ResultsPlus

edexcel

Examiners' Report
June 2014

GCE Design & Technology 6RM02 01

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

ResultsPlus

Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit www.edexcel.com/resultsplus.
Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk.

June 2014

Publications Code US038533

Introduction

This is now a well established examination and candidates are clearly benefiting from extensive use of past papers which bring an understanding of the types of responses required from the questions. In general, responses were well structured with points contextualised in sentences. The longer questions requiring more in depth answers also contained appropriate detail with candidates understanding the need to explain points rather than just state them. Having said this, there still remains a minority of candidates whose performance is significantly affected by poor exam technique rather than a lack of knowledge. Some examples of this have been included in the report in an attempt to continue to stress the importance of effective exam technique.

Question 1(a)

This was a straight forward introductory question which still had a measure of challenge. Most candidates were able to identify one or two characteristics, with a minority gaining three. "Do not contain iron" and "do not corrode" were the most common responses but all points in the mark scheme were commonly seen.

1 Metals can be classified as ferrous or non-ferrous.

(a) Give **three** characteristics of non-ferrous metals compared with ferrous metals.

(3)

1 It is magnetic

2 It contains iron

3 And unless treated it will rust

ResultsPlus
Examiner Comments

Some candidates lost marks because they did not specify the metal classification they were referring to. In this example the candidate simply stated that they are magnetic, contain iron and corrode. No marks were awarded as the question is directed towards characteristics of non-ferrous metals. If the above example had been contextualised to state that 'Ferrous metals are magnetic…' then marks would have been awarded.

1 Metals can be classified as ferrous or non-ferrous.

(a) Give **three** characteristics of non-ferrous metals compared with ferrous metals.

(3)

1 They do not rust

2 They do not Corrode

3 Theey are weather resistant

ResultsPlus
Examiner Comments

This response scored 1 mark. A small number of responses followed this pattern where a candidate repeated the same point using different terms. Candidates need to avoid repetition.

ResultsPlus
Examiner Tip

Checking your answers will make a difference to your result.

Question 1(b)

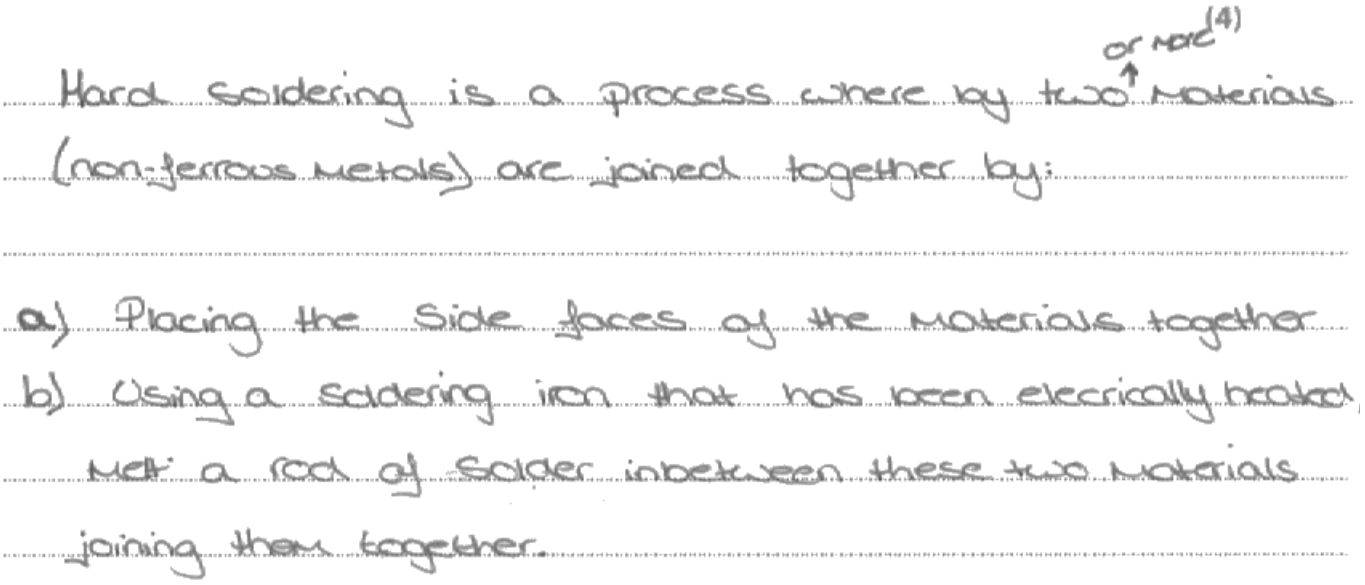
The vast majority of candidates were able to identify copper as one of the constituents of brass, with zinc being a little more problematic. Tin and aluminium were frequent, but incorrect answers.

