放射線管理士測驗
Radiation Safety Manager

2025 年 8 月 24 日星期日

1. 除題意不清楚或是圖片有問題，禁止詢問與試題有關的問題。
2. 應答時禁止使用任何文件。
3. 請在電腦答案卡上圈選作答

項目	**填寫內容**
姓名	您的中文與英文姓名
試題名稱	RSM Test
項目	不用填寫
科目	不用填寫
受試者識別代碼	您的准考證號碼後五碼：24XXX 將您選定之數字的圓圈塗滿。
科目代碼	不用填寫
地點代碼	不用填寫
作答方式	本測驗共有 90 題問題。請使用 Q1 到 Q90 作答欄位。 請將測驗卷 Q1 的答案填入答案卷的答案選擇 1。Q2 = 答案選擇 2，Q3 = 答案選擇 3…依此類推。

1. Which of the following is the most related with Bremsstrahlung?
(A) α-ray
(B) β-ray
(C) γ-ray
(D) Heavy ion
(E) Neutron

2. What is associated with energy given to a substance per unit length of α-ray?
(A) Exposure dose
(B) Absorbed dose
(C) Equivalent dose
(D) Kerma
(E) LET

3. Which of the following is the correct explanation about interaction of radiation and matter?
(A) Range : A progress direction which charged particle pass though matter.
(B) LET : Electromagnetic wave radiation which is released when a pair of positron and negatron lead to annihilation.
(C) W-value : Needed average energy to makes a pair of ion when radiation ionizes gas.
(D) Stopping power : Total energy which is received by charged particle when it pass though matter.
(E) Mass stopping power : The divided value for stopping power by mass for excluding dependency of density of matter.

4. Which of the following is the right setting up method to extend GM counter's durability?
(A) Threshold value voltage
(B) Middle voltage of plateau
(C) 25% of the lower voltage from the end of plateau
(D) 30% of the upper voltage from the end of plateau
(E) 50% of the lower voltage from the end of plateau

5. Which of following is the correct description for specificity of nuclear force?
(A) The nuclear force is worked with gravitation and repulsion.
(B) It is the force in a long distance.
(C) The nuclear force is not related with spin direction of nucleus
(D) The characteristic of nuclear force has saturation.
(E) It has the quark exchange power.

6. Which reaction is the greatest effect in the interaction between a substance and Alpha and Beta ray?
(A) elastic scattering
(B) inelastic scattering
(C) Cherenkov effect
(D) Rayleigh scattering
(E) nuclear reaction

7. Which is the correct answer for pair of unit in radioactivity?
(A) C/kg, J/kg
(B) Gy, Sv
(C) Gy/h, Sv/h
(D) dps, Gy/h
(E) Ci, Bq

8. Which is the correct explanation for K-edge of an atom?
(A) Kinetic energy is lowest.
(B) Potential energy is highest.
(C) Velocity of electron is fastest.
(D) Energy level is highest.
(E) The largest number of electron which fill up in K-edge is 4.

9. What is the correct answer for the electro-magnetic wave?
(A) The electro-magnetic wave has a mass.
(B) The X-ray source is from intra-nucleus, and gamma ray source is from extra-nucleus.
(C) From the quantum theory, electro-magnetic wave has wave-nature and particle-nature
(D) The electro-magnetic radiation is in proportion to momentum.
(E) The electro-magnetic wave has an electrical charge.

10. What is the correct answer for the energy value about one stopped electron?
(A) 0.511 MeV
(B) 1.022 MeV
(C) 931.5 MeV
(D) 939.5 MeV
(E) 13.6 MeV

11. Which answer is correct for the pair of radionuclides and their half-life?
(A) Co-60 : 5.31 days
(B) I-131 : 8 hours
(C) Cs-137 : 30 years
(D) Sr-90 : 64 hours
(E) Ir-192 : 8 days

12. Which is the correct explanation for Bergoni-Tribondeau's law?
(A) The cell become more mature, more sensible for radiation.
(B) The younger cells are insensible for radiation.
(C) The low metabolic-rate cells are sensible for radiation.
(D) The stem-cells or interstitial-cells are insensible for radiation.
(E) The tissues that has frequent cell division or rapid growth are sensible for radiation.

