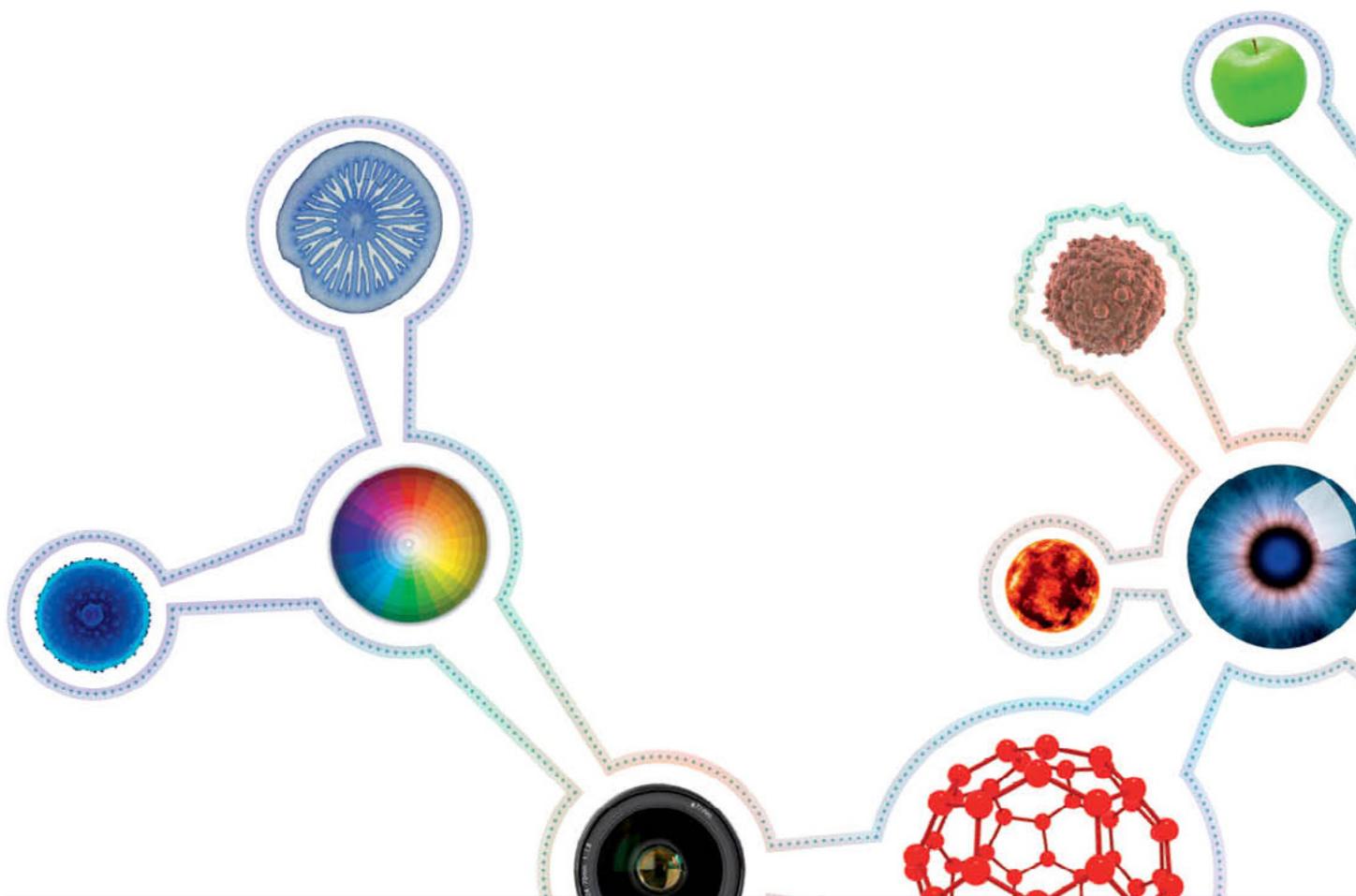


ADDITIONAL APPLIED SCIENCE
CANDIDATE STYLE
ANSWERS -
CANDIDATE C

VERSION 1 DECEMBER 2011

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INTRODUCTION

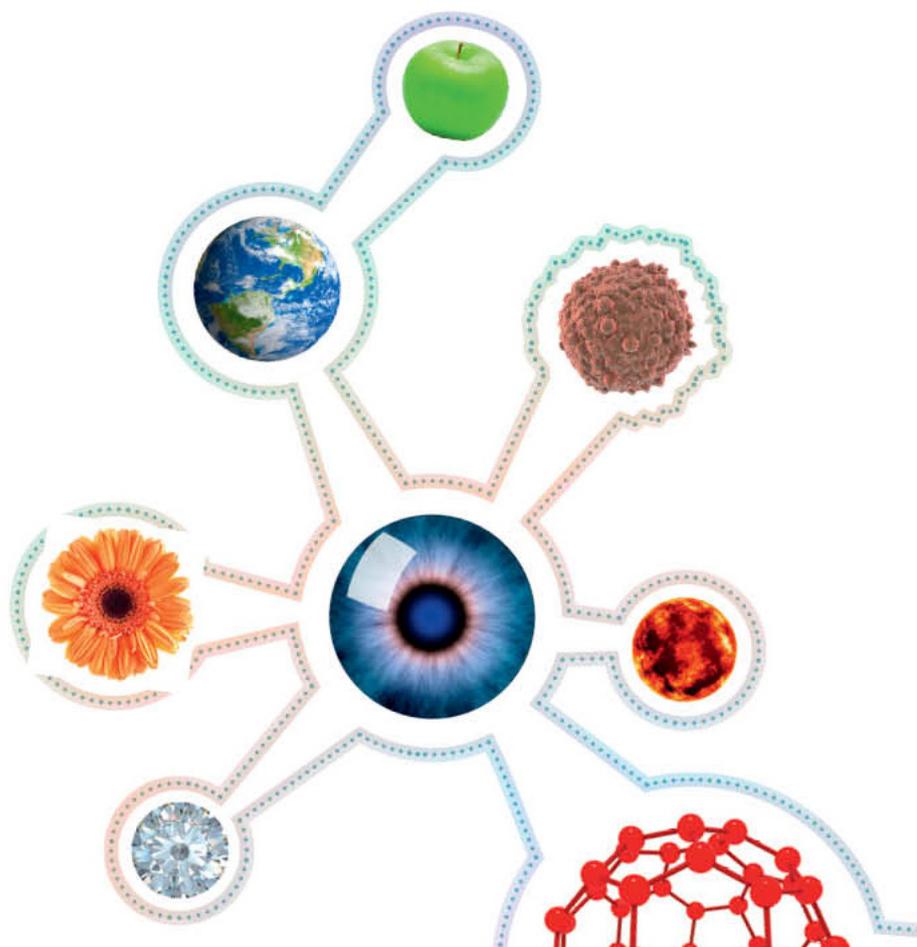
These support materials are intended to support teachers in their marking. There are three candidate style responses with accompanying commentary. These exemplars are based on the published Specimen Assessment Materials (SAMs), which can be downloaded from the relevant OCR webpage for the specification.

