Hoja 1

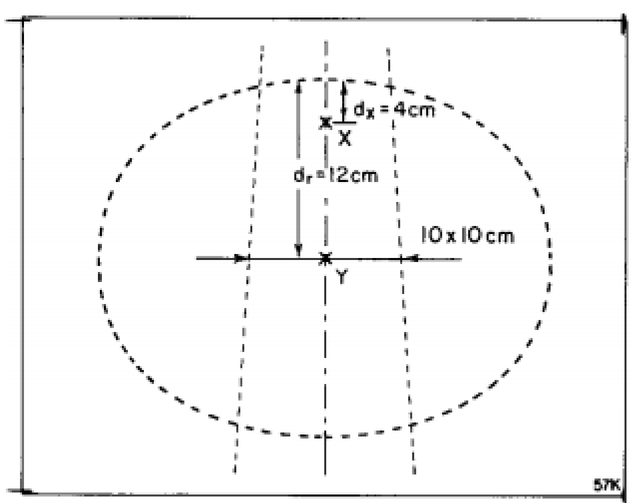
1. Una cavidad de 1 cm^3 de aire en condiciones STP es irradiada por un campo de que libera $3{,}336x10^{-10}$ C. Determina la dosis absorbida en aire.

2. Una cavidad de 1 cm^3 de aire en un bloque de carbono es irradiada con rayos gamma de ^{60}Co liberando $3x10^{-8}$ C que son recogidos en la cavidad. Asumiendo STP, halla la dosis absorbida en carbono.

3. Una cámara de ionización de paredes de carbono y con una cavidad de 1 cm^3 de aire se sitúa en un fantoma de agua y se somete a radiación gamma de ^{60}Co. Si se liberan $3x10^{-8}$ C, ¿cuál es la dosis absorbida en agua? Asume que las paredes de carbono son un poco más gruesas que el rango de los electrones.

4. Una unidad de ^{60}Co isocéntrica entrega una dosis de 1 Gy en un minuto a una pequeña masa de tejido en aire en el eje del equipo en un punto X'. Luego se coloca a un paciente con un centrado en X'. El tumor está situado a 10 cm desde la piel del paciente y el tamaño de campo es de 10x10 cm. Determina la dosis en el tumor.

5. Un paciente (figura) es irradiado por un haz de una unidad isocéntrica de cobalto. El punto Y está en el eje de rotación a una distancia de 80 cm de la fuente. El tamaño de campo en el punto Y es 10x10 cm y se encuentra a 12 cm de profundidad. En una sesión de tratamiento el punto Y recibe 2,5 Gy. Determina la dosis en el punto X a 4 cm de profundidad haciendo uso del TAR.



6. Resuelve el problema anterior haciendo uso de la PDD.

Ratio of averaged stopping powers, $\bar{\bar{S}}_{air}^{med}$ for a number of materials relative to air for a series of photon spectra. Data was calculated using equation 7-10. For comparison, $\bar{\bar{S}}$ water/$\bar{\bar{S}}$ air, determined using equation 6-45, is entered in the last column.

		$\bar{\bar{S}}_{air}^{med}$ for Various Media					
Spectrum Number*	Description	Carbon	Bakelite	Lucite	Poly-styrene	Water	$\frac{\bar{\bar{S}}_{water}}{\bar{\bar{S}}_{air}}$
1	60 kV_p, HVL—1.6 mm Al	1.022	1.094	1.125	1.137	1.140	1.141
2	100 kV_p, HVL—2.8 mm Al	1.022	1.095	1.126	1.138	1.140	1.141
3	250 kV_p, HVL—2.6 mm Cu	1.021	1.090	1.121	1.132	1.139	1.139
4	270 kV_p primary only, 2.7 mm Cu	1.020	1.089	1.120	1.131	1.138	1.138
5	270 kV_p primary plus scatter	1.022	1.094	1.124	1.136	1.139	1.137
6	400 kV_p, HVL—4 mm Cu	1.019	1.086	1.116	1.127	1.138	1.137
7	Cs-137	1.015	1.075	1.104	1.112	1.133	1.132
8	Co-60, primary only	1.009	1.071	1.099	1.105	1.129	1.128
9	Co-60, primary plus scatter	1.011	1.073	1.101	1.109	1.131	1.129
10	6 MV, Linac	1.000	1.064	1.092	1.098	1.123	1.120
11	8 MV, Linac	.993	1.058	1.085	1.091	1.117	1.114
12	12 MV, Schiff spect.	.976	1.043	1.069	1.073	1.102	1.100
13	18 MV, Schiff spect.	.965	1.033	1.059	1.063	1.092	1.091
14	26 MV, Betatron	.960	1.028	1.053	1.057	1.086	1.083
15	26 MV, Linac	.968	1.035	1.061	1.065	1.094	1.092
16	35 MV, Schiff spect.	.946	1.015	1.039	1.043	1.073	1.073
17	45 MV, Schiff spect.	.940	1.009	1.034	1.037	1.068	1.068

