OCR
RECOGNISING ACHIEVEMENT

ADDITIONAL APPLIED SCIENCE

CANDIDATE STYLE ANSWERS - CANDIDATE B

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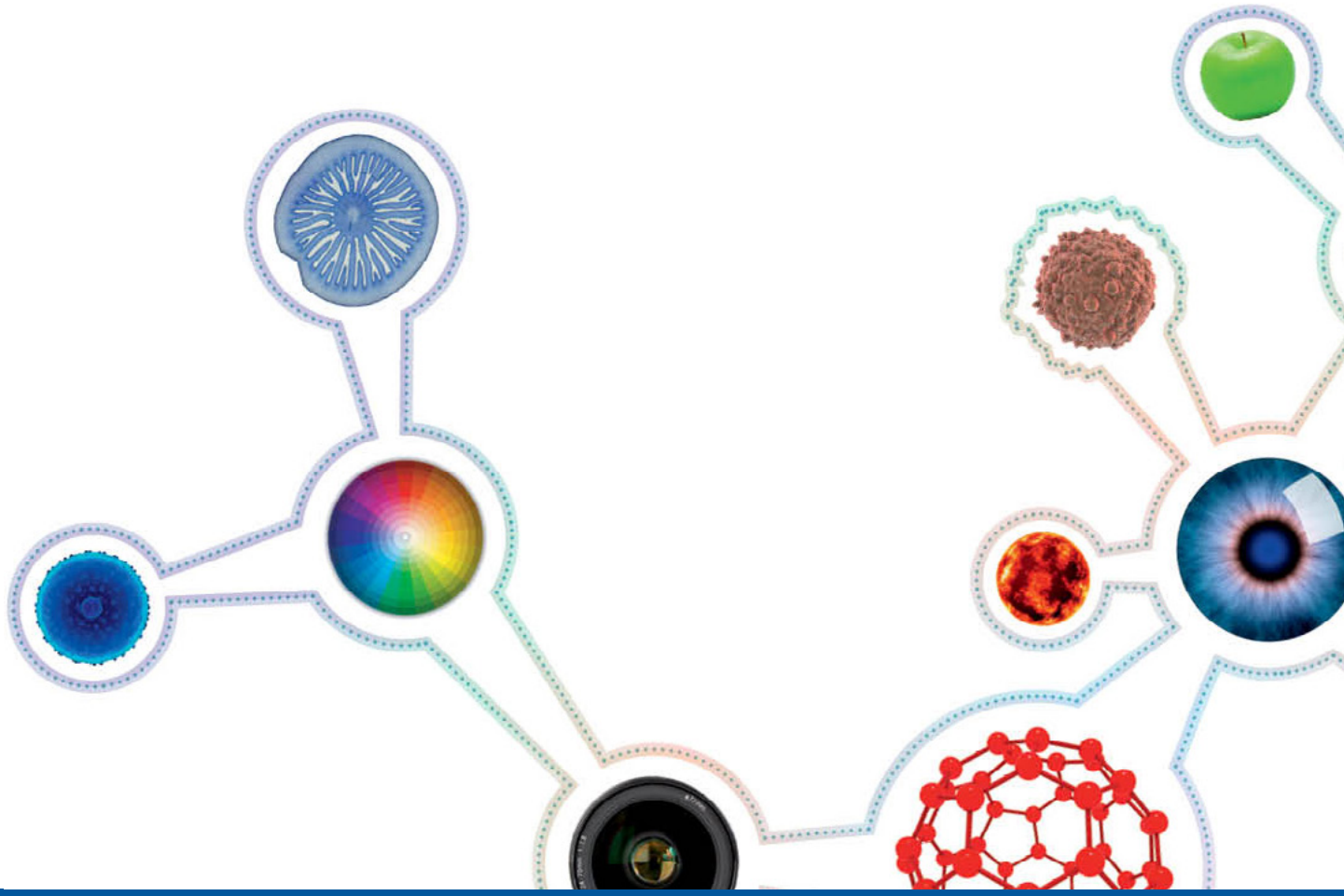
INDEX



INTRODUCTION

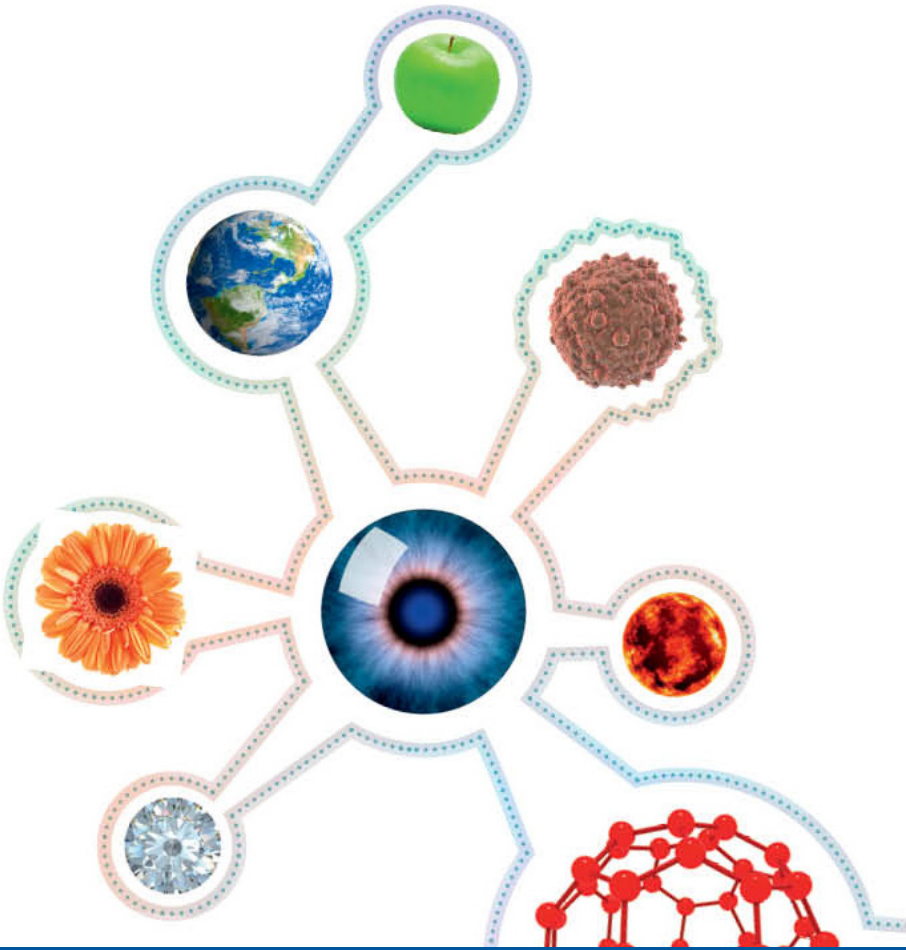
These support materials are intended to support teachers in their marking. There are three candidate style responses with accompanying commentary. These exemplars are based on the published Specimen Assessment Materials (SAMs), which can be downloaded from the relevant OCR webpage for the specification.

The exemplars and commentaries should be read alongside the Specifications and the Guide to Controlled Assessment for GCSE Gateway Science, all of which are available from the website.

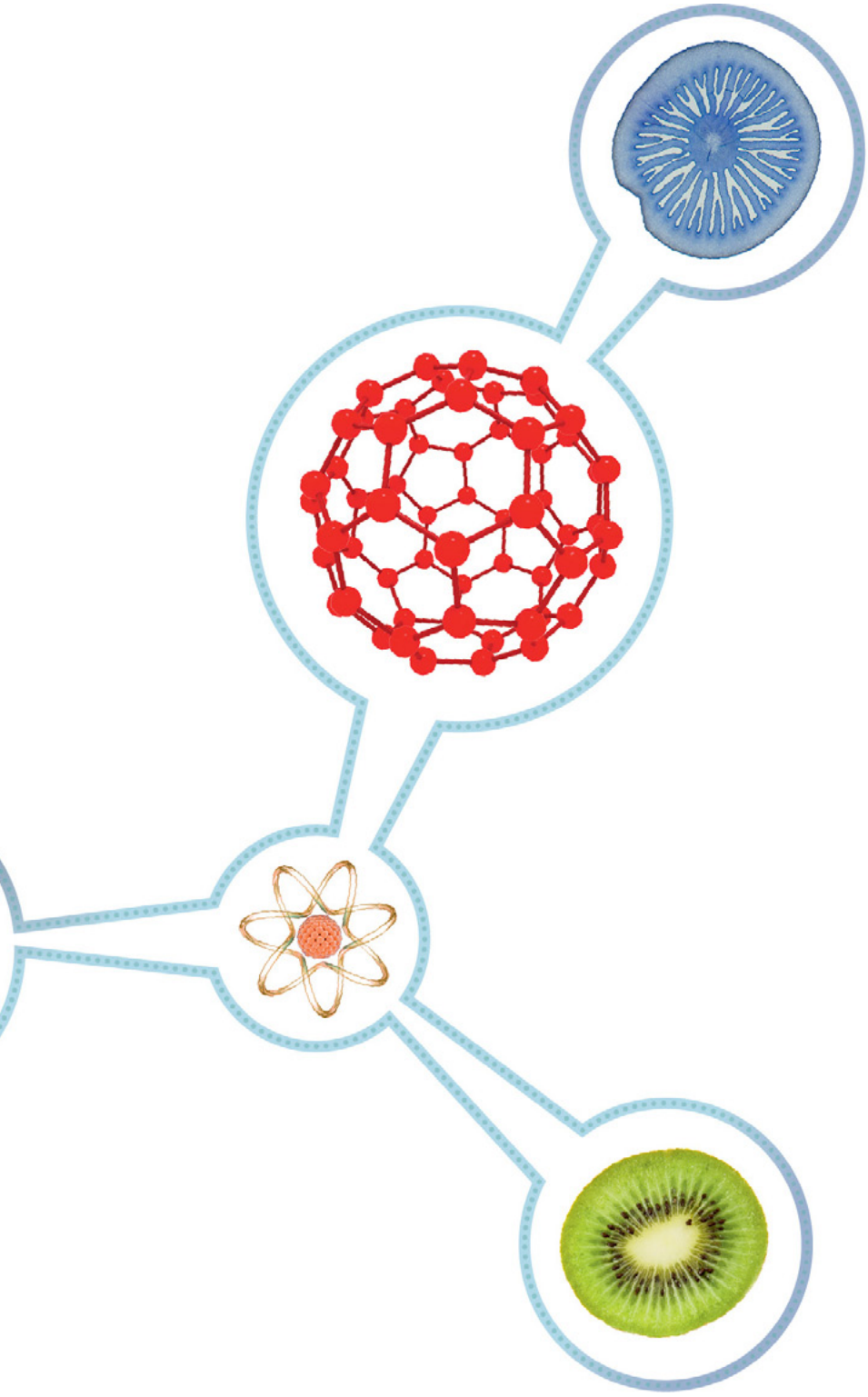
OCR will update these materials as appropriate.