Question 1(c)

This hard soldering question generated a wide range of responses. Simplistic answers gained marks for the use of heat, and melting some form of secondary metal into the joint. Responses that confused the process with soft soldering or welding methods also gained some marks for the above points. Better answers identified the use of flux, appropriate methods of generating the heat, and suitable temperatures.

(c) Many non-ferrous metals can be joined using hard soldering.

Describe the process of hard soldering. (4)



ResultsPlus
Examiner Comments

This was a superficial response but it gained 2 marks for a reference to 'heat' and 'melting a rod of solder'. Placing the materials together was too vague as the application of heat or the action of the flux will cause movement. An understanding of the need for the materials to be secured/held/clamped is required.

(c) Many non-ferrous metals can be joined using hard soldering.

Describe the process of hard soldering.

(4)

Hard soldering is a method of joining using heats of arround 875 °c. Before the wield is done the base metals have to be cleaned using an emmly cloth and a flux must be added the base Meta flux allows the melted spelter to flow. the spelter is made from 65% copper 35% zinc. the melted spelter joins the two pieces of meltal together using capillary action.

ResultsPlus

Examiner Comments

This was a good quality response that gained four marks. Although not all details are technically correct (e.g. references to 'weilding' and use of 'emmly' cloth to clean the surfaces) there is more than sufficient evidence to show that the correct process is understood.

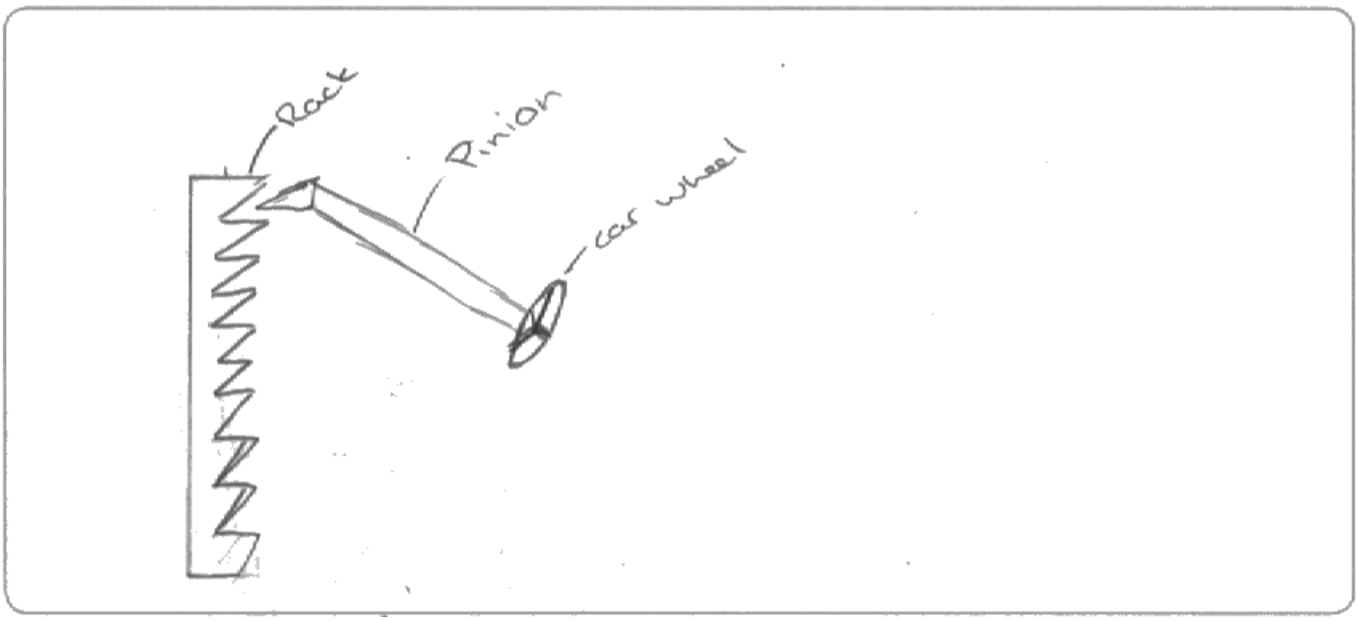
Question 2(a)

Historically, candidates have scored poorly on questions drawn from the 'mechanism' section of the specification, but this was a well answered question with most candidates scoring the full 2 marks. Clearly identifiable components were generally sketched in both pictorial and symbolic forms. Having said this, there were a significant number of responses which showed simple gear trains and bevel gears, both of which were awarded 1 mark for a pinion.

