

C 5165

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Name.....

Reg. No.....

**FOURTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT)
EXAMINATION, MAY 2016**

(UG—CCSS)

Complementary Course

PH 4C 07—ELECTRICITY, MAGNETISM AND NUCLEAR PHYSICS

(2013 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Section A

I. Answer *all* questions. Each question carries a weightage of $\frac{1}{4}$:

Choose the correct alternative :

- 1 Two identical capacitors are joined in parallel, charged to a potential V , separated and then connected in series i.e., the positive plate of one is connected to the negative plate of the other. Then,
 - (a) The charges on the free plates connected together are destroyed.
 - (b) Charges on the free plates are enhanced.
 - (c) The energy stored in the system increases.
 - (d) The potential difference between the free plates is $2V$.
- 2 The binding energy of a nucleus is a measure of its _____.
 - (a) Stability.
 - (b) Mass.
 - (c) Charge.
 - (d) Size.
- 3 A parallel plate capacitor is charged and the battery is then disconnected. If the plates of the capacitor are moved further apart by means of insulating handles.
 - (a) The charge on the capacitor increases.
 - (b) The voltage across the plates increases.
 - (c) The capacitance increases.
 - (d) The electrostatic energy stored in the capacitor decreases.
- 4 The quark content of proton is :
 - (a) uud.
 - (b) udd.
 - (c) uds.
 - (d) uus.

Turn over

Fill in the blanks :

- 5 Nucleus with same mass number and different atomic number are called _____
- 6 Electric field due to a point charge is given by $E =$ _____ ?
- 7 Magnetic susceptibility of paramagnetic substance is _____ ?
- 8 The radius of a nucleus is given by the formula $R \approx$ _____ ?

Give one word answers :

- 9 The electron belongs to which class of elementary particles ?
- 10 Give an example of a particle accelerator.
- 11 What is the relationship between half life and decay constant ?
- 12 The angle made by the resultant earth's magnetic field with the horizontal is called ?

($12 \times \frac{1}{4} = 3$ weightage)

Section B

II. Answer all *nine* questions. Each question carries a weightage of 1 :

- 13 State and explain Coulomb's law.
- 14 Explain Meissner effect.
- 15 Distinguish between ferromagnetism and paramagnetism.
- 16 Find the radius of a nuclide of mass number 64, if the radius of a nuclide with mass number 27 is 3.6 fm.
- 17 Explain longitude effect in cosmic rays.
- 18 What is the use of a moderator in a fission reactor ? Name one moderator.
- 19 Explain how particles are accelerated in a linear accelerator.
- 20 Explain why electric field lines can never intersect.
- 21 Define temperature coefficient of resistance.

Section C

($9 \times 1 = 9$ weightage)

III. Answer any *five* questions. Each question carries a weightage of 2 :

- 22 Define drift velocity. Obtain the relation between electric current and drift velocity.
- 23 State the theory of tangent galvanometer ? How can it be used to find the horizontal component of earth's magnetic field ?
- 24 Name the different types of quarks and list their charge, spin and strangeness. Also explain the concept of colour and flavour of quarks.
- 25 Relative abundance of the two isotopes of Uranium, ^{238}U and ^{235}U in natural uranium is 99.3% and 0.7% and their half life periods are 4.5×10^9 and 7×10^8 years respectively. Estimate the age of earth.

- 26 Using Gauss's law, find the electric field at a point due to an infinite plane sheet of uniform charge density.
- 27 Explain nuclear fusion. Write a note on fusion reactors.
- 28 Define capacitance of a capacitor. Derive the expression for the capacitance of an arrangement having two parallel plates of area A separated by a distance d in air. What will be the change in capacitance if the area of the plates is doubled?

(5 × 2 = 10 weightage)

Section D

[V. Answer any *two* questions. Each question carries a weightage of 4 :

- 29 Explain, with circuit diagram and necessary theory, how the resistance of a wire can be determined using a potentiometer.
- 30 Describe the working principle of a deflection magnetometer. Discuss, with necessary theory, the experiment to determine the moment of a bar magnet using deflection magnetometer in the tan A position.
- 31 Discuss the classification of elementary particles.

(2 × 4 = 8 weightage)