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.

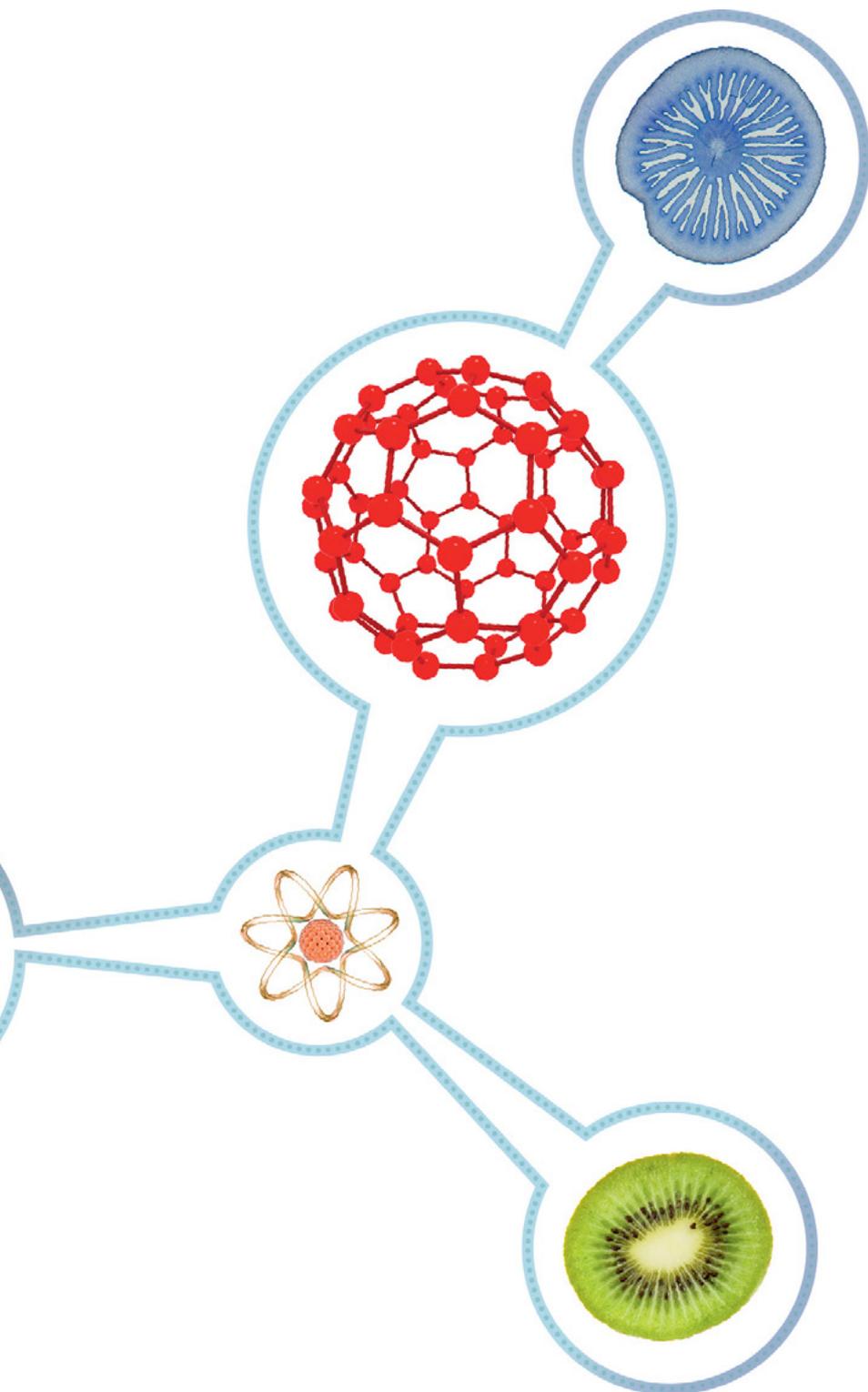
OCR will update these materials as appropriate.

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



Standard Procedure

Candidates will be expected to provide 4 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]

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:ltera_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 0.1g.
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 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
Material 2 steel	x	x	x	x
Material 3 Aluminium	80	1	1	24

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

1. Calculate the volume of each material.
Using **volume = length x width x height (cm³)**
2. Calculate the density of each material.
Using **density = $\frac{\text{mass (g)}}{\text{volume (cm}^3\text{)}}$**

Wood

Volume = $6 \times 2 \times 1 = 12$ mass = 5.9

Density = 2.0338983

Aluminium

Volume = $80 \times 1 \times 1 = 80$ mass = 24

Density = 3.333

Risk Assessment & Managing the Risks**Level of Risk :**

This standard procedure is easy. There are not many hazards. I will follow the school laboratory safety rules.

