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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| 1a |  | M1  M1  A1 | 1.1a  1.1b  1.1b | 6th  Understand exponential models in bivariate data. |
|  | (3) |  |  |
| 1b | *b* is the proportional rate at which the temperature changes per minute. | A1 | 3.2a | 6th  Understand exponential models in bivariate data. |
|  | (1) |  |  |
| 1c | Extrapolation/out of the range of the data. | A1 | 2.4 | 4th  Understand the concepts of interpolation and extrapolation. |
|  | (1) |  |  |
| (5 marks) | | | | |
| **Notes** | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| 2a |  | M1  M1  A1 | 1.1a  1.1b  1.1b | 6th  Understand exponential models in bivariate data. |
|  | (3) |  |  |
| 2b | *a* is a constant of proportionality. | A1 | 3.2a | 6th  Understand exponential models in bivariate data. |
|  | (1) |  |  |
| 2c | Extrapolation/out of the range of the data. | A1 | 2.4 | 4th  Understand the concepts of interpolation and extrapolation. |
|  | (1) |  |  |
| (5 marks) | | | | |
| **Notes** | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| 3a | The data seems to follow an exponential distribution. | B1 | 2.4 | 6th  Understand exponential models in bivariate data. |
|  | (1) |  |  |
| 3b |  | B1 | 2.2a | 2nd  Know and understand the language of correlation and regression. |
| which gives a strong positive correlation. | B1 | 2.4 |
|  | (2) |  |  |
| 3c | Model is a good fit with a reason. For example,  Very strong positive linear correlation between *t* and log10 *p.*  The transformed data points lie close (enough) to a straight line. | B2 | 3.2a | 6th  Understand exponential models in bivariate data. |
|  | (2) |  |  |
| (5 marks) | | | | |
| Notes  **3c**  B0 for just stating the model is a good fit with no reason. | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **4a** | H0 : = 0, H1 : < 0  Critical value = −0.6319  −0.6319 < −0.136 no evidence to reject H0 (test statistic not in critical region)  There is insufficient evidence to suggest that the weight of chickens and average weight of eggs are negatively correlated. | **B1**  **M1**  **A1** | 2.5  1.1a  2.2b | 6th  Carry out a hypothesis test for zero correlation. |
|  | **(3)** |  |  |
| **4b** | Sensible explanation. For example, correlation shows there is no (or extremely weak) linear realtionship between the two variables. | **B1** | 1.2 | 7th  Interpret the results of a hypothesis test for zero correlation. |
| For example, there could be a non-linear relationship between the two variables. | **B1** | 3.5b |
|  | **(2)** |  |  |
| (5 marks) | | | | |
| Notes | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **5a** | A critical value is the point (or points) on the scale of the test statistic beyond which we reject the null hypothesis. | **B1** | 1.2 | 5th  Understand the language of hypothesis testing. |
|  | **(1)** |  |  |
| **5b** | H0 : = 0, H1 : > 0  Critical value = 0.5494  0.714 > 0.5494 (test statistic in critical region)  There is evidence to reject H0  There is evidence that there is a positive correlation between the number of vehicles and road traffic accidents. | **B1**  **M1**  **A1** | 2.5  1.1b  2.2b | 6th  Carry out a hypothesis test for zero correlation. |
|  | **(3)** |  |  |
| **5c** | *r* = −7.0 + 0.02*v* | **B1** | 1.2 | 4th  Make predictions using the regression line within the range of the data. |
|  | **(1)** |  |  |
| **5d** | Road fatalities per 100 000 population. | **B1** | 1.2 | 2nd  Know and understand the language of correlation and regression. |
|  | **(1)** |  |  |
| **5e** | Outside the range of the data used in the model.  or  This would require extrapolation. | **B1** | 3.5b | 4th  Understand the concepts of interpolation and extrapolation. |
|  | **(1)** |  |  |
| (7 marks) | | | | |
| Notes | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **6a** | Linear association between *e* and *f*. | **B1** | 1.2 | 2nd  Know and understand the language of correlation and regression. |
|  | **(1)** |  |  |