13. Choose the correct equation.?
(A) 1 b(barn) = 10-24 m2
(B) 1 R = 2.58 X 10-4 J/kg
(C) 1 eV = 1.602 X 10-19 C
(D) 1 amu = 1.66 X 10-27 kg

(E) Avogadro number = 6.023 X 10-23 C/mole

14. One atom named 'X' has become ${}^{A-8}_{Z-4}X$. What is expected to be generated after some disintegration?
(A) 1 alpha decay, 2 gamma decay
(B) 1 alpha decay, 2 beta decay
(C) 2 alpha decay, 1 gamma decay
(D) 2 alpha decay, 2 beta decay
(E) 2 gamma decay, 2 beta decay

15. What is the correct procedure of radiation?
(A) Radioactivity management – People management – Environment management
(B) Environment management - People management - Radioactivity management
(C) Radioactivity management - Environment management - People management
(D) People management - Environment management - Radioactivity management
(E) People management - Radioactivity management - Environment management

16. Which is the correct answer that an exposure dose of LD50/60 which the exposed person died in a few months as a blood forming function disorder caused by radiation exposure?
(A) 1 ~ 2 Gy
(B) 3 ~ 5 Gy
(C) 6 ~ 8 Gy
(D) 8 ~ 10 Gy
(E) 0.75 ~ 1.25 Gy

17. What is the most important peak in the analysis of radioisotope at gamma ray?
(A) Photo peak
(B) Single escape peak
(C) Double escape peak
(D) Backscatter
(E) Compton edge

18.What is appropriate measuring instrument and height for the surface contamination measurement?
(A) Ionization chamber, 1 m
(B) Fancake GM, 1 cm
(C) Fancake GM, 10 cm
(D) Fancake GM, 5 cm
(E) Proportional counter, 1 cm

19. What is the correct explanation for Single Channel Analyzer(SCA)?
(A) It is used the coincidence circuit.
(B) It is possible to count the pulse through upper selector only.
(C) It has longer dead time than multi channel analyzer.
(D) It is mainly used to monitoring radiation existence of special energy.
(E) It is mainly used to monitoring radiation existence of various energy.

20. What is the advantage of the semiconductor detector?
(A) Energy resolution is good.
(B) Radiation damage is low.
(C) Maintenance cost is low.
(D) High radiation dose can be measured.
(E) It is easy to make a product of broad effective counting area.

21. What is the correct combination of explanation blow?

a. Kerma is only applied to indirect ionizing radiation.
b. Bragg-Gray's principal is used for measurement of exposure dose.
c. Absorbed dose has no relation what radiation or matter is.
d. Absorbed dose of γ-ray is maximum compared to any depth of incidence matter.

(A) a, b
(B) a, c
(C) a, d
(D) b, c
(E) c, d

22. What is the scintillation substance which has a different character among scintillator?
(A) Anthracene
(B) CsI(Tl)
(C) BGO
(D) LiI(Eu)
(E) CsI(Na)

23. What nuclide causes the disorder in a bone with internal exposure?
(A) H-3
(B) C-14
(C) I-131
(D) Sr-90
(E) Rn-222

24. What is the time that the output pulse arrive counter's minimum selection level in GM counter?
(A) Operating time
(B) Dead time
(C) Resolving time
(D) Recovery time
(E) Repetition time

25. What is Γ ray scattering angle at which the energy of the Compton electron becomes maximum in the Γ ray energy spectrum?
(A) 180 degrees
(B) 140 degrees
(C) 120 degrees

(D) 65 degrees
(E) 40 degrees

26. Which of the following is correct explanation of effective half-life?
(A) It is time to take half of the number of atom of radioisotope.
(B) It is time to take half of the number of atom at a point in decay process of radioisotope.
(C) It is time to take half of radioactivity into human body by metabolic reaction.
(D) It is time to take half of radioactivity into human body by physical decay.
(E) It is time to take half of radioactivity in the human body by physical decay and biological decay.

