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Part III — FOUNDATION SCIENCE

(Common to Medical Laboratory Assistant, Nursing Course, Hospital Housekeeping, Ophthalmic Technician, Physiotherapy and Dental Hygienist)

(English Version)

Time Allowed : 3 Hours]

[Maximum Marks : 150

Note : Each Section carries 75 marks.

- Instructions :
- i) Answer the questions in *two subjects only* in the Foundation Science, leaving out the subject chosen under related Subjects.
 - ii) Candidates should answer the *two* Subjects in *separate* answer-books indicating the name of the Subject.

SECTION - A

(CHEMISTRY)

(Marks : 75)

- I. Answer any *four* of the following : 4 × 5 = 20
1. State and Explain Henry's law. Briefly explain its applications.
 2. Explain Lowry and Brønsted theory of acids and bases with suitable examples.

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3. What are colligative properties ? Explain them giving one example of each.
4. Define solubility product. Explain with any two of its applications.
5. State the postulates of Arrhenius theory of electrolytic dissociation.

II. Answer any *three* of the following :

3 × 9 = 27

6.
 - a) Define osmosis and osmotic pressure.
 - b) Explain in detail how osmotic pressure of a solution is determined.
7.
 - a) Derive Henderson's equation.
 - b) Define pH. Explain the nature of pH of an acidic and a basic solution.
8. Explain the following reactions :
 - a) Kolbe's reaction
 - b) Reimer-Tiemann reaction
 - c) Gattermann reaction.
9. Give one example for each of the following reactions taking a suitable organic compound :
 - a) Decarboxylation
 - b) Esterification
 - c) Alkylation of an aromatic compound.

10. How are the following compounds prepared ?

a) DDT

b) TNT

c) GTN.

III. Answer any *two* questions of the following :

2 × 14 = 28

11. How are the following compounds synthesised ?

a) Sulphanilamide

b) Chloroform

c) Picric acid

d) Benzoic acid

e) Aspirin.

12. a) What are buffer solutions ? Give an example for a buffer solution.

b) Explain the buffer action of sodium acetate-acetic acid buffer.

c) Calculate the pH of a buffer mixture containing 0.1M NH_4OH and 0.4 M NH_4Cl . Given that K_B for NH_4OH is 1.8×10^{-5} .

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13. a) Illustrate optical isomerism choosing tartaric acid as an example.
- b) Give the structures of glucose and fructose.
- c) What are hormones ? Explain their functions.
14. Give the reasons for the following in one or two sentences each :
- a) The boiling points of carboxylic acids are higher than those of alcohols of same molecular weight.
- b) Carboxylic acids are more acidic than phenols.
- c) Formic acid reduces Fehling's solution but acetic acid does not.
- d) BF_3 is a Lewis acid while NH_3 is a Lewis base.
- e) Metals are good conductors of electricity.

SECTION - B**(PHYSICS)****(Marks : 75)**

I. Answer any *four* of the following questions :

4 × 5 = 20

1. The critical angle of a prism is 41° . Calculate the refractive index of the material of the prism.
2. Explain Huygen's wave theory of light.

3. How are magnets arranged to prevent demagnetising effect ?
4. Find the effective resistance when a number of resistances are connected in parallel.
5. Explain thermionic emission.

II. Answer any *three* of the following questions :

$3 \times 9 = 27$

6. What are the common defects in the images produced by a lens ? How can these defects be removed ?
7. Explain molecular theory of magnetism.
8. How is a galvanometer converted into an ammeter ?
9. Give the properties of cathode rays.
10. Explain the working of a photoelectric cell.

III. Answer any *two* of the following questions :

$2 \times 14 = 28$

11. Describe infrared spectrometer with a neat diagram.
12. Describe the principle, construction and working of an AC dynamo.
13. With the help of block diagrams, explain TV transmission and reception.
14. How are X-rays produced in a Coolidge tube ? Explain continuous and characteristic X-rays .

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SECTION - C**(ZOOLOGY)****(Marks : 75)**

I. Answer any *four* of the following questions in not more than 5 lines each :

4 × 5 = 20

1. Define the law of Independent assortment.
2. Explain briefly the Rh Factor.
3. Give a short note on *Oenothera Lamarckiana*.
4. Define the Parthenogenesis.
5. Mention the Endocrine glands.

II. Answer any *three* of the following in not more than 15 lines each : 3 × 9 = 27

6. What are the basic concepts of Biogenesis ?
7. Explain the role of hormones in metabolism.
8. Explain how eugenics help in the welfare of the human race.
9. Draw a neat labelled diagram of human brain and list out its functions.
10. Explain Oogenesis and Spermatogenesis.

III. Answer any *two* of the following questions in not more than 25 lines each :

2 × 14 = 28

11. Explain the process of fertilization.
 12. Give an account of the Blood groups and the Rh system.
 13. Describe the structure and mechanism of the working of human heart.
 14. Narrate the origin of life on abiogenetic and biogenetic level.
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