



Mark Scheme (Results)

Summer 2018

Pearson Edexcel GCE A-Level
In D&T: Graphic Products
6GR03 Paper 1

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by 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.

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

Summer 2018

Publications Code 6GR03_01

All the material in this publication is copyright

© Pearson Education Ltd 2018

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1(a)	An outline covering four of the following principles: • Reduce/minimise quantities of materials or energy used eg savings on quantity of packaging needed / avoiding over ordering (1) • Reusing products eg refillable containers etc (1) • Bulk delivery and storage of materials reduces the use of storage containers and packaging (1) • Reprocessing production waste to reintroduce into the manufacturing process (1) • Recovery of waste energy for reuse eg district heating schemes or combined heat and power units, this reduces the volume of waste (1) • Designing to minimise waste eg use of modular materials (1) • Reducing waste via improved quality control / quality assurance (1) • Reducing multiple handling / to reduce potential damage to materials / components (1) • Use of lean manufacturing techniques / use of JIT (1) • Better 'lay planning' / tessellation to minimise waste (1) • Use of CAM to reduce human error / increase precision (1) • Avoiding over-ordering / accurate calculation of materials required (1) • Avoiding cross contamination of recyclable materials (1) (4 x 1)	(4)
1(b)	A discussion covering four of the following points: • Applying life cycle assessment (LCA) techniques to products in order to determine the current carbon footprint(1) • Identifying 'hot spots' in the production process in terms of energy consumption (1) • Determining the amount of carbon dioxide produced as a result of the manufacturing processes (1) • Optimising energy efficiency of new and existing plant (1) • Regular maintenance of plant and equipment to ensure that they are operating at peak efficiency (1) • Installing new energy efficient plant and machinery (1) • Use of carbon offsetting solutions to neutralise the carbon dioxide emissions that cannot be eliminated by energy saving measures eg use of alternative renewable fuels (1) • Installation of alternative energy solutions / photovoltaic cells / wind turbines / solar power / combined heat and power (CHP) etc (1) • Use of ground source or air source heating for the factory (1) • Use of electric / hybrid / fuel cell technology in vehicles (1)	

Question Number	Answer	Mark
	- Optimising locations to reduce emissions from transport (1) - Methods of maximising amount carried during transportation (1) - Turning off machines/lights/equipment/heating when not in use (1) - Waste reduction strategies to minimise transportation and processing (1) (4 x 1)	(4)
	Total for question	8

Question Number	Answer	Mark
2(a)	Explanations covering three of the following: - The director can choose any angle for a scene (1) increasing opportunities for theatrical impact (1) - Impossible angles can be achieved (1) providing more dynamism in live action movies (1) - Reduces need for green screen filming (1) resulting in more realistic interaction between characters and their environments (1) - CGI characters can be created (1) that interact with live characters in real location (1) - Reduced need for set construction (1) which saves time and costs (1) - Limitless possibilities for special effects / characters (1) without the need to capture the images during a one-off 'staged' event eg an explosion (1) - Features of the characters can be changed (1) to suit the needs of the specific scene (1) - Light colours, filters and weather effects can be added digitally after filming (1) allowing changes to the 'mood' of the scene (1) - Allows dangerous situations and scenes to be created (1) whilst working in a safe environment/reduced risk to actors/stunt people (1) - Locations can be created / inserted (1) reducing the need to travel (1) - Rogue objects eg harnesses and rigs (1) can be removed in post production (1) - Allows fantasy / magical locations to be created (1) which interact with characters and special effects/ allows more 'adventurous' productions (1) (3 x 2)	(6)
2(b)	A discussion covering four of the following points: - Starts with traditional filming (1) - Animators trace over live action movement (1)	

	• Different layers of movement are produced (1) • Allows realistic human/animal movement to be replicated accurately (1) • Traditional methods included the projection of film frames onto frosted glass and tracing (1) • Each frame is traced (1) • Traditional methods replaced by computerised systems / rotoscoping software (1) • Interpolated rotoscoping is now used (1) • Aided by 'motion tracking' and 'onion skinning' software (1) • Effect can be used to produce 'motion blurs' (1) (4 x 1)	(4)
	Total for question	10

Question Number	Answer	Mark
3(a)	• The manufacture of one product through a series of operations/considered the ideal lean manufacturing cell (1) perfect for a small product range (1) with high volume manufacturers (1) • Efficient / only carries out necessary processes (1) used with a small product range / single products / dedicated machinery (1) ideal for high volume production / concurrent manufacturing (1) • Single product produced (1) efficient / 'fat' removed from the manufacturing process (1) right first time approach (1) (1 x 3)	(3)
3(b)	An outline covering five of the following points: • Value - focus on the value on the context of what the customer/end-user is prepared to pay for (1) • Value stream – identify how value-adding and non-value-adding activities affect efficiency throughout production / 'no fat' approach to production (1) • Flow – design of processes that result in uninterrupted flow from raw materials to delivery of the finished product / including the use of JIT (1) • Pull (Kanban) – design manufacturing for 'pull' of the product through the process as a response to demand (1) • Perfection (Kaizen) – adopt an approach that continually improves working processes / getting it right first time (1) Do not award marks for merely naming the stages (5 x 1)	(5)
3(c)	A discussion covering six of the following points:	