27. What is the semiconductor detector can be used on the normal temperature?
(A) Ge(Li)
(B) Si(Li)
(C) HPGe
(D) NaI(Tl)
(E) CdTe

28. Gas-filled radiation detector is changed their character from applied voltage. Which of following is correct for the lowest voltage region?
(A) GM region
(B) Recombination region
(C) Ionization region
(D) Limited Proportional region
(E) Proportional region

29. What is the most dangerous atom when it come inside human body?
(A) ^{3}H
(B) ^{51}Cr
(C) ^{90}Sr
(D) ^{226}Ra
(E) ^{99m}Tc

30. Which of the following is true for dose limitation of radiation workers?
(A) Dose limit is defined the maximum value of a radiation dose for the external exposure.
(B) Dose limit is defined the maximum value of a radiation dose for the internal exposure.
(C) Effective dose limit of the radiation worker is 50 mSv per 3 years, but cannot exceed 20 mSv per year.
(D) Effective dose limit of the radiation worker is 100 mSv per 5 years, but cannot exceed 20 mSv per year.
(E) Effective dose limit of the radiation worker is 100 mSv per 5 years, but cannot exceed 50 mSv per year.

31. Which is the correct measurement technique for the radioactive measurement?
(A) Defined solid angle method
(B) Liquid scintillation counting method

(C) Coincidence counting method
(D) 2π counting method
(E) 4π counting method

32. Which is the temporary sterilization dose for exposure on a genital gland?
(A) 1 ~ 2 Gy
(B) 2 ~ 4 Gy
(C) 4 ~ 6 Gy
(D) 6 ~ 8 Gy
(E) 0.1 ~ 0.5 Gy

33. Which is the correct period that cause decline in intelligence of an embryo by radiation exposure?
(A) Pre-natal period
(B) Post-implantation period
(C) Pre-implantation period
(D) After delivery
(E) Organogenic period

34. Which of following explanation for Hufet(Human Embryo and Fetus)?
(A) Hypoplasia can be occurred in every pregnancy states.
(B) Radiation exposure hardly effects Hufet.
(C) Hufet has many cell divisions, so that is insensible in radiation.
(D) For Hufet, focus on stochastic effects more than deterministic effects.
(E) Embryo death mainly occurs by radiation exposure in organogenic period

35. What is used for PET or PET/CT due to no delay of output signal?
(A) BGO
(B) SI (Li)
(C) CsI (Na)
(D) NaI (Tl)
(E) ZnS (Ag)

36. What is the correct flow of energy unit from low to high?
(A) 1 erg < 1 eV < 1 J < 1 cal
(B) 1 cal < 1 J < 1 erg < 1 eV
(C) 1 eV < 1 cal < 1 J < 1 erg
(D) 1 eV < 1 erg < 1 J < 1 cal
(E) 1 J < 1 cal < 1 erg < 1 eV

37. Which dose is the same unit as Kerma?
(A) Exposure dose
(B) Absorbed dose
(C) Dose equivalent
(D) Effective dose
(E) Committed dose

38. Which is the correct explanation for the exposure dose?
(A) The value of dose equivalent multiplied by tissue weighting factor

(B) The dose when there is energy absorption of 1 J / 1 kg
(C) The value of average absorbed dose multiplied by radiation weighting factor
(D) The dose when there is energy absorption of 1 erg / 1 kg
(E) Gamma ray or X-ray dose when it produce electronic charge of 2.58 x 10-4 Coulomb in air of 1 kg

39. Choose the correct scatter angle which is received the greatest energy to recoil electron by Compton effect?
(A) 0°
(B) 45°
(C) 90°
(D) 120°
(E) 180°

40. What is the applying dose when calibrating radiation counter?
(A) Absorbed dose
(B) Exposure dose
(C) Effective dose
(D) Equivalent dose
(E) Committed dose

41. What radiation is that the parent nuclide emits the daughter nuclide with an electron capture?
(A) Alpha-ray
(B) Beta-ray
(C) Neutrino
(D) Anti-neutrino
(E) Infra-red

42. Which is the correct explanation for an atom's energy level?
(A) Atom's excitation is unstable.
(B) K-edge's energy level is highest.
(C) Photon is emitted when the atom moves ground state to excited state
(D) When the electron is far from nucleus, the bigger the binding energy with nucleus.
(E) Atom's orbital has continuous energy state in Bohr's atom model.

