OCR
Oxford Cambridge and RSA

AS Level Physics B

H157/02 Physics in depth

Question Set 2

1 In 1974, the Mariner 10 space probe took the first digital photographs of the surface of the planet Mercury.

(a) In each photograph, every pixel had a value from 0 (white) to 255 (black).

(i) State how this fact shows that each pixel was encoded by 1 byte (8 bits) of data. **[2]**

(ii) Radiation from the Sun affected the cameras in the probe, changing the values of some pixels, so the photograph of **Fig. 1.1** was severely affected by noise.

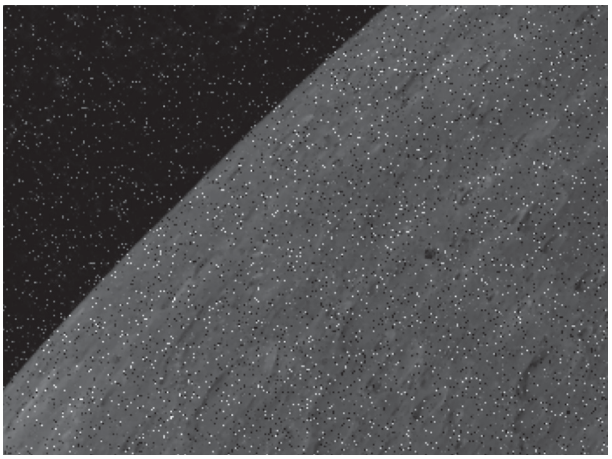

Fig. 1.1

State and explain how **Fig. 1.1** shows that noise resulted in changes to the values encoded in some pixels.

[2]

(b) **Fig. 1.2** is a magnified view of part of **Fig. 1.1**

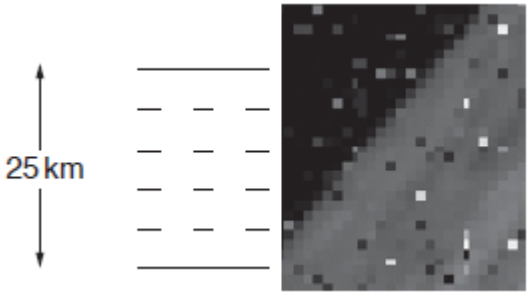

Fig. 1.2

Use **Fig. 1.2** to estimate the resolution of the surface of Mercury in this image. Show your working.

resolution = ... m **[2]**

(c) The data generating **Fig. 1.1** was processed by computer to give the image shown in **Fig. 1.3**.

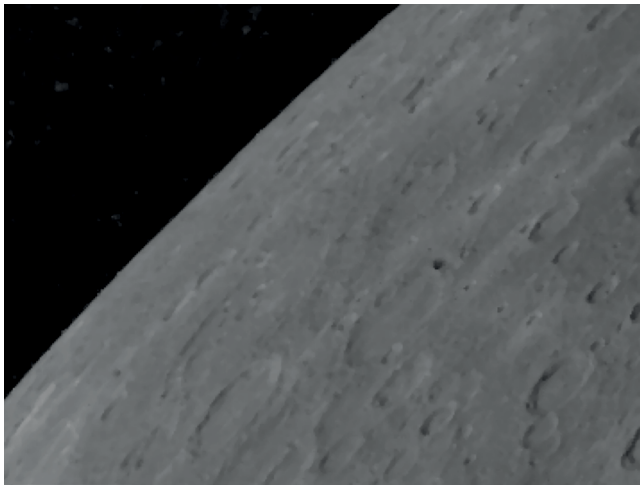

Fig. 8.3

Removal of noise has both advantages and disadvantages.
Suggest and explain one advantage and one disadvantage of this noise removal.

[4]

(d) The data for the image in **Fig. 1.1** was sent from the Mariner space probe back to Earth at a rate of 117.6 kilobits s^{-1}. The complete image was transmitted in 22 blocks, each containing 31 944 bytes.

Calculate, to the nearest second, the time taken to send the complete image.

time = …… s **[3]**

[Question total: 13]

Total Marks for Question Set 2: 13