

FS1019

PHY - I

08/12/2022

Rizvi College of Arts Science &amp; Commerce

FYBSc Sem - I PHYSICS Paper - I (USPH101)

Time: (2 1/2 Hours)

[ Total Marks : 75]

N.B.

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat diagrams wherever necessary.
- 4) Symbols have usual meaning unless otherwise stated.
- 5) Use of non-programmable calculator is allowed.

Q.1) Attempt any Two of the following. [10 Marks each] (20 M)

- i) Two unequal masses  $m_1$  and  $m_2$ , connected by light an inextensible string of negligible mass are hung vertically over light and frictionless pulley. (The system is known as Atwood's machine). If  $m_1 > m_2$  determine the acceleration of two masses and the tension in the string.
- ii) Two blocks of equal weight are connected to the two ends of string which passes over a smooth frictionless pulley. The coefficient of friction is  $\mu$  for all surfaces in contact. If the system is on the verge of motion, show that angle of inclination  $\theta = 2 \tan^{-1}(\mu)$ .
- iii) State and prove the work energy theorem.
- iv) A block of mass  $M$  is pulled up an inclined plane by supplying a force  $P$  making an angle  $\beta$  to the horizontal. If the coefficient of friction is  $\tan \phi$  and the angle of inclination is  $\theta$ , show that  $P = \frac{Mg \sin(\theta + \phi)}{\cos(\beta + \phi)}$ . What is the minimum value of  $P$  for a given angle? Also block slides down an incline of angle  $37^\circ$  with an acceleration of  $0.3g$ . Find the coefficient of kinetic friction if  $\sin 37^\circ = 0.6$ .

Q.2) Attempt any Two of the following. [10 Marks each] (20 M)

- i) Define the term Young's modulus  $Y$ , Bulk modulus  $k$  and Poisson's ratio  $\sigma$ . Show that for a homogeneous isotropic materials, the Young's modulus  $Y$  is given by

$$Y = 3k(1 - 2\sigma)$$

- ii) Define terminal velocity and obtain an expression for the terminal velocity of a small spherical body falling through the liquid.
- iii) Show that Bernoulli's equation of a liquid flowing through a pipe of non-uniform cross section at any point is  $\frac{P}{\rho} + \frac{v^2}{2} + gh = \text{constant}$
- iv) State Stoke's law and obtain the expression for Stoke's law using dimensional analysis.

Q.3) Attempt any Two of the following. [10 Marks each] (20 M)

- i) Describe the Carnot Cycle with the help of indicator diagram
- ii) Obtain an expression for the work done during isothermal change.
- iii) Derive the Van der Waals equation.
- iv) A perfect gas having volume  $3 \text{ m}^3$  and initial pressure of 1 atmosphere undergoes expansion to a volume of  $6 \text{ m}^3$ . Calculate the work done by gas. And also A gas at  $0^\circ\text{C}$  is suddenly compressed half its volume. Calculate the final temperature of gas if  $\gamma = 1.4$ .

Q.4) Attempt any Three of the following. [05 Marks each] (15 M)

- i) A cricket ball of mass 350 g is moving with a velocity of 14 m/s and is hit by a bat so that the ball is turned back with a velocity of 24 m/s. The force of the blow acts for 0.035 s. Find the average force exerted on the ball by the bat.
- ii) A block is placed on an inclined plane that has a constant coefficient of friction is  $\mu$ . If the block starts from rest, show that at time t (a) its acceleration  $g(\sin \alpha - \mu \cos \alpha)$  and (b) its velocity is  $g(\sin \alpha - \mu \cos \alpha)t$ . The inclined plane makes angle to the horizontal.
- iii) For brass, the bulk modulus is  $11.2 \times 10^{10} \text{ N/m}^2$  and modulus of rigidity is  $3.7 \times 10^{10} \text{ N/m}^2$ . Calculate Poisson's ratio for brass.
- iv) Water is flowing a pipe of varying diameter, the diameter at A is 6cm and at B is 3cm. The velocity of the liquid at A is 80cm/s. Calculate
  - i) the velocity at B and
  - ii) amount of water collected per second through the pipe.

- v) Prove that Difference between specific heat at constant pressure and constant volume,  $C_p - C_v = R$ , for a perfect gas (Mayer Relation).
- vi) Find the efficiency of Carnot's engine working between  $127^\circ\text{C}$  and  $27^\circ\text{C}$ . It absorbs 80 calories of heat. How much heat is rejected.

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\*\*\*\*\* THE END \*\*\*\*\*

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Rizvi Education Society's  
**RIZVI COLLEGE**  
 OF ARTS, SCIENCE & COMMERCE

F.Y.B.Sc.

