CONFERENCE VERSION – 07/09/2023

CONFIDENTIAL

GCE A LEVEL MARKING SCHEME

SUMMER 2024

A LEVEL
BUILT ENVIRONMENT – UNIT 3
1509U30-1

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WJEC GCE AS BUILT ENVIRONMENT – UNIT 3

SUMMER 2024 MARK SCHEME

Question	Answer	AO1	AO2	AO3	Total Marks
1a	*Describe how steel is manufactured and processed before use*	4			4
	Award **one** mark for a basic description of a stage in the process, to a maximum of 2 marks. for example: • Iron ore is mined, smelted and carbon is added. • Molten steel is cast into a mould ready for cutting and primary forming followed by secondary forming. Award **two** marks for a more developed description of a stage in the process, to a maximum of 2 marks for example: • Iron ore is mined and melted in a blast furnace, along with other metals to produce the alloy required, such as chromium for stainless steel. • Molten steel is cast into a mould ready for cutting and primary forming, by hot rolling; followed by secondary forming, including cold rolling or shaping, machining and surface treatment.				
1b	*Describe the measures available to prevent and reduce degradation of steel.*	6			6
	Answers may refer to the following measures that prevent and reduce degradation in steel: • Use of powder coating or paint to protect the steel. • Reduce exposure to rain or seawater. Use of corrosion inhibiting chemicals that react with the metal's surface to suppress electrochemical reactions that cause corrosion.				

Band	AO1
3	**5-6 Marks** A very good description which shows: • Thorough knowledge and understanding of measures used to prevent and reduce steel degradation. • A confident grasp on the technical terms for steel degradation prevention and reduction.
2	**3-4 Marks** A good description which shows: • Generally secure knowledge and understanding of measures used to prevent and reduce steel degradation. • A generally secure grasp on the technical terms for steel degradation prevention and reduction.
1	**1-2 Marks** A basic description which shows: • Some knowledge and understanding of measures used to prevent and reduce steel degradation. • Some grasp on the technical terms for steel degradation prevention and reduction.
	0 Marks Response not creditworthy or not attempted.

Question	Answer	AO1	AO2	AO3	Total Marks
2	*Describe two ways that materials may respond to changes in air temperature*	4			4
	Award **one** mark for a basic description of how building materials respond to changes in air temperature, to a maximum of 2 marks for example: • Expansion • Contraction Award **two** marks for a more developed description of how building materials respond to changes in air temperature, to a maximum of 4 marks, for example: • Thermal Expansion due to rising temperatures may produce internal stresses and cause cracking, bowing and other forms of deformation. • Contraction in cold temperatures may cause materials to shrink resulting in cracking and joints opening.				

Question	Answer	AO1	AO2	AO3	Total Marks
3	*Explain how the material degradation shown in the picture has occurred and the impact this may have on the brickwork.*		6		6
	Answers may refer to the following aspects of the damage shown and the impact on the building material: **Indicative content** • Salt crystallisation caused by natural or absorbed salt crystalising within a porous material. • Excessive salt crystallisation within pores can produce internal pressures. • Efflorescence occurs in brickwork when salts escape while drying gradually causing an unsightly powdery residue on the surface. • In new brickwork efflorescence will dissipate over time if the brickwork is allowed to dry after completion and if environmental factors such as wind and rain are given sufficient time to naturally clean the bricks. • Efflorescence that occurs a year or more after construction is complete is generally attributed to excessive water penetration requiring investigation and repair.				

Band	AO2
3	**5-6 Marks** A very good explanation which shows: • Thorough knowledge and understanding of salt crystallisation as a factor of material degradation. • A confident grasp on the technical terms for material degradation terminology.
2	**3-4 Marks** A good explanation which shows: • Generally secure knowledge and understanding of salt crystallisation as a factor of material degradation. • A generally secure grasp on the technical terms for material degradation terminology.
1	**1-2 Marks** A basic explanation which shows: • Some knowledge and understanding of salt crystallisation as a factor of material degradation. • Some grasp of material degradation terminology.
	0 Marks Response not creditworthy or not attempted.