43. What is the element that has a different number of composed neutrons, but the same number of protons, and atomic number and chemical characteristics?
(A) Rare-earth element
(B) Isomer
(C) Isotone
(D) Isobar
(E) Isotope

44. Which is the true about TLD?
(A) It is not reusable.
(B) It is possible to permanent preserve the report.

(C) Amount of thermoluminescence is inverse ratio to absorbed dose in the organization.
(D) It cannot measure equivalence dose with combined filter.
(E) It is reusable by recovering to primary stage with heating, cooling process.

45. Which period is the highest radiation sensibility in the cell cycle?
(A) S phase
(B) M phase
(C) Inter-phase
(D) G1 phase
(E) G2 phase

46. Which of the following is a correct condition of radioisotope clinically?
(A) Chemical toxicity
(B) Useful and short half-life
(C) Must not be take easily
(D) Must be difficult to chemical separation
(E) Release radiation about characteristic right to use

47. What is the correct character for scintillation matter in scintillation detector?
(A) It is not easy to detect light
(B) Transition of excited electronic will happen as needed
(C) Light output is inversely proportional to incident radiation
(D) Charged particle of kinetic energy has to have heat efficiency.
(E) The reflection rate of the substance should be similar to glass.

48. Which sentence is the correct answer?
(A) The Auger electron emission occurs from the atom of lower atomic number generally.
(B) The summation of every fraction of the composition of internal conversion electron factor.
(C) The internal conversion competitively occurs with characteristic X-ray radiation
(D) The internal conversion normally occurs in external orbital electron
(E) The internal conversion electron has continuous spectrum.

49. What is called to be natural decreased radiation value in radiation source?
(A) Contamination
(B) Equilibrium
(C) Decay
(D) Absorption
(E) Reflection

50. What is the correct answer?
(A) Proton is heavier than neutron.
(B) Neutron’s mass is bigger than proton’s mass.
(C) Substance’s mass decreases when its velocity is close to the velocity of light.
(D) Neutron’s stopped mass is almost same as 1840 times of proton’s mass.
(E) Nuclear force is the force between a nucleus and a electron.

51. What is the nuclide for the smallest binding energy per a nucleon?
(A) H-1
(B) He-4
(C) C-12
(D) -16
(E) Fe-56

52. What is the representative chronic disorder for the deterministic effect caused by radiation exposure?
(A) Cancer
(B) Leukemia
(C) Cataract
(D) Heredity defect
(E) Inflammatory erythema

53. Which of the following is a correct guiding principle of radiation detector?
(A) Ionizing chamber – Electron avalanche
(B) GM counter - Solid ionization
(C) Chemical dosimeter – Changing of material
(D) Semiconductor detector - Nuclear reaction
(E) Proportional counter – Excitation of gas

54. What is the detector which should be refrigerated by using fluid nitrogen for keeping?
(A) BGO scintillation
(B) Ge(Li) semiconductor detector
(C) Li drift semiconductor detector
(D) Si surface barrier semiconductor detector
(E) HPGe detector

55. Which of the following is correct?
(A) GM counter is used for measuring α-ray and γ-ray.
(B) W-value of semiconductor detector is around 29~36 eV.
(C) HPGe semiconductor detector is not needed cooling to use.
(D) Usually surface barrier semiconductor detector is used for measuring γ-ray.
(E) A degree of γ- ray detection efficiency is proportioned to atomic number.

56. What is the effect that little amount of radiation exposure expedite the physiological activity and beneficial effect?
(A) Adjustment reaction
(B) Spectator effect
(C) Stochastic effect
(D) Heredity instability
(E) Radiation hormesis

57. Which is most quickly effected when human is exposed by gamma ray?
(A) Lymphocyte
(B) Granulocyte
(C) Hemoglobin

(D) Platelet
(E) Matured red blood cell

58. Which of the following is correct radioisotope for smog sensor of fire monitoring?
(A) 14C
(B) 90Sr
(C) 131I
(D) 18F
(E) ^{241}Am

59. Which is the effect that the cell which can be die under normal condition restores when preserve a specific condition?
(A) Dilution effect
(B) Recombinational repair
(C) SLD restoration
(D) PLD restoration
(E) Chemical protection effect

60. Which is the correct range of specific binding energy when it has bigger than 15 mass number?
(A) 1 ~ 3 MeV
(B) 3 ~ 5 MeV
(C) 5 ~ 6 MeV
(D) 7 ~ 8 MeV
(E) 8 ~ 10 MeV

