AAFAQ ACADEMY KASUR

Physics Book II **Chapter 21(1) NEW** **Objective + Subjective**

NUCLEAR PHYSICS

Test Session 2014 – Name : _____ Roll No: (in words) _____
Group: _____ **Dated: March 10,2014**

OBJECTIVE

Note: Write your roll No. in space provided. Over-writing, cutting, erasing, using of lead pencils will result into loss of marks.

1. Encircle the correct answers. (10)

i. The chemical properties of any element depends upon
a) Number of isotopes
b) Number of isobars
c) Atomic mass
d) Atomic charge

ii. The binding energy per nucleon is
a) Greatest for heavy nuclei
b) Least for heavy nuclei
c) Greatest for light nuclei
d) Greatest for middle nuclei

iii. Gamma ray emission from the nucleus of an atom causes
a) Change in **A**
b) Change in **Z** only
c) Change in both **A** and **Z**
d) No change in **A** and **Z**

iv. The reciprocal of decay constant of a radioactive material is
a) curie
b) Half life
c) Mean life
d) Total life

v. The number of naturally occurring radioactive series are
a) Infinite
b) Zero
c) Four
d) Three

vi. Nuclear fission chain reaction is controlled by using
a) **Steel rods**
b) **Graphite rods**
c) **Cadmium rods**
d) **Iron rods**

vii. The source of sun energy is mainly due to
a) Fission
b) Fusion
c) Pair production
d) None of the above

viii. Moderators used in **LMFBR** fast reactor is
a) **Uranium - 234**
b) **Water**
c) **Sodium**
d) **Graphite**

ix. The minimum safe limit dose for a person working in a nuclear reactor is
a) **1 mSv per week**
b) **2 mSv per week**
c) **4 mSv per week**
d) **5 mSv per week**

x. The unit for the rate of absorption of radiation causing same biological effects on the human body is known as
a) **curie**
b) **rontgen**
c) **rem**
d) **joule**

SUBJECTIVE

Time: 50 min. **Marks: 20**

2. Write answer for each question. (2×6)

i. What %age fraction of a radioactive sample decays after four half – lives elapsed?
ii. Define absorbed dose and its units.
iii. Prove that 1 u = 931 MeV.
iv. What factors make fusion reaction difficult to achieve?
v. Describe a brief account of interaction of various types of radiation with matter.
vi. What do we mean by the term critical mass?
vii. If a nucleus has a half life of 1 year, does this mean that it will be completely decayed after 2 years? Explain.
viii. Why must a Geiger – Mueller tube for detecting α - particles have a very thin end window? Why does a Geiger – Mueller tube for detecting γ - rays not need a window at all?

3. Do as directed...

i. What is nuclear fission? (1)
ii. Describe different nuclear fission reactions. Also discuss controlled fission reaction. (4)
iii. A **75 kg** person receives a whole body radiation dose of **24 mrad**, delivered by alpha particles for which **RBE** factor is **12**. Calculate (a) The absorbed energy in **joules**, and (b) The equivalent dose in **rem**. (3)

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d) Both b and c

xx. Radioactive materials can be identified by measuring their
a) Density
b) Elasticity
c) Mass number
d) Half life

xi. The maximum safe limit dose for a person per year is
a) 1 mSv
b) 2 mSv
c) 3 mSv
d) None of the above

xii. Radiations used for the treatment of bone cancer are emitted from
a) Iodine – 131
b) Sodium – 24
c) Phosphorous – 32
d) Carbon – 14

xiii. γ - rays possess greater penetration power than that of α - particles due to its
a) Smaller ionizing power
b) Greater ionizing power
c) Neither greater or smaller ionizing power
d) Same ionizing power

xiv. Why γ - rays are used to kill bacteria, to sterilize surgical equipments etc?
a) Highly penetrating
b) Mass less
c) Charge less
d) All of the above

xv. Charge on α - particle is
a) + 1e
b) + 2e
c) − 2e
d) − 1e

xvi. β - particles can produce fluorescence in
a) Barium platinocyanide
b) Zinc sulphide
c) Calcium tungstate
d) All of the above

xvii. β - particles can ionize an atom
a) Through direct collision
b) Through electrostatic repulsion
c) Through electrostatic attraction
d) All of the above

xviii. CFC is used in
a) Aerosol sprays
b) Refrigeration
c) Plastic foam industry
d) All of the above

xix. Hadrons are
a) Elementary particles
b) Consist on elementary particles
c) Consists on baryons and mesons

SUBJECTIVE

Time: 50 min. **Marks: 36**

4. Write answer for each question. (2×10)

i. What %age fraction of a radioactive sample decays after four half – lives elapsed?
ii. Define absorbed dose and its units.
iii. Prove that 1 u = 931 MeV.
iv. What factors make fusion reaction difficult to achieve?
v. Describe a brief account of interaction of various types of radiation with matter.
vi. What do we mean by the term critical mass?
vii. If a nucleus has a half life of 1 year, does this mean that it will be completely decayed after 2 years? Explain.
viii. Why must a Geiger – Mueller tube for detecting α - particles have a very thin end window? Why does a Geiger – Mueller tube for detecting γ - rays not need a window at all?
ix. Discuss the advantages and disadvantages of fusion power from the point of safety, pollution and resources.
x. What are tracer techniques? Explain.

5. Do as directed...

i. Give common working principle of radiation detectors. (1)
ii. Describe the construction and working of **Geiger – Mueller** counter in detail. (5)
iii. The half life of $^{91}_{38}Sr$ is **9.70 hours**. Find its decay constant. (4)

6. Do as directed...

i. What is nuclear fission? (1)
ii. Describe different nuclear fission reactions. Also discuss controlled fission reaction. (5)
iii. A **75 kg** person receives a whole body radiation dose of **24 mrad**, delivered by alpha particles for which **RBE** factor is **12**. Calculate (a) The absorbed energy in **joules**, and (b) The equivalent dose in **rem**. (4)

Good Luck
Ch. Khalid Mahmood Ashraf