2 (a) Rack and pinion mechanisms are used in car steering systems and pillar drills.

Draw a diagram of a rack and pinion mechanism.

(2)



ResultsPlus
Examiner Comments

Knowledge of a rack is shown for 1 mark, but no understanding of the pinion, even though it is labelled, as the labels are stated in the question.

Question 2(b)

The two key points of 'heat' causing a 'shape change' were being looked for. Most candidates plainly identified these points and gained the two marks.

(b) Shape Memory Alloys (SMA) are often used in fire alarms and air-conditioning units.

Explain the smart property of a Shape Memory Alloy (SMA) that makes it suitable for these applications.

(2)

if a shape memory alloy becomes deformed, or bent in some way, once you apply heat it returns to its original shape, making them suitable for the alarms as once heat from a fire is applied it will change shape and set the alarm off, and air conditioning units to turn them on when it is hot.

ResultsPlus
Examiner Comments

This was a good response which showed a clear understanding of the function of SMA and an understanding of its function within the contexts. Two marks were awarded.

(b) Shape Memory Alloys (SMA) are often used in fire alarms and air-conditioning units.

Explain the smart property of a Shape Memory Alloy (SMA) that makes it suitable for these applications.

(2)

It is suitable for these application as Alloy heat or cold air will not change thier Properties making the ac unit not become brittle as constant cold air will be passed though it. The fire alarm will not melt in a fire making is suitable as it will give a constent warning to the customer.

ResultsPlus
Examiner Comments

This misdirected response focuses on the heat resistance of SMA and subsequently scored no marks.

Question 2(c)

This question produced a well spread range of responses with most candidates gaining 4-5 marks, but relatively few achieving the full 6. The vast majority identified heat resistance as an essential property, with other answers being drawn from across the mark scheme. A common misconception seen was that thermo-ceramics are a good heat conductor.

(c) Turbine blades in jet engines and brake discs in high performance cars are often made from thermo-ceramics.

Explain **three** advantages of thermo-ceramics that make them appropriate in these situations.

(6)

1 as a lot of heat is produced in turbine blades and brake disks due to friction, the thermo-ceramics are able to withstand a lot of heat

2 thermo-ceramics have a very smooth finish, helping to reduce friction, making the component more efficient. ~~If a lubricant~~

ResultsPlus
Examiner Comments

This response scored 3 marks. The first point in this response states that thermo-ceramics are heat resistant, but fails to explain why this is important, so it is awarded only 1 mark. The second point is incorrect as smoothness of finish is more a product of the manufacturing process rather than the material. 2 marks were awarded for the final response with its correct explanation.

(c) Turbine blades in jet engines and brake discs in high performance cars are often made from thermo-ceramics.

Explain **three** advantages of thermo-ceramics that make them appropriate in these situations.

(6)

1 They can withstand extremely high temperatures. Jet engines and brake discs create alot of heat, to the point where they glow red hot. With standard metals this could mean that they would melt.

2 They are light. Being light means that they can be more efficient - if as little weight as possible is added to the car, it makes braking easier.

ResultsPlus
Examiner Comments

This was a strong response that gained 5 out of the 6 marks. The first and second reasons are well structured as the candidate has made a point then explained it. The final point is a valid one but the explanation does not fit the point made in that hardness means it will resist wear rather than bending.

ResultsPlus
Examiner Tip

Ensure your justifications fit the points you are making as disjointed explanations will not be awarded marks even if they are in the mark scheme.

Question 3(a)

Many candidates struggled to give the correct names of the parts of the centre lathe indicated. The majority of candidates correctly identified the chuck, and a lesser number identified the tail stock. Very few identified the saddle or carriage and many stated that the tool post was a 'tool rest' as it would be on a wood lathe. Knowing the correct names of the main parts of machine tools is important when describing how to use them.