61. Which is the highest threshold value in deterministic effect? (The condition is limited 1 time exposure only)
(A) Alopecia
(B) Bone marrow death
(C) Cataract
(D) Erythema
(E) Sterilization in the male

62. Which is the correct explanation for genital and fetus exposure?
(A) Sterilization is the result of cell mutant.
(B) Because prenatal period is stable, radiation hardly effects a fetus.
(C) There is no sense to decline an intelligence in a fetus from a radiation exposure.
(D) The Embryo death is the result from a radiation exposure in an organogenic period.
(E) In case of the malformation, it is from an exposure in organogenic period, but there is a possibility from parent's exposure.

63. Which unit is SI unit and considered with biological effect?
(A) Bq
(B) Gy
(C) Sv
(D) rem
(E) J/kg

64. If the substance of 1 kg is absorbed energy of 1 Joule, which is the correct value for the substance's absorbed dose?
(A) 1 rad
(B) 10 rad
(C) 100 rad
(D) 1,000 rad
(E) 10,000 rad

65. Which is the correct answer for the unit of man-Sv in radiation protection?
(A) Collective dose
(B) Committed dose
(C) Dose equivalent
(D) Effective dose
(E) Committed effective dose

66. Which is the most correct answer in radiation?
(A) The decay constant is the probability that 1 atomic nucleus is decayed in an unit time.
(B) The half-life is 1.44 times of mean-life.
(C) The decay constant is great, the radionuclide is slowly decayed.
(D) The half-life is theoretically longer than mean-life
(E) The nuclide is stable when half-life is shorter

67. Which sentence is correct answer?
(A) The electron number is 28 that is able to fill up as far as M edge in the atom.
(B) The binding energy is fixed with 7~8 MeV regardless the nuclide.
(C) When get a new nucleus B from the collision between an accelerated proton and a target nucleus A, the generated nucleus is the isotone of the target nucleus.
(D) If the mass number, the specific binding energy is increased.
(E) The nuclide which has greatest specific binding energy is C-12.

68. Which is the correct answer for the electron capture?
(A) emits a positron and characteristic X-ray
(B) emits neutrino and characteristic X-ray
(C) emits internal conversion electron at the same time
(D) Mass number is decreased by 4
(E) Atomic number is increased by 1

69. Which has a linear spectrum distribution?
(A) Neutrino from the electron capture
(B) Bremsstrahlung ray
(C) Electron-pair production
(D) Beta ray
(E) Compton scatter

70. What is the protection objective for the stochastic effect and deterministic effect?
(A) Stochastic effect reduction – Deterministic effect reduction
(B) Stochastic effect reduction – Deterministic effect protection

(C) Stochastic effect protection – Deterministic effect reduction
(D) Stochastic effect protection – Deterministic effect protection
(E) Stochastic effect interception – Deterministic effect reduction

71. Which is the correct pair for the radiation hazard that does not have threshold dose?
(A) Lung cancer and sterilization
(B) Life shortening and skin cancer
(C) Skin cancer and erythema
(D) Cataract and decline in intelligence
(E) Erythema and alopecia

72. Which is the dose limitation that recommended from ICRP60 and unescapable intervention for the prevention of accident expansion?
(A) Effective dose 200 mSv, Skin dose equivalent 2 Sv
(B) Effective dose 200 mSv, Skin dose equivalent 5 Sv
(C) Effective dose 300 mSv, Skin dose equivalent 2 Sv
(D) Effective dose 500 mSv, Skin dose equivalent 2 Sv
(E) Effective dose 500 mSv, Skin dose equivalent 5 Sv

73. Which is the most correct measurement method for internal deposited area among the external contamination measurement method?
(A) Smear method
(B) External measurement
(C) Survey method
(D) Bioassey method
(E) Airborne radioactivity density measurement

74. What is the specificity in the bioassay method for the internal radioactivity contamination measurement?
(A) The error of an internal exposure dose is small.
(B) Correct internal contamination dose can be measure.
(C) Internal radiation can be measured on the outside of human directly.
(D) It can measure every nuclides including α and β ray emitter
(E) Human needs a shower because distinct internal and external contamination before bioassay method.