Question Number	Answer	Mark
	• Allows for 100% sampling (1) • Utilises coordinate measuring machines (CMM) (1) • Incorporates optical character recognition and barcode readers (1) • Can incorporate ultrasound scanning (1) • Use of measuring probes (1) • Can give immediate feedback on errors (1) • Highly efficient/fast checking process (1) • High levels of accuracy (1) • Cost efficient method of quality control in mass production (1) • Automated production of QC records / QC data can be stored and reviewed (1) • Allows computerised adjustments to be made (1) • Uses feedback systems (1) • Removes human error (1) • Can operate in hazardous environments (1) • Can continuously check quality without rest breaks / can run 24/7 (1) • Can check several aspects simultaneously (1) • Can include failure mode and effects analysis (FMEA) (1) • Links to statistical process control (SPC) (1) • Laser scanning system can build 3D image to compare with ideal CAD model (1) • Unable to cope with unexpected issues so human intervention is often necessary (1) • High set-up costs (1) • Staff require training (1) • Machines need to be maintained / calibrated (1) (6 x 1)	
	Total for question	14

Question Number	Answer	Mark
4(a)	Explanations covering two of the following: • Currently large/abundant supplies of fuel are still readily available / only require extraction / require limited processing (1) therefore is a relatively cheap source of energy (1) • Infrastructure is already in place (1) therefore additional investment is not required (1) • Gas-fired power stations are very efficient / fuels have a relatively high yield (1) producing a relatively inexpensive source of power (1) • Power stations can be built almost anywhere (1) reducing the potential 'transmission losses'/reducing fuel	

Question Number	Answer	Mark
	transportation costs (1) • Can provide a secondary source of energy (1) which can be used in district heating schemes (1) • Safer than nuclear (1) due to lack of radioactivity/reduced terrorist threat (1) • Reliable source of energy (1) because it is not dependant upon the weather (1) • Easier to boost short term energy production (1) to meet short term increases/spikes in demand (1) • Fossil fuels are often available locally in many countries (1) so the country is not reliant on imported fuels/Technologies/more self-sufficient/less vulnerable to political pressure (1) • Existing infrastructure / vehicles support fossil fuels (1) supply of fossil fuels will meet this high level of demand (1) • Production / extraction of fossil fuels (1) provides profits to industry / employment of workers (1) (2 x 2)	(4)
4(b)	A discussion covering six of the following points: • Biomass uses organic materials from plants / trees eg hemp / willow (1) • Takes up land that could be used for food production (1) • Potentially produces food shortages / increases food prices (1) • The ethical debate about food v energy when people are starving (1) • Ecological damage to the natural environment as land is converted for biomass production (1) • Increased deforestation / impact on animal habitats (1) • Mono-culture crops damage biodiversity (1) • Biomass still requires processing to convert into fuel pellets etc (1) • Requires road transportation (1) • Emissions associated with transportation (1) • Requires space for storage of biomass (1) • Emissions/smells associated with the burning of biomass / emits CO₂ contributing to greenhouse gas emissions (1) • Produces ash which has to be disposed of (1) • Not as efficient as other fuels / relatively low yield (1) • Still limited supplies of processed biomass (1) • Fuel still relatively expensive (1) • Requires special boilers / equipment (1) • Boilers/plant require regular maintenance (1) (6 x 1)	(6)
	Total for question	10

Question Number	Answer	Mark
5(a)	An outline covering four of the following: • Looking towards a bright futuristic age (1) • Space age designs (1) • Designs that depict motion (1) • Designs are often car oriented/influenced by car culture (1) • Designs influenced by aircraft / space travel (1) • Large exaggerated and angled roofs (1) • Integration of natural and new materials eg stone and concrete (1) • Large pole and pylon signs integrated into the roofline (1) • Use of sub-tropical landscaping (1) • Multi-coloured lighting schemes (1) • Geometric/curvaceous/parabolic/boomerang shapes (1) • Hyperbolic paraboloid roof structures (1) • Use of the 'teardrop' shape / curves / aerodynamic influence / sleek (1) • Form over function (1) • Streamlining has been used to design buildings and environments to be safe in high winds (1) • Art Deco influences within the design (1) • Use of bright/contrasting colours (1) (4 x 1)	(4)
5(b)	A discussion covering six of the following: • Function over form merging with form over function with aerodynamic styling as the main driver (1) • Influenced the design style of Streamline Moderne (1) • Known as 'the father of industrial design' (1) • Introduced 'good appearance' as a saleable commodity (1) • First design was for a streamlined duplicator (1) • Designed cars / boats / rail locomotives / bullet train (1) • Designed iconic logos and signs (1) • Influenced by aerodynamic design (1) • Designs reduced drag and increased speed and fuel efficiency (1) • Teardrop / bullet shapes widely used (1) • Futuristic designs (1) • Designs thought to be modern and forward thinking (1) • Not all designs reached the production stage but influenced other designers (1) • Linked with Art Deco (1) • Applied to domestic products such as radios/vacuum cleaners/ refrigerators (1) • Some of his design work was used by NASA eg the interior of 'skylab' (1) • Use of fins and aerodynamic design features (1)	

