Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

(a) x-rays are absorbed by the Earth's atmosphere **(1)**

1

(b) (i) an object whose escape velocity is greater than the speed of light **(1)**

1

(ii) use of $Rs = 2GM/c^2$

to give $Rs = 2 \times 6.67 \times 10^{-11} \times 7 \times 2 \times 10^{30}/(3 \times 10^8)^2$ **(1)**

$= 2.08 \times 10^4$ (m) **(1)**

2

(c) CCD consists of silicon (chip) **(1)**

incident photons cause electrons to be released **(1)**

electrons are trapped in potential wells in the CCD **(1)**

3

[7]

Q2.

(a) (use of $R = \rho l/A$)

$R = 4.0 \times 10^{-3} \times 0.060$ **(1)**$/(\pi \times 0.012^2)$ **(1)**

$R = 0.53$ (Ω) **(1)**

2 significant figures **(1)**

4

(b) the mark scheme for this part of the question includes an overall assessment for the Quality of Written Communication

circuit must include:

voltmeter and ammeter connected correctly **(1)**

power supply with means of varying current **(1)**

2

QWC	descriptor	mark

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		range
good-excellent	(i) Uses accurately appropriate grammar, spelling, punctuation and legibility. (ii) Uses the most appropriate form and style of writing to give an explanation or to present an argument in a well structured piece of extended writing. [may include bullet points and/or formulae or equations] An excellent candidate will have a working circuit diagram with correct description of measurements (including range of results) and processing. An excellent candidate uses a range of results and finds a mean value or uses a graphical method, eg *I*-*V* characteristics. They also mention precision eg use of vernier callipers.	**5**-**6**
modest-adequate	(i) Only a few errors. (ii) Some structure to answer, style acceptable, arguments or explanations partially supported by evidence or examples. An adequate candidate will have a working circuit and a description with only a few errors, eg do not consider precision. They have not taken a range of results and fail to realise that the diameter needs to be measured in several places.	**3**-**4**
poor-limited	(i) Several significant errors. (ii) Answer lacking structure, arguments not supported by evidence and contains limited information. Several significant errors, eg important measurement missed, incorrect circuit, no awareness of how to calculate resistivity.	**1**-**2**
incorrect, inappropriate or no response		**0**

The explanation expected in a good answer should include a coherent account of the procedure and include most of the following points.

- length with a ruler
- thickness/diameter with vernier callipers/micrometer
- measure voltage
- measure current
- calculate resistance
- use of graph, eg *I*-*V* or resistance against length
- use of diameter to calculate cross-sectional area
- mention of precision, eg vernier callipers or full scale readings

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for V and I

- flat metal electrodes at each end to improve connection

6

[12]

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