Feedback for Problem Sheet 4

Markers: James Byrne, Amari Jaconelli, Sohyun Park

Question 1

a. Done mostly well, some still forgetting to act with identity on the systems they're not measuring. Many but not all rewrite the state in terms of the X basis which makes their lives much easier
b. Post-measurement states are sometimes given for only Alice's qubits / only Bob's qubit

Question 2

a. Local unitary equivalence was shown well, although many make the same mistake as on the last sheet where they don't justify how operations can be composed or inverted to get between any two states. Orthonormality wasn't too troubling for most if they remembered to do it, but many went for the direct calculation, with some forgetting to check normalisation or weren't bothered to write out all the necessary inner products. A few spotted the relation to Bell states
b. A large number of students misread this and just stated the normal teleportation protocol without changing the initial state to $|\varphi_3\rangle$. This question is about what happens if the usual operations are done, but the state is not the standard one. Another common mistake was missing the final local unitary operations
c. Done well for the most part, some gave measurement probabilities but didn't relate this to the corresponding two bits. Some were confused over different conventions for mapping Bell states to bit strings so got the right probabilities but for the wrong messages

Question 3

Some thought this obvious and tried to explain the general rules of measurement (e.g. Born's rule) to justify what they thought was immediately clear. A few calculated with three successive measurements but failed to normalise between measurements. On the whole this was done well however

Question 4

a. Some tried alternative methods to showing unitarity, but these usually went astray. The suggested method, when followed, was done well
b. Caused few problems