75. Which is the correct answer for the fundamental rules of radiation protection?
(A) Justification of action, Optimization of protection, Dose limits
(B) Justification of action, Dose limits, Prevention of deterministic effect
(C) Optimization of protection, Dose limits, Prevention of deterministic effect
(D) Dose limits, Prevention of deterministic effect, Minimization of stochastic effect
(E) Justification of action, Prevention of deterministic effect, Minimization of stochastic effect

76. Which is the correct method for capture I-131 as air radioactive materials?
(A) Cold trap
(B) Paper fiber
(C) Ion chamber

(D) Filtration scavenging
(E) active carbon cartridge

77. If the distance from radioactive source become 4 times long, what is the correct exposure dose at the same time?
(A) 4 times
(B) 8 times
(C) 16 times
(D) 1/4 times
(E) 1/16 times

78. When controlled a radioactive source using forceps or tong in radiation working, which category of radiation protection does it cover?
(A) Reduce the working hours for an exposure reduction
(B) Keep away from a radiation source
(C) Reduce the density of the a radioactive source
(D) Block the radioactive materials for an exposure reduction
(E) Maintain a shielding state from the radioactive source

79. Which is the dose limit for the acute radiation workers who are committed to radiation accident site?
(A) 0.5 mSv
(B) 1 mSv
(C) 5 mSv
(D) 10 mSv
(E) No limitation

80. What is the measurement principle for the semiconductor detector?
(A) Track detection
(B) Physical damage
(C) Solid ionization
(D) Fluorescence
(E) Nuclear fission

81. What is the objective to add halogen or organic gas in GM counter?
(A) Prevention of occurrence the electron avalanche from a negative ion
(B) Exterior insulation
(C) Prevention of occurrence the secondary electrons from a positive ion
(D) Energy division of incidence radiation
(E) Dead time reduction

82. Which is the correct answer for the deterministic and stochastic effect?
(A) For stochastic effect, a radiation exposure dose is in proportion to a severity.
(B) For deterministic effect, a radiation exposure dose is not effected from a severity.
(C) Deterministic effect cannot be perfectly prevent because of a natural occurrence probability.
(D) There is a difference from a severity because of the difference of sensitivity of exposed person in the deterministic effect.
(E) Since the deterministic effect has a threshold dose, if the dose is kept below the

threshold dose, the incidence can be limited to acceptable level.

83. Which is the correct answer for a common feature GM counter and proportional counter?
(A) Applied voltage
(B) Kind of extinction gas
(C) Operating voltage
(D) Principle of measurement
(E) Energy division

84. What is the precondition for applying an exposure dose?
(A) It is applied for every radiation.
(B) The interactive targets for the light particle is always the material.
(C) Outflow electron energy is always smaller than inflow electron energy
(D) It needs a charged particle equilibrium
(E) The energy of light particle must be over 3 MeV.

85. Which is the correct answer for the specificity of the deterministic effect from radiation exposure?
(A) The most symptom is expressed as chronicity.
(B) It appears from the cell mutant.
(C) The representative example is cancer and leucosis.
(D) The symptom is ambiguous that it occurs from radiation.
(E) The deterministic effect can be prevent when exposure dose preserves under threshold dose.

86. Which organ has the lowest radiation sensibility?
(A) Spermatogonium
(B) Intestinal epithelial cell
(C) Matured lymphocyte
(D) Cutaneous basal cell
(E) Cerebral cortical cell

87. What is the detector using lowest applied voltage among the air ionization detector?
(A) Proportional counter
(B) GM counter
(C) GaAs
(D) LiI(Eu)
(E) Ionization chamber

88. What is the reason for cooling of semiconductor detector?
(A) Prevention of damage from external impact
(B) Prevention of thermal ionization from the normal temperature
(C) Depletion layer expansion
(D) Maintenance of high voltage
(E) work function reduction

89. What is the phenomenon that the exposed gamma ray gives its energy to the

electrons in the atoms and become extinct itself?
(A) Compton scatter
(B) Electron-pair production
(C) Triple-electon production
(D) Photo-electric effect
(E) Photonuclear reaction

90. What is the major phenomenon when exposure 200 mGy to the embryo in preimplantation period?
(A) Malformation
(B) Embryonic death
(C) Decline in intelligence
(D) Heritable defect
(E) Congenital atrichia