Activity 1 Multiple Choice Questions

1. $^{226}_{88}Ra$ represents an atom of radium. How many particles are there in the nucleus of this atom?

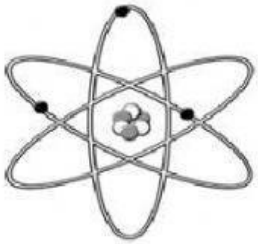
A. 88 B. 138 C. 226 D. 314

2. $^{235}_{92}U$ represents one of the isotopes of uranium.

How many neutrons are there in the nucleus of the isotope?

A. 92 B. 143 C. 235 D. 327

3. The diagram represents an atom.

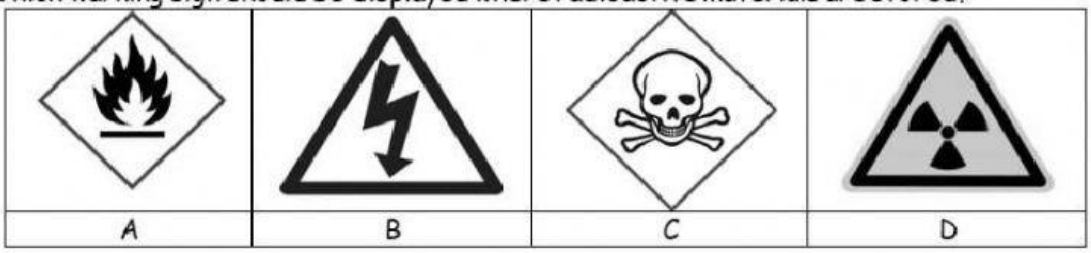


	electrons	Neutrons	Protons
A	nucleus	orbits	nucleus
B	nucleus	orbits	orbits
C	orbits	nucleus	nucleus
D	orbits	nucleus	orbits

4. A neutral atom has 10 protons and 12 neutrons. How many electrons does it have?

A. 0 B. 2 C. 10 D. 12

5. Which warning sign should be displayed where radioactive materials are stored?



A	B	C	D

5. Which statement about the numbers of particles in a neutral atom is correct?

A. number of protons = number of electrons
B. number of protons = number of neutrons
C. number of protons = number of electrons = number of neutrons
D. number of protons + number of neutrons = number of electrons

6. How is the nucleon number (mass number) of an atom calculated?

A. electron + neutrons + protons
B. protons + electrons
C. protons + neutrons
D. protons only

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7. Which collection of protons, p, neutrons, n, and electrons, e, could be an ion with a single positive charge?

A. 2p 2n 2e B. 3p 4n 2e C. 4p 5n 5e D. 11p 12n 12e

8. An isotope of uranium can be represented by $^{235}_{92}U$. Which row lists the number of electrons, neutrons and protons from a neutral atom of the uranium isotope?

	Electrons	Neutrons	Protons
A	92	143	235
B	92	92	143
C	92	143	92
D	143	92	92

9. What does the nucleus of an atom contain?

A. electrons and neutrons
B. neutrons and protons
C. neutrons and protons
D. neutrons only

10. What is the source of energy in a nuclear power plant?

A. combustion B. electrolysis C. fission D. fusion

11. Which of the following makes use of a fission reaction?

A. atomic power plant
B. a coal-fired power plant
C. cobalt-60 in cancer treatment
D. the sun

12. To prevent fruit from rotting which of the following nuclear radiations are used?

A. alpha B. beta C. gamma D. alpha and beta

13. Plutonium-234 is an alpha-emitting radioactive isotope. Which describes the radiation given out by the isotope?

A. the nuclei of helium atoms
B. high frequency electromagnetic radiation
C. neutrons from a shell
D. electrons from an atomic nucleus

14. What is the function of the moderator in a nuclear fission reactor?

A. to absorb neutrons
B. to cool the reactor
C. to slow down neutrons
D. to increase the number of neutrons produced

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15. Which of the following is used to detect radioactivity?

A. Van de Graff generator
B. Voltmeter
C. Galvanometer
D. Geiger-Müller tube

16. Which of the three types of radioactive radiation carry electric charge?

A. both alpha and gamma
B. beta only
C. both alpha and beta
D. both beta and gamma

17. The scattering of alpha particles by gold foil suggest that

A. an atom consists of electrons buried in a positive mass
B. gold atoms have a large negative charge
C. alpha particles move very slowly
D. there must be a positive charge in the nucleus of the atom

18. Two nuclides have the symbols ${}^{19}_{9}F$ and ${}^{39}_{19}K$. Which statement is true?

A. a nucleus of F has twice the mass number as a nucleus of K
B. a nucleus of K has twice as many protons as a nucleus of F
C. a nucleus of K has twice as many neutrons as a nucleus of F.
D. a nucleus of K has twice as many electrons as a nucleus of F

19. A nuclide is represented as ${}^{144}_{60}\mathrm{Nd}$. The number of neutrons in this nuclide is

A. 60 B. 84 C. 144 D. 204

20. Which list shows radiation in order of decreasing penetrating power?

A. $\gamma\beta\alpha$ B. $\gamma\alpha\beta$ C. $\beta\gamma\alpha$ D. $\alpha\beta\gamma$

21. Which of the following list nuclear radiations in order of increasing penetrating power?

A. $\gamma\beta\alpha$ B. $\gamma\alpha\beta$ C. $\beta\gamma\alpha$ D. $\alpha\beta\gamma$

22. Paper coming out of a photocopier sometimes carries a negative charge which makes it stick to things. A radioactive source has been used to reduce this charge, as shown in the diagram.