Hazard	Risk involved	Safety precautions	What to do if accident happens
Sample blocks	Could drop them on my foot or they could be thrown about the lab.	Behave in the lab.	Tell the teacher.
Electrical balances	Electric shock	Use as the teacher tells you.	Tell the teacher.

How we managed the risks

I did not drop any of the samples and nobody in the lab messed about. Mrs Harris told us off when we were talking and not doing the practical.

I thought the experiment went well and no one had any accidents.

Standard Procedure Report: Mark Allocation (F grade candidate)

Skills to be assessed	0	1-2	3-4	5-6	Mark awarded
Collect primary data (a)		2			2
Process primary data (b)		1			1
Manage risks (c)		2			2
Average mark for 3 skills = $5/3 = (1.6)$ 2					2

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
1-2 marks	Candidate has recorded data correctly for wood. Data for Aluminium is inaccurate (correct value=8.0)	Candidates working at these lower levels will have possibly collected one or two pieces of data and will have recorded them in a table which can be provided by the centre. There may be some errors or inaccuracies in their recording. At least one piece of data needs to be recorded correctly.

(b) process primary data

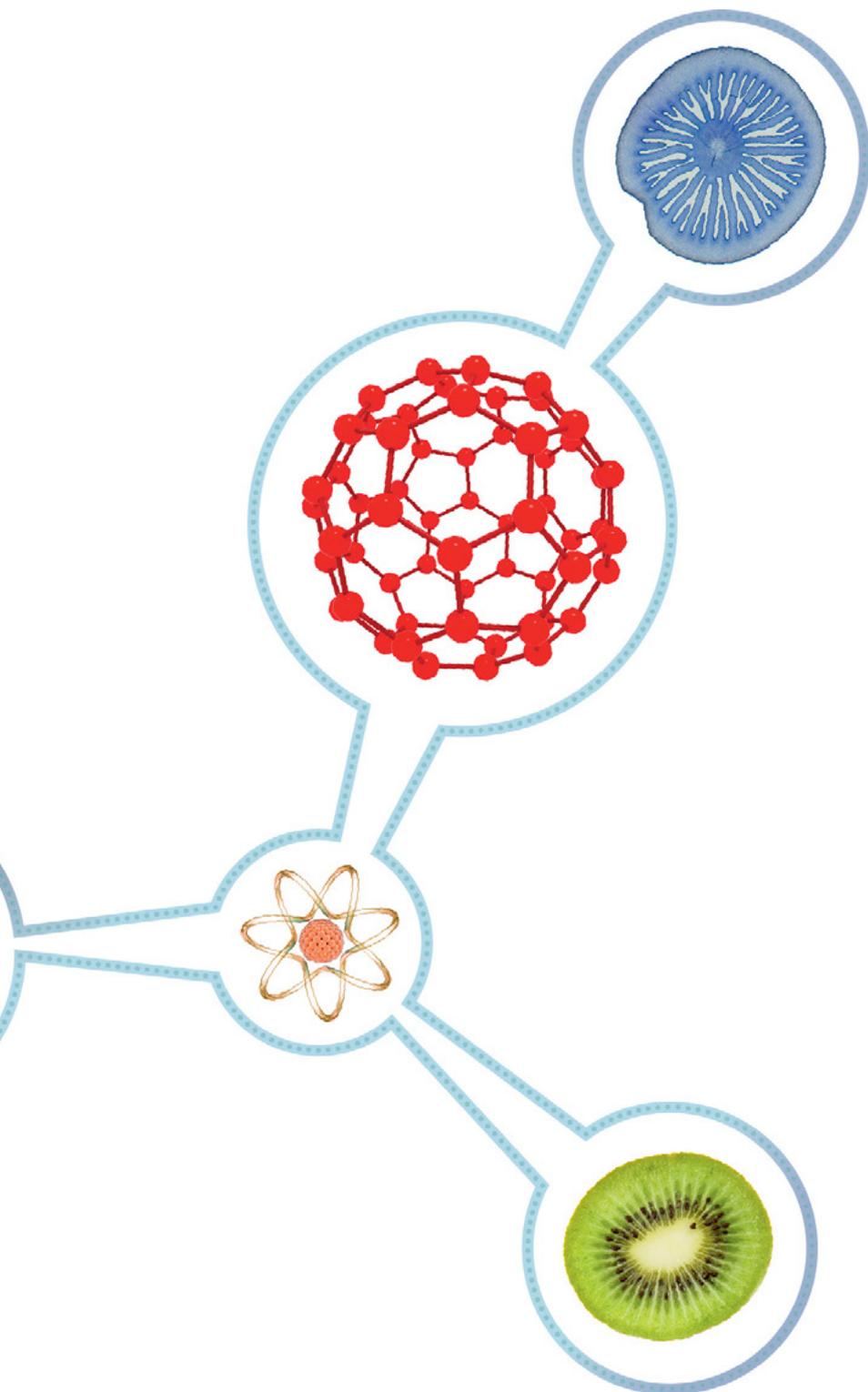
Mark allocated	Comments	Guidance
1-2 marks	The candidate has completed a division but they have divided volume by mass It is suggested that 1 mark is awarded, as the mathematical answer to the processing is correct.	Candidates working at these lower levels will probably display data in simple bar charts or if graphs are shown there will be errors in plotting and lack of labels on axes. A result from a basic mathematical technique may be seen e.g. a simple mean or a subtraction in finding a yield.