Question 3(b)

Most candidates made a good attempt at describing how to cut the slot using a milling machine which was encouraging. Those who had used the machine were likely to have gained the higher marks being able to give more detailed responses. A small minority described how a CNC milling machine would be used and gained some marks for parallel knowledge, although improved exam technique may have led to higher marks.

Describe the process of machining the slot in the steel block using a manual milling machine.

(5)

a manual milling machine allows you to take out parts of a material quickly and effectively first you turn the machine on and centre it. you then control it using a wheel pivot. you then gently ease the milling machine tool down onto your material and cut out the desired gauge you want

ResultsPlus

Examiner Comments

This response was awarded 2 marks. The first mark was for recognition that the tool needs 'centring' on the slot. The second mark was for showing sufficient knowledge that a wheel is turned to ease the cutting tool through the material.

Describe the process of machining the slot in the steel block using a manual milling machine.

(5)

Insure the correct size milling tool is fitted and that the block of steel is secured tightly. Line the milling tool up with where you are going to make the slot. put the milling tool onto the steel so it is touching and then lower 1mm. move the tool sideways and then back again slowly as to not damage the tool and give you a better quality cut. lower 1mm and repeat until required depth is acquired.

ResultsPlus

Examiner Comments

This example represents a detailed response where the candidate shows a solid understanding of how to use a milling machine. The process is described in a sensible order and in sufficient detail to gain the full 5 marks.

Question 4(a)

Identifying a suitable polymer for use in GRP mouldings was more challenging than expected with only a minority of candidates specifying a correct one. The mark scheme contained a range of suitable thermosetting polymers but the majority of responses incorrectly stated a thermoplastic.

Question 4(b)

This was a very well answered question with many candidates showing a detailed knowledge of the GRP lay-up process. Most points in the mark scheme were commonly seen with the exception of having to mix the resin with a catalyst prior to application. A small minority confused the lay-up process with rotational moulding or injection moulding but still gained the occasional mark for recognising that a mould was required.

(b) Describe the steps involved in producing a glass reinforced plastic (GRP) moulding.

(6)

first a mould needs to be made of the product. The mould needs to have very smooth sides to ensure the GRP comes out with a smooth finish. first a release agent is applied onto the mould so the product wont get stuck in the mould. then a layer of resin is applied on to the the mould. After this the glass fibres are placed on top of the resin making sure that it is applied evenly. The layer is then rolled with rollers to push the GRP into all the crevises of the mould to ensure you get an accurate representation of the mould. It is then left to dry and then the proceer is repeated to slowly build up the thickness.

ResultsPlus

Examiner Comments

This is an excellent response and similar ones were not uncommon. A clear knowledge of how to complete the different steps of the process is shown, and although the occasional step is missed, it shows sufficient knowledge to gain the full 6 marks.

(b) Describe the steps involved in producing a glass reinforced plastic (GRP) moulding.

(6)

the polymer and strips / small pirss of glass are heated at a very high temperature they are then mixed or bag pound together in to a mould so they take up a shape. it is then left too cool down in the air and removed from the mold. any decorations or paints are then applied and smoothed down.

ResultsPlus
Examiner Comments

Although generally incorrect this response was awarded 2 marks. The first was for recognition that the process used 'small strips of glass', and the second for understanding that a mould is required.

Question 4(c)

This was a challenging question for most candidates which required them to match their knowledge of GRP production against batch production methods and explain the links. Many candidates scored 2-3 marks, but very few achieved the full 4. Common correct responses focused on long production times matching limited market demand, and the adaptability of the process allowing it to respond to frequently changing market demands. Poorer responses simply described the advantages of batch production methods, such as the economies of scale, which failed to gain marks.

(c) Explain why the production of glass reinforced plastic (GRP) products is suited to batch production.

Suited to batch (4)

The production of GRP is ~~not suited to batch~~ production because people will want different, perhaps unique shapes therefore needing a new mould. Continous production does not suit GRP because it is not a material which has a massively high demand so there would be a lot more wastage with continous production rather than batch production.

ResultsPlus
Examiner Comments

This answer gained 3 marks. It is an example of one of the stronger responses as it recognizes the flexible nature of the process which allows it to cater for different consumer demands. There is also an understanding of how the limited demand for GRP products would not match a higher production level leading to wastage.

(c) Explain why the production of glass reinforced plastic (GRP) products is suited to batch production.