Centres may wish to use these support materials in a number of ways:

- teacher training in interpretation of the marking criteria
- departmental standardisation meetings
- exemplars for candidates to review



STANDARD PROCEDURE



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Standard Procedure
Candidates will be expected to provide four standard procedures

Properties such as strength, density, stiffness and toughness are all important when manufacturing sports' equipment.

You are going to measure the density of some materials found in sports' equipment.

The density of a material can be calculated by using the following formula:

$$\text{density} = \frac{\text{mass (g)}}{\text{volume (cm}^3\text{)}}$$

You are required to write a risk assessment, to follow the appropriate standard procedure, record your results in an appropriate manner, process the data you collected and evaluate how you managed risks during the procedure.

[Total: 6 marks]

(Information provided by the centre to put procedure into a vocational context – this is not essential)

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Bicycles need different materials in their construction but why measure density?

Density, which is a measure of how light or heavy the material per unit volume is an important property in the manufacture of bicycles.

One of the most common materials used for the tubes of bicycle frames has been steel. Steel frames can be very inexpensive – from carbon steel to highly specialised materials using high performance alloys. Frames can also be made from other materials such as aluminum alloys, titanium, carbon fibre wood, plastics and even bamboo.

The properties of a material help decide manufactures to decide whether it is appropriate in the construction of a bicycle frame:

Steel


Taken by Degen Earthfast
http://en.wikipedia.org/wiki/File:2002_Trek_800_Sport.JPG

A steel-framed 2002 fully rigid Trek 800 Sport. Steel frames are often used - they are strong, easy to work, and relatively inexpensive, but denser (heavier) than many other structural materials.

Wood

Several bicycle frames have been made of wood, either solid or laminate. Although one survived 265 grueling kilometers of the Paris Road Race, aesthetic appeal has often been as much of a motivator as ride characteristics. Wood is used to fashion bicycles in East Africa.

Thermoplastics


Taken by Racerbyce
http://en.wikipedia.org/wiki/File:Itera_plastic_bicycle.jpg
A plastic bicycle from the early 1980s. Thermoplastics are polymers that can be reheated and reshaped, and there are several ways that they can be used to create a bicycle frame.

Aluminum alloys


Taken by Keanu4
http://en.wikipedia.org/wiki/File:CNC_machined_MTB_frame.JPG
Mountain bike frames are made of sections of machined aluminum welded and bolted together. Aluminum alloys have a lower density and lower strength compared with steel alloys, however, possess a better strength-to-weight ratio, giving them notable weight advantages over steel. Popular alloys for bicycle frames are 6061 aluminum and 7005 aluminum.

Information below was provided by the Centre.

Before you begin read the procedure and collect together the equipment you require, this is listed below.

Equipment available
balance – available on side bench
metre ruler
small ruler and pencil
samples of materials used in sports equipment.

Risk Assessment

Write a suitable risk assessment for this standard procedure before you begin. You can use the format provided. Comment on how you managed the risks when you have completed your experiment.

Standard procedure to Measure Density

Follow the standard procedure given below to collect and record your primary data.

Choose three samples which could be used for making bicycle frames:

1. Measure the mass of each sample of material using a suitable balance. Record each mass to the nearest 0.1 g.
2. Measure the length, width and height of each sample of material using a suitable rule. Record each measurement to the nearest 0.1 cm.
3. Record all your results in the format provided.

Candidate B Centre Number XXXXX Candidate Number XXXX Date

Complete the table below as you follow the standard procedure:

Standard procedure to find density of some materials used to make bicycle frames

Results

	Length/cm	Width/cm	Height/cm	mass, g
Material 1 wood	**6**	**2**	**1**	**5.9 g**
Material 2 steel	**4**	**2**	**0.5**	**30 g**
Material 3 aluminium	**8**	**1**	**1**	**24 g**

Data processing : Process your data using the information given below:

1. Calculate the volume of each material.
Using **volume = length x width x height (cm^3)**

2. Calculate the density of each material.
Using **density = $\frac{\text{mass (g)}}{\text{volume } (cm^3)}$**

Wood

Volume = 6x2x1 = $12cm^3$ mass = 5.9g

Density = 0.49166

Steel

Volume = 4x2x0.5 = $4cm^3$ mass = 30g

Density = 7.5

Aluminium

Volume = 8x1x1 = $8cm^3$ mass = 24g

Density = 3

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Risk Assessment & Managing the Risks

Level of Risk :
This standard procedure is low risk. There are not many hazards and if I follow the normal laboratory safety rules the experiment should be completed without any problems.

Hazard	Risk involved	Safety precautions	What to do in the event of an accident
Sample blocks	Could drop them on my foot or they could be thrown about the lab.	Make sure they are placed in the middle of the bench when not being used. Follow the safety rules of the lab at all times.	Report any accidents to the teacher.
Electrical balances	Electric shock	Check that before using the balance they have been tested for electrical safety (there should be a sticker on the balance). Do not use if there is no sticker.	Report any accidents to the teacher.

After the experiment: How the risks were managed

Before the experiment: I collected the equipment needed and placed it on the bench where we were working. We checked the balance and there was a sticker on the balance which showed that the balance was tested last year – this was safe to use.

During the experiment: I did not drop any of the samples and nobody in the lab messed about during the experiment. The teacher gave us anything we needed and she was around to check everything was safe.

After the experiment: I returned all the equipment to the front bench and switched off the balance. I thought the experiment went well and no one had any accidents.

Standard Procedure Report: Mark Allocation (C grade candidate)

Skills to be assessed	0	1-2	3-4	5-6	Mark awarded
Collect primary data (a)			4		4
Process primary data (b)				5	5
Manage risks (c)				5	5
Average mark for 3 skills = 14/3 = 4.6					**5**

Standard Procedure (0-6 marks for each procedure)
Teachers are advised to read the guidance given in the specification 5.5 Task marking: Section 5.5.3.

(a) collect primary data

Mark allocated	Comments	Guidance
3-4 marks	A range of data has been collected. The table has been provided by the centre. Dimensions of the materials could have been recorded with greater precision, and there are some inconsistencies in the results table. The Standard Procedure states that measurements of length and mass should be recorded to the nearest 0.1 cm and 0.1 g, but this has not been done. The measurements recorded use an inconsistent number of decimal points. Column headings include units, but these are repeated for measurements of mass.	Candidates will have collected a range of data from the procedure and will have recorded it appropriately in a format which can be provided by the centre. Minimal errors or inaccuracies may be seen e.g. omission of units / inconsistent significant figures.

(b) process primary data

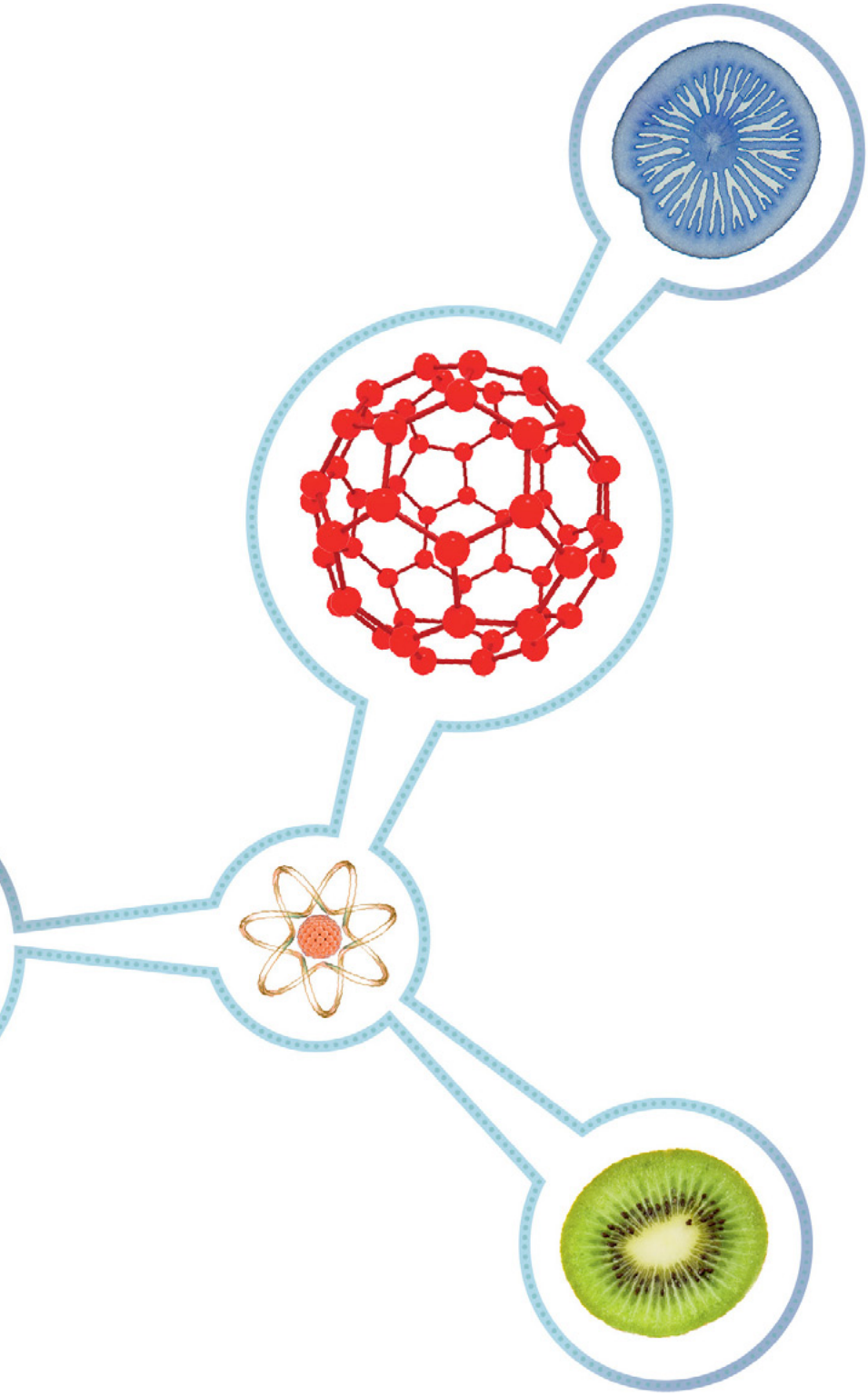
Mark allocated	Comments	Guidance
5-6 marks	The calculations of data have been carried out correctly. The answers are clearly indicated, but the use of significant figures is incorrect and inconsistent and units of density are omitted, so five marks rather than six.	Candidates will produce well-drawn line graphs with appropriate lines of best fit, axes will be labelled and appropriate scales will be chosen. Mathematical techniques will be correctly carried out with answers clearly and accurately presented.