REGULAR (SEMESTER - I)

DECEMBER - 2022

(PAPER II)

N.B. :

Total - 100 marks

- All questions are compulsory.
- Answer to the same question must be written together.
- Figures to the right side indicate full marks
- Use of non-programmable calculator is allowed

Q1A. Multiple choice question (Attempt any 10 out of 15):-

15 marks

- $H_2 + I_2 \longrightarrow 2HI$ 
  - First order reaction
  - Second order
  - Third order
- \_\_\_\_\_ defined as the no of molecules taking part in a reaction.
  - Order of reaction
  - Molecularity of reaction
  - Rate of reaction
- \_\_\_\_\_ defined as number of molecules on which rate of reaction depends.
  - Order of reaction
  - Molecularity of reaction
  - Rate of reaction
- Surface tension of liquid \_\_\_\_\_ with increase of temperature.
  - Decreases
  - Increases
  - No effect
- The molecule with high intermolecular attractive forces have \_\_\_\_\_ viscosity.
  - Low
  - High
  - Intermediate
- \_\_\_\_\_ measures the resistance of a liquid flow.
  - Density
  - Viscosity
  - Volume
- Which are the diagonal pair
  - Lithium-Aluminum
  - Oxygen-Chlorine
  - Boron-Magnesium
- The elements of group 13-18 belong to \_\_\_\_\_ block in periodic table.
  - p
  - s
  - d
- Diamond and Graphite is an allotrope of \_\_\_\_\_.
  - Silicon
  - Carbon
  - Oxygen
- Chemical formula of caustic soda is \_\_\_\_\_.
  - $Na_2CO_3$
  - $Ca(OH)_2$
  - NaOH

- Buckminster fullerene is an allotrope of
  - Carbon
  - sulphur
  - silicon
- Ozone is an allotrope of \_\_\_\_\_
  - Silicon
  - Carbon
  - Oxygen
- \_\_\_\_\_ instrument is used to measure optical activity.
  - Colorimeter
  - Polarimeter
  - Spectrophotometer
- In the Fischer projection formulae the horizontal lines represent bonds that
  - Project above the plane of the paper
  - Project behind the plane of the paper
  - In the plane of paper

In \_\_\_\_\_ projection formulae the molecule is projected such that the central C-C bond is at the angle of the plane of paper.

  - Sawhorse
  - Newman
  - Fischer
- Meso form is optically inactive due to \_\_\_\_\_
  - Internal compensation
  - External compensation
  - Absence of chiral centre

Q1B. Say true or false (Attempt any 5 out of 8):-

05 marks

- Half time of the second order reaction is independent of initial concentration.
- First order reaction depends on the initial concentration of one reactant.
- The resistance to flow is called viscosity.
- The layers of a liquid flow the same velocity.
- Sodium chloride is called common salt
- Haemoglobin has more affinity towards CO than for O<sub>2</sub>.
- The energy trapping phenomenon by infrared active molecules or the gases in the atmosphere is known as green house effect.
- Meso compounds can be resolved.

Q1C. Match the column (Attempt any 5 out of 7):-

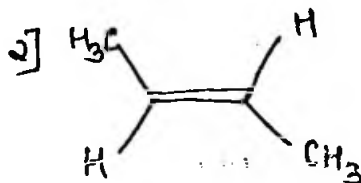
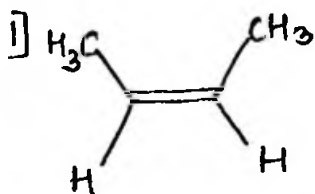
05 marks

Sr. no.	Column 1		Column 2
1.	Unit for second order reaction	A	Self-linkage
2.	Unit for first order reaction	B	E- isomers
3.	Nematic mesophase	C	High concentration of CO <sub>2</sub> in atmosphere
4.	Catenation	D	dm <sup>3</sup> mol <sup>-1</sup> s <sup>-1</sup>
5.	Lime stone	E	CaCO <sub>3</sub>
6.	Global warming	F	Liquid crystals
7.	High priority groups are on the opposite side of double bond	G	Time <sup>-1</sup>

- Q2. Attempt any 4 out of 6 20M
- A. Define half time of a reaction. Derive the expression for half time of a first order and second order reaction. 5M
- B. A second order reaction of equal concentration required 750seconds to undergo 40% completion, how much time will it be required for the reaction to undergo 90% completion? 5M
- C. Derive the integration equation of second order reaction. 5M
- D. Define 5M
- Intrinsic viscosity
  - Relative viscosity
  - Specific viscosity
  - Refractive index
- E. How are the liquid crystals classified? 5M
- F. Difference between smectic liquid crystals and nematic liquid crystals 5M

- Q3. Attempt any 4 out of 6 20M
- A. Describe any two methods of preparation and uses of alkali and alkaline earth metals:- 5M
- Hydroxides
  - Nitrides
- B. Explain anomalous behaviour of Fluorine. 5M
- C. Write a note on oxidation state of group 13 elements. 5M
- D. Mention method of preparation and their uses of the following:- 5M
- Sodium bicarbonate
  - Sodium carbonate
- E. Explain diagonal relationship of Li and Mg. 5M
- F. Short note on acid rain. 5M