(4)

glass ~~(reinforced)~~ reinforced plastic is a very strong and light weight material so it has a good strength to weight ratios, It is easly manfuctued in many diffent process and can easly be work with or along side other materials and is at a high Demand becuse of the types of ~~mat~~ product it is used to make.

ResultsPlus
Examiner Comments

This response is largely misdirected as it focuses on the advantages of GRP rather than answering the question. The final statement concerning demand is incorrect. The answer did not gain any marks.

ResultsPlus
Examiner Tip

Candidates must read questions carefully in order to understand what is being asked. A good technique now used by many is to underline the key words in the question. This helps to focus you on the important issues.

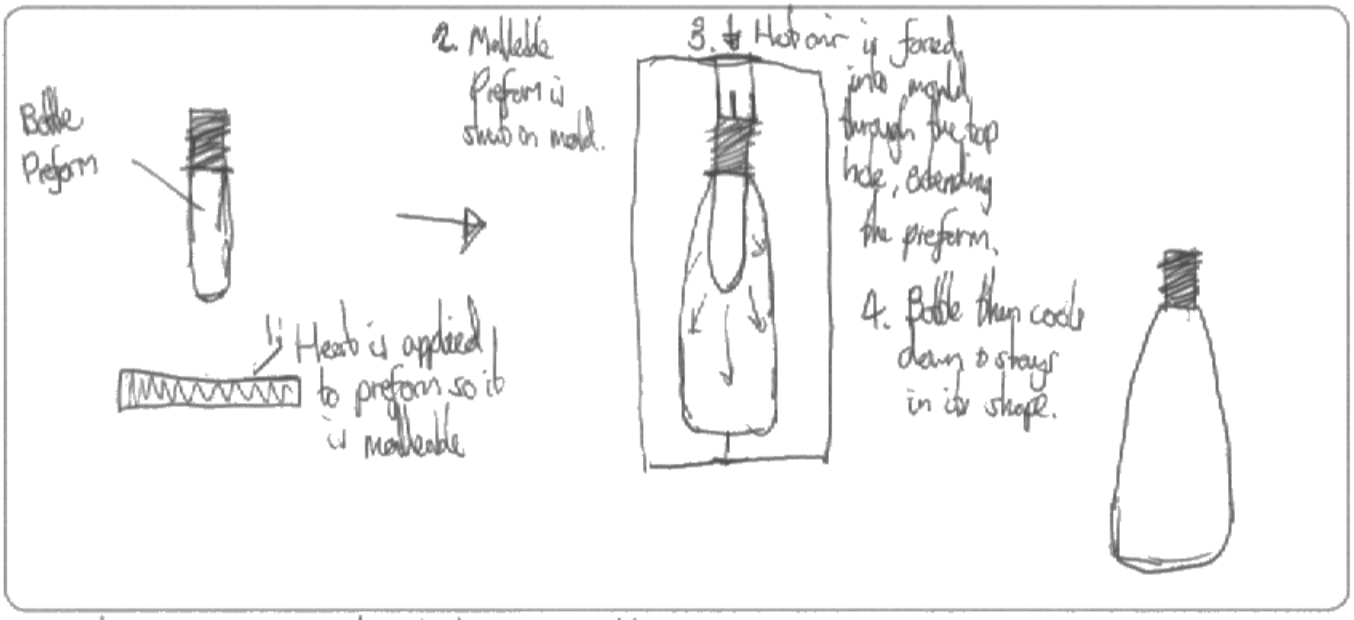
Question 5(a)

There were many strong responses to this question which showed a well understood process. Most responses scored well for describing the main part of the process but descriptions were weaker at the start and end. For example, many candidates did not make reference to the forming of the parison with an extruder, or the heating of a pre-form. Similarly at the end a reference to cooling and opening the mould were frequently missed off.

5 (a) Blow moulding is commonly used for the production of plastic bottles.

Describe, using notes and/or sketches, the blow moulding process.

(6)



In blow moulding, the plastic can either be in the form of a preform, which is injection moulded beforehand, or the plastic can be extruded and then immediately blow moulded.

ResultsPlus
Examiner Comments

This response is quite strong and shows the process starting with a 'pre-form' rather than the more common extruder which is just as valid. The response shows most details correctly but does not show the mould opening and closing at appropriate times, neither is this described in the text. Overall, this response was awarded 5 marks out of a possible 6.

ResultsPlus
Examiner Tip

Well drawn diagrams allow details to be clearly seen so appropriate marks can be awarded. The time limit on the examination does allow for quality diagrams to be produced.