(c) manage risks when carrying out standard procedures

Mark allocated	Comments	Guidance
5-6 marks	The level of risk is indicated as being low for this Standard Procedure. The review at the end is a useful inclusion although a more critical approach would be needed for 6 marks. The risk assessment for this low-risk Standard Procedure is good, but perhaps a little more detail could be added, e.g. a note on the limited risks associated with the handling of the individual materials, and what to do in the event of an accident, in addition to reporting the incident to the teacher.	Candidates will produce information on potential hazards and whether they are high or low risk and the steps which were made in order to minimise these risks.

Candidates will probably produce a risk assessment for this strand. For 3-4 marks this must include how the risks are managed and for 5-6 marks this needs to be supported by a critical evaluation of how the risks are managed.

SUITABILITY TEST



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SUITABILITY TEST

WHAT IS THE BEST METHOD FOR TESTING FOR GLUCOSE IN URINE IN A BUSY PATHOLOGY LABORATORY?

picture of test tubes

Contents

Research Information (using secondary data)

My suitability test
In this suitability test, I am going to explain and write about what I think is the best method for a technician to use to measure glucose in urine in a pathology laboratory.

The testing for the presence of glucose in urine is usually performed when a patient may be diabetic.

What is glucose and how does it get into your urine?
Glucose is a type of sugar. It gets into the body from the food you eat and from sugary drinks. You can also find glucose in foods that have starch present. You can find starch in foods like rice and pasta.

How does glucose get into your bloodstream?
Glucose is absorbed through the small intestine into the blood capillaries in the tiny finger like projections that come out of the wall of the intestine.

Once you eat or drink anything containing glucose, it will enter the blood and gets used by the cells in your body. If glucose reaches a certain concentration in the blood, it gets put into your urine and is excreted. This concentration is called the renal threshold.

What might glucose in your urine indicate?
The renal threshold for glucose in your blood is 10 mmol/ litre. If you have urine test and you receive the results that you have glucose present in your urine, it could be a sign of diabetes, which are extremely high glucose levels in your blood. You shouldn't have any glucose present at all in your urine, so if you do you could be a diabetic or become a diabetic.

Diabetes is currently an incurable condition in which too much glucose is present in the body. There are two types of diabetes, type 1 which is usually treated with insulin injections and type 2 which is usually controlled by diet or tablets. Statistically if you have diabetes you are at least twice as likely as other people to have heart disease or a stroke. This means that 80% of diabetics will develop heart disease and due to their condition are less likely to suffer any symptoms until their condition has worsened.

Tests available
Many people each year need to be checked for diabetes. There are various tests available to test to see if glucose is present in urine and therefore a patient may be diabetic.

Such tests include
- Benedict's test
- Use of Clinistix
- Use of potassium permanganate

Criteria for suitability
The purpose of these tests is to see if the patient's urine contains glucose, and how much, which would determine if the amount of glucose is adversely affecting the patient. I am going to carry out each experiment to see which one is the most suitable.

The tests need to be accurate, quick, easy to use and not too expensive. They need to be **accurate** as if the wrong result was given to a patient the patient could die. The test needs to be quick so that the result can be quickly found so the patient can be given the correct treatment.

Cost is always important and as this test needs to be carried out on lots of patients. It shouldn't be too expensive or else the NHS would not carry it out.

It is important that the doctor knows if the urine contains glucose because if there is glucose present it means the patient has diabetes. It is also important that the technician knows how much glucose is present in order to determine what type of diabetes the patient has which will therefore inform the doctor on what type of treatment the patient needs.

References
See Appendix 1

PLANNING

1. I will carry out the three tests

- Benedict's test
- Clinistix
- Potassium permanganate (Standard curve)

on a number of urine samples which contained a known amount of glucose, over the next 3 weeks in my science lessons.
2. I will follow the instructions provided by the teacher and any guidance supplied with the clinistixs.
3. I will use the same volume of sample for each test. I will also carry out the test on two urine samples from patients Jim (1) and Iqbal (2). I will repeat the tests at least twice each.

Benedict's Test
Equipment and chemicals needed:
- Benedict's reagent
- urine samples
- glucose samples
- small beaker
- water
- water bath and thermometer
- watch

Method
- Put 5ml of Benedict's reagent into a beaker along with 5ml of urine.
- Put the mixture into a water bath at 70 degrees Celsius for 5 minutes.
- Record the results of the colour change in a table.

Clinistix
The apparatus needed:

- Reagent strips
- Urine samples
- Glucose samples
- Stopwatch
- Colour chart

Method
- Dip the reagent end of the strip into the sample solution and remove it immediately
- Tap the edge of the strip against the container to remove excess sample solution
- Time exactly 10 seconds after removing from the sample solution and compare the reagent side of the test area with the colour chart.
- Record the results of the colour change in a table.

Standard curve
In this test I will use potassium permanganate to test for glucose in the samples.

Apparatus needed
- acid
- beaker
- glass rod
- potassium permanganate
- sample solutions
- urine samples
- stop watch

Method
- Pour 25ml of acid into a beaker and 25ml of potassium permanganate into another beaker.
- Put 10ml of the sample solution into a boiling tube and added 5ml of the acid solution and 2ml of the potassium permanganate solution.
- Start the stopwatch and time how long it takes for the colour to disappear. The mixture needs to be stirred using a glass rod.
- Record all the times in a table and plot the results.
- Use the graph to find the % of glucose in the patient's urine.

RISK ASSESSMENT

See Appendix 2

Results
I carried out the tests with my partner. I designed the tables myself.

Benedict's Reagent

All solutions started off the same colour before heating.

Sample solution	Colour	Colour (repeat)
10%	bright orange	bright orange
8%	brown with a hint of orange	brown with a hint of orange
6%	orangey red	orangey (brick)
4%	light brown	light brown
2%	light brown	light brown
Patient 1	bright orange	bright orange
Patient 2	light brown	light brown

This test was quite fiddly to carry out and it took quite a bit of time for the colour to change. You also needed to have a hot water bath. You needed to do use a risk assessment.

This procedure cost £9.24 for the chemicals or 2p per test for the chemicals.

The desirable characteristic of the Benedict's test is its accuracy, however in a busy lab it would take up more time. The test was repeatable as the colours were the same.

Patient 1 Report
Glucose present 10%

Patient 2 Report
Glucose present range from 2% - 4%

Clinistix

Sample solution (glucose % / patient)	Colour	Colour (repeat)
2%	light	medium
4%	medium	medium
6%	dark	dark
8%	dark	medium
10%	dark	medium
Patient 1	dark	medium
Patient 2	light	light

This test was very quick and easy to carry out.
This procedure cost £5.35 for 50 strips or 11p per test.

I think that the Clinistix test is a quick and easy method. It can test whether the patient has glucose in their urine but unfortunately does not tell how much glucose is present. It would be easy to use in a busy lab.

The desirable characteristics of the clinistix test is that it is quick and easy to do, however the downside is that it doesn't tell you the glucose concentration. The test was mostly repeatable as long as you know what dark medium and light mean.

The cost is cheap as these can be bought easily from suppliers.

Patient 1 Report
Glucose present range from 2% -10%

Patient 2 Report
Glucose present range from 2% -6%

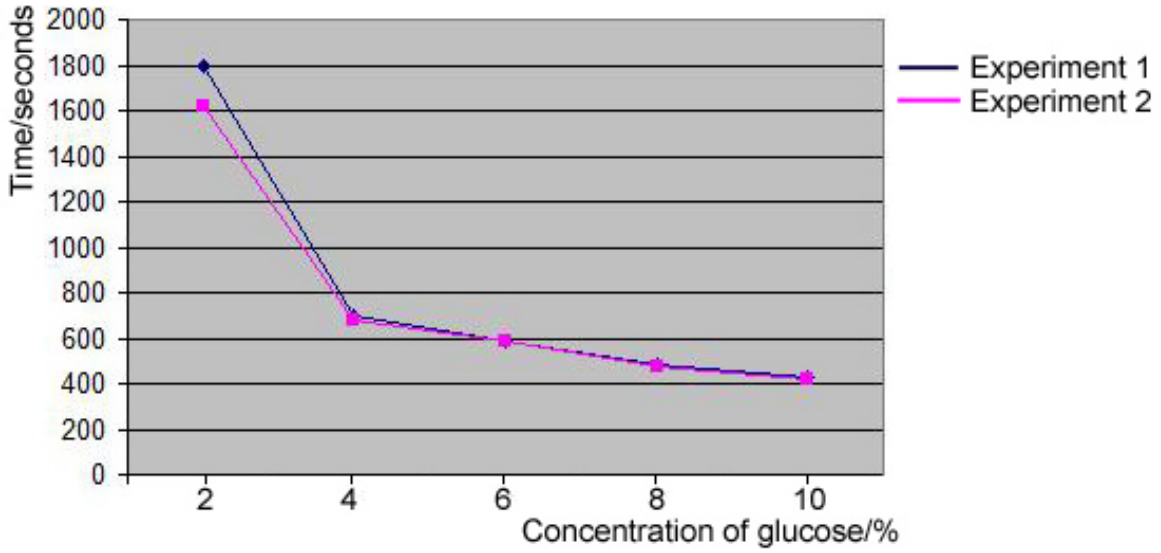
Standard curve

Sample solution (glucose % / patient)	Time (seconds)	Time (seconds) (repeat)	Average time (seconds) (T1 + T2) / 2
2%	1800	1615	1707.5
4%	696	680	688
6%	587	587	587
8%	41	484	484
10%	429	420	424.5
Patient 1	480	485	482.5
Patient 2	1700	1680	1690

Independent Work

The candidate devised all their own results tables.

Signed A. Teacher



Patient 1 Report
Glucose present range from standard curve = 8%

Patient 2 Report
Glucose present range from standard curve = 2%

I thought this was the best test for glucose as it not only tests for glucose it also tells you the glucose concentration. It did take more time than the Clinistix.

The desirable characteristics of the standard curve are that it is fairly quick and also accurate. I feel this would be the most desirable for the technician to use. When I repeated this test the result was ok for the 8% so I must have made a mistake.

This procedure cost 9/10th of a penny to complete – it is very cheap.

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Evaluation
I did not have any major problems when carrying out the different procedures. There were limitations with all three.

The most difficult was the Benedict's as it took longest to do and a water bath was needed at a constant temperature. The standard curve experiment needed constant stirring and this varied as to who stirred it, as somebody may be stirring it quicker than others and this may change the results. To make the clinistix more reliable we should make sure that we use strips that are new and have a clear colour chart. To make the Benedict's test more reliable we could have the same person looking at the colours and describing them. Some more repeats should be done where the results looked a bit odd.