Question	Answer	AO1	AO2	AO3	Total Marks
4	*Describe the potential impact of material degradation on the environment.*	8			8
	Answers may refer to the following areas of impact that material degradation can have on the environment: **Indicative content** • Aesthetics – such as staining caused by run-off from corroding materials detracting from appearance. • Dust – causing particles into the air/pollution. • Vibration – causing noise concerns due to metal fatigue and possible structural damage. • Greater use of CO^2 and non-renewable resources due to repair and replacement of materials				

Band	AO1
4	**7-8 Marks** An excellent description which shows: • Thorough knowledge and understanding of the environmental impact of material degradation. • A confident grasp of key concepts of material degradation
3	**5-6 Marks** A good description which shows: • Generally secure knowledge and understanding of the environmental impact of material degradation. • A generally secure grasp of material degradation
2	**3-4 Marks** A basic description which shows: • Some knowledge and understanding of the environmental impact of material degradation. • Some grasp of key concepts of material degradation
1	**1-2 Marks** A limited description which shows: • Limited knowledge and understanding of the environmental impact of material degradation. • Little grasp of key concepts of material degradation
	0 Marks Response not creditworthy or not attempted

Question	Answer	AO1	AO2	AO3	Total Marks
5	*The bathroom in a property being refurbished requires wall tiles from floor to ceiling. The tiles are 450mm x 300mm.* *The bathroom is 1.9m long, 2.3m wide with a floor to ceiling height of 2.3m. It includes one door (0.9m wide xy 2.25m high) and one window (1.25m wide x 0.6m high).* *Calculate the number of tiles required for the bathroom.* *Show all calculations*		4		4
	Award marks for the relevant steps in calculation as follows (With no allowance / deductions for sanitaryware): • Total wall length = 1.9m+1.9m+2.3m+2.3m = 8.4m Total wall area = 8.4m x 2.3m = 19.32m² • Total Door and wall area = (0.9m x 2.23m)+(0.6m x 1.25m = 2.03m² + 0.75m² = 2.78m² • Total Area to be tiled = 19.32m² - 2.78m² = 16.54m² • Area of each tile = 0.45m x 0.3m = 0.135m² • Total number of tiles required = 16.54m² / 0.135m² = 122.51 tiles • ANSWER = 123 TILES Alternative Method: • Number of vertical courses = 2300 / 300 = 7.6 = 8 • Deduct for door: 2250 x 900 = 8 x 2 = 16 tiles • Deduct for window: 600 x 1250 = 2 x 3 = 6 tiles • Width: 2300 / 450 = 5.1 x 2 = 10.2 tiles • Depth 1900 / 450 = 4.2 x 2 = 8.4 tiles • Overall = ((10 + 9) x 8)) – 22 = 130 tiles • ANSWER = 130 TILES		1 1 1 1 1 1 1 1 1		

Question	Answer	AO1	AO2	AO3	Total Marks
6a	*An Architect is working on a design for a four-storey apartment building with three apartments on each floor, as part of the design process sound proofing is a consideration to prevent the travel of sound between residents.* *Discuss how material properties influence building design in relation to acoustics and sounds.*			8	8
	Answers may refer to the following influences of material properties in relation to acoustics and sound: • Geometry and volume of a space. • Sound absorption, transmission and reflection characterises of surfaces enclosing the space. • Sound absorption, transmission and reflection characterises of materials separating spaces. • Airborne sound transmission.				

Band	AO3
4	**7-8 Marks** An excellent discussion which shows: • Thorough knowledge and understanding of materials properties influencing acoustics in buildings. • A confident grasp of key concepts of building acoustics and sound
3	**5-6 Marks** A good discussion which shows: • Generally secure knowledge and understanding of materials properties influencing acoustics in buildings. • A generally secure grasp of building acoustics and sound.
2	**3-4 Marks** A basic discussion which shows: • Some knowledge and understanding of materials properties influencing acoustics in buildings. • Some grasp of key concepts of building acoustics and sound.
1	**1-2 Marks** A limited discussion which shows: • Limited knowledge and understanding of materials properties influencing acoustics in buildings. • Little grasp of key concepts of building acoustics and sound.
	0 Marks Response not creditworthy or not attempted

Question	Answer	AO1	AO2	AO3	Total Marks
6b	*Describe the scientific principles of measuring sound.*	6			6

	Answers may refer to the following principles of measuring sound:
	• Frequency – cycles per second of sound (Hz)
	• Wavelength – distance between two successive sound waves
	• Amplitude – height of sound wave
	• Loudness – dependent on amplitude and expressed in decibel (dB)
	  ○ Amplitude is large, sound is said to be loud.
	  ○ If amplitude doubles, the loudness is quadrupled.				

Band	AO
3	**5-6 Marks** A very good description which shows: • Thorough knowledge and understanding of principles of measuring sound. • A confident grasp on the technical terms for measuring sound.
2	**3-4 Marks** A good description which shows: • Generally secure knowledge and understanding of principles of measuring sound. • A generally secure grasp on the technical terms for measuring sound.
1	**1-2 Marks** A basic description which shows: • Some knowledge and understanding of principles of measuring sound. • Some grasp on the technical terms for measuring sound.
	0 Marks Response not creditworthy or not attempted.

