Do specificity of neural computation and information loss always go hand in hand? Describe three examples in the retina to support your answer.

Yes, specificity of neural computation directly relates to information loss. By extracting features, it is necessary to remove irrelevant information that doesn't relate to the specific feature. Examples: Direction selective ganglion cells respond to moving stimuli, preferring one direction over the other. However, information about color or texture is removed. Texture motion cause Y-type ganglion cells to fire, but information about the direction of the movement is loss. Object motion detection through the OMS ganglion cells respond only to differential motion, but not when the image moves across the retina rigidly.

Describe three general strategies that retinal neurons employ to reduce noise in processing.

1. Temporal filtering, by enhancing the frequencies that contain light signals and reducing others.
2. Thresholding – rod signals below a certain threshold are discarded, reducing noise (and signal)
3. Summation – summing over rods average out individual noise levels.

What is rectification? What is its computational function? Give two specific examples in which it performs important functions in the retina.

Rectification is a step to process noise and getting a clearer signal. Two examples:

1. Signals from the rod are rectified through the thresholding mechanism.
2. Signals from the ganglion cell are rectified to adjust for sensitivity in global brightness.

Our interpretation of what neurons care about largely depends on what kind of stimuli are used in the experiment. For a long time, it was thought that most retinal ganglion cells have static center-surround receptive fields. Give three examples of retinal ganglion cells that would appear to have ordinary center-surround responses for static point stimuli, but in fact encode more specific information when richer stimuli are used.

1. Approaching motion is specifically encoded in certain OFF bipolar cells, resulting in a strong response. However, lateral motion is not encoded.
2. Motion extrapolation is done through standard center-surround receptive fields in the ganglion cells, but predict where an object may go.
3. Omitted stimulus response happens when a visual system anticipates a periodic stimulus but it doesn't happen, inside a center surround field.