Management of Risks

There were no incidents during the practical and no help was needed from the teacher.
Signed A. Teacher

Conclusion

After finishing my tests I collected all the results and compared them to the repeat tests to check for accuracy in order to make them more reliable.

From my research I found that the standard curve to be the most suitable, as this procedure show the glucose concentration, which is needed to find out when glucose is present and exactly how much, which would indicate to the tester how bad the person's diabetes is and also the type of diabetes they have.

Clinistix test
This test was a fast and easy test, however it didn't tell us the glucose concentration which is needed and also the ones we used were old and this may have affected the results, making it not very reliable. This procedure cost £5.35 for 50 strips.

The Benedict's test
This test proved to be the most difficult as it was difficult to keep the temperatures of the water at 70 °C, but my results show that the colours were similar in both tests so this test was reliable. The chemicals were cheap £ 9.24 or 2p per test but the cost of keeping a water bath hot so the test could be used any time would increase the cost.

The standard curve test
This test was not the fastest but it was reliable as the repeats were similar, except for one value which we did again and got a suitable result the test did take quite a long time, however it did tell us the concentration of glucose. The chemicals were quite cheap. £11.40 was spent but 9/10 p per test.

Looking at my data I think my conclusion is quite reliable as it tells me which procedure was most effective and looked at the different characteristics. And why and what are the downsides of each of the methods. I have also included the costing of each test.

I think the technician may prefer to use the clinstix, as this is a fast and easy method to use. However it doesn't show the glucose concentration so this is not very informative test if actual values are needed. The better test for concentration is the use of the potassium permanganate. This was found to be reliable and a repeat test can be used for confirmation.

Appendix 1

Bibliography

Information on researching the test was found using

http://en.wikipedia.org/wiki/Blood_sugar
http://www.creative-chemistry.org.uk/activities/urine.htm
http://www.bbc.co.uk/health/conditions
http://www.pharmacy2u.co.uk/clinistix-reagent-strips-p3215.html
http://en.wikipedia.org/wiki/Clinistrip

Appendix 2

Risk Assessment Form

<table>
<tr><td colspan="2">Activity
Testing for glucose in urine: using Clinistix, Benedict’s and Potassium permanganate</td></tr>
<tr><td>Hazards
1. Glassware
2. Chemicals
3. Hot water & water bath</td><td>Risks
Getting cut
Burns
Scalds, electric shock</td></tr>
<tr><td colspan="2">Control measures
1. wear goggles and follow laboratory safety rules
2. check Hazcards and follow guidelines
3. check water bath works correctly</td></tr>
<tr><td colspan="2">Emergency Action
1. contact teacher or lab technician
2. tell teacher if any chemicals in eyes
3. tell the teacher if water too hot.</td></tr>
<tr><td colspan="2">Notes
Make sure to follow practical instructions; don’t mess around in the laboratory.</td></tr>
</table>

Suitability Test: Mark Allocation (C grade candidate)

	0	1-2	3-4	5-6	7-8	Mark awarded
Strand A			a b	**a b** **6 5**		5
Stand B			**a** b c **4**	a **b c** **5 5**		5
Strand C			c	**c** **5**		5
Strand D			a b	**a b** **5 5**		5
Strand E			a **b** c d **3**	**a** b **c d** **6 6 5**		5
Strand F			a b	**a c** **5 5**		5

Teachers are advised to read the guidance given in the specification 5.5 Task marking: Section 5.5.3.

Strand A: Researching the Purpose of the Test

(a) Collect and process secondary data

The aim of this strand is for candidates to demonstrate that they can collect and use secondary data to describe the purpose of the material, process or device and its relevance in an applied, workplace context.

Mark allocated	Comments	Guidance
5-6 marks	In the first four sections on page 3, the candidate puts the Suitability Test into perspective by giving a basic description of the absorption, transport in the blood, and the use of glucose by the cells. The implications of the occurrence in glucose in the urine are described, and related to the renal threshold of glucose in the blood, along with the applied context – the need to test many people each year for glucose in their urine. This section does not attain the highest mark band, however. The description is not fully detailed, and some of the language used in the description is confused, and the workplace context has not been developed sufficiently.	Candidates will have selected suitable research, it will be well presented and easy to follow and a detailed description of the use or purpose will be included. Higher level marks will be awarded where candidates have been selective in only choosing relevant material and the description is detailed but precise.

(b) Analyse and interpret secondary data

The aim of this strand is for candidates to demonstrate that they can use secondary data to describe the desirable properties of the material, process or device and explain their relevance.

Mark allocated	Comments	Guidance
5-6 marks (just)	The candidate has described four properties on page 3-4 (qualitative and quantitative analysis for glucose; accuracy; ease of use; cost), although the explanations of why these criteria for suitability are rather vague (e.g. for accuracy, 'if the wrong result was given, the patient could die'). Reasons should have been provided here to attain the highest mark band. Although the candidate has stated clearly that the tests are 'to see if the patient's urine contains glucose, and how much,' a discussion of using a test that is specific to glucose (the use of tests using Cu(II) ions and potassium permanganate will detect any reducing agent) has not been developed.	Candidates will have selected suitable research, and used it to give a description of the properties which will be studied in the suitability practical work. Explanation of why one of these properties is necessary is needed for 5-6 marks. However, for higher level marks, the level of description needs to be detailed, logical and both or more of the explanations need to show high level understanding.

Strand B: Planning and risk assessment

(a) Assess risks for the collection of data

The aim of this strand is to assess how candidates can manage the risks for their experimental procedures. Candidates will need to write their risks assessments following completion of their planning.

Mark allocated	Comments	Guidance
3-4 marks	The candidate has identified materials and procedures that may be hazardous, but has not extended on this to identify the hazards, and associated risks in any detail, e.g. the risk for hazardous 'chemicals' is given as 'burns.' Hazards cited for higher level responses should be specific to each chemical/ procedure/ piece of equipment and be more specific when assigning the appropriate risk.	For 3-4 marks, identification of hazards will be included, but risk assessments will be lacking in detail. For 5-6 marks, candidates will have identified significant risks with some precautions to minimise these. Risk assessments will be workable documents. Higher level candidates will be producing detailed and relevant risk assessments which include all potential hazards and the ways in which risks are minimised will be fully identified.

(b) Devise methods to solve problems

The aim of this strand is for candidates to show their ability to plan how they will organise experimental procedures to demonstrate suitability of their chosen material/device/procedure.

Mark allocated	Comments	Guidance
5-6 marks	The candidate has produced a workable plan (on using the three tests to test for glucose, but does not go beyond this in describing other research that will be carried out, e.g. on costs). Three tests are to be carried out, with a repeat carried out for each, making the procedure relatively complex. The production of a form of calibration curve adds to the complexity.	Candidates will need to be a carrying out at least one complex procedure and their plan should be linking to the purpose of the suitability of the chosen material/ procedure/ device. Higher level candidates should be completing a range of experimental work to enable comparisons to be made, rather than repeating the same procedure. Planning should reflect this. Their plans need to include experimental work which will enable them to collect high quality data. 7-8 marks should indicate that candidates have worked independently - centres can indicate this by annotating work.

***(c) Quality of written communication**

Quality of written communication will be assessed in this strand, alongside the science content in the planning section of this report.

Mark allocated	Comments	Guidance
5-6 marks	The plan has been communicated clearly, and information organised effectively. The plan does not attain the higher marks as, while it is a good description of the tests carried out, it does not communicate all the information required, e.g. the use of 'acid' in the potassium permanganate test, and there is little in the way of justification of procedures, e.g. why was a range of concentrations of 2-10% glucose used?.	7-8 mark, higher level candidates will make full and effective use of scientific terminology, the plan will be organised effectively, relevant and logically sequenced. It will be easy to follow and concise. (Refer to marking criteria for more detail)

Strand C: Collecting data

(a) Collect primary data

The aim of this strand is for candidates to collect and record sufficient data to support their experimental procedures to demonstrate suitability of their chosen material/device/procedure.

Mark allocated	Comments	Guidance
5-6 marks	The candidate devised their own results table, as indicated by the centre annotation. The amount of data collected was just adequate, and more than one repeat could have been carried out. There is nothing to indicate that the data are not of reasonably good quality, and an outlier has been identified for the potassium permanganate test The qualitative data collected on colour change for the Benedict's test and Clinistix could have been more precise, e.g. the results for the Clinistix are limited to 'light', 'dark' and 'medium'. In instances where colour changes are found, sometimes candidates find it useful to supplement results tables with scans or photographs of their results.	Candidates working at this level need to be given the opportunity to devise their own format for recording their data - centres can indicate this by annotating work. For 5-6 marks, candidates need to collect a range of data (from more than one experiment), with some evidence of repetition and generally of good quality. The data need to be correctly recorded with minimal errors. For 7-8 marks, the data needs to show that it has been collected from an appropriate range of experimental work which supports the plan to demonstrate suitability. Data will be recorded accurately and to an appropriate degree of precision (see marking criteria for more detail).

Strand D: Processing and analysing data

(a) Process primary data

The aim of this strand is for candidates to demonstrate that they can process and use the data they have collected.

Mark allocated	Comments	Guidance
5-6 marks	A graphical technique has been used to display data from the potassium permanganate test. The candidate has chosen to plot the data from the test and repeat carried out, rather than plotting the means (though these have been calculated). Axes have been well-chosen and appropriately labelled, but the candidate has used a computer-generated graph and joined the points dot to dot.	For 5-6 marks, candidates will use well produced graphs or charts or correctly completed mathematical techniques to support their data – minimal errors will be seen. For 7-8 marks, candidates will produce and use well-drawn line graphs with appropriate lines of best fit. Axes will be labelled and appropriate scales will be chosen, or clearly labelled charts or correctly completed mathematical techniques with answers are clearly and accurately presented to support the Suitability tests. Some indication of level of uncertainty of data should be seen for full marks.

(b) Analyse and interpret primary data

The aim of this strand is for candidates to demonstrate that they can interpret and analyse the primary data they have collected to support the desirable properties of the material /process or device they have chosen.

Mark allocated	Comments	Guidance
3-4 marks	Trends are described across the three parameters investigated (glucose concentration; ease of use; cost), linking with the purpose of the test, with few, if any, errors, but interpretation is limited. Use of quantitative data is also limited, owing to the nature of the tests carried out. A result that is anomalous has been highlighted in a different colour in the results table for the potassium permanganate test, but there is no indication (perhaps in the way of annotation) to indicate why this has been highlighted.	1-2 mark candidates will just identify a trend or pattern in the results. 3-4 mark candidates will give statements and limited description of their data. There will be some link to the purpose of the test to indicate suitability of the material/process/device.

Strand E: Evaluating

(a) Evaluate methods used to solve practical problems
The aim of this strand is to assess (in this instance) how candidates evaluate the methods used to determine the suitability of the tests used to analyse urine for glucose.