(c) manage risks when carrying out standard procedures

Mark allocated	Comments	Guidance
1-2 marks	The candidate has reviewed the risks of the experiment although only at a low level	Candidates will make simple comments about taking care when handling equipment, chemicals or biological material. The statements will probably be generic and be basic laboratory safety.

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



SUITABILITY TEST

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

Contents

Title page

Contents

Diabetes

Results

Analysis

Evaluation

Conclusion

Diabetes

Diabetes is a common life-long health condition. There are 2.8 million people diagnosed with diabetes in the UK and an estimated 850,000 people who have the condition but don't know it.

Diabetes is a condition where the amount of glucose in your blood is too high because the body cannot use it properly. This is because your pancreas does not produce any insulin, or not enough, to help glucose enter your body's cells – or the insulin that is produced does not work properly (known as insulin resistance).

Insulin is the hormone produced by the pancreas that allows glucose to enter the body's cells, where it is used as fuel for energy so we can work, play and generally live our lives. It is vital for life.

Glucose comes from digesting carbohydrate and is also produced by the liver. Carbohydrate comes from many different kinds of foods and drink, including starchy foods such as bread, potatoes and chapatis; fruit; some dairy products; sugar and other sweet foods.

If you have diabetes, your body cannot make proper use of this glucose so it builds up in the blood and isn't able to be used as fuel.

Diabetes types

There are two main types of diabetes:

- [Type 1 diabetes](#)
- [Type 2 diabetes](#)

[http://www.diabetes.org.uk/Guide-to-diabetes/Introduction-to-diabetes/What is diabetes/](http://www.diabetes.org.uk/Guide-to-diabetes/Introduction-to-diabetes/What%20is%20diabetes/)

Diabetes develops when glucose can't enter the body's cells to be used as fuel. This happens because either...



There is no key (insulin) to unlock the door to the cells... as in **Type 1 diabetes**

...or the key (insulin) is unable to unlock the door properly and/or ...the key (insulin) is there but the lock doesn't work properly as in **Type 2 diabetes**

Suitability test

In this suitability test, I am going to write about what I think the best method is for a technician to use to measure glucose in samples for people who think they may have diabetes

THE Tests

The tests that we have been given to test are

- Benedict's
- Clinistix
- Standard curve

The test needs to show if the patient's urine contains sugar, I am going to carry out each experiment to see which one is the most suitable.

The test needs to give the right answer as if the wrong result was given to a patient the patient could die.

The test needs to be quick so it is easy to do.

It needs to be cheap as lots of these tests are given to patients.

PLANNING (Mrs Harris gave us the tests to follow)

I will carry out the tests on the samples and then look at the results and decide which is the best.

Benedicts

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

Results

Mrs Harris gave us the table.

I carried out the tests with Sajid and Mark. I filled the table in myself.

Benedict's tests

All solutions started off the same colour before heating.

Sample solution	Colour
1	orange
2	brown
3	red
4	light yellow
5	light brown

Patient	Colour
1	orange
2	brown

This test was fiddly and it took quite a bit of time for the colour to change.

This test would be expensive as you would have to buy chemicals and use electricity for the hot bath.

I would not recommend this test.

Patient 1 Report

The colour was orange

Patient 2 Report

The colour was brown

Clinistix

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

Sample solution	Colour
1	light
2	medium
3	dark
4	dark
5	dark

Patient	Colour
1	dark
2	light

I think that the Clinistix test is a quick and easy method. It quickly changes colour and the colour was easy to see.

The cost are cheap as there is no chemicals to be bought.

Patient 1 Report

The test was dark.

Patient 2 Report

The test was light.

Standard curve

1. 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.

Sample solution	Time (seconds)	Time (seconds rpt)	Average
1	1800	1600	1700
2			
3			
4			
5	430	400	415

Patient	Time (seconds)
1	
2	1500

Independent Work

The candidate was provided with tables to record their results

Signed A. Teacher

Patient 1 Report

Did not have time

Patient 2 Report

The test was 1500

I found this test difficult to do
I would not recommend this test

Evaluation & Conclusion

i followed the instructions and found out some things and wrote them in the tables.

i found some of the experiments hard to do

It is easy to do the Benedict's test but we had to wait for the colour to change colour.
This is not a very good test.

The standard curve experiment was also hard I did not have time as my group was away and we did not work together very well. it took us a long time.

The Clinistix was good and easy to use. This is the best test.

Management of Risks

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

Risk Assessment Form

Activity Testing for glucose in urine:	
Hazards 1. Glassware 2. Chemicals 3. Hot water & water bath	Risks Getting cut Burns Scalds, electric shock
Control measures 1. wear goggles and follow laboratory safety rules 2. check Hazcards and follow guidelines 3. check water bath works correctly	
Emergency Action 1. contact teacher or lab technician 2. tell teacher if any chemicals in eyes 3. tell the teacher if water too hot.	
Notes Make sure to follow practical instructions; don't mess around in the laboratory.	

Suitability Test: Mark Allocation (F grade candidate)

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

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
1-2 marks	There is some good information on diabetes, but limited reference to the purpose of the test. The candidate has cut and pasted material from the Internet –although the references are included. Some irrelevant material.	Candidates will produce some research which is relevant to the task but it will not be logically presented. For the lower marks there will also be irrelevant material. Some description of the use or purpose will be stated.

(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
1-2 marks	Statements of desirable properties were given.	Lower marked candidates will produce some research which will include irrelevant material. Work will not be logically presented. Statements and limited description of the properties will be seen. There will be no link to the suitability of the material/process/device.

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 completed a risk assessment. More than making a comment about safety issues has been included.	For 3-4 marks, identification of hazards will be included, but risk assessments will be lacking in detail.

(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
3-4 marks	Candidate had indicated how they would plan to follow the procedures. Methods provided.	Lower marked candidates planning will be focused on one straightforward experimental procedure that they are aiming to carry out. For 3-4 marks there will probably be information on planning possibly two procedures but most of the marks for planning work will be from description of methods which the candidates are going to use.