Question Number	Answer	Mark
	- Inspired by new technologies such as welding (1) - Use of metals and other modern materials (1) - Clean lines / sleek / clean / smooth / metallic appearance (1) (6 x 1)	(6)
	Total for question	10

Question Number	Answer	Mark
6(a)	An explanation covering one of the following: - Controls the amount of heat passing through a window (1) reducing the need for air-conditioning/saving energy costs/regulating temperatures/providing comfort (1) - Changes from clear to opaque when voltage is adjusted/applied (1) providing privacy for occupiers/providing shade to improve human comfort/reducing glare/providing UV protection (1) - Can change the level of translucency (1) to improve human comfort levels (1) (1 x 2)	(2)
*6(b) QWC	An evaluation covering eight of the following points: - Demand for books and magazines has potentially been changed (1) Advantages: - E-readers have backlighting / can now be read in all lighting levels unlike paper based products that require daylight or appropriate natural light (1) - Non-reflective screen mimics paper easy to read (1) - Miniaturisation of electronics allows for a compact product (1) - Modern battery technology is reducing in size / has a long battery life (1) - Smart ink/electronic paper/electroluminescent lighting have very low power consumption allowing long periods between charging (1) - Smart ink/electronic paper/electroluminescent lighting are very thin allowing for a compact product (1) - Solid state storage allows many books/magazines to be stored on one small device which is ideal for holiday use (1) - Lighter / smaller than traditional books (1) - Font sizes can be changed to meet individual needs (1) - Magazine subscriptions can now be purchased for e-readers (1) - Reduces deforestation/impact on the environment / use of paper (1) - E-Books can be downloaded wirelessly reducing need to	

Question Number	Answer	Mark
	visit shop/wait for delivery (1) • E-books stored safely and are not prone to damage and wear and tear (1) • E-books can be navigated/searched rapidly to find specific passages (1) • Easier to hold and navigate than some traditional books where you have to physically turn pages (1) Disadvantages • Potential for malfunctioning (1) • Books/magazines still have to be purchased in electronic format (1) • Consumer may feel that something is 'missing' when they are not able to handle the book / prefer the feel of a book (1) • Not easy to scan the publication to find key points (1) • Colour images may not be available (1) • More difficult to share the publication with others (1) • Although E-books are often less expensive the E-reader requires a relatively large investment (1) • Could cause eye strain (1) • Environmental impact of E-reader production /embodied energy (1) • Needs charging when battery power is low / need electricity to function (1) • You are reliant on a reliable Internet connection to purchase books which is not always available (1) • Specialist disposal needed because of lithium batteries (1) • Cannot be used for all type of books eg pop up books (1) Maximum mark of 7 if only advantages or only disadvantages are covered. (8 x 1)	(8)
	Total for question	10

Question Number	Answer	Mark
*7 QWC	An discussion covering eight of the following points: • Quick response manufacturing was developed to make companies more efficient (1) • Requires a move from traditional batch to flow production (1) • Involves total quality management (TQM) (1) • Incorporates 'Lean' / just-in-time (JIT) (1) • Utilises flexible teams/manufacturing cells (1) • Production systems are triggered by demand (1) Advantages • Reduced lead times (1) • Can incorporate individual customer options within	

	continuous production methods (1) • Less storage space required for materials and components (1) • Less capital tied up in stock (1) • Better position to capitalise on changes in demand (1) • Smaller batches are produced lowering storage costs of the completed products (1) • Goods can be immediately 'shipped' as they are produced in response to demand (1) • Waste is minimised (1) • Production teams take responsibility for their own quality (1) • Flexibility/responsiveness achieved by adopting a "pull" processes/kanban system (1) • Flexibility/responsiveness achieved by employing modern manufacturing systems such as FMS (1) • QRM is often characterised by the use of highly automated technologies such as robotics, AGVs, CAQ (1) • Increased responsibility leading to increased job satisfaction (1) • Increased responsiveness can attract more customers (1) • Increased turnover of stock as production systems are triggered by demand (1) Disadvantages • Increased reliance on the supply chain (1) • Industrial action in the supply chain impacts on the companies ability to react (1) • Transportation issues could cause disruption (1) • May not have the capacity to meet large changes in demand/to meet large orders (1) • Managing and implementing the change may be difficult as QRM changes the roles and responsibilities of employees (1) • Reliant on simultaneous / concurrent manufacture if one stage is halted overall production is halted (1) • Cannot take advantages of economies of scale / bulk buying (1) Maximum mark of 7 if only advantages or only disadvantages are covered. (8 x 1)	(8)
	Total for question	8