

**Level 3 Advanced Technical Diploma  
in Engineering (540)**

**1145-31**

**Level 3 Advanced Technical  
Extended Diploma in Engineering (720)**

**1145-32**

**Sample External Test 2**

An engineering company manufactures advanced plastic components for water purification plants. They are planning to open a manufacturing plant in the UK. It is intended that the new plant will use 'green' technology: all of the company cars will be electric or hybrid and the company's electricity supply will be, in part, supplied from an environmentally friendly, low-carbon source. The new premises will have Solar PV panels covering the roof, the rainwater and 'grey' waste water will be captured and re-used, and as much waste material from the production process as possible will be re-cycled.

The following question are about the safety aspects of operating a manufacturing company, and about some of the technology that may be used by the company.

### Question 1

One of the issues the company have to deal with is health and safety in their UK premises. The main piece of legislation they will have to comply with is the Health and Safety at Work etc. Act 1974.

- a) Explain the main legal responsibilities **of an employer**, towards employees and visitors to the company premises. **(10 marks)**
- b) Explain what the law expects from UK based employees. **(5 marks)**
- c) Explain what is meant by a 'safety culture' and how employees can help to maintain it. **(10 marks)**

### Question 2

- a) Explain what is meant by 'renewable energies'. **(5 marks)**
- b) Select **one** type of renewable energy.
  - i. Explain how it works. **(6 marks)**
  - ii. Explain why it is beneficial to the environment. **(2 marks)**
  - iii. Describe **one** criticism that could or has been made about the form of energy. **(2 marks)**
- c) Explain what is meant by 'carbon capture'. **(5 marks)**

### Question 3

The new company will be manufacturing parts for water purification plants, which will be used in remote parts of the world. In terms of water purification:

- a) Explain and give an example of what is meant by 'Innovation'.

**(5 marks)**

- b) Explain how new technologies and materials affect the engineering industry.

**(10 marks)**

- c) Describe a new technology that would enable small spare parts to be manufactured on a one-off or small batch basis in a remote area in order to temporarily repair a water treatment plant.

**(5 marks)**

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**Sample External Test 2 Mark Scheme**

**Question 1**

- a) One mark for each of the following up to a maximum of 10 marks:
- Maintain a safe working environment
  - Provide safe systems of work
  - Provide PPE
  - Carry out risk assessments
  - Minimise risk as far as is reasonably practicable
  - Conduct business so that members of the public and visitors to the premises are not harmed
  - Conduct business so that members of the public and visitors to the premises are not exposed to unnecessary risk
  - Provide information to enable employees to work safely
  - Provide training to enable employees to work safely
  - Consult with employees on health and safety matters
  - Any other appropriate response
- (10 marks)**
- b) One mark for each of the following up to a maximum 5 marks:
- Behave and work in a way so as not to harm self or anyone in the vicinity
  - Co-operate with the employer in the health and safety measures put in place
  - Not to interfere with safety devices or arrangements put in place to comply with the law (eg: removing machine guards, moving or discharging fire extinguishers unless dealing with a fire etc.)
  - Report hazards
  - Not to attempt any work unless properly trained and authorised to do so
  - Any other appropriate response
- (5 marks)**
- c) One mark for each of the following up to a maximum 5 marks:
- Safety culture covers all members of the organisation
  - Includes individual and collective responsibility
  - Includes everything that is done within or by the organisation
  - Involves the default behaviour of everyone to be the safe behaviour
  - Involves a commitment to on-going training and improvement of safety performance
  - Any other relevant response
- (5 marks)**

**(Question total 20 marks)**

**Question 2**

Mark scheme

- a) One mark for each of the following up to a maximum 5 marks
- They do not take anything material directly from the environment
  - Usually converts to electricity, but also solar to hot water
  - They convert energy that is there whether it is used or not
  - Types of energy :wind, solar, wave/tidal
  - Requires equipment that is sometimes expensive in order to convert the energy to electricity or heat
  - Any other appropriate response
- (5 marks)**
- b)
- i.
- Concise explanation of the basic principles of that source
- (6 marks)**
- ii. One mark for any relevant point to a maximum two marks eg:
- Reduces the use of fossil fuels
  - Reduces overall carbon footprint of an industry or geographical area
- (2 marks)**
- iii. Any valid answer such as:  
Spoils the view, birds fly into it, destroys marine life etc.
- (1 mark)**
- c) One mark for each of the following up to a maximum 5 marks
- Carbon is generally 'captured' or removed
  - It comes from a high volume source such as a power station or a factory
  - It is placed in a 'carbon store'
  - This can be cavities or porous rock deep underground
  - It can be dissolved under extreme pressure in a liquid such as water
  - Any other appropriate response
- (5 marks)**
- (Question total 20 marks)**

### Question 3

- a) One mark for each of the following up to a maximum 5 marks
- Any valid explanation of the term Innovation
  - Any valid example of innovation such as
    - new filter materials such as nano-materials
    - new hand pump design to make transportation and assembly easier
    - tougher, cheaper materials to give greater unit volume and longer life
  - Any other appropriate response

**(5 marks)**

- b) Any valid explanation that demonstrates the learner's understanding of what technology and materials development really is and what it can achieve

**(10 marks)**

- c) One mark for a valid example of a new technology and 1 mark for relevant content to a maximum 4 marks

- EG 3D printing
- How it is used
- How it is relevant for small batch development
- Relative costs
- Any other appropriate response
- Transportation and availability

**(5 marks)**

**(Question total 20 marks)**