Mark allocated	Comments	Guidance
5-6 marks	Possible limitations of the methods used to assess the suitability of the three tests have been stated, namely: • Differences in stirring technique of different group members during the reduction of potassium permanganate • The age of the Clinistix strips (leading to colour variations) • Differences in judgement of colours, but there is little in the way of practical detail in how to eliminate these problems.	5-6 marks - work at this level involves descriptions rather than simple comments or statements, with some suggestions on how to improve to include limited practical detail, e.g. change the temperature, but no information on how to do it.

(b) Evaluate the validity and quality of evidence
The aim of this strand is for candidates to show their ability to evaluate the quality and validity of the data they have collected.

Mark allocated	Comments	Guidance
3-4 marks	Comments are made on the 'repeatability' of data obtained, and it is stated that for the 'standard curve test', mistake was made. No discussion on 'anomalous' results. In two instances, claims are made for the accuracy of Benedict's test (page 5), and the 'standard curve test' (page 7), but these claims are not supported by candidate discussion other than saying these results repeatable. The candidate has raised some pertinent points in their discussion, but these are not well-tailored to the marking criteria.	For 3-4 marks, candidates may make a statement that their results are "repeatable' and 'accurate', with a statement about the suitability of their chosen material/ device/ procedure

c) Evaluate the management of risks when using practical techniques
The aim of this strand is for candidates to show their ability to demonstrate that the safety procedures put in place, i.e. suitable risk assessment allowed safe completion of the experimental work.

Mark allocated	Comments	Guidance
5-6 marks	Annotation is provided by the centre that risks were managed successfully and there were no incidents during the practical, and no help was needed from the teacher.	Higher level candidates should have shown evidence of safely completing experimental work, using an appropriate risk assessment with no intervention needed for the teacher. This can be indicated by a statement or brief annotation from both the candidate and the teacher.

***(d) Quality of scientific communication**
Quality of written communication will be assessed in this strand, alongside the science content in the evaluation of this suitability test.

Mark allocated	Comments	Guidance
5-6 marks	Use of technical and scientific vocabulary has been made, and spelling, punctuation and grammar is generally sound. Five marks, rather than six, as there are some inconsistencies, e.g. the use of the term 'accuracy' (and also the inconsistent use of capitalisation when writing 'Clinistix').	Higher level candidates will make full and effective use of scientific terminology, with evaluations suitably structured and focused, and supported by good spelling, punctuation and grammar. (refer to the marking criteria for detail)

Strand F: Justifying a conclusion

(a) Draw evidence-based conclusions
The aim of this strand is for candidates to show their ability to use the data collected and their scientific knowledge to conclude suitability of the material/device or procedure.

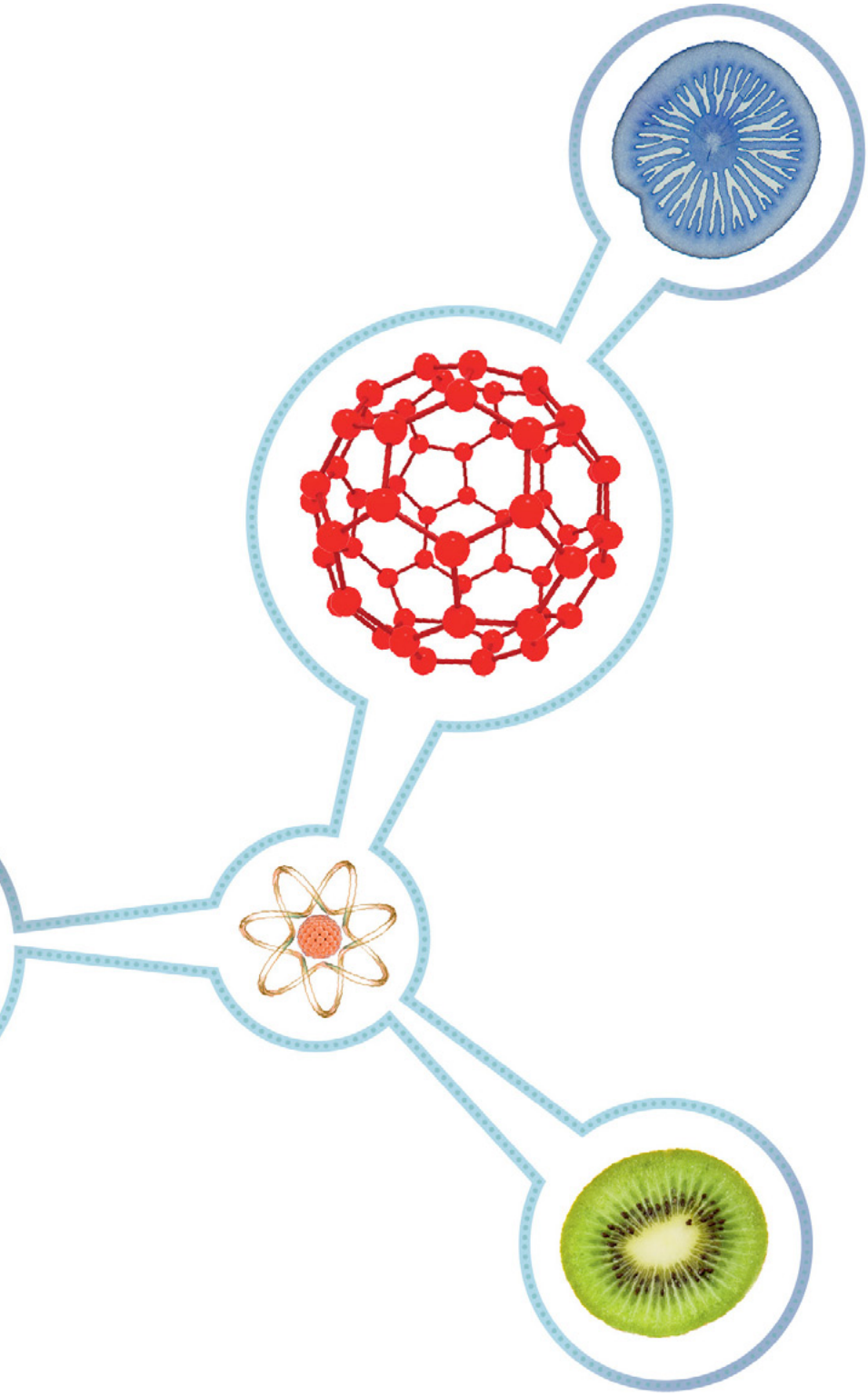
Mark allocated	Comments	Guidance
5-6 marks	The procedures used are sufficiently complex to attain this mark band. The conclusion is linked satisfactorily to the overall pattern of results.	For 5-6 marks, candidates will be carrying out at least one complex procedure and the conclusion should be linked to the overall pattern of results obtained supported by recommendations of suitability of the material / device / procedure.

***(b) Quality of written communication**

Quality of written communication will be assessed in this strand, alongside the science content in the conclusion section of this report.

Mark allocated	Comments	Guidance
5-6 marks	Use of technical and scientific vocabulary has been made, and spelling, punctuation and grammar is generally sound. Five marks, rather than six, as there are some inconsistencies, e.g. the use of the term 'accuracy' (and also the inconsistent use of capitalisation when writing 'Clinistix').	Higher level candidates will make full and effective use of scientific terminology in their conclusions. The conclusions will be organised, easy to follow and well reported and suitably persuasive to support the suitability of the material/device/procedure. Spelling punctuation and grammar will show minimal or no errors. (refer to marking criteria for detail)

WORK RELATED REPORT



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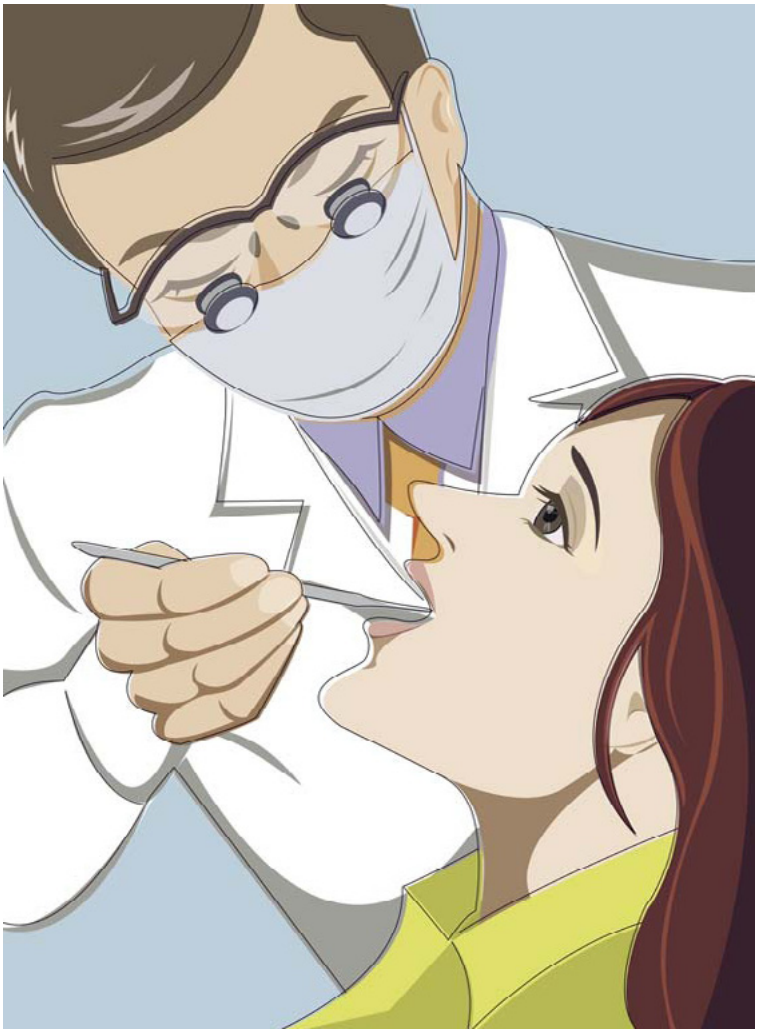
WORK RELATED REPORT

Research a practitioner in a job role linked to any profession that uses materials to support their every day work.



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CONTENTS

Introduction
In my work related report I have chosen dentistry. Dentistry uses lots of science and dentists use all different types of materials to help them in their jobs. There are many jobs that exist in the dentist industry. These include dental receptionist, dentist, dental nurses, orthodontic, dental hygienist and many more. Dentists are health care professionals have an important effect on society by providing corrective and preventative treatments for problems that affect the mouth and teeth.

Primary data
This is data which I collected by visiting my dental surgery and looking at how the surgery was run. I also gathered information by speaking to a qualified dentist. I had a list of questions which she answered. I planned the questions before the visit. I also asked my teacher about the scientific knowledge on X-rays and composites.The references are recorded throughout my report.

