

QUESTION 6

Your university conducts a wide variety of medical and clinical research and, as the newly appointed Radiation Safety Manager, you have been asked to determine work controls for radiological work by declared pregnant staff workers, none of whom are minors.

GIVEN

- P-32: Beta $E(\text{max}) = 1.7 \text{ MeV}$
- I-131: Beta $E(\text{max}) = 0.606 \text{ MeV}$; gamma exposure rate = $0.21 \text{ R}\cdot\text{m}^2/\text{hr}\cdot\text{Ci}$

POINTS

For each of the work descriptions below, state whether you would recommend to

- prohibit the work,
- allow the work to continue, but with additional specific work controls, or,
- allow the work to continue without any additional work controls.

Provide the technical basis for your recommendations, including any assumptions. If (b) is selected, state which specific work controls you would implement.

10 A Work consists of cell labeling starting with a 1 ml stock solution of 10 mCi of P-32-labeled nucleotides. The stock solution is diluted by a factor of 1,000 prior to use. Dilutions are done on a weekly basis, and require about a half hour of hands-on work. Work with the diluted material requires about 10 hours of hand-on work per week. Normal controls include a fume hood, Plexiglas shield, and use of gloves, labcoat, and tongs.

10 B Work consists of interventional radiology with a variable monthly work load. A TLD is worn outside of a lead apron that provides 2 half-value layers (HVL) of attenuation. A typical 9-month dosimeter history is shown below:

TLD reading (rem):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0.050	0.100	0.285	0.115	0.075	0.110	0.185	0.230	0.175

- 10** **C** Work consists of performing iodinations using a stock solution of 30 mCi of I-131 as Sodium Iodide. Iodinations are performed on a weekly basis, and require about a half-hour of hands-on work. Work with the iodinated protein requires about 10 hours of hands on work per week. Normal controls include use of a a fume hood, shields, gloves, labcoat, and tongs. Work history indicates that the average worker is exposed to one DAC - hour per week as a result of performing iodinations.
- 10** **D** Work consists of performing maintenance on an 18 MeV electron accelerator. The accelerator is typically operated continuously from Tuesday through Saturday and routine maintenance is conducted on Monday. Maintenance takes about 4 hours in areas where the dose rate averages 4.5 mrem/hr.
- 10** **E** Work consists of conducting x-ray fluorescence analysis on a variety of materials. Although the exposure rate outside the machine is not detectable above background, the machine is capable of producing a severe overexposure of the fingers, should the interlocks fail or be bypassed.