***(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
3-4 marks	Plan shows some structure on what they are going to do, and three tests are being compared.	For 1-2 marks candidates will use minimal scientific vocabulary and content. Work will not be structured and show limited focus on the task. 3-4 marks will show some structure and some evidence of structured plan. (refer to marking criteria)

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
3-4 marks	The candidate has recorded observations and some measurements in limited detail. Some measurements are missing, i.e. for the manganate(VII) test. They did not devise their own tables.	1-2 mark candidates will have collected one or two pieces of data and recorded this in a table provided by the centre. It will be of low quality and will reflect the completion of minimal practical work. For 3-4 marks candidates need to show evidence of collection and recording of data from all their completed experimental work. There may be some errors or omissions in the recording.

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
1-2 marks	Candidates have found an average but processing is limited.	For 1-2 marks candidates working at these lower levels will probably display data in simple bar charts or if graphs are shown there will be errors in plotting and lack of labels on axes or a result from a basic mathematical technique may be seen e.g. a simple mean.

(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
1-2 marks	Candidate has attempted to interpret the data gathered but the work is limited.	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
1-2 marks	Comments very vague on problems associated with apparatus and techniques. 2 marks awarded.	For 1-2 marks candidates should make a simple comment about how the primary data was collected.- this may be found in the methods, if they have included these with their work. For 3-4 marks candidates will state a problem they had with the experimental work or a statement everything went well.

(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
1-2 marks	Very limited work here – 1 mark awarded as candidate has made limited comments about collecting the data and a statement about the Clinistix being the most suitable.	For 1-2 marks candidates may make a statement that their results are 'repeatable' (similar to other groups' results) but do this without referring to their data and a simple statement about the suitability of their chosen material/device/ procedure. (this may found be elsewhere in the report)

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
3-4 marks	Annotation is provided by the centre that risks were managed successfully and there were no incidents during the practical, and support was given from the teacher to ensure safety.	Lower level candidates should have shown evidence that they can manage risks successfully and work safely. This can be indicated by a statement or brief annotation from both the candidate and the teacher. Support from the teacher is allowed at this level to ensure safety.

***(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
3-4 marks	There is some structure to the evaluation, but limited use of technical and scientific vocabulary has been made. Spelling, punctuation and grammar are of variable quality.	Lower marked candidates will use minimal scientific vocabulary with frequent errors in punctuation and grammar. Work will not be structured and show limited focus on the task. (refer to marking criteria).

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.

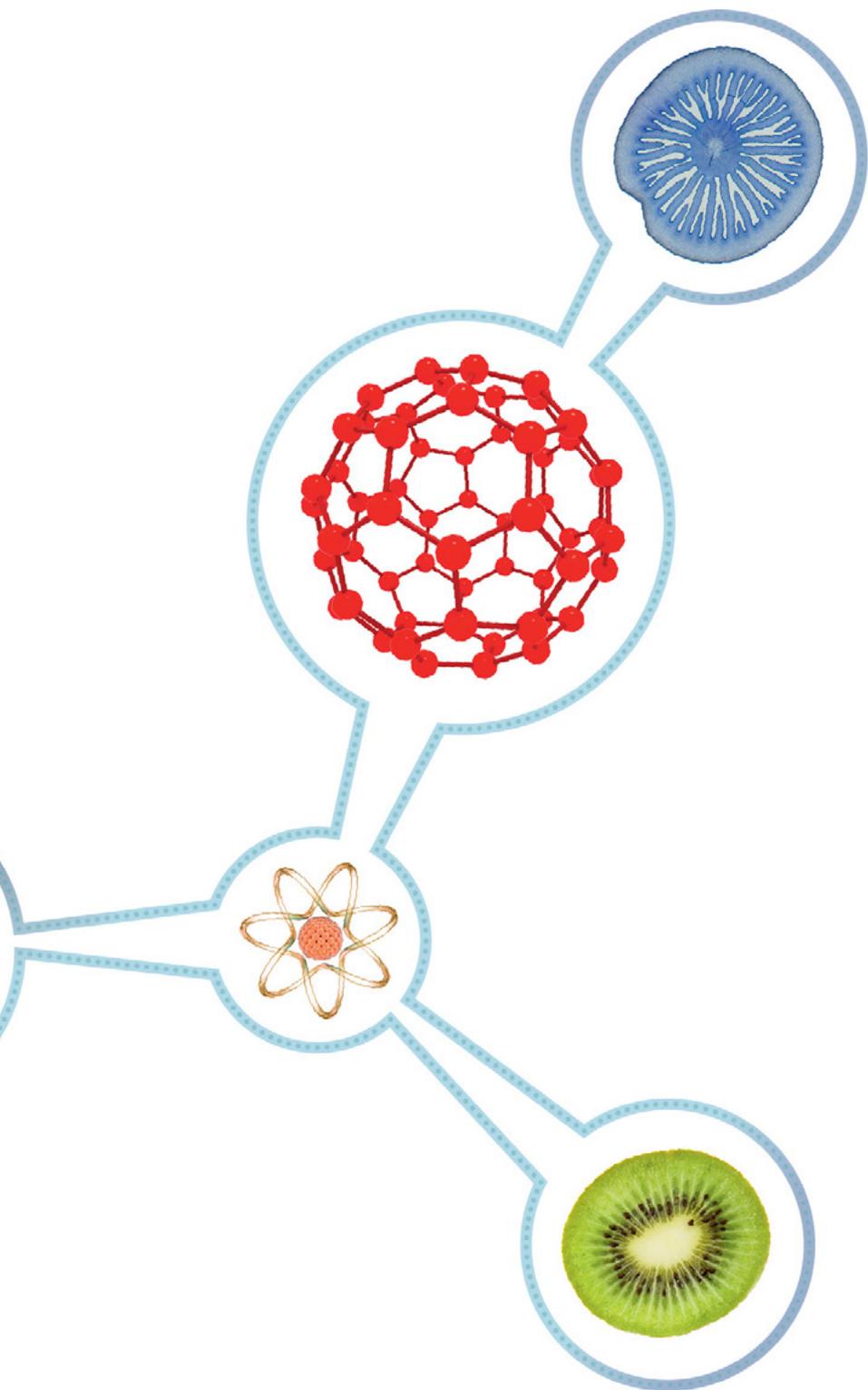
Mark allocated	Comments	Guidance
1-2 marks	A simple conclusion has been made but no reference to the data Patient report work just restates data; no conclusions have been made	Lower marked candidates will have reported some data found and may just make a simple conclusion e.g. a statement about the experiment or a statement to say which material /device/ procedure is most suitable but with no justification. For 3-4 marks there will be a conclusion based on the results collected, it will show limited scientific knowledge but a statement about how the results support suitability is needed.