Secondary data
This is data that I have collected from my science notes, material on the Internet and my science text books. The references are recorded throughout my report.

The work place
I visited my local Dental Practice at 17 High Road

Google map showing position of dental practice

There are three dentists in this practice; one is the senior partner and works full time. The other two have a job share.

The **dental receptionist** works in the entrance to the practice desk and greets the patients as they come into the practice. They also arrange appointments with the dentists or the dental hygenists.

The **dentist** is some one who is specially trained to care for teeth, gums and mouths. When you visit for check ups your dentist will look at your teeth and gums to check for any problems. The dentist also wants to make sure your teeth are developing properly as you grow. Dentists treat problems with teeth and gums, provide preventative care and advice, straighten teeth and perform surgery.

They must be familiar with a wide variety of advanced equipment, including X rays and other technologies. Dentists work for four to five days a week and can work at weekends to attend to the needs of their patients. They also can work up to 40 hours per week. A dentist is typically responsible for

- Educating patients on oral health care
- Examining teeth and diagnosing patient's dental conditions, using tools such as x rays
- Assessing treatment options and agreeing treatment plans with patients
- Carrying out agreed clinical treatments, such as treating gum disease, restoring teeth affected by decay etc.

- Maintaining patients' dental records
- Recruiting training and managing staff
- Managing budgets and maintaining stocks of equipment
- Marketing services to new clients

Most dentists work as self-employed practitioners in general practice, providing dental care to the public under the National Health Service (NHS) and /or privately. Others work in a specialism in hospital dentistry, community dentistry, the armed forces or university teaching and research.

The **dental nurse** assists the dentist. This includes cross infection control, mixing filling and impression materials, charting teeth and making notes during fillings and extractions and giving oral hygiene instruction and suction of mouth debris. There are three dental nurses employed in this practice.

Dental technicians work for dentists in providing materials for them. They work with a variety of materials including waxes, plastics precious and non precious alloys, stainless steel, a variety of porcelains and composites or polymer glass combinations. It is important for a technician to help create tooth replacements that are both attractive and functional. They work in a laboratory about 2 miles from the practice.

Location
Dental practices are usually located so that the public can get to the surgery easily, the practice I visited was on a main bus route and there was also a car park for patients to park. The practice was clean and the waiting room had lots of magazines so we were able to read these and not get nervous while waiting to see the dentist. There was also a children's play area this was good as little children could play while they were waiting. It is important that there are dental surgeries in easy reach of people and that they are places where children don't mind going as if we do not look after our teeth this will mean lots of pain and a high cost for the NHS. In many places the water contains fluoride which helps to prevent decay. It is also important that people brush their teeth regularly.

Reference: Information from visit to Dental practice : 17 High Road

Qualifications needed in Dentistry
You will need a degree in dentistry, which takes around 5 years to complete and leads to a BDS or BChD. When you graduate, you also need to register with the General Dental Council (GDC) before you can practise. To get on to a degree course you will usually need

- At least five GCSEs (A –C) including maths, English and science subjects.
- Three A levels grades ranging from AAA to ABB, including chemistry and maths.

Further Development and training that you can do
Once you have graduated from dental school you will begin a period of work based vocational training (VT), working under supervision in an approved dental practice.

The next step many trainee dentists take is to join an established dental practice as an associate which involves working as a self employed dentist in a practice owned by another dental professional. With experience you could go on to become a partner in the practice or set up on your own.

The dentist I talked to, Dr Louisa Simpson BDS, had completed her degree at Sheffield University Dental School and had been working at the practice for 5 years.

Personal Skills needed by a dentist

Communication

One of the main personal skills needed as a dentist is to be a good communicator. This means by having this skill you are able to listen to patients' concerns and problems as well as being able to explain the problems and solutions.

Patience

Another good personal skill to have is patience. You will need patience in times of where you will need to be able to handle a wide range of patients: the very old to the very young and nervous. They may well test your ability to remain calm.

Kindness and Compassion

You need to be able to show kindness and compassion. People often only go to the dentist when they have a problem such as pain and swelling, broken teeth, infection, bleeding gums etc., It is therefore important to be non judgemental and supportive of your patients and show your desire to want to help relieve their suffering, regardless to their class or background.

Professionalism

Professionalism is a personal skill that is important to someone who becomes a dentist. They need to put the needs of the patients first and have high clinical standards.

Physical Fitness and health

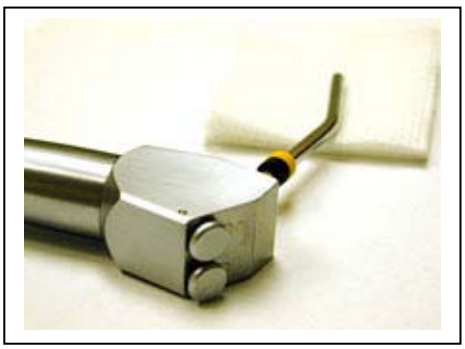
Working as a dentist can be tiring, both physically and mentally. It is important to be physically fit and healthy because the hands, eyes and back can be strained.

Dr Simpson said she "enjoyed being a dentist as she liked working with the patients and found it very rewarding when they went away happy."

Reference: I found this information from the Internet - www.bda.org/public/careers-in-dentistry/

The dentist's tools

The dentists need to be able to use the equipment:



© dentist-tools 2011

In the dentists there are many instruments and tools that are used.

While some tools are specific to certain branches of dentistry, there are a few basic instruments that are used in just about all dental practices:

A mouth mirror is a hand-held tool that allows the dentist to see inside the patient's mouth, at a variety of angles. The tool is designed to provide indirect vision, as well as reflect light and magnify the interior of the mouth. Today's mouth mirrors can be single-sided or double-sided, and some are even disposable.

Several different kinds of hand-held probes are used by the dentist. The one used most often in a regular examination is the sickle or contra-angled probe. This probe allows the dentist to detect pits and fissures, calculus, issues with bridges and crowns, and caries.

College tweezers are another basic piece of equipment used in dentistry. These allow the dentist to place and retrieve small objects into and from the mouth. Some of them have a locking mechanism to prevent the object from being dropped. A metal ruler is often used to measure the length of endodontic K files.

In addition to the tools used in a basic dental examination, other tools are used for other purposes. Most dentists and their hygienists use masks, protective gloves, safety glasses, and face shields during dental procedures to protect them from debris, bacteria, and chemicals.

Most dentists also have radiography equipment in their offices, to allow them to x-ray their patients' teeth. In addition to the actual x-ray machine, radiograph film is also needed to complete the procedure. Radiograph film comes in several sizes and shapes, depending upon the area of the mouth to be x-rayed.

Since dental work often results in excess saliva and moisture, most dentists use specific instruments designed to control moisture. The most commonly used is the disposable saliva ejector, which uses a low volume of suction to remove saliva from the mouth during procedures. A variety of cotton wool rolls and pellets are also available to absorb saliva, blood, and excess dental material.

For painful dental procedures, the dentist will need tools, like syringes and disposable needles that provide anaesthesia. In procedures where a dentist is isolating one tooth or one specific part of the mouth, a rubber dam is used to allow the dentist to see better, as well as protect the patient's airway.

When it comes to filling cavities, repairing chips, or any other process that requires smoothing, dental burs are used to smooth and polish. They are also used to remove tooth tissue before restorations or other work. Burs come in several sizes and shapes, depending upon where and how they are going to be used. Most of us are familiar with the dental hand piece, or dentist drill, which can rotate a bur at high speeds.
Reference : I took this information from
http://www.dentist-tools.com/

What science is used in dentistry?
There are many sciences used in dentistry, these include physics, microbiology, biology, chemistry, anatomy, physiology, biochemistry, histology, pathology, psychology and pharmacology.

Reference:
http://wiki.answers.com/Q/What_science_takes_place_in_dentistry&isLookUp=1

Inside the mouth live bacteria which produce starch and sugar. This can be harmful and cause small holes in the tooth's enamel. Eventually the hole can grow bigger until it reaches the nerve inside the tooth and causes a lot of pain. This is important for the dentist to know so that they can react to this by filling the hole to prevent further decay before it reaches the nerve.

For many years dentists have used their chemical knowledge to decide how to fill holes in teeth. They used a mixture of metals called an amalgam. The word amalgam means an alloy of mercury. The amalgam contains metals such as mercury, silver and other metals. The reason

why they use alloys to fill holes is because these alloys are strong and can withstand the pressures on the back teeth when chewing and crunching. The disadvantages of having these fillings are that they are dark and silver. Also the filling is a good conductor of heat and therefore can cause discomfort when eating hot or cold things.

Most recently dentists have started to use white composite for filling the holes in teeth instead of amalgam.

Composites used in dentistry are types of synthetic resins. Composites use the properties of the materials they are made from to make sure the mixture can be easily manipulated, hard and un-reactive in the mouth. These days they also have to have an attractive appearance.

Benefits
Aesthetics – can be matched to the original tooth colour
The dentist has control of the time for setting. They are set using a light.
They are easy to work with.

Downside
They shrink may have sensitivity.

Unlike amalgam which just fills a hole and requires retention features to hold the filling, composite cavity restorations when used with dentine and enamel bonding techniques restore the tooth back to near its original – need to take less of the tooth

They bond to the tooth via a bonding agent.

The composite is made of a resin matrix and filler materials. The filler is present to try and reduce the shrinkage.

There is a lot of discussion about the toxicity of amalgam fillings (though this is controversial), because they contain mercury, so this is regulating their use by some dentists.

Doing a dental filling
Stage 1
Etch the tooth

Stage 2
Place a dentine bonding agent on the tooth and then add the composite
The composite also contains a catalyst which causes the resin monomers to react to form the polymer. Crosslinking occurs between the polymer chains, which causes the final filling to harden.
Reference: I gained this information from talking to the dentist.
Composites are tooth-coloured filling materials made of resin reinforced with silica or porcelain particles. They are used in dentistry as one of several alternatives to dental amalgams.

Composites are typically hardened using light
© Factoria Singular / iStock. www.istockphoto.com

Reference : http://ec.europa.eu/health/opinions/en/dental-amalgam/glossary/abc/composites.htm

picture of teeth with an amalgam filling	picture of teeth with a composite filling

Diagnostic treatments – use of X rays

Dentists have to be trained to take and interpret Xrays
European guidelines on radiation protection in dental radiology.

The safe use of radiographs in dental practice the ionising radiations regulations 1999 – relates to protection of workers and the public and the equipment aspect of patient protection

The ionising radiation medical exposure regulations 2000 – relates to patient protection.