Question 5(b)

This proved to be a demanding question with few candidates scoring more than 2 marks. Most answers focused on tolerances being a method of ensuring that all products were made exactly the same and to the highest standards possible. This is contrary to the correct reason being that they are established to set acceptable levels of variation in accuracy, within which products are deemed to be of an acceptable level of quality and fit for purpose.

(b) The use of tolerances is an essential part of quality control systems within manufacturing.

Explain **two** reasons why tolerances are set.

(4)

1) To ensure that every product produced is of good quality so there's no ~~disregard~~ disappointment from users when they used the product.

2) To ensure all the specification points/ key criteria of the product has been fulfilled in the making of the product.

ResultsPlus
Examiner Comments

This response was awarded a single mark for recognition that tolerances ensure products are of good quality and fit for users. The second statement is misdirected.

(b) The use of tolerances is an essential part of quality control systems within manufacturing.

Explain **two** reasons why tolerances are set.

(4)

Tolerances are the dimensional regions which a product has to lie within in order to pass quality control. One reason they are used is so that every product is similar and produced to almost the same accuracy. This assures the client that they have a quality product which isn't too large or small to function correctly. They are also used so that any products which are too large or small are noticed and removed. Over/undersized products wouldn't function properly and wouldn't be able to be sold so it is best to spot them beforehand.

ResultsPlus
Examiner Comments

In this full mark response the candidate has shown appropriate understanding that tolerances allow for acceptable levels of inaccuracy. The answer goes on to explain how they are used to ensure that products being sold are fit for purpose.

Question 6(a)

Most candidates scored 3-5 marks on this question. Common answers included explained points on strength and durability. A minority incorrectly focused on aesthetics issues failing to understand the context of the question.

*(a) Explain **three** reasons why the frame is made from solid mahogany rather than veneered medium density fibreboard (MDF).

(6)

1. using mahogany gives the table a longer life span as it's a more durable material than veneered wood.

2. mahogany wood is much stronger than veneered MDF wood Therefore The Frame has to be strong and able to withstand heavy loads.

3. using mahogany wood will give the table better stability. It is also more aesthetically pleasing than veneered MDF wood.

ResultsPlus
Examiner Comments

This example scored 4 marks out of a possible 6 with two explained points concerning durability and strength. The final point contains two incorrect responses, as stability is more dependent upon the design of the frame rather than the material used. Also aesthetically there should be no difference between a mahogany veneered MDF frame and a solid mahogany frame.

ResultsPlus
Examiner Tip

More careful reading of the question and consideration of the specific details given may have helped this candidate realise that aesthetic considerations were going to be invalid.

Question 6(b)(i)

In general, responses to this question were good with most candidates achieving 3-5 marks. Points were drawn from all areas of the mark scheme and showed good knowledge of control measures beyond PPE.

(b) Figure 5 shows a hand-held router that was used in the manufacture of the table frame.

(Source: © 2013 Sitebox Ltd)

Figure 5

(i) A risk assessment is necessary before using power tools. To reduce the risk of injury, a range of personal protective equipment (PPE) is worn as a control measure.

Outline **five** further control measures for the safe use of a hand-held router.

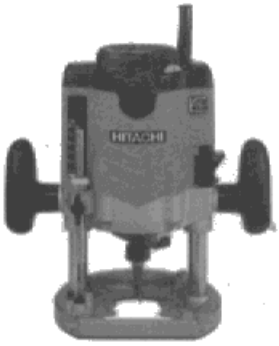
(5)

- Making sure the router tool is sharp
- Making sure the project is securely clamped down and the clamps are suitable
- Making sure the router tool is securely fastened in the router
- Making sure any power supplies or cables are away from the routing area

ResultsPlus
Examiner Comments

This is a top quality response which scored 5 out of 5 marks. It identifies 7 correct points even though only 5 are asked for. Each point is stated clearly in a sentence ensuring clear communication rather than single words or short phrases which can sometimes be ambiguous.

(b) Figure 5 shows a hand-held router that was used in the manufacture of the table frame.



(Source: © 2013 Sitebox Ltd)

Figure 5

(i) A risk assessment is necessary before using power tools. To reduce the risk of injury, a range of personal protective equipment (PPE) is worn as a control measure.

Outline **five** further control measures for the safe use of a hand-held router.