***(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
3-4 marks	Work is understandable and although there are some errors 3 marks are awarded.	For 1-2 marks candidates will use minimal scientific vocabulary and content and spelling punctuation and grammar will be of poor quality. For 3-4 marks will show limited use of scientific vocabulary. The conclusion will be understandable and spelling punctuation and grammar will show several errors.

WORK RELATED REPORT



WORK RELATED REPORT

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



<http://www.clipartguide.>

CONTENTS

Introduction
The Dentist
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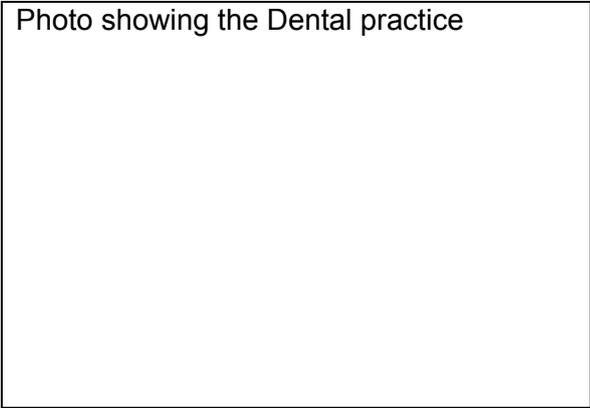
Introduction

Dentists use lots of science and dentists use all different types of materials to help them in their jobs. I don't like going to the dentist but dentists are important to make sure that your teeth do not decay. They carry out check ups, fillings and make false teeth.

The Dentist

I visited my local Dental Practice at 4 Market Street. I talked to the dentist, the nurse and the receptionist.

Photo showing the Dental practice



There are two dentists, two nurses and a receptionist at this dentist.

The receptionist works full time and tells the patients to wait for their appointments she also arranges the appointments with the dentists.

I talked to my dentist and she told me what she did during a typical day.

Starts the day by checking the post and if there is any lab work or patient messages.

She then looks to see if there are any referral letters. Puts on her uniform and washes and disinfects her hands.

The nurse gets the patients and the treatment begins.

After each patient she writes up the notes and needs to use an alcohol rub on her hands and the nurse cleans the surgery and sterilises any equipment. She needs to change her gloves after each patient.

At the end of the day she needs to check that any letters to the hospital are written or referred for braces.

Reference: This is my primary data I collected it from a visit to my dentist.

Starting a career as a dentist

Today, the emphasis of dental care is focused on educating the public to care for their mouths and teeth.

Dentists will work with patients and the general public in a number of ways, preventing and treating dental and oral disease, correcting dental irregularities (particularly in children) and treating dental and facial injuries.

Training to be a dentist

Education:

Dental education comprises three main related stages:

1. undergraduate dental education
2. postgraduate dental education
 - dental foundation training/vocational training
 - specialist training
3. continuing professional education
 - continuing professional development

The first two stages permit progression to the next stage, whereas the final phase starts when a dentist takes up a career post and extends throughout a dentists career until retirement.

The General Dental Council (GDC) keeps a close check on the standards of UK dental education at undergraduate and postgraduate level. It publishes its requirements on the content and scope of undergraduate dental degree programmes (and of dental hygiene and therapy courses).

All new degree programmes and courses must meet these requirements and be GDC-approved. The GDC also makes regular visits to the schools.

Dental Team

"Keeping Britain smiling"

If you like the idea of working with people, doing a job that's respected, and which offers flexibility and security, a career with the dental team could be right for you. The Dental Team includes dentists, dental nurses, hygienists, technicians and therapists. Providing dental care for the community or in an acute setting is a team responsibility. Each member of the dental team has an important role to play in promoting and maintaining dental health.

There's a range of different employment options for members of the dental team. People working in general practice will be employed by – or be partners in – a dental practice; some may be self-employed, dividing their time between different practices and other settings for providing care. Dental technicians work for commercial laboratories or in NHS hospital laboratories. Staff working in dental hospitals will usually be employed directly by an NHS employer.

Whatever your role, you'll be making a big contribution to improving the health of the nation's teeth and gums. In recent years there has been a cut in the number of fillings needed and more of us are keeping our teeth. What's more, the skills of the dental team, coupled with advances in dentistry, mean that a visit to the dentist is no longer the intimidating event that it once seemed.

Dentists

Lead the dental care team: diagnosing problems, identifying treatments, carrying out surgery, and providing advice to patients.

Dental Nurses

Assist dentists and look after patients during treatment, along with other support work in the surgery.

Dental Hygienists

Help to prevent the onset of tooth decay and gum disease through regular treatment and educating people in good oral health.

Dental Therapists

Carry out a range of straightforward treatments, including simple fillings or extractions, usually working with children, older people and those with special needs. They also provide oral health advice.

