

Radiation Detector 2018/19 (SPA6309), Homework 5

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Name: ID:

[1] Order following particles (A, B, C, D) from light to heavy

- A. Higgs boson
- B. electron
- C. hydrogen atom
- D. muon

[2] Order following particles (A, B, C, D) from short-lived to long-lived

- A. proton (uud)
- B. neutron (udd)
- C. π^- meson ($\bar{u}d$)
- D. B^+ meson ($u\bar{b}$)

Choose one from the list (A, B, C, D) for the following questions

[3] Choose one particle which is NOT a lepton

- A. muon
- B. electron
- C. tau neutrino
- D. Lambda

[4] Choose one particle which is NOT a hadron

- A. proton
- B. neutron
- C. pion
- D. tau

[5] π^- ($\bar{u}d$) meson decays to a muon and a muon antineutrino ($\pi^- \rightarrow \mu^- + \bar{\nu}_\mu$). This decay is most likely mediated by the

- A. strong force
- B. electromagnetic force
- C. weak force
- D. equal probability with all of above

[6] A muon with unknown energy passes through a detector filled with a liquid scintillator ($\sim 1\text{g/cm}^3$). The total measured energy is 1 GeV. Then the total energy of the muon is

- A. 1 GeV
- B. 1 GeV or higher
- C. 1 GeV or lower
- D. No idea

[7] The main energy loss of any very high energy particle is

- A. Photo-electric effect
- B. ionization
- C. Bremsstrahlung
- D. Compton scattering

[8] Choose the most UNSUITABLE material to stop an electromagnetic shower

- A. Lead bricks
- B. Iron plate
- C. Polymer sheet
- D. Tungsten-based glass

[9] A certain random phenomenon is measured to happen 100 times a year. Assuming the Poisson distribution, the statistical error of this phenomena in a year is

- A. Negligible
- B. 1
- C. 10
- D. 100

[10] Choose one distribution which is always symmetric

- A. Binomial distribution
- B. Poisson distribution
- C. Gaussian
- D. all of these

[11] Choose one INCORRECT statement about a 1-dimensional histogram of measured data of a quantity by a detector

- A. Y-axis shows the number of events
- B. It may not describe the true distribution of the quantity, without correcting biases introduced by the detector
- C. Usually, there is only one peak
- D. It is usually a wider distribution than the true distribution of the quantity

[12] Choose one component which is an important part of a coaxial cable

- A. Shield
- B. Insulator
- C. Conductor
- D. All of these

[13] The signal delay of the signal in a typical 50Ω coaxial cable is

- A. 1 ns/m
- B. 5 ns/m
- C. 1 μ /m
- D. 5 μ /m

[14] Which operation has to be applied to signals from 2 radiation detectors if one wants to make a trigger signal from a coincidence.

- A. Amplification
- B. Discrimination
- C. Adding delay to adjust the timing
- D. All of these

[15] 2 logic signals "X" and "Y" go into a device. The function of this device is "AND", then the outgoing signal is

- A. $X = Y$
- B. $X \propto Y$
- C. $X \cap Y$
- D. $X \cup Y$

[16] Choose one which has the highest quality factor

- A. alpha-ray
- B. beta-ray
- C. gamma-ray
- D. X-ray

[17] The annual radiation limit for a radiation worker is

- A. 20 mCi
- B. 20 mBq
- C. 20 mGy
- D. 20 mSv

[18] Please start to think about your report topic radiation detector

- A. Yes
- B. No

solution

[1] B,D,C,A [2] D.C.B.A [3] D [4] D [5] C [6] B [7] C [8] C [9] C [10] C [11] C [12] D [13] B
[14] D [15] C [16] A [17] D [18] A