Question	Answer	AO1	AO2	AO3	Total Marks
6c	*Describe the purpose of Building Regulations, Approved Document E.*	4			4
	Award **one** mark for a basic definition of approved document E, for example: • Approved document E sets out standards for the resistance to the passage of sound. • Approved document E provides guidance on how minimum levels of sound transferred and how to achieve these. Award **two** marks for a more developed description of approved document E, for example: • Approved document E sets out standards for the resistance to the passage of sound for new builds, alterations and conversion projects. • Approved document E provides guidance on how minimum levels of sound transferred and how to achieve these so that the building regulations are complied with. How to comply with minimum values set out for airborne sound and impact sounds are part of the approved documents.				

Question	Answer	AO1	AO2	AO3	Total Marks
7a	*Explain the main factors for consideration during the design process for lighting in a building.*		8		8
	Answers may refer to the following factors considered when designing lighting for a building: • The kind of activity for which light is required. • Amount of light required. • Colour of light • Distribution of light within the space to be lit.				

Band	AO2
4	**7-8 Marks** An excellent explanation which shows: • Thorough knowledge and understanding of design requirements for lighting within a building. • A confident grasp of key concepts of factors influencing lighting requirements.
3	**5-6 Marks** A good explanation which shows: • Generally secure knowledge and understanding of design requirements for lighting within a building. • A generally secure grasp of factors influencing lighting requirements.
2	**3-4 Marks** A basic explanation which shows: • Some knowledge and understanding of design requirements for lighting within a building. • Some grasp of key concepts of factors influencing lighting requirements.
1	**1-2 Marks** A limited explanation which shows: • Limited knowledge and understanding of design requirements for lighting within a building. • Little grasp of key concepts of factors influencing lighting requirements.
	0 Marks Response not creditworthy or not attempted

Question	Answer	AO1	AO2	AO3	Total Marks
7b	*Describe methods for measuring light within a building.*	4			4

	Award one mark for identifying a method, one mark for an associated description to a maximum of 4 marks.
	For example:
	• Daylight factors – the percentage of daylight available inside a room.
	• Illuminance – the amount of light received on the surface.
	• Luminance – the amount of light reflected or emitted from a surface.
	• SI Units
	  ○ Lux – SI unit for illuminance
	  ○ Candela (cd) – SI unit of luminous intensity
	
	Maximum of three marks awarded for a list of methods identified.				

Question	Answer	AO1	AO2	AO3	Total Marks
8a.	*Damp patches caused by penetrating damp are an example of moisture risk. Describe other forms of moisture risk that affect buildings.*	8			8
	Answers may refer to the following description of risks associated with moisture in the building: • Surface condensation occurs with visible moisture on the surface of a materials. • Interstitial condensation is unseen moisture within the material or layers of the construction. • Penetrating damp is when damp moves from through an external surface to the interior of a building. Answers may refer to risks that may occur in the following form: • Mould growth. • Damage to surface finishes. • Corrosion and decay of building fabric. • Frost damage. • Poor performance of insulation.				

Band	AO1
4	**7-8 Marks** An excellent description which shows: • Thorough knowledge and understanding of common form of moisture risk. • A confident grasp of technical vocabulary for moisture risks in buildings.
3	**5-6 Marks** A good description which shows: • Generally secure knowledge and understanding of common form of moisture risk. • A generally secure grasp of technical vocabulary for moisture risks in buildings.
2	**3-4 Marks** A basic description which shows: • Some knowledge and understanding of common form of moisture risk. • Some grasp of key concepts of technical vocabulary for moisture risks in buildings.
1	**1-2 Marks** A limited description which shows: • Limited knowledge and understanding of common form of moisture risk. • Little grasp of key concepts of technical vocabulary for moisture risks in buildings.
	0 Marks Response not creditworthy or not attempted

Question	Answer	AO1	AO2	AO3	Total Marks
8b	*A condition survey of a detached house constructed in the 1920s identified several damp patches and instnaces of mould growth. Discuss measures that should be taken to manage the risk of moisture damage.*		12		12
	Answers may refer to the following appropriate management strategy for reducing and preventing moisture related defects: **Indicative Content:** • Limiting the sources of moisture and increasing temperatures of the air and surface. • Dehumidification to remove moisture from the air. • Provide adequate natural ventilate to promote good airflow which reduces excess moisture in the air. • Vapour barriers to prevent warm indoor air from condensing. • Use external treatments to prevent moisture from causing penetrating damp issues.				