- Ensure that all doses are kept as low as reasonably acceptable (ALARA) - need reason to take xray / take accurately/ distance of everybody is 1.5m away
- Keep up to date with training (every 5 years renewal) and new developments
- Skill the dentists accurately to fit the film.
- Accurately position the x-ray beam in the correct place –to minimise retakes.
- Use a rectangular collimator to reduce scattering of the rays.
- Check where manual processing takes place –person trained to ensure no retakes.
- Nurses can be trained to take x rays but need to do an extra course.
- Xrays be used for diagnosis treatment planning and monitoring treatment.
- Routine screening – bite wing xrays – shows crowns of the teeth decay between teeth and under fillings.

Bone levels
X rays will pass through soft tissue and are absorbed by hard tissues.

Nowadays digital x rays which are processed on to the computer directly give an instant result.

Dentist needs to be at least 1.5metre away from xray machine

Dose needs to be kept as low as possible needs justification

Reference: Data on X-rays and composites was gathered by asking a dentist Dr J. Simpson BDS

She gave me the information on X-rays and safety from European guidelines on radiation protection in dental radiology.

She also looked up the information on composites as well as the information she uses in her day to day work.

Digital X-Rays

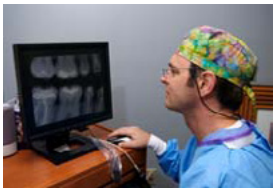
Many diseases of the teeth and surrounding tissues cannot be seen when your dentist examines your mouth. An X-ray examination may reveal:

- small areas of decay between the teeth or below existing restorations (fillings);
- infections in the bone;
- periodontal (gum) disease;
- abscesses or cysts;
- developmental abnormalities;
- some types of tumors.

Finding and treating dental problems at an early stage can save time, money and unnecessary discomfort. It can detect damage to oral structures not visible during a regular exam. If you have a hidden tumor, radiographs may even help save your life.

Digital Radiography

Dental technology has improved the way dentists practise their craft. Thanks to science, modern dental techniques allow patients to receive treatment without the pain and time associated with old-fashioned dentistry. Dental technology is even being developed to make dental X-rays safer and more convenient.



© dlewis33 / iStock. www.istockphoto.com

While dental X-rays emit low amounts of radiation and every precaution is taken to protect patients from exposure, some dental patients may still put off dental X-rays for safety reasons. Dental X-rays bring up other issues for patients, including the wait time for film to be developed and environmental concerns. Dentists are addressing these issues with digital radiography, a high-tech replacement for traditional dental X-rays.

Reference: https://sites.google.com/site/bgdestinydental1/links/digital-x-rays

Lights! Digital Camera! Action!

The physical process for digital radiography is actually similar to traditional dental X-rays that use film: With digital radiography, your dentist inserts a sensor into your mouth to capture images of your teeth -- but that's where the similarities between conventional and digital dental X-rays end. Although it resembles the film used for bitewings and other X-rays, the digital sensor is electronic and connected to a computer. Once the X-ray is taken, the image is projected on a screen for your dentist to view.

There are several benefits to using digital radiography over traditional film X-rays:

Less Radiation – The equipment used in digital radiography exposes dental patients to much less radiation. In fact, digital X-rays use up to 90 percent less radiation than film X-rays. While conventional dental X-rays are relatively safe, digital radiography is an excellent option for those who take X-rays on a regular basis or for those who are concerned about radiation.

Shorter Dental Appointments -- Digital radiography can also shorten your dental appointment! With traditional dental X-rays, you'll have to wait while your dentist develops the film. With digital radiography, the sensor develops the picture almost instantly and projects it onto a computer screen right before your eyes.

Higher Quality Images -- The standard size of traditional X-rays can make viewing difficult, but digital radiography has done away with the "one size fits all" mentality. Once on the screen, digital X-rays can be enlarged or magnified for a better visual of the tooth's structure. Brightness,

contrast and color can also be adjusted, allowing your dentist to see small dental cavities easier. If you need a hard copy of your X-ray, digital images can also be printed out.

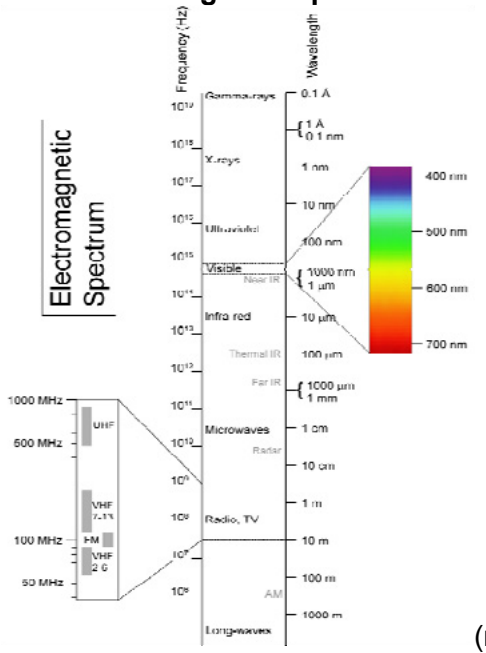
Transferring Dental Records -- Digital images can be e-mailed to a dental specialist for immediate review. Digital X-rays are taking away the expense and time needed to copy files and mail them to another dentist, making it easier to transfer dental records or get a second opinion.

As more offices are turning to electronic patient charts, computers may eliminate the need to mail dental records altogether.

Environmentally Friendly -- Digital dental X-rays are better for the environment! With digital radiography, no chemicals are used to develop film. There's also no wasted space of a darkroom and no need to store film, which can pile up in a dentist's files.

http://www.colgate.com/app/CP/US/EN/OC/Information/Articles/Oral-and-Dental-Health-Basics/Checkups-and-Dental-Procedures/X-Rays/article/X-rays-and-Intraoral-Pictures.cvsp

The electromagnetic spectrum



(Diagram by Materialscientist (Wikipedia))
http://en.wikipedia.org/wiki/File:Electromagnetic-Spectrum.png

How often and how many dental x ray images should be taken?
Dental Client: "Dental xrays again? It seems like you take them every time I come in,"

Me: "No it's been over a year since your last radiographs were taken, time sure does fly doesn't it?"

One of the most common conversations for me and every other dental hygienist, second only to: "Can you believe this crazy weather we're having?"

It's just as crazy as it was last year... about the time we took that set of dental xrays.

The comment makes sense considering dentists are one of the few health care providers to recommend radiographs "just in case". Your physician never wants to take a quick x ray just to be sure your leg isn't broken. If your leg feels fine, no need to look further.

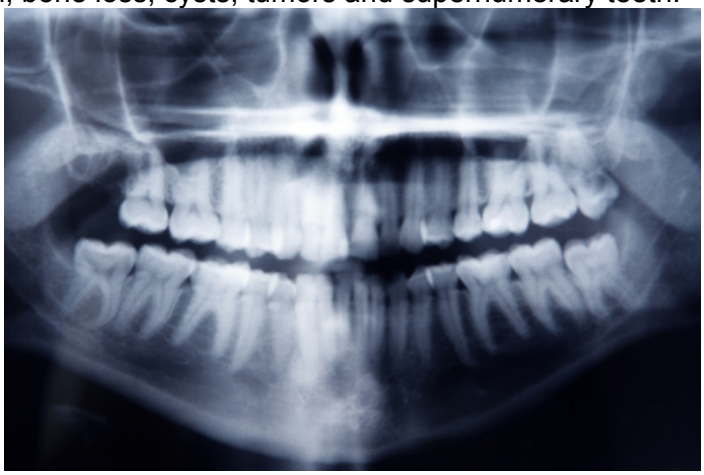
Why? Because teeth sometimes feel fine when they are not fine. Dental caries or cavities can be detected long before you feel pain. Dental x rays provide a lot of valuable information and

require a fraction of radiation when compared to radiographs taken of larger body parts, like legs.
Because they are a safe, practical and important part of your dental check up, dental xrays are routinely taken.

How often and how many dental xrays are needed?
Most dentists follow the ADA's recommendation, taking bitewing x rays (4-7 radiographs) every year and a full set (18 radiographs) of x rays every 3-5 years.
Of course, when and how many x rays you have taken is up to you. There is always wiggle room in every recommendation and dental xrays are no exception. Here's when you may or may not want to delay your dental xrays.

Reference: http://www.gum-disease-cure.com/dental-xrays.html

Some people may wonder why Orem dentists and other dental practitioners even take dental X-rays. They provide the dentist with a lot of important information. X-rays show the dentist where cavities and decay are, reveal nerves, roots, or crooked teeth, and also the location of the patient's wisdom teeth, bone loss, cysts, tumors and supernumerary teeth.



Reference: *© Amanda Rohde / iStock. www.istockphoto.com*

Dental professionals may be at risk from exposure to numerous biological, chemical, environmental, physical and psychological work place hazards. These hazards includeexposure to blood borne pathogens, pharmeuceuticals, xrays, ergonomic factors, noise vibration and workplace violence

Reference: http://www.osha.gov/SLTC/dentistry/index.html
Sterilisation and Infection Control

- You need to be wearing gloves, masks and protective eyewear during each patient examination
- You need to sterilize instruments and equipment for germ free use.
- Regularly clean each exam room to eliminate bacteria
- Sterilisation of all dental hand pieces
- Covering patients chair, x ray units and light handles with disposable plastic wraps.

Specimen Bottles

- Specimen bottles should be kept tightly capped until just before usage
- Tissue specimens should be placed in the specimen bottle and the cap secured. Care should be taken when collecting specimens to avoid contamination of the outside of the container. If contamination occurs, the container should be cleaned and disinfected as recommended by CDC and ADA.

Work-related Report: Mark Allocation (C grade candidate)

	0	1-2	3-4	5-6	7-8	Mark awarded
Strand A			a b	**a b** **6 6**		6
Stand B			a b	**a b** **6 6**		6
Strand C			a b **c** **4**	**a b c** **5 5**		5
Strand D			a b	**a b** **5 6**		6
Strand E			**a b** **4 4**	a b		4
Strand F			a b c	**a b c** **5 5 6**		5

Teachers are advised to read the guidance given in the specification 5.5 Task marking: Section 5.5.3.

Strand A: Collecting primary data (Information)

(a) Collecting primary data
The aim of this strand is for candidates to demonstrate that they have collected suitable primary information for their Work-related Report.

Mark allocated	Comments	Guidance
5- 6 marks	The candidate has collected relevant and appropriate data from a variety of sources, including a practitioner. The candidate does not go beyond the 5-6 mark band as there is no discussion of the validity of the information sources used.	Candidates will have collected and selected relevant primary data, for their report from a variety of sources which includes suitable selection of the data collected from a visit or practitioner. For 7-8 marks, candidates will comment on the validity of the sources used.

Note: 'Primary data', in this context, refers to data (numerical and/or textual information) collected by the candidate directly from their own observations and experiences. It is hoped that all candidates will have the opportunity to collect data from either a visit or a practitioner. If a face to face opportunity is not possible, candidates can obtain their data through telephone conversations, letters or electronic means and discussion.

(b) References to sources

The aim of this strand is for candidates to demonstrate that they can reference their sources accurately and correctly.

