

Radiation Safety Review for 511-keV Emitters in Nuclear Medicine

For each of the following questions, select the best answer. Then circle the number on the CE Tests Answer Sheet that corresponds to the answer you have selected. Complete the answer sheet. Keep a record of your responses so that you can compare them with the correct answers, which will be published in the next issue of *JNMT*. Answers to these test questions should be returned on the Answer Sheet no later than **May 15, 1997**. An 80% correct response rate is required to receive 1.0 CEH (Continuing Education Hour) credit for each article. SNM Technologist Section members can find their VOICE number on the upper left-hand corner of their *JNMT* mailing labels. If you've joined our Nonmember VOICE Tracking Program, please check the **NMVTP** box on the Answer Sheet (no extra fee is required). Documentation will appear on your VOICE transcript which is issued in March of each year. Nonmembers who have not joined our Nonmember VOICE Tracking Program must mail a \$10.00 check or money order, made payable to SNM, along with the completed quiz. You will receive a certificate of completion indicating credit awarded for receiving a passing score of 80% or better.

A. *The annihilation photons that are detected in PET imaging are emitted*

- 101. 60° apart
- 102. 90° apart
- 103. 120° apart
- 104. 180° apart
- 105. 270° apart

B. *Collimators that can be used to detect 511-keV emitters differ from medium-energy collimators because they have*

- 106. greater septal thickness and more holes
- 107. thinner septal thickness and fewer holes
- 108. greater septal thickness and fewer holes
- 109. thinner septal thickness and more holes
- 110. none of the above are correct

C. *For PET imaging, coincidence cameras have which of the following advantages compared to single-headed cameras?*

- 111. increased sensitivity
- 112. increased intrinsic resolution
- 113. decreased required imaging time
- 114. only 111 and 113 are correct
- 115. 111, 112 and 113 are correct

D. *A dose calibrator with high activity limits is preferable for measuring PET radiopharmaceuticals because the PET isotopes produce a higher current in the instrument due to the higher energy.*

- 116. true
- 117. false

E. *Adequate lead shielding surrounding a dose calibrator used to measure 511-keV emitters should be of what thickness?*

- 118. 1 cm
- 119. 2 cm
- 120. 3 cm
- 121. 4 cm
- 122. 5 cm

F. *Which of the following has the lowest gamma ray dose constant?*

- 123. ^{99m}Tc
- 124. ^{201}Tl
- 125. ^{131}I
- 126. ^{18}F

G. *Which of the following has the highest gamma ray dose constant?*

- 127. ^{99m}Tc
- 128. ^{201}Tl
- 129. ^{131}I
- 130. ^{18}F

H. *Which of the following has the lowest linear attenuation coefficient for lead?*

- 131. ^{99m}Tc
- 132. ^{201}Tl
- 133. ^{131}I
- 134. ^{18}F

I. *Which of the following has the highest linear attenuation coefficient for lead?*

- 135. ^{99m}Tc
- 136. ^{201}Tl
- 137. ^{131}I
- 138. ^{18}F

J. *To provide the same amount of attenuation for ^{18}F as is currently provided for ^{99m}Tc , the thickness of lead must be*

- 139. decreased by a factor of 2
- 140. decreased by a factor of 4
- 141. increased by a factor of 8
- 142. increased by a factor of 16
- 143. increased by a factor of 32

K. *Which of the following is a better shielding material than lead for 511-keV emitters?*

- 144. lucite
- 145. paper
- 146. tungsten
- 147. cement
- 148. leaded glass

L. *The physical half life of ^{18}F is approximately*

- 149. 10 min
- 150. 50 min
- 151. 100 min
- 152. 150 min
- 153. 10 hr

M. *Which of the following waste disposal methods is best for PET radiopharmaceuticals?*

- 154. decay in storage
- 155. sewer dilution
- 156. incineration
- 157. transfer to a waste site for decay
- 158. no special method is needed

