

**1 A chest wall tumour is to be treated with radiation therapy treatment. It extends from midline to post/lateral ribs and from clavicle to lower ribs. Describe each of the following treatment techniques with particular attention to the limitations and possible solutions:**

- (a) Fixed field electrons**
- (b) Electron arc**
- (c) MV photons**

- a) Due to size of treatment field and curvature, it would not be possible to get a homogeneous dose to the chest wall. **correct but why? and what is the name of this phenomenon? {obliquity}**  
One solution would be to use multiple electron fields, but due to lateral constriction at higher isodoses, and different angle of incidence of the fields, this would make junctioning difficult, possibly leading to areas of inadequate or excessive dose to the chest wall. **correct BUT what sort of gap should be placed between the electron fields?**  
Instead of fixed field electrons, in the scenario of the chest wall, electron arc therapy would deliver a more homogenous dose to the chest wall. **once again correct BUT this is the next part and so no marks. Write about electron fields.**
- b) An electron arc would be able to overcome the problem of chest wall curvature and deliver a homogeneous dose to the chest wall.  
Due to Bremsstrahlung a small amount of energy from the electrons will be converted to photons. As it is an arc therapy, there will be an area where all the photon beams intersect within the lung. This will create a hot spot within the lung, and possibly result in an unacceptable dose in the lung. **excellent point**  
**what about the fact the chest walls often aren't spherical leading to a variable SSD? what about the set up to get a sharp dose at the start and end of the arc?**
- c) MV photons are penetrating in nature. They also have a skin sparing effect. Again with the curvature of the chest, it would be difficult to get a homogeneous dose. Use of compensators would help deliver a uniform dose to the chest wall. Bolus could also be considered. But in bolus this would bring the dose up to the skin surface, and the skin sparing effect of MV photon beams would be lost. This would be an advantage if the chest wall tumor was superficial and you were trying to treat up to the skin.  
The size of the area to be treated is large. It may be possible to use tangents to treat the chest wall, to spare lung tissue. But due to the size of area required to be treated, this may not be possible, and it may be necessary to use parallel opposed beams to obtain adequate coverage. But due to the penetrating nature of photon beams, the lungs would receive an unacceptably high dose of radiation.  
**this is garbled, the point about photons is that you have to address their orientation. You bring up "tangents" but it sounds like you are using a SINGLE beam because later you say " and it may be necessary to use parallel opposed beams to obtain adequate coverage"!**

Overall, in this situation, electron arc therapy would be the most appropriate technique of choice. **The question does not ask for this, so no marks.**