Band	AO2
4	**10-12 Marks** An excellent response which includes: • Perceptive and informed recommendations for measures to reduce moisture related defects. • Confident and detailed engagement with the principles of prevention moisture related defects.
3	**7-9 Marks** A good response which includes: • Reasoned recommendations for measures to reduce moisture related defects. • Thorough engagement with the principles of prevention moisture related defects.
2	**4-6 Marks** A basic response which includes: • Generally valid recommendations for measures to reduce moisture related defects. • Straightforward engagement with the principles of prevention moisture related defects.
1	**1-3 Marks** A limited response which includes: • Little evidence of recommendations for measures to reduce moisture related defects. • Little engagement with the principles of prevention moisture related defects.
	0 Marks Response not creditworthy or not attempted

Question	Answer	AO1	AO2	AO3	Total Marks
9a	*Describe three forms of renewable energy.*	6			6
	Answers may refer to the following methods of renewable energy: • Solar energy – converting sunlight into electricity (PV) or using it to heat air or water (solar thermal). • Wind energy – converting kinetic energy into electricity through use of turbines. • Hydroelectricity – converting potential energy of moving water into electricity. • Geothermal –heat energy from the ground as a source of heat. • Bioenergy – burning biomass fuels to generate electricity and heat.				

Band	AO
3	**5-6 Marks** A very good description which shows: • Thorough knowledge and understanding of renewable energy sources. • A confident grasp on the technical terms for renewable energy sources
2	**3-4 Marks** A good description which shows: • Generally secure knowledge and understanding of renewable energy sources. • A generally secure grasp on the technical terms for renewable energy sources
1	**1-2 Marks** A basic description which shows: • Some knowledge and understanding of renewable energy sources. • Some grasp on the technical terms for renewable energy sources
	0 Marks Response not creditworthy or not attempted.

Question	Answer	AO1	AO2	AO3	Total Marks
9b	*A new housing estate is being developed in a coastal area of North Wales with the intention of being completely reliant on renewable energy to meet the government's drive towards sustainability.* *Evaluate the benefits and drawbacks of using solely renewable energy sources to provide energy to the new housing estate.*			12	
	Answers may refer to the following benefits of renewable energy: • No energy bills. • Not reliant on fossil fuels. • Selling energy generated back to grid to create income revenue. Answers may refer to the following drawbacks of renewable energy: • Not consistent supply of electricity. • Not consistent supply of heat for either water or heating systems. • High cost for initial construction. • Aesthetics of area could be impacted.				

Band	AO
4	**10-12 Marks** An excellent response which shows: • Confident and detailed justification of solely using renewable energy for the new housing estate. • Perceptive and informed consideration of different methods of renewable energy sources within the context. • Writing is very well structured and organised, using accurate grammar, punctuation, and spelling. • A range of specialist terminology is used with accuracy.
3	**7-9 Marks** A good response which shows: • Thorough justification of solely using renewable energy for the new housing estate • Reasoned consideration of different methods of renewable energy sources within the context. • Writing is generally well structured and organised, using mainly accurate grammar, punctuation, and spelling. • Specialist terminology is used with accuracy.
2	**4-6 Marks** A basic response which shows: • Clear justification of solely using renewable energy for the new housing estate • Generally valid consideration of different methods of renewable energy sources within the context. • Writing shows evidence of structure although some errors in grammar, punctuation and spelling affect meaning. • Basic use of specialist terminology.
1	**1-3 Marks** A limited response which shows: • Little justification of solely using renewable energy for the new housing estate • Little consideration of different methods of renewable energy sources within the context. • Some errors in grammar, punctuation, and spelling, which affect clarity of communication. • Limited use of specialist terminology.
	0 Marks Response not creditworthy of not attempted.

GCE Built Environment Unit 3 - Summer 2024															
Question		Specification Content										Mark Allocation			
		Section									Part	Total Marks	AO1	AO2	AO3
		2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8	2.1.9					
1	a		4								b	4	4		
	b			6							b	6	6		
2		4									b	4	4		
3		6									c	6		6	
4						4					c d	4		4	
5				8							d	8	8		
6	a				8						c	8			8
	b							6			a	6	6		
	c							4			b	4	4		
7	a				8						d	8		8	
	b								4		b	4	4		
8	a						8				c	8	8		
	b						12				c	12		12	
9	a									6	b	6	6		
	b									12	b	12			12
		10	4	14	16	4	20	10	4	18		100	50	30	20