Mark allocated	Comments	Guidance
5-6 marks	The information source, i.e. the dental practitioner, are identified clearly in-text.	Candidates will have identified a range of sources that they have accessed to complete collection of primary data. For higher marks source should be recorded in sufficient detail to know who/when/how data was collected. To attain the 7-8 mark band, more detail could have been added to the references provided, namely the date or dates when the information was provided by the practitioner. For candidates working at higher levels, it is also good practice to include reference to the practitioner in a references list at the end of the document.

Strand B: Collecting secondary data (Information)

(a) Collecting secondary data
The aim of this strand is for candidates to demonstrate that they can carry out research to collect relevant secondary data to support their Work-related Report.

Mark allocated	Comments	Guidance
5-6 marks	Although more than one piece of secondary data has been used in the Work-related Report. The data has been reported accurately, but there is some that is less relevant owing to its American origin, e.g. the dental/ digital X-ray information, and reference to Orem dentists. Some information, e.g. the mailing of dental records, and the use of electronic charts, refers very specifically to dental records in the USA. Some direct 'cut and paste' was also evident in report.	Evidence should show research, selection and use of relevant secondary data. For higher marks, candidates should show research skills demonstrating suitable selection of appropriate material from the available resources, rather than indiscriminate copying. 7-8 marks, higher level candidates will show the ability to adapt and re-structure secondary data collected to suit the purpose of the work related report. At this level candidates possibly will comment on the validity of the sources used.

Note: 'Secondary data', in this context, refers to data (numerical and/or textual information) that has already been collected and presented by somebody else, for a reason other than to use for this Work-related Report. There is a wide range of secondary data that can be accessed from published material, e.g. books, letters, records, policies, results from market research, as well as material on the Internet or the candidates' own notes.

(b) References to sources
The aim of this strand is for candidates to demonstrate that they can reference secondary sources accurately and correctly.

Mark allocated	Comments	Guidance
5-6 marks	The information sources used are identified clearly in-text. To attain the 7-8 mark band, more detail could have been added to the Internet references provided, including the date of access. For candidates working at higher levels, it is also good practice to compile a references list at the end of the document.	Higher marked candidates should be showing evidence of referencing through their report in addition to a references list or bibliography. Candidates will have identified a range of sources and should cite books or articles to one of the accepted conventions and websites should provide the full URL, and record date accessed.

Strand C: The work carried out

Note that in this strand, the marking depends on how the candidates have used their researched information in their report

1-2 marks: candidates **make a relevant statement**
3-4 marks: candidates **identify** the work etc.
5-6 marks: candidates need **to explain** roles of employees /purpose of work etc.
7-8 marks: candidates need **to analyse** importance /purpose/factors which influence.

(a) The organisation/workplace
The aim of this strand is to assess how candidates use their research from both primary and secondary sources on the structure of their chosen workplace in their work related report.

Mark allocated	Comments	Guidance
5-6 marks	The candidate explains the roles of practitioners at their local dental practice. Although the dental hygienist is mentioned, detail on this role is omitted, so 5, rather than 6 marks.	For 5-6 marks candidates need to give explanations on how the employees contribute to the organisation rather than simple comments or statements. For 7-8 marks candidates need to use their researched information to analyse the importance of the roles of the employees. Material should be suitably selected form their research and link directly to the specific organisation the candidate is studying. At this level work should not be generic.

(b) The work carried out in a chosen job role and its place in the wider organisation
The aim of this strand is to assess how candidates use their research from both primary and secondary sources to identify and describe the work carried out in a chosen job role and how it fits into the wider organisation.

Mark allocated	Comments	Guidance
5-6 marks	There is some description of how the roles of the various practitioners fit within the dental practice, on page 3-4, which is more that 'identification', for 3-4 marks, but there is minimal explanation provided. Five marks, therefore.	For 5-6 marks, candidates need to give explanations on the purpose of the job role showing understanding of how it fits in to the wider organisation rather than simple comments or statements. For 7-8 marks, candidates need to use their researched information to analyse the purpose of the work and its importance in the wider organisation. Material should be suitably selected from their research and linked directly to the specific organisation the candidate is studying. At this level, work should not be generic.

(c) The location of the organisation/workplace and the effect on society
The aim of this strand is to assess how candidates use their research from both primary and secondary sources on the location of the organisation and its effect on society in their Work-related Report.

Mark allocated	Comments	Guidance
3-4 marks	The location of the practice is cited and one reason for its particular location, i.e. that it is on a main bus route, is given. This has not been extended into an explanation of its location. The effect of the dental service on society is identified in the opening paragraph.	For 1-2 marks, candidates will just make a statement about where the workplace /organisation is located and one effect it has on society, e.g. the hospital is located on a main A road. The public can get there easily. Cut and paste and irrelevant material will be seen at this level, road maps are often seen. For 3-4 marks, candidates will identify one reason for the location the workplace /organisation and one effect of the work on the society. Work at this level will just include basic statements to identify the requirements of this strand. For 5-6 marks, candidates need to give explanations on the reasons for the location of the organisation and more than one effect the work has on society rather than simple comments or statements.

Strand D: Skills used in the workplace

Note that in this strand, the marking depends on how the candidates have used their researched information in their report

1-2 marks: candidates **make a relevant statement**
3-4 marks: candidates **identify** the work etc.
5-6 marks: candidates need **to explain** roles of employees /purpose of work etc.
7-8 marks: candidates need **to analyse** importance /purpose/factors which influence.

(a) Technical skills applied in the workplace
The aim of this strand is to assess how candidates use their research skills and their understanding of skills needed at work, to find out about the technical skills used in their chosen job role is applied in the work place.

Mark allocated	Comments	Guidance
5-6 marks	One technical skill – the filling of teeth – has been described on page 7, to some reference above this giving some explanation of the application of amalgam and composite fillings. Other technical skills are alluded to, e.g. the use of tools for examinations and treatment, anaesthesia, the use of X-rays, health and safety issues associated with these, interpretation of X-rays, sterilisation and infection control, but these have not been identified or discussed specifically as technical skills. For higher marks, this candidate response could have been tailored more carefully to the marking criteria.	For 5-6 marks, candidates need to explain how the technical skills are applied in the workplace. The technical skill information at this level needs to link to how the practitioner uses the skill within the job role. For 7-8 marks, candidates need to use their researched information to analyse the technical skills applied in the workplace, e.g. why and how these skills are necessary. Material should be suitably selected from their research and link directly to the specific organisation the candidate is studying. At this level, work should not be generic.

(b) The expertise needed by an individual, or a working group, with the vocational qualifications and personal qualities required.

The aim of this strand is to assess how candidates use their research skills from both primary and secondary sources to find out about the expertise, qualifications and personal qualities used in their chosen job role for their Work-related Report.

Mark allocated	Comments	Guidance
5-6 marks	There is a good description of the qualifications required to become a dentist, and reference to the expertise required (see technical skills, above), though the importance of these is not explained. The section on personal skills required by the dentist includes good explanations of why these skills are required, at the 7-8 mark band, so 6 marks overall.	For 5-6 marks, candidates need to explain how the expertise, personal qualities and qualifications needed in the job role are applied in the workplace. Note that, as well as the need to include all three qualities, the work needs to be an explanation of what these are and how they are used not just statements to identify them. For 7-8 marks, candidates need to use their researched information to analyse the expertise needed in the workplace, e.g. why and how this expertise is needed. It is also necessary to explain the relevance of the personal qualities and qualifications needed in the job role. e.g. why and how they link within the job role. Material should be suitably selected form their research and link directly to the specific organisation the candidate is studying

Strand E: Scientific knowledge applied in the workplace

Note that in this strand, the marking depends on how the candidates have used their researched information in their report:

1-2 marks: candidates **make a relevant statement**.
3-4 marks: candidates **identify** the work etc..
5-6 marks: candidates need **to explain** roles of employees /purpose of work etc..
7-8 marks: candidates need **to analyse** importance /purpose/factors which influence.

(a) Scientific knowledge applied in the workplace
The aim of this strand is to assess how candidates use their research skills and their scientific knowledge to find out about how science knowledge is applied in their chosen job role.

Mark allocated	Comments	Guidance
3-4 marks	The information contained in the report identifies the scientific disciplines involved in dentistry but does not elaborate on these. Reference is made to the chemistry of amalgams and composite filling materials, X-rays (a diagram of the electromagnetic spectrum has been included, but with no captioning or explanation), and hygiene/ sterilisation, but these have not been developed.	For 1-2 marks, candidates will just make a relevant statement about the scientific knowledge used in the type of work studied, e.g. knowledge which they have covered in the related topic form either A192 or A193. Cut and paste and irrelevant material will be seen at this level. For 3-4 marks, candidates will need to identify examples of scientific knowledge involved in the chosen job role. Work at this level will just include basic statements to identify the requirements of this strand.

(b) Financial or other regulatory contexts that impact on the work done
The aim of this strand is for candidates to show their ability to:

Mark allocated	Comments	Guidance
3-4 marks	Regulatory factors identified include the use of X-rays on page 8, and the reference to the use of amalgam fillings on page as a factor regulating their use by some dentists on page 7. Their impact, however, is not described well (or explained at all), so the mark is limited to the lower mark band.	For 1-2 marks, candidates will just make a relevant statement about a financial or other regulatory factor used in the workplace, e.g. health and safety regulations are easy to find and important in all work places. Cut and paste and irrelevant material will be seen at this level. For 3-4 marks, candidates will need to identify examples of two examples of the impact of financial or regulatory factors (this can include one from each section or two from the same) involved in the chosen job role. Work at this level will just include basic statements on impacts. Again, take care that candidates include the impact of these regulations and not just statements of what they are.

Strand F: Quality of the presentation

(a) The structure and organisation of the scientific report

Mark allocated	Comments
5-6 marks	Relevant information is communicated (for the most part), and the report is well-organised (although the quality does tend to tail off towards the end). Contents listing and page numbering is provided, but there is no references list. Five marks, therefore.

(b) Use of visual means of communication (charts, graphs, pictures etc)

Mark allocated	Comments
5-6 marks	Visual information is used to convey information and ideas, but these are variously lacking in captions or annotation, so in the 5-6 mark band.

(c) General quality of communication

The aim of this strand is to assess how candidates can organise and write a scientific report, using relevant scientific or technical vocabulary and suitable visual material.

It is advisable that candidates are given the marking criteria for this section so they are aware of what they need to do to complete a well-structured scientific report.

Mark allocated	Comments
5-6 marks	There is adequate/ good use of scientific and technical vocabulary. Spelling is generally sound. There is some inconsistency in punctuation and spelling, e.g. 'X-rays' are spelt more than one way, and there is some American English (tumours spelt as 'tumors'). A few typos, which could easily have been corrected, creep in towards the end of the report.

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