CONTINUING EDUCATION TEST #2

Cancer Imaging with Radiolabeled Antibodies

N. One disadvantage of ^{111}In -labeled antibodies was _____.

- 159. binding to normal liver tissue
- 160. the short half life of ^{111}In
- 161. the fast clearing from the blood pool
- 162. high tumor-to-background ratios within 2 hr
- 163. all of the above

O. Serum CEA is not a specific tumor marker as it can be elevated in some benign and inflammatory conditions.

- 164. true
- 165. false

P. Anti-CEA Mab Fab' labeled with $^{99\text{m}}\text{Tc}$ is approved by the FDA for detecting recurrent or metastatic _____.

- 166. basal cell carcinoma
- 167. renal cell carcinoma
- 168. thyroid carcinoma
- 169. colorectal carcinoma
- 170. all of the above

Q. One milligram of $^{99\text{m}}\text{Tc}$ anti-CEA Mab Fab' was injected and scintigraphy is performed at _____.

- 171. 2-5 hr
- 172. 18-24 hr
- 173. 48-96 hr
- 174. 171 and 172 are correct
- 175. 172 and 173 are correct

R. The true-positive rate for $^{99\text{m}}\text{Tc}$ anti-CEA Mab Fab' scintigraphy alone was _____ than the true-positive rate for CT alone in the abdomen and pelvis.

- 176. higher
- 177. lower

S. The positive predictive value in patients with known disease when both the $^{99\text{m}}\text{Tc}$ anti-CEA Mab Fab' scintigraphy and CT results were positive was _____.

- 178. 58%
- 179. 68%
- 180. 78%
- 181. 88%
- 182. 98%

T. Approximately what percent of patients developed an immune, anti-mouse antibody response (HAMA) to $^{99\text{m}}\text{Tc}$ anti-CEA Mab Fab'?

- 183. 1%
- 184. 10%
- 185. 20%
- 186. 50%
- 187. 80%

U. The upper limit of the normal range for serum CEA levels is _____.

- 188. 2.5 mg/ml
- 189. 25 mg/ml
- 190. 250 mg/ml
- 191. >2000 mg/ml

V. Serum CEA levels of _____ did not show complexation of the anti-CEA Mab Fab'.

- 192. 2.5 mg/ml
- 193. 25 mg/ml
- 194. 250 mg/ml
- 195. >2000 mg/ml

W. Serum CEA levels of _____ did show complexation of approximately 50% of the injected anti-CEA Mab Fab'.

- 196. 2.5 mg/ml
- 197. 25 mg/ml
- 198. 250 mg/ml
- 199. >2000 mg/ml

X. Which of the following isotopes is used in radioimmunotherapy?

- 200. $^{99\text{m}}\text{Tc}$
- 201. ^{111}In
- 202. ^{131}I
- 203. ^{90}Y
- 204. both 202 and 203 are correct

Y. The highest radiation doses delivered by radioimmunotherapy are inversely proportional to tumor size.

- 205. true
- 206. false

Z. Radioimmunotherapy may prove to be profoundly important in treating micrometastatic disease.

- 207. true
- 208. false

CONTINUING EDUCATION TEST #3

Caring for the Older Patient, Part I

AA. JCAHO standards require that hospital personnel meet the special needs of certain patient age groups.

- 209. true
- 210. false

BB. The fastest growing segment of the U.S. population consists of individuals in what age group?

- 211. 55–60 yr
- 212. 61–69 yr
- 213. 70–74 yr
- 214. over 75 yr

CC. Currently individuals over 65 yr old make up about what percentage of the U.S. population?

- 215. 5%
- 216. 13%
- 217. 22%
- 218. 35%

DD. The three leading causes of death among adults 65 yr or older are _____.

- 219. heart disease, stroke and pneumonia
- 220. cancer, stroke and diabetes
- 221. heart disease, cancer and cerebrovascular disease
- 222. accidents, heart disease and cancer

EE. Normal aging does not affect an individual's adaptive response to changes in the body's systems.