Which type of source will be most effective in reducing the negative charge?

A. α particle
B. γ ray
C. β particle
D. neutron

23. Which of the three types of ionizing radiation α, β, and γ are charged particles?

A. All of them
B. α and γ only
C. α and β only
D. β and γ

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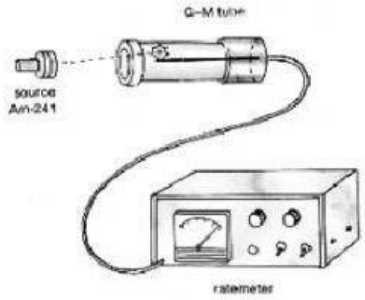
24. Which of the following list the types of radiation in the order of increasing ionising ability?

A. alpha, gamma, beta
B. beta, alpha, gamma
C. alpha, beta, gamma
D. gamma, beta, alpha

25. Which type of radiation can be stopped by a sheet of paper?

A. α-particle
B. β - particle
C. γ -rays
D. X-rays

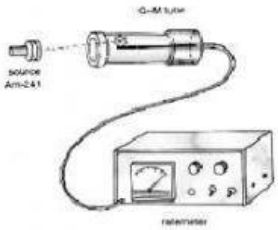
26. A radiation detector is placed near a sample of radioactive material and is used to measure the count rate.



The radioactive material is removed but there is still a count rate. Why is this?

A. It takes a long time for all of the emissions from the material to reach the detector.
B. The detector has become radioactive.
C. The radioactive material has not finished decaying.
D. There is always some background radiation.

27. A thin sheet of paper is placed between a radioactive source and a detector. The count rate falls to a low reading.

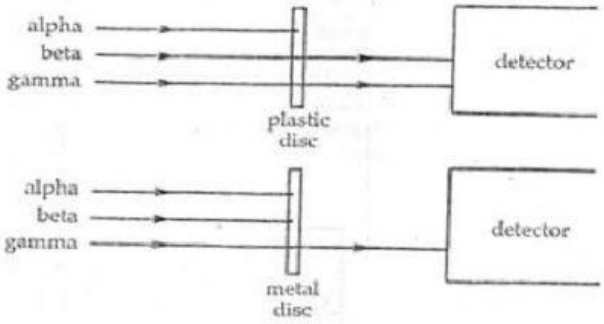


What type of radiation is the source emitting?

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

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28 The diagram shows which types of radiation can pass through discs made from plastic and metal to reach a detector.



Which type or types of radiation could be used to tell the difference between a plastic disc and a metal disc?

A. alpha only
B. either alpha or beta
C. beta only
D. gamma ray

29. An alpha-emission source is used in an attempt to kill cancer cells in the lung by directing a beam of alpha-particles at the chest.

Why is this not suitable?

A. Alpha particles will pass straight through the body.
B. Alpha particles will cause too much damage to the skin.
C. Alpha particles will not pass through skin.
D. Alpha particles are too dangerous.

30. The nucleus of a radioactive atom gives out an α-particle. What happens to the number of protons in the nucleus?

A. It goes up by one.
B. It stays the same.
C. It goes down by two.
D. It goes down by four.

31. The nuclide $^{90}_{38}Sr$ decays to $^{90}_{39}Y$. How does this happen?

A. By emission of an alpha particle.
B. By emission of a beta-particle.
C. By gaining an electron.
D. By gaining a neutron.

32. A radioactive decay can be represented as shown below.

$$^{233}_{91}Pa \longrightarrow {}^{233}_{92}U$$

In this decay, the nucleus changes by

A. absorbing a neutron
B. emitting an alpha particle
C. absorbing a proton
D. emitting a beta particle

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33. The nuclide $^{216}_{84}Po$ decays to $^{212}_{82}Pb$. How does this occur?

A. emission of alpha particle
B. emission of beta-particle
C. emission of a neutron
D. emission of a proton

34. What happens to the number of protons in the nucleus after a radioactive atom gives out a β-particle?

A. it increases by one
B. it stays the same
C. it decreases by two
D. it decreases by four

35. A radioactive nucleus of an isotope emits a fast moving electron. How does the nucleus change in this decay?

A. number of protons increases by 2
B. number of protons increases by 1
C. number of protons stays the same
D. number of protons decreases by 2

36. Mo-99 decays into Tc-99 as shown in the equation.

$$^{90}_{42}Mo \longrightarrow {}^{90}_{43}Mo + {}^{0}_{-1}X$$

What is X ?