Dental Technicians

Make the dentures, crowns, bridges and braces that people may need in the course of dental treatment.

Reference : This is my secondary data I found this information on the Internet.

The dental practice I visited was near the town centre. It was easy to get to on the bus. Inside in the waiting room there were lots of magazines and advertisements about brushing your teeth and sugary foods.

The dentist, had completed her degree at Sheffield University Dental School and had been working at the practice for 5 years.

Entry Requirements and Selection Procedure

The School receives between 950 and 1050 applications each year for the 75 places available on the BDS programme. Selection for interview takes place from October with invitations for interview being sent out mid January. Applications are initially assessed using all the information provided on the UCAS application form. The competition for places is extremely high and therefore applicants are selected for interview using the following criteria.

Academic Criteria

- GCSE and A-Level or equivalent qualifications are required for entry onto the BDS programme.
- **GCSE:** Although we attempt to take an holistic approach to the selection of students most applicants who secure an interview have a minimum of 6 A grades including Maths, English Language and Science subjects.
- **AS:** Currently we do not take into account AS grades when assessing the Academic record. We use A2 grades or predicted grades where applicable.
- **A levels:** The minimum requirement for entry onto the programme is AAA, including Chemistry, plus one other science. (For Entry in 2013 the requirement will be for both Chemistry and Biology)
- Most applicants select Biology as their second science A-Level as many schools stipulate both Chemistry and Biology. The third A level may be in any subject. At Sheffield we do not give preference to any particular subject for this third A-level choice. Similarly preference is not given to applicants who are taking 4 A-levels or additional AS levels.

Continuing Professional Development

All dental professionals must complete CPD in order to maintain their registration with the GDC.

The Dental School provides online and hands-on Continuing Professional Development courses through Dental Additions, its online CPD hub.

There are also a wide range of CPD opportunities provided by the the Faculty of Medicine, Dentistry and Health for practitioners employed within Yorkshire and the Humber and the East Midlands NHS services.

Personal Skills needed by a dentist

One of the main personal skills needed as a dentist is to be good at listening to the patients and to be good with your hands so you can do fillings and extractions. You need to keep calm and help the patients.

The dentist said ‘ As a dentist you need to put the needs of the patients first and have high clinical standards. ‘

The dentist said she “enjoyed being a dentist as she liked working with the patients and found it very rewarding when they went away happy.”

The dentists need to be able to use different tools

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

Dental instruments are the [tools](#) that dental professionals use to provide dental treatment. They include tools to examine, manipulate, restore and remove [teeth](#) and surrounding [oral](#) structures.

Standard instruments are the instruments used to examine, restore and extract teeth and manipulate tissues.

[Mouth mirror](#)

Dental mirrors are used by the [dentist](#) or [dental auxiliary](#) to view a mirror image of the teeth in locations of the mouth where visibility is difficult or impossible. They also are useful for reflecting light onto desired surfaces, and with retraction of soft tissues to improve access or vision.

In addition to the tools used in a basic dental exam, 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 radiograph 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.

What science is used in dentistry?

Answer

Physics, Microbiology, Chemistry, Anatomy, Physiology, Biochemistry, Histology, Pathology, Psychology, Pharmacology, and more.

The dentist told us about doing fillings

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 Composites are tooth-coloured filling materials used by dentists.

Composites are typically hardened using light.

Dentists have to be trained to take and interpret Xrays

X-ray Safety

All types of radiation can cause damage to body cells. In very high doses, such as might be released during a nuclear reactor accident, the damage can be swift, leading to "radiation burn" and other serious effects. People who receive large doses of radiation as part of their cancer treatment can also experience skin burns or damage to healthy body tissue near the cancer.

The X-rays used in dental and medical offices emit extremely small doses of radiation. However, cells can be damaged by many small doses of radiation that add up over time. Although the amount of radiation used in dental X-rays is very small, the effect is cumulative, so all radiation counts. That's why experts recommend that X-rays be used judiciously and with precautions to help protect the patient from unnecessary radiation exposure. To keep exposure to X-rays low for their patients, dentists and regulatory agencies have done several things:

- **Reduced X-ray dose -**
The single most important way dentists keep their patients safe from radiation is by limiting the beam to the small area being X-rayed and by reducing the amount of radiation that strays from that path. This is done by a process called collimation, in which the machine directs the X-rays through a lead-lined column and out a tiny opening at the end. So although an X-ray machine looks quite large, the X-rays are limited to a small area less than three inches in diameter as they come out of a small cone at the end. X-ray machines are well shielded and there is very little radiation exposure beyond the diameter of the primary beam.
- **Improved X-ray film -**
The speed of films used for dental X-rays has been improved so less exposure is needed to get the same results.
- **Changed to using film holders -**
Do you remember the days when dental patients had to hold X-ray film in their mouths with their fingers? Those days are long gone. Now, fingers have been replaced by holders that not only keep the film in place, but also help the dentist aim the X-ray machine. By using film holders, there is less chance of the film slipping or being held in the wrong place, which means that fewer repeat X-rays need to be taken.

Required regular X-ray machine checks and licensure -

Federal law requires that X-ray machines be checked for accuracy and safety every two years, and some states require more frequent checks. Once the machine passes the testing process, the dentist receives a license to operate the machine. If you have any doubts about the safety of the X-ray machine in your dentist's office, feel free to ask to see a copy of the inspection license.

