentage and percentage increase. A significant number experienced difficulty here but were able to gain some credit by selecting the correct data from the information provided in the question. Part c. required candidates to suggest why there had been an increase in the incidence of AMD in the last ten years. The answer to this could have been deduced from the pre-release material, but many candidates incorrectly referred to an increase in the number of smokers.

5. This simple calculation proved difficult for many candidates. The majority were able to calculate the annual cost of ranibizumab using information from the data provided at the start of the case study but were then unable to use the data provided in the question to complete the calculation.

Questions 6-11 Case Study 2: Kidney Stones

6. This question required candidates to have a knowledge of the structure of bases present in DNA and the food types which lead to an increase in the production of uric acid as a waste product. Candidates were either able to achieve full marks or make some wild guesses especially when they were required to link foods high in protein to the production of uric acid.

7. The majority of candidates were able to achieve full marks here for correctly identifying the colour changes involved in some simple laboratory tests.

8. Most candidates used the data presented at the start of the case study to identify bladder volume and the equation provided to calculate bladder compliance. The pre-release material referred to using simple urodynamic studies in the diagnosing of kidney stones but very few candidates could reference this in their answers.

9. The role of the alpha-blocker drug, tamsulosin, was known by the majority of candidates in helping pass kidney stones. Fewer candidates were able to describe it as a muscle relaxant or which muscles were being affected. A few candidates described its role as a vasodilator, which it is, but is not relevant to this question.

10. This question required candidates to identify three clear trends in a graph. The majority of candidates could identify two trends. However, many were vague in how they expressed that the incidence of kidney stones is increasingly higher in older males and were therefore unable to gain credit.

11. This 10-mark question required a description of osmoregulation. There were some excellent answers which gained full credit. At the other extreme, a few candidates did not gain any credit with a few references to hormones causing moodiness or keeping the body clean.

Questions 12-16 Case Study 3: Leptospirosis

12. This question required a knowledge of how bacteria may be identified.

    (a) The majority of candidates were able to identify how a healthy person can be infected by *Leptospira* bacteria.
    (b) The steps involved in gram staining were well known by most candidates.
    (c) This section required candidates to explain why some of the stages in the staining process were necessary and how they worked. This proved more challenging. Very few knew that the alcohol used removed the lipopolysaccharide layer exposing the peptidoglycan layer for counterstaining.
    (d) Many candidates were able to quote size and shape of bacteria as distinguishing features and were therefore able to achieve full credit for this question.

13. The advantages and disadvantages of using over-the-counter painkillers were well described by many candidates. However, there was some confusion between prescribed and over-the-counter drugs.

14. A graph at the start of this case study provided information about the antibody concentration in the blood in the days following infection.
    (a) Candidates correctly used this information to explain why an ELISA test could not be carried out until a week after infection but a surprisingly large number of candidates did not make the link to antibody concentration, referring instead to antigen concentration.
    (b) Many candidates failed to gain credit by giving ambiguous answers. For example ‘antibiotic resistance’ on its own is insufficient to gain credit without reference to over-prescription of antibiotics leading to antibiotic resistance.
    (c) It was encouraging that there were a few good answers to this question on the humoral immune response, a topic which has proved to be particularly challenging in recent years. A good answer should refer to clonal selection, clonal expansion, clonal activation and the role of B lymphocytes. However, knowledge of this topic is still limited and there was confusion between the humoral and the specific immune response.

15. The pre-release material referred to the antibiotics doxycycline and penicillin. Candidates who had researched the mode of action of these drugs were able to achieve full credit here. A few candidates incorrectly referred to doxycycline preventing bacteria ‘growing’ rather than ‘reproducing’.

16. Surprisingly few candidates were able to make the link between bacteria being able to reproduce more rapidly in the warmer Jamaican water compared to the colder water in the UK, although most did realise that Jamaica had a warmer environment. There were some vague references to Jamaica having more wild animals.

Summary of key points:

The use of the pre-release prior to sitting this examination is especially important. Centres and candidates who perform best have read the pre-release and researched information about each case study especially:

- the prevalence and symptoms of the disease
- the named causes and the processes used in diagnosis
- named treatments
- the mode of action of any named drugs

The questions asked throughout the paper have a synoptic element. Therefore, it is essential that candidates have a knowledge and understanding of all the units studied throughout the course.

Candidates need an understanding of the command words used in the questions, such as, describe, explain, compare, list, and suggest.

Supporting you

Useful contacts and links

Our friendly subject team are on hand to support you between 8.30am and 5.30pm, Monday to Friday.
Tel: **029 2240 4252**
Email: science@wjec.co.uk
Qualification webpage: https://www.wjec.co.uk/qualifications/medical-science-level-3/#tab_keydocuments

See other useful contacts here: Useful Contacts | WJEC

CPD Training / Professional Learning

Access our popular, free online CPD/PL courses to receive exam feedback and put questions to our subject team, and attend one of our face-to-face events, focused on enhancing teaching and learning, providing practical classroom ideas and developing understanding of marking and assessment.

Please find details for all our courses here: https://www.wjec.co.uk/home/professional-learning/

WJEC Qualifications

As Wales' largest awarding body, at WJEC we provide trusted bilingual qualifications, straight-forward specialist support, and reliable assessment to schools and colleges across the country. With more than 70 years' experience, we are also amongst the leading providers in both England and Northern Ireland.

We support our education communities by providing trusted qualifications and specialist support, to allow our learners the opportunity to reach their full potential.

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk

[i] ***Please note that where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.***