Values of $\left(\frac{\bar{\mu}_{ab}}{\rho}\right)_{med}^{water}$ for Carbon, Bakelite, Lucite, and Polystyrene and $\left(\frac{\bar{\mu}_{ab}}{\rho}\right)_{air}^{med}$ for Water, Muscle, and Fat Determined Using Equation 7-12 for Photon Spectra Listed in Table 7-2.

	$\left(\frac{\bar{\mu}_{ab}}{\rho}\right)_{med}^{water}$				$\left(\frac{\bar{\mu}_{ab}}{\rho}\right)_{air}^{med}$			
(1) Photon Spectrum*	(2) Carbon	(3) Bakelite	(4) Lucite	(5) Polyst.	(6) Water	(7) Muscle	(8) Fat	(9) Bone
1. 60 kV_p	2.399	1.931	1.622	2.518	1.016	1.057	.617	4.873
2. 100 kV_p	2.112	1.758	1.519	2.152	1.026	1.062	.670	4.524
3. 250 kV_p	1.155	1.086	1.056	1.076	1.103	1.098	1.073	1.427
4. 270 kV_p	1.170	1.098	1.065	1.092	1.100	1.097	1.060	1.530
5. 270 kV_p	1.372	1.253	1.181	1.303	1.073	1.085	.924	2.668
6. 400 kV_p	1.129	1.065	1.040	1.050	1.108	1.101	1.095	1.217
7. ^{137}Cs	1.111	1.051	1.029	1.032	1.112	1.102	1.112	1.064
8. ^{60}Co	1.111	1.051	1.029	1.032	1.112	1.103	1.113	1.061
9. ^{60}Co	1.116	1.055	1.032	1.037	1.111	1.102	1.107	1.105
10. 6 MV	1.112	1.053	1.030	1.035	1.111	1.101	1.109	1.066
11. 8 MV	1.114	1.055	1.032	1.038	1.109	1.098	1.104	1.067
12. 12 MV	1.120	1.062	1.039	1.049	1.101	1.090	1.087	1.078
13. 18 MV	1.125	1.068	1.044	1.059	1.095	1.083	1.073	1.087
14. 26 MV	1.129	1.073	1.049	1.067	1.089	1.078	1.061	1.094
15. 26 MV	1.124	1.068	1.044	1.058	1.095	1.084	1.074	1.085
16. 35 MV	1.135	1.081	1.056	1.080	1.081	1.069	1.043	1.102
17. 45 MV	1.137	1.085	1.059	1.085	1.077	1.065	1.035	1.106