| **6b** | It requires extropolation and hence it may be unreliable. | **B1** | 1.2 | 4th  Understand the concepts of interpolation and extrapolation. |
|  | **(1)** |  |  |
| **6c** | Fuel consumption (*f*) | **B1** | 1.2 | 2nd  Know and understand the language of correlation and regression. |
|  | **(1)** |  |  |
| **6d** | A hypothesis test is a statistical test that is used to determine whether there is enough evidence in a sample of data to infer that a certain condition is true for the entire population. | **B1** | 1.2 | 5th  Understand the language of hypothesis testing. |
|  | **(1)** |  |  |
| **6e** | H0 : *ρ* = 0, H1 : *ρ* < 0  Critical value = −0.3665  −0.803 < −0.3665 (test statistic in critical region) Reject H0  There is evidence that the product moment correlation coeficient for CO2 emissions and fuel consumption is less than zero. | **B1**  **M1**  **A1** | 2.5  1.1b  2.2b | 6th  Carry out a hypothesis test for zero correlation. |
|  | **(3)** |  |  |
| (7 marks) | | | | |
| Notes | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **7a** | A statistic that is calculated from sample data in order to test a hypothesis about a population. | **B1** | 1.2 | 5th  Understand the language of hypothesis testing. |
|  | **(1)** |  |  |
| **7b** | H0 : = 0, H1 : ≠ 0  *p-*value < 0.05  There is evidence to reject H0  There is evidence (at 5% level) of a correlation between the daily mean temperature and daily mean pressure. | **B1**  **M1**  **A1** | 2.5  1.1b  2.2b | 6th  Carry out a hypothesis test for zero correlation. |
|  | **(3)** |  |  |
| **7c** | Two sensible interpretations or observations. For example,  Two distinct distributions  Similar gradients of regression line.  Similar correlations for each season.  Lower temperaure in autumn.  More spread for the daily mean pressure in autumn. | **B2** | 3.2a | 4th  Use the principles of bivariate data analysis in the context of the large data set. |
|  | **(2)** |  |  |
| (6 marks) | | | | |
| **Notes** | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **8a** | Linear association between two variables. | **B1** | 1.2 | 2nd  Know and understand the language of correlation and regression. |
|  | **(1)** |  |  |
| **8b** | Negative correlation. | **B1** | 1.2 | 2nd  Know and understand the language of correlation and regression. |
|  | **(1)** |  |  |
| **8c** | As daily mean pressure increases (rises) daily mean wind speed decreases (falls) in Hurn May to October in 2015.  or  As daily mean pressure decreases (falls) daily mean wind speed increases (rises) in Hurn May to October in 2015. | **B1** | 3.2 | 5th  Interpret the PPMC as a measure of correlation. |
|  | **(1)** |  |  |
| **8d** | H0 : = 0, H1 : < 0  *p-*value < 0.05  There is evidence to reject H0.  There is (strong) evidence of negative correlation between the daily mean wind speed and daily mean pressure. | **B1**  **M1**  **A1** | 2.5  1.1b  2.2b | 6th  Carry out a hypothesis test for zero correlation. |
|  | **(3)** |  |  |
| **8e** | Daily mean wind speed = 180 − 0.170 × daily mean pressure. | **B2** | 1.1b | 4th  Use the principles of bivariate data analysis in the context of the large data set. |
|  | **(2)** |  |  |

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| **8f** | The regression model suggests for every hPa increase in daily mean pressure the daily mean wind speed decreases by 0.1694 knots.  or  The regression model suggests for every hPa decrease in daily mean pressure the daily mean wind speed increases by 0.1694 knots. | **B1** | 3.2 | 4th  Use the principles of bivariate data analysis in the context of the large data set. |
|  | **(1)** |  |  |
| **8g** | Sensible comment. For example,  Not very accurate as very few or no points  Not very accurate as near the bottom range for the data. | **B1** | 3.5b | 4th  Make predictions using the regression line within the range of the data. |
|  | **(1)** |  |  |
| (10 marks) | | | | |
| **Notes**  **8e**  B1 *y* = 180.0 − 0.1694*x* unless *x* and *y* are defined. | | | | |