A. a neutron
B. an alpha particle
C. a beta particle
D. a gamma ray

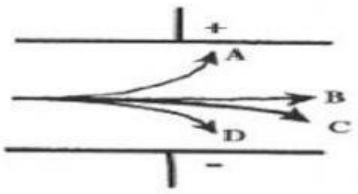
37. A radioactive decay can be represented as shown.

$$^{226}_{88}Mo \longrightarrow {}^{226}_{86}Mo + X$$

What is X ?

A. a neutron
B. a proton
C. an alpha particle
D. a beta particle

38. Which line in the diagram shows the path taken by beta particles passing between two charged plates?



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39. The table shows the variation of mass of a radioactive substance with time.

Mass of radioactive substance/g	1600	800	400	200	100
Time/minutes	0	6	12	18	24

What is the half-life of the substance?

A. 2 minutes B. 4 minutes C. 6 minutes D. 8 minutes

40. The table gives the variation of activity rate of a radioactive substance with time.

Activity rate/counts per minute	400	200	100	50	25
Time/minutes	0	8	16	24	32

What is the half-life of the substance?

A. 12.5 minutes B. 8 minutes C. 4 minutes D. 2 minutes

41. A sample of radioactive uranium has mass 1g. Another sample of the same material has mass 2g. Which of the following quantities is the same for both?

A. the amount of radiation emitted is the same for both.
B. the half life
C. the number of uranium atoms
D. the volume

42. The half-life of a radioactive material is 30 minutes. If a sample, initially, contain 480g of this material, how much will contain after 2 hours?

A. 240g B. 120g C. 60g D. 30g

43. The table shows the radioactive half-lives of different isotopes of iodine.

	Isotope	Half-life
A	Iodine 129	17 million years
B	Iodine 131	8.05 days
C	Iodine 132	2.3 hours
D	Iodine 136	83 seconds

Which isotope would most suitable to inject into someone's bloodstream to use as a tracer?

44. A radioactive source has a half life of 2 years. If a sample has an initial mass of 4 g how long will it take before only 0.5g remains?

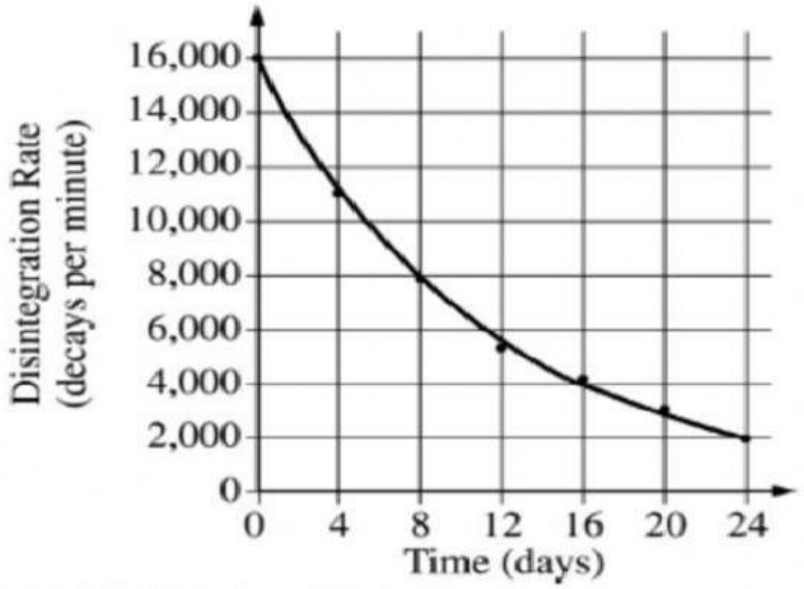
A. 1 year B. 2 years C. 3 years D. 6 years

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45. Medical imaging sometimes involves a radioactive isotope which is either injected intravenously or ingested orally.
Which describes two properties of such as isotope?
A. long half-life, alpha emitter
B. long half-life, gamma emitter
C. short half-life, alpha emitter
D. short half-life, gamma emitter

46. A radioactive source has a half life of 2 years. If a sample has an initial mass of 4g, how long will it take before only 0.5g remains?
A. 1 year B. 2 years C. 3 years D. 6 years

47. The graph shows how the count rate of a certain radioactive isotope changes with time.



What is the half-life of the radioisotope?
A. 4 days B. 8 days C. 16 days D. 20 days

Activity 1.2 Paper 2 Radioactivity

This question is about radioactivity. Gold has one stable isotope and 36 radioactive isotopes.

(a) One of the radioactive isotopes, Gold-198 decays by emitting a beta particle.

(i) Define the term isotope. [2]

(ii) Explain what happens in the nucleus when a beta particle is emitted. [2]

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