(5)

Mask to prevent inhaling dust

goggle to protect eyes

thick gloves to help protect hands from splinters

apron to protect clothing from dust

~~solid work boots~~ Hard hat to protect the head from shrapnel.

ResultsPlus
Examiner Comments

Fortunately there were few responses like this example where the question has not been read carefully. The candidate has not understood that control measures other than the wearing of PPE are required, resulting in the loss of valuable marks due to poor exam technique rather than lack of knowledge. No marks were awarded.

ResultsPlus
Examiner Tip

Read questions carefully and underline key words.

Question 6(b)(ii)

Most candidates found it difficult to separate the reasons for recording a risk assessment from the reasons for carrying out a risk assessment, resulting in few high marks. The minority who scored well generally identified the reasons of compliance with regulations and the need to prove that regulations had been followed in the event of an injury and the resulting investigation.

(ii) Justify the requirement for risk assessments to be formally recorded and stored.

(4)

Risk assessments should be formally recorded to ensure that injuries do not occur, and if they do, the company cannot be responsible because they have followed the legal requirements. Formally recording them also allows the user to follow the steps correctly and to follow the protocol without injuries. Any one is able to access the risk assessments if required.

ResultsPlus

Examiner Comments

This response scored 3 marks. A reduction in injuries comes as a result of doing risk assessments rather than recording them, so the first statement is incorrect. The response then continues with a valid point concerning compliance with regulations. The point concerning the use of a recorded risk assessment for training or an instructional document was also awarded a mark.

(ii) Justify the requirement for risk assessments to be formally recorded and stored.

(4)

This must be done so it can be seen if equipment faulty. So a risk assessment must be carried out for example all equipment checked and when not faulty or some also if cleaning or mat floors then must have required sign and stored to evidence they can look back to check it has been done so it can be seen if they can show the company as it had their own fault.

ResultsPlus
Examiner Comments

This response scored 2 marks. Responses similar to this which are very difficult to read are unfortunately not that uncommon and are on the increase. Every attempt is made to decipher this sort of response but in extreme circumstances if a response simply cannot be read it is awarded no marks.

ResultsPlus
Examiner Tip

Write legibly so examiners can credit worthy points.

Question 7

The final question on this examination required a level of mental agility to get to the required answers. Few candidates scored well with most gaining 2-4 marks. The advantages and disadvantages to the business of complying with BSI standards were being looked for, whereas many candidates gave issues concerning consumers and issues concerning the workforce, but did not follow these through to a point where they resulted in an advantage or disadvantage to the business. Common correct answers were increased sales and an increased reputation, as well as the additional time and costs needed to bring their product into compliance. Common incorrect answers were greater customer satisfaction and a safer working environment for the workforce.

***7** The role of the British Standards Institute (BSI) is to promote safety and quality throughout product manufacture and usage.

Evaluate the advantages and disadvantages to a business of ensuring their practices and products comply with BSI standards.

(6)

For businesses to comply with the BSI standards it ensures that they meet certain regulations and that buyers are able to trust the products that they are buying and using.
However it does mean that they may have to use more quality control checks to ensure that this product is meeting guidelines.
~~It does~~ Another advantage could include that it & the product is of high standard and ~~was~~ should last for a longer time than products that don't meets these ~~as~~ regulations.

ResultsPlus
Examiner Comments

This low level response scored 1 mark. It focuses initially on buyers having an increased trust. The candidate has stopped short of stating that this is likely to increase sales or improves the business reputation. The issue of needing more quality control checks is a valid disadvantage to the business and was awarded a mark. The final statement about the product lasting longer is incorrect as this is a benefit to the consumer, again the candidate stops short of turning this point into a benefit to the business.

Paper Summary

This was generally a well answered paper which allowed candidates to demonstrate wide ranging and detailed knowledge of the subject which is a credit to them and to their centres. Based on their performance on this paper, candidates are offered the following advice:

- Take advantage of opportunities throughout the course to build up a range of practical experiences that will help you to respond well to questions that require descriptions of processes
- Develop a sound knowledge of mechanical systems
- Ensure handwriting is clear and legible so it can be understood and marks can be awarded to relevant points
- Before responding to the longer questions write a brief plan consisting of your key words/ points in the first line or two of the response area. This will help you structure your answer and reduce the risk of deviating from the points you want to make
- Where there is time at the end of the examination always read your responses through again carefully. Making corrections to one answer could make all the difference.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE