2025

(v) Which one of the following combinations is the correct **ascending order** of electromagnetic waves in terms of **wavelength**?

(a) gamma-rays, visible light, microwaves

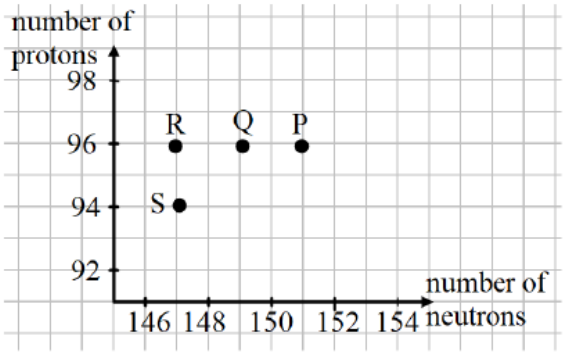
(b) microwaves, visible light, gamma-rays

(c) gamma-rays, microwaves, visible light

(d) microwaves, gamma-rays, visible light

(f) The nuclear radiation with **lowest** ionizing power is _____ $[\alpha / \beta / \gamma]$.

(vii) Curium is a radioactive element with the symbol $^{247}_{96}Cm$ named in honour of Madam Curie. The graph of **number of protons** vs **number of neutrons** for some elements are shown below: [3]



(a) Which point on the graph indicates the element *Cm*?

(b) Which point on the graph indicates daughter nucleus after *Cm* undergoes radioactive decay of 1 α followed by 2 β?

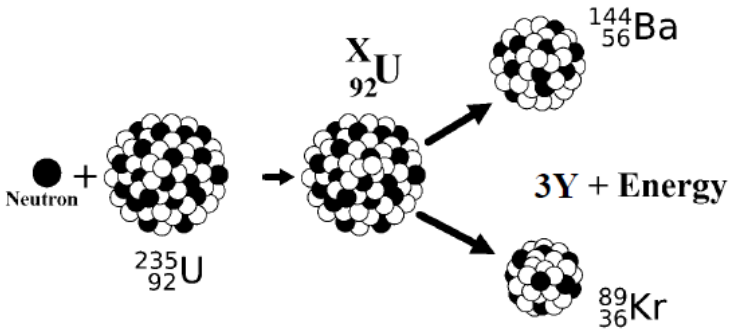
(c) State the mass number of the daughter nucleus.

(iii) (a) Name the **radiations**: [4]

1. for which a quartz prism is used to study the spectrum.
2. which are used in remote sensing devices.
3. which are used in traffic signals in India.

(b) Name **one** property **common** to all electromagnetic radiations.

(ii) Study the diagram given below and answer the questions that follow: [3]

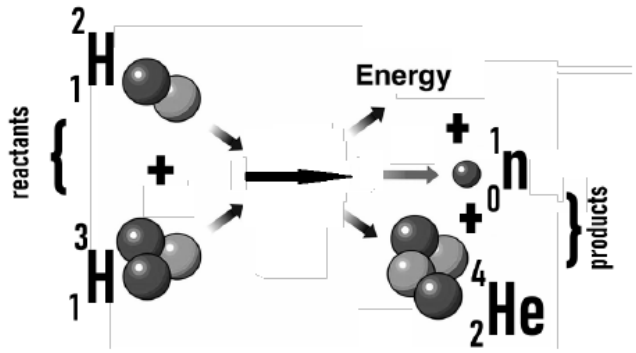


(a) Name the process depicted in the diagram.

(b) What is the value of **X**?

(c) Identify **Y**, the missing product of the reaction.

(ii) Study the diagram and answer the questions that follow: [3]



(a) Name the nuclear process displayed in the diagram.

(b) Is it possible to conduct this process at room temperature?

(c) Mass of reactants _____ mass of the products.

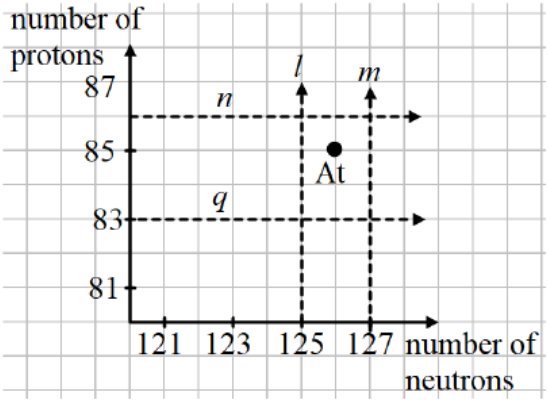
[Fill in the blank using <, > or =]

(iii) (a) Name the electromagnetic radiations which are used for **sterilising water** in a water purifier. [4]

(b) State any one property of the radiations mentioned by you in part (a).

(c) Why are the danger signals red in colour?