- **Recommended or required use of lead shields -**

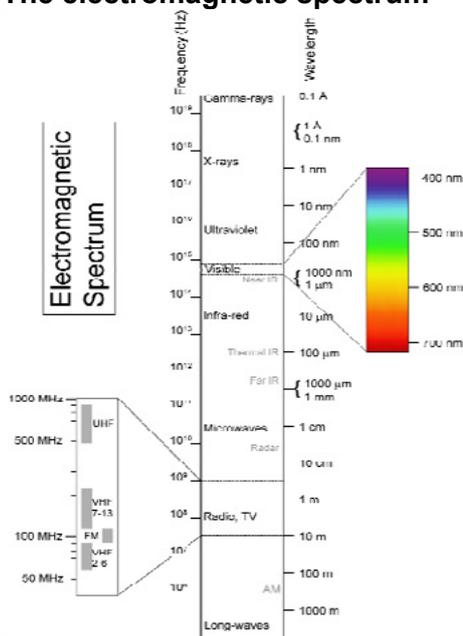
Before making radiographs, dentists will cover a patient from the neck to the knees with a lead-lined full-body apron. If the apron doesn't extend up to the neck, a separate neck protector called a thyroid collar may also be used. These shields have been used for decades to help protect patients from radiation scatter. Many states now require lead shields to be used. Although this type of protection was very important in the old days of high-scatter machines, today the lead aprons offer more peace of mind than actual protection because stray radiation from modern dental X-ray machines is almost nonexistent.

- **Recommended that radiographs be made only when necessary for diagnosis and treatment -**

There are no such things as necessary "routine" radiographs the way there are required vaccination schedules for children. Instead, dentists make radiographs only when they think they are necessary to make an accurate dental assessment or diagnosis. This keeps the number of X-rays taken to the minimal needed for dental health.

- **Developed digital radiography -**

A new system of taking X-rays, called digital radiography, reduces radiation by as much as 80 percent

The electromagnetic spectrum**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.

Health & safety

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

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

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

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
3-4 marks	The candidate has collected relevant information from the visit to the dentist.	Candidates in this instance will need to show evidence that they have asked questions or gather information from peers or teachers during discussion or practitioners if they go on a visit. 3-4 marks will reflect that work has been produced by using an additional source e.g. from email, telephone call etc

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
3-4 marks	The information source, i.e. the dental practitioner/ nurse/ receptionist/ place, are identified although no names are given. However, the address of the practice is included.	Lower marked candidates will have limited referencing in their report.

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
3-4 marks	Although more than one piece of secondary data has been used in the Work-related Report, most is direct 'cut and paste'	For 1-2 marks candidates working at lower levels will provide evidence of basic research skills and have found secondary data linked to a job role e.g. evidence probably from a careers site, work may be cut and paste, or a complete article included which will probably contain irrelevant information. For 3-4 marks candidates will show that they have completed research using secondary data to identify suitable facts needed for their report e.g. specific qualifications needed for the job role. Candidates may highlight chosen information to identify facts required.

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
0 marks	Candidate only refer to clip art and made vague reference to internet use mark band 1-2 not attained.	Lower marked candidates will have limited referencing in their report: Internet references will give Google/ Wikipedia etc. and referral to text books may be limited to a title.

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
3-4 marks	Just 3 marks as the work shows evidence of the structure of the dental practice and some information on what the employees do, although there is 'cut and paste' and some irrelevant material.	For 1-2 marks candidates will just make a statement about the organisation they are studying e.g. information on a department, number of employees etc. Cut and paste and irrelevant material will be seen at this level. For 3-4 marks candidates will need to identify the structure of the organisation and name the different types of employees. Work at this level will just include basic statements to identify the structure etc of the workplace.

(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
3-4 marks	The report does give statements about the nature of the work and its purpose.	For 1-2 marks candidates will just make a statement about the nature of the work in the organisation they are studying e.g. a midwife works with pregnant ladies to deliver babies. Cut and paste and irrelevant material will be seen at this level. For 3-4 marks candidates will need to identify the work and its purpose and place in the wider organisation e.g. the purpose of the midwife's work and how it links to e.g. the NHS or the community Work at this level will just include basic statements to identify the requirements of this strand.

(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
2 marks	The location of the practice is cited and one effect on society. An effect the dentist has on society is provided in the introduction.	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.

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
3-4 marks	Candidate has given information about doing a filling and stated 'Dentists have to be trained to take and interpret X-rays.'	<p>For 1-2 marks candidates will just make a statement about a technical skill used e.g. a midwife needs to know how to take a blood sample. Cut and paste and irrelevant material will be seen at this level. The skill may be difficult to find in the report and linked with basic science knowledge.</p> <p>For 3-4 marks candidates will need to identify examples of more than one skill that is involved in the job role. Again this may be included in scientific knowledge or in qualifications.</p> <p>Work at this level will just include basic statements to identify the requirements of this strand. However the skill needs to be technical – not a personal attribute e.g. is very calm, has a pleasant personality is not acceptable.</p>

(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
1-2 marks	'Cut and paste' information on qualifications was included by the candidate. Although qualifications and personal qualities were included, these were only identified with no explanation.	For 1-2 marks candidates will just make one statement about the expertise or qualifications or personal qualities need in the job role. Cut and paste and irrelevant material will be seen at this level. It is common to see qualifications needed to get on a course to do e.g. nursing etc. and candidates include this rather than the qualification needed to do the actual job, this is not acceptable. For 3-4 marks candidates will need to identify in their report the expertise or qualifications or personal qualities need in the job role Work at this level will just include basic statements or information which identifies the qualifications etc. needed in the job role. Candidates will probably identify qualifications and personal qualities etc. but the work will be at a lower level than the explanation needed for 5-6 marks so will still be 3-4 marks.

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
1-2 marks	A relevant statement about 'sciences' involved was made but limited evidence of understanding of science involved. There is 'cut and paste' on X-rays.	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
1-2 marks	Limited work on health & safety. 2 marks.	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
3-4 marks	The report shows some structure with some suitability to its purpose.

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

Mark allocated	Comments
3-4 marks	Visual information is related to dentistry but is not informative.

(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
3-4 marks	There is a lot of 'cut and paste' with limited work showing the candidate's own words. The quality of the grammar is variable

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