Tissue-Air Ratios for Rectangular Fields

Cobalt-60

d (cm)	0×0	4×4	4×6	4×8	4×10	4×15	5×5	6×6	6×8	6×10	6×15	7×7	8×8	8×10
*0.5	1.000	1.015	1.018	1.020	1.022	1.025	1.018	1.022	1.025	1.027	1.031	1.025	1.029	1.032
1	.965	.996	1.001	1.005	1.008	1.012	1.003	1.009	1.014	1.018	1.023	1.015	1.021	1.025
2	.905	.956	.965	.970	.973	.978	.967	.976	.983	.988	.994	.985	.992	.997
3	.845	.915	.926	.932	.936	.942	.928	.940	.948	.954	.961	.950	.959	.966
4	.792	.872	.885	.893	.897	.903	.888	.902	.912	.918	.926	.914	.924	.931
5	.742	.829	.843	.852	.856	.863	.847	.862	.873	.880	.889	.875	.887	.895
6	.694	.786	.801	.810	.815	.823	.805	.821	.833	.840	.851	.835	.847	.856
7	.650	.743	.758	.767	.773	.781	.762	.778	.791	.799	.810	.793	.807	.819
8	.608	.700	.715	.725	.731	.740	.719	.736	.749	.757	.769	.751	.765	.775
9	.570	.659	.674	.684	.689	.700	.677	.695	.708	.716	.730	.710	.724	.734
10	.534	.620	.635	.644	.650	.661	.638	.655	.668	.677	.691	.671	.685	.695
11	.501	.581	.596	.606	.612	.623	.600	.616	.630	.639	.652	.632	.647	.658
12	.469	.546	.560	.570	.576	.587	.563	.580	.594	.603	.617	.596	.611	.622
13	.440	.513	.527	.537	.544	.555	.530	.547	.561	.570	.584	.563	.578	.589
14	.412	.482	.496	.505	.512	.523	.499	.515	.528	.538	.552	.531	.545	.557
15	.386	.454	.467	.476	.483	.494	.470	.485	.498	.507	.522	.501	.515	.526
16	.361	.427	.440	.449	.455	.466	.443	.458	.470	.479	.494	.472	.485	.496
17	.338	.402	.414	.423	.429	.440	.417	.431	.443	.452	.467	.445	.458	.469
18	.317	.378	.390	.398	.404	.415	.393	.406	.418	.426	.441	.420	.433	.443
19	.297	.355	.366	.375	.381	.391	.369	.383	.394	.403	.417	.396	.409	.420
20	.278	.333	.344	.353	.358	.369	.347	.361	.372	.380	.394	.374	.386	.396
22	.246	.293	.304	.312	.317	.327	.306	.318	.328	.336	.350	.330	.342	.352
24	.215	.258	.268	.275	.280	.290	.270	.281	.290	.298	.311	.292	.303	.312
26	.187	.228	.236	.243	.248	.257	.238	.249	.258	.264	.277	.259	.270	.278
28	.164	.200	.210	.215	.219	.228	.210	.221	.228	.234	.246	.230	.239	.246
30	.144	.178	.185	.190	.194	.202	.186	.195	.202	.208	.218	.203	.212	.219

d (cm)	8×15	8×20	10×10	10×15	10×20	12×12	15×15	15×20	20×20	20×30	25×25	30×30	35×35
*0.5	1.037	1.041	1.035	1.042	1.046	1.041	1.051	1.056	1.063	1.071	1.073	1.080	1.084
1	1.032	1.035	1.031	1.038	1.043	1.038	1.048	1.054	1.062	1.069	1.072	1.079	1.084
2	1.005	1.009	1.004	1.013	1.018	1.014	1.025	1.032	1.040	1.049	1.052	1.059	1.065
3	.975	.980	.974	.985	.990	.985	.999	1.006	1.016	1.026	1.029	1.038	1.044
4	.942	.947	.940	.952	.959	.953	.968	.977	.987	.999	1.002	1.014	1.021
5	.907	.913	.905	.918	.925	.919	.936	.946	.957	.971	.974	.988	.998
6	.869	.876	.867	.882	.890	.883	.902	.912	.925	.940	.944	.959	.970
7	.830	.837	.827	.844	.853	.845	.866	.878	.893	.909	.913	.929	.941
8	.790	.798	.787	.805	.815	.806	.830	.843	.859	.877	.881	.899	.912
9	.751	.760	.747	.767	.778	.768	.793	.808	.825	.845	.849	.869	.882
10	.713	.722	.709	.729	.741	.730	.756	.771	.790	.811	.816	.837	.852
11	.675	.685	.672	.692	.704	.692	.719	.736	.755	.777	.782	.803	.820
12	.640	.650	.636	.657	.670	.658	.685	.702	.722	.744	.750	.772	.790
13	.607	.618	.603	.625	.638	.626	.653	.670	.690	.713	.720	.743	.762
14	.575	.586	.571	.593	.606	.594	.622	.639	.660	.684	.691	.715	.734
15	.545	.556	.540	.563	.576	.563	.593	.610	.633	.656	.662	.687	.706
16	.516	.527	.510	.533	.547	.533	.564	.582	.605	.628	.634	.660	.679
17	.488	.499	.483	.506	.519	.506	.536	.554	.577	.601	.608	.633	.653
18	.462	.474	.457	.479	.493	.479	.509	.528	.551	.575	.582	.607	.627
19	.438	.449	.433	.455	.469	.455	.485	.503	.526	.550	.557	.583	.603
20	.415	.426	.410	.431	.445	.431	.461	.479	.502	.527	.534	.560	.580
22	.369	.380	.364	.385	.393	.384	.413	.431	.456	.481	.488	.515	.535
24	.329	.340	.324	.345	.358	.345	.373	.390	.412	.438	.446	.471	.492
26	.294	.304	.290	.309	.322	.308	.336	.352	.373	.398	.405	.431	.451
28	.263	.270	.257	.276	.288	.276	.302	.320	.339	.362	.368	.393	.413
30	.233	.242	.228	.245	.257	.244	.268	.286	.305	.328	.335	.358	.377