2008

PHYSICS

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

PAPER—PH 2103 A

Full Marks : 20

Time : 1 hour

(*Nuclear Physics*)

Answer **Q. No. 1** and any *one* from the rest

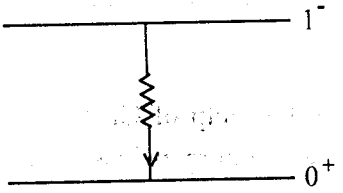
1. Answer any *five* bits : 2 x 5

(*a*) Write the examples of the following nuclei :

(*i*) $${}_{1}X^{A}_{2}\ ;\quad {}_{2}X^{A}_{1}$$

(*ii*) $${}_{Z}X^{A_1}_{N_1}\ ;\quad {}_{Z}X^{A_2}_{N_2}$$

(*b*) State the multipole characters (E-l, M-l) of γ-radiation emitted in the following transition with given spin-parity values:



(*c*) What do you mean by electric quadrupole moment of a nuclei?

(*d*) What do you mean by nuclear isomerism?

(*e*) A nucleus with mass number 120 undergoes α emission. Find the ratio of energy shared between the α particle and the daughter nuclei.

(*f*) Draw a block diagram of double focusing mass spectrometer for detection of isotopes.

(*g*) Explain the different modes at γ-emission.

2. Answer any *one* bit: 10 x 1

(*a*) Following Fermi's theory at beta decay find out the probability per unit time for the emission of an electron in the momentum range p_e and $p_e + d_{p_e}$. Explain what is Kurie plot. 8 + 2

(*b*) Explain with the help of Gamow theory, how α-particles with energies less than the hight of the potential barrier are emitted from a radioactive nucleus. 10

PAPER—PH 2103 B

Full Marks : 20

Time : 1 hour

(*Particle Physics*)

Answer **Q. No. 1** and any *two* from the rest

1. Answer any *three*: 2 x 3

(*a*) Calculate the value of coupling constant for weak force in N. U.

(*b*) How many generators are there in SU(2) gr. ? Write down the generators.

(*c*) Define Mandelstam variables and write their relationship.

(*d*) Prove that Schrodinger equation is invariant under time reversal operator.

(*e*) Explain spontaneous symmetry breaking in particle physics.

2. (*a*) Calculate the invariant mass for (π^+, p) system for Δ^{++} resonance.

(*b*) Charge conjugation invariance predicts that gr. state of Positronium $(e^+ e^-)$ can not emit two photons. Justify the statement. 5 + 2

3. (*a*) Write down GNN formula for quarks. Calculate the charges for *S* and *d* quarks by this formula.

(*b*) Define *G* parity. What is its value for π^+ . 5 + 2

4. (*a*) Prove that in SU (3)

$$3 \otimes 3 \otimes 3 = 10 \oplus 8 \oplus 8 \oplus 1 .$$

(*b*) Define structure constant in lie group and rank of a group. 5 + 2

5. (*a*) How intrinsic parity of π-meson is determined experimentally ?

(*b*) Explain parity non-conservation in K-meson decay. 4 + 3