(vii) Astatine *(At)* is a radioactive element. Study the graph given below showing the number of protons vs the number of neutrons of radioactive nuclei. [3]



(a) Identify the mass number of the nucleus Astatine *(At)*.

(b) Which line on the graph *(l, m, n, or q)* will never pass through the position of the daughter nuclei, regardless of **any number** of α, β, or γ emissions?

(c) Give a reason for your choice in (b).

(f) In a nuclear reactor, the **fission** reaction is initiated by bombardment with _____ *[a proton / a neutron / an α particle]*.

(xv) During β emission the parent and daughter nuclei will be:

(a) isomers

(b) isotopes

(c) isotones

(d) isobars

(iii) 10 eV is _____.

(a) 1.6×10^{-18} J

(b) 1.6×10^{-19} J

(c) 6.25×10^{19} J

(d) 6.25×10^{18} J

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(iv) A radioactive nucleus containing 128 **nucleons** emits a β – particle. After β – emission the number of **nucleons** present in the nucleus will be:

(a) 128

(b) 129

(c) 124

(d) 127

(v) **Assertion (A):** Ultraviolet radiations are scattered more as compared to the microwave radiations.

Reason (R): Wavelength of ultraviolet radiation is more than the wavelength of microwave radiation.

(a) Both A and R are true.

(b) A is true but R is false.

(c) A is false but R is true.

(d) Both A and R are false.

(xiii) A radioactive element is placed in an evacuated chamber. Then the rate of **radioactive decay** will:

(a) Decrease

(b) Increase

(c) Remain unchanged

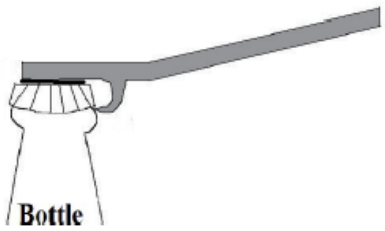
(d) Depend on the surrounding temperature

Question 2

(i) (a) In the following atoms, which one is a radioisotope? Give *one* use of this isotope. [3]

O^{16}, C^{14}, N^{14}, He^{4}

(b) Name the class of the lever shown in the picture below:



(v) Copy and complete the nuclear reaction by filling in the blanks. [2]

$$_{92}U^{235} + {}_{0}n^{1} \longrightarrow {}_{56}Ba^{---} + {}_{--}Kr^{92} + 3\ {}_{0}n^{1}$$

(ii) Below is an incomplete table showing the arrangement of **electromagnetic spectrum** in the increasing order of their wavelength. Complete the table. [3]

Gamma ray	X – ray	U V rays	Visible rays	Infrared	**A**	Radio waves

(a) Identify the radiation **A**.

(b) Name the radiation used to detect fracture in bones.

(c) Name *one* property common to both **A** and Radio waves.

(ii) (a) Complete the following radioactive reaction: [3]

$$_{-}^{-}\boldsymbol{X} \rightarrow \boldsymbol{Y}_{\square}^{\square} + {}_{2}^{4}\boldsymbol{He} \rightarrow {}_{91}^{234}\boldsymbol{Z} + {}_{-1}^{o}\boldsymbol{e}$$

(b) Uranium is available in two forms U-235 and U-238. Which of the two isotopes of Uranium is **more** fissionable?

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(iv) Which of the following radiations suffer maximum deflection in a magnetic field?

(a) Alpha radiations

(b) Beta radiations

(c) Gamma radiations

(d) X-radiations

Question 2

(i) (a) When does the nucleus of an atom tend to become radioactive?

(ii) (a) Complete the following nuclear changes: [3]

$$^{238}_{92}P \rightarrow \_\_Q + {}^{4}_{2}He \rightarrow \_\_R + {}^{0}_{-1}e$$

(b) Name the nuclear radiation which has the highest ionizing power.

(iii) We are able to see the T.V. channels clearly when we set T.V. on *auto-tuning*. [4]

(a) Which *phenomenon* led to the clear visibility of the channels, due to auto-tuning?

(b) Define the above phenomenon mentioned by you.

(c) Give *any one* more example of this phenomenon.

(ii) (a) Which nuclear radiation will travel undeviated in an electric field? [3]

(b) How can one stop the radiations escaping from a nuclear reactor in a nuclear power plant?

(c) Name *one* internal source of background radiations.

(ix) The heaviest nuclear radiation is

(a) x-radiation

(b) α-radiation

(c) γ-radiation

(d) β–radiation

(x) To study the age of excavated material of archaeological significance we study the rate of decay of an isotope of

(a) Uranium

(b) Cobalt

(c) Carbon

(d) Chlorine

(iii) (a) What is nuclear energy? [4]

(b) After emission of a nuclear radiation, the atomic number of the daughter nucleus increases by 1. Identify the nuclear radiation.

(c) Write a nuclear reaction indicating the nuclear change mentioned in (b).

(d) What is the special name given to the parent and daughter nucleus when this radiation is emitted?

(b) Complete the rewrite of the following nuclear reaction by filling in the blanks.

$$^{235}U \rightarrow +_{90}Th + {}^{4}_{2}He$$

(ii) A certain beam of α particles, β particles and γ radiations travel through a region of electric field produced between two oppositely charged parallel plates A(+) and B(–). [3]

(a) Which of the above three has the maximum speed?

(b) Which one deviates the most from its original path?

(c) Which one does not deviate at all when passing through a region of electric or magnetic field?

(d) A nucleus ${}_{84}X^{202}$ of an element emits an alpha particle followed by a beta particle. The final nucleus is ${}_{a}Y^{b}$. Find a and b. [2]

(b) (i) Differentiate between nuclear fusion and nuclear fission. [3]

(ii) State one safety precaution in the disposal of nuclear waste.

(c) An atomic nucleus A is composed of 84 protons and 128 neutrons. The nucleus **A** emits an alpha particle and is transformed into a nucleus **B**. [4]

(i) What is the composition of B?

(ii) The nucleus B emits a beta particle and is transformed into a nucleus C. What is the composition of C?

(iii) What is mass number of the nucleus A?

(iv) Does the composition of C change if it emits gamma radiations?

Question 2

(a) An electromagnetic radiation is used for photography in fog. [2]

(i) Identify the radiation.

(ii) Why is this radiation mentioned by you, ideal for this purpose?

(c) How does an increase in the temperature affect the specific resistance of a: [2

(i) Metal and

(ii) Semiconductor?

(d) (i) Why is a nuclear fusion reaction called a thermo nuclear reaction? [2]

(ii) Complete the reaction:

$$^{3}He_{2} + {}^{2}H_{1} \longrightarrow {}^{4}He_{2} + \ldots\ldots\ldots\ldots\ldots + \text{Energy}$$

(b) (i) Define nuclear fission. [3]

(ii) Rewrite and complete the following nuclear reaction by filling in the atomic number of Ba and mass number of Kr:

$$^{235}_{92}U + ^{1}_{0}n \longrightarrow ^{144}_{\ldots\ldots}Ba + ^{\ldots\ldots}_{36}Kr + 3\ ^{1}_{0}n + Energy$$

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(c) (i) What do you understand by the term nuclear fusion? [2]

(ii) Nuclear power plants use **nuclear fission** reaction to produce electricity. What is the advantage of producing electricity by **fusion** reaction?

(d) (i) What are isobars? [2]

(ii) Give one example of isobars.

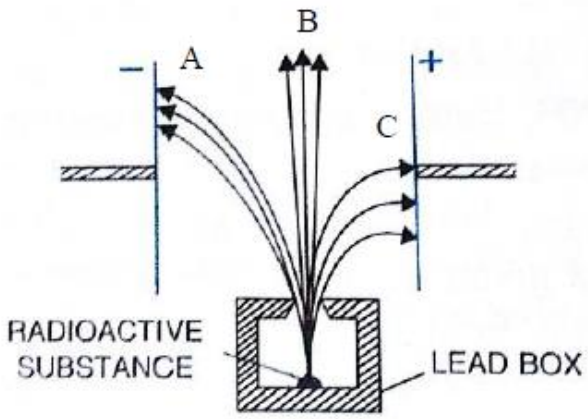
(b) The ore of Uranium found in nature contains $_{92}U^{238}$ and $_{92}U^{235}$. Although both the isotopes are fissionable, it is found out experimentally that one of the two isotopes is more easily fissionable. [3]

(i) Name the isotope of Uranium which is easily fissionable.

(ii) Give a reason for your answer.

(iii) Write a nuclear reaction when Uranium 238 emits an alpha particle to form a Thorium (Th) nucleus.

(c) Radiations given out from a source when subjected to an electric field in a direction perpendicular to their path are shown below in the diagram. The arrows show the path of the radiation A, B and C. Answer the following questions in terms of A, B and C. [4]



(i) Name the radiation B which is unaffected by the electrostatic field.

(ii) Why does the radiation C deflect more than A?

(iii) Which among the three causes the least biological damage externally?

(iv) Name the radiation which is used in carbon dating.

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Question 10

(a) Answer the following questions based on a hot cathode ray tube. [3]

(i) Name the charged particles.

(ii) State the approximate voltage used to heat the filament.

(iii) What will happen to the beam when it passes through the electric field?

(b) State three factors on which the rate of emission of electrons from a metal surface depends. [3]

(c) (i) What are free electrons? [4]

(ii) Why do they not leave the metal surface on their own?

(iii) How can they be made to leave the metal surface? (State any two ways)