- 223. true
- 224. false

FF. The geriatric approach to patient care is best suited to _____.

- 225. the frail elderly
- 226. the able elderly
- 227. all patients over 65 yr
- 228. all patients over 75 yr

GG. Which of the following statements about gerontology is true?

- 229. It views aging as a normal process.
- 230. It is a study of the treatment of diseases affecting the elderly.
- 231. It suggests that biological changes are the best measure of age.
- 232. All of the above.

HH. Hayflick's limit refers to the maximum human life span of 110–120 yr.

- 233. true
- 234. false

II. The use of antioxidants to retard aging is based on which of the following theories of aging?

- 235. cross-linkage theory
- 236. wear-and-tear theory
- 237. metabolic waste theory
- 238. free radical theory

JJ. The social theory of aging that assumes an individual's inner self remains the same regardless of external changes is the _____.

- 239. social exchange theory
- 240. disengagement theory
- 241. continuity theory
- 242. activity theory

KK. Which of the following statements about intelligence is false?

- 243. Intelligence is thought to increase until about the age of 60 yr.
- 244. Crystallized intelligence decreases with age.
- 245. Fluid intelligence relates to how quickly a new skill can be learned.
- 246. Older individuals take longer to learn new concepts.

LL. Fasting in preparation for a nuclear medicine examination may cause dehydration and confusion in an elderly patient.

- 247. true
- 248. false

MM. Which of the following actions demonstrates respect for an elderly patient?

- 249. The technologist completes the patient's sentences.
- 250. The technologist asks the patient several questions at once.
- 251. The technologist calls the patient by his first name.
- 252. The technologist explains her role in the care of the patient.

NN. Which of the following are common changes due to aging?

- 253. easily distracted by irrelevant stimuli
- 254. information processing occurs more slowly
- 255. loss of hearing in the high frequency range
- 256. all of the above

OO. Which of the following statements is/are true?

- 257. Acute conditions occur more frequently in later life.
- 258. Almost 80% of older adults have multiple chronic conditions.
- 259. Chronic diseases are more prevalent in the elderly than in other age groups.
- 260. 257 and 259 are correct

Answers to CE Article Test #1, December 1996

The continuing education article "Camera Purchasing by Bid Specification" by Bloe et al., was accompanied by a CE test. The correct answers are as follows.

A. 105	D. 115	G. 129	J. 140	M. 155
B. 110	E. 120	H. 133	K. 148	N. 156
C. 111	F. 126	I. 135	L. 153	

Answers to CE Article Test #2, December 1996

The continuing education article "Internet Update" by Glowniak was accompanied by a CE test. The correct answers are as follows.

Q. 161	R. 177	U. 187	X. 196	AA. 206
P. 167	S. 181	V. 190	Y. 203	BB. 215
Q. 172	T. 184	W. 192	Z. 204	

CONTINUING EDUCATION TEST #1, #2 and #3

Answer Sheet

101	112	123	134	145	156	167	178	189	200	211	222	233	244	255
102	113	124	135	146	157	168	179	190	201	212	223	234	245	256
103	114	125	136	147	158	169	180	191	202	213	224	235	246	257
104	115	126	137	148	159	170	181	192	203	214	225	236	247	258
105	116	127	138	149	160	171	182	193	204	215	226	237	248	259
106	117	128	139	150	161	172	183	194	205	216	227	238	249	260
107	118	129	140	151	162	173	184	195	206	217	228	239	250	261
108	119	130	141	152	163	174	185	196	207	218	229	240	251	262
109	120	131	142	153	164	175	186	197	208	219	230	241	252	263
110	121	132	143	154	165	176	187	198	209	220	231	242	253	264
111	122	133	144	155	166	177	188	199	210	221	232	243	254	265

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VOICE No. _____ Or please check one: NMVTP participant (no fee required) Nonmember—\$10 check or money order enclosed

Return a copy of this answer sheet no later than May 15, 1997 to:
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