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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **1a** |  | **M1**  **A1**  **M1**  **M1**  **A1** | 1.1a  1.1b  1.1a  1.1b  2.1 | 6th  Understand and use the method of differences to sum series, including using partial fractions |
|  | **(5)** |  |  |
| **1b** |  | **B1** | 2.2a | 6th  Understand and use the method of differences to sum series, including using partial fractions |
|  | **(1)** |  |  |
| **1c** |  | **M1**  **A1**  **M1**  **A1** | 1.1a  2.2a  1.1b  1.1b | 6th  Understand and use the method of differences to sum series, including using partial fractions |
|  | **(4)** |  |  |
| (10 marks) | | | | |

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| Notes  **1a: M1** for splitting into two fractions over *r* and *r* + 1  **A1** for correct values of *A* and *B*  **M1** for expanding from 1 to *n*  **M1** for cancelling out terms  **A1** for showing that *a* = 3  **1b: B1** cao  **1c: M1** for writing as a subtraction of two sums  **A1** a correct expression using answer to part **a**  **M1** for subtracting  **A1** cao |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **2a** |  | **M1**  **A1** | 1.1a  1.1b | 6th  Understand and use the method of differences to sum series, including using partial fractions |
|  | **(2)** |  |  |
| **2b** |  | **M1**  **M1**  **A1** | 2.2a  1.1b  2.1 | 6th  Understand and use the method of differences to sum series, including using partial fractions |
|  | **(3)** |  |  |
| (5 marks) | | | | |
| Notes  **2a: M1** for expanding  **A1** cao  **2b: M1** for correct expression using part **a**  **M1** for correct expansion  **A1** cao (A.G.) | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **3a** |  | **M1**  **M1**  **A1** | 1.1a  1.1b  1.1b | 6th  Understand and use the method of differences to sum series, including using partial fractions |
|  | **(3)** |  |  |
| **3b** |  | **M1**  **M1**  **A1**  **M1**  **A1** | 2.2a  1.1b  1.1b  1.1a  2.1 | 6th  Understand and use the method of differences to sum series, including using partial fractions |
|  | **(5)** |  |  |
| (8 marks) | | | | |
| Notes  **3a: M1** for splitting into three fractions in the correct format  **M1** for multiplying through by (*r* + 2)(*r* + 3)(*r* + 4)  **A1** for correct values of *A*, *B* and *C*  **3b: M1** for writing in partial fraction form  **M1** for writing out terms from 1 to *n*  **A1** cao  **M1** for attempting to add the three fractions  **A1** cao | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **4a** |  | **M1**  **A1**  **M1**  **A1** | 1.1a  1.1b  1.2  2.1 | 4th  Be able to find higher derivatives of functions |
|  | **(4)** |  |  |
| **4b** |  | **M1**  **M1**  **B1**  **M1**  **A1** | 1.1a  1.1a  1.1b  1.1a  1.1b | 5th  Express functions as an infinite series using Maclaurin’s expansion |
|  | **(5)** |  |  |
| (9 marks) | | | | |
| Notes  **4a: M1** for differentiating twice using the product rule  **A1** for correct second differential  **M1** for correctly substitutes for  **A1** cao (A.G.)  **4b: M1** for attempting3rd differential  **M1** for attempting4th differential  **B1** for substituting *x* = 0 and obtaining correct values  **M1** for using standard Maclaurin expansion  **A1** cao | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **5a** |  | **M1**  **M1**  **A1** | 1.1a  1.1a  2.1 | 5th  Find and recognise the series expansions of standard functions |
|  | **(3)** |  |  |
| **5b** |  | **M1**  **M1**  **A1** | 1.1a  1.1b  1.1b | 7th  Derive the series expansions of composite functions |
|  | **(3)** |  |  |
| (6 marks) | | | | |
| Notes  **5a: M1** for splitting the expression  **M1** for attempting to substitute –*x* into the standard expansion for e*x*  **A1** cao (A.G)  **5b: M1** for attempting to use the standard expansion for sin *x*  **M1** for substituting in 3*x*2  **A1** cao | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **6a** |  | **M1**  **B1**  **M1**  **A1**  **A1** | 1.1a  1.1b  1.1b  1.1b  2.1 | 7th  Derive the series expansions of composite functions |
|  | **(5)** |  |  |
| **6b** |  | **B1** | 1.1b | 6th  Understand the values of *x* for which series expansions are valid |
|  | **(1)** |  |  |
| **6c** |  | **M1**  **A1**  **M1**  **A1** | 2.2a  1.1b  1.1b  1.1b | 5th  Express functions as an infinite series using Maclaurin’s expansion |
|  | **(4)** |  |  |

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| **6d** |  | **M1**  **A1** | 2.2a  1.1b | 7th  Derive the series expansions of composite functions |
|  | **(2)** |  |  |
| (12 marks) | | | | |
| Notes  **6a : M1** for using of the law of logarithms  **B1** for correctly substituting 3*x* into standard expression  **M1** for substituting –2*x* into standard expression  **A1** for correct expansion for ln(1 – 2*x*)  **A1** cao (A.G.)  **6b: B1** for correct range  **6c: M1** for setting up equation for *x*  **A1** for solving for *x*  **M1** substitutes value of *x* into expression from part **a**  **A1** cao  **6d: M1** for bringing out the power of a half  **A1** cao | | | | |