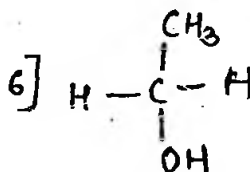
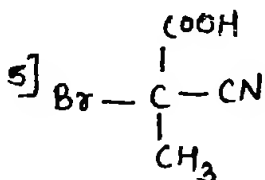
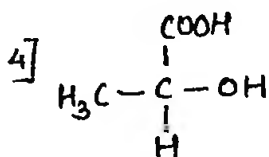
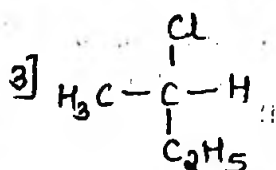
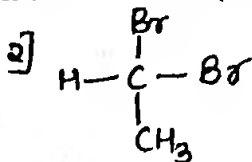
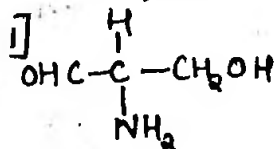
- Q4. Attempt any 4 out of 6 20M
- A. Short note on 5M
- Enantiomers
  - Diastereoisomers
- B. i) Assign 'cis' or 'trans' descriptor to the following molecules. 2M



- ii) Draw Newman and Sawhorse projection formulae for 2,3-dichlorobutane 3M

C. Identify which molecule is chiral or achiral (Any 5):-

5M



D. Difference between racemic mixture and meso compound.

5M

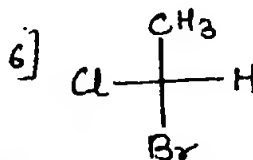
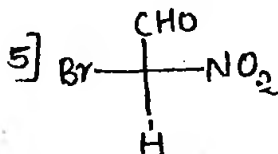
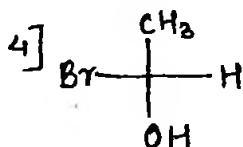
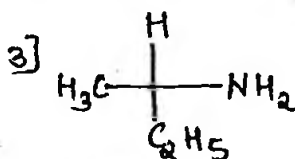
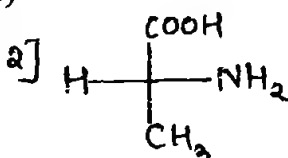
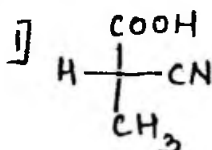
E. Define

5M

- Racemic mixture
- Meso compound
- Chirality or asymmetric carbon
- Achirality or symmetric carbon
- Geometrical isomerism

F. Assign 'R' or 'S' descriptor to the following molecules using sequence rules:- (Any 5)

5M



Q5. Attempt any 4 out of 6

20M

A. Define

5M

- Rate of reaction
- Order of reaction
- Molecularity of reaction
- Half time of reaction

(Time: 3 hours)

Total Marks: 100

N.B.: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Use of non-programmable calculator is allowed.

Q1 A Fill in the blanks (any 12)

12M

- 1 \_\_\_\_\_ equation is the expression for the first law of thermodynamics.  
a)  $q = \Delta E - w$  b)  $q = w - \Delta E$  c)  $\Delta E = w - q$
- 2 The flow of heat from higher to lower temperature is \_\_\_\_\_ process.  
a) Reversible b) Irreversible c) Isochoric
- 3 In Isobaric process pressure of the system is \_\_\_\_\_  
a) Positive b) Negative c) Constant
- 4 A system which exchange only energy with the surrounding but not matter is called \_\_\_\_\_.  
a) Open system b) Closed system c) Isolated system
- 5 1 dm<sup>3</sup> of 1M HNO<sub>3</sub> contains \_\_\_\_\_ moles of HNO<sub>3</sub>.  
a) 1 b) 1.6 c) 16
- 6 Number of moles corresponding to 90 g of water is \_\_\_\_\_.  
a) 3 b) 5 c) 22
- 7 The value of  $n_1 = 2$  and  $n_2 = 3, 4, 5, 6$  etc. belongs to \_\_\_\_\_ series of hydrogen spectrum.  
a) Balmer b) Paschen c) Brackett
- 8 The subshell with value  $n = 4$  and  $l = 2$  is designated as \_\_\_\_\_.  
a) 3p b) 4p c) 4d
- 9 Number of radial nodes for 4d orbitals is \_\_\_\_\_.  
a) 0 b) 1 c) 2
- 10 The shape of d-orbital is \_\_\_\_\_.  
a) double dumb-bell b) dumb-bell c) irregular
- 11 Given are the following atoms.  
Na, O, Al, S, H  
Arrange the following in terms of increasing atomic radius \_\_\_\_\_.  
a)  $H < O < S < Al < Na$  b)  $H < O < Al < S < Na$  c)  $H < O < Al < Na < S$
- 12 Electron gain enthalpy \_\_\_\_\_ across the period.  
a) increases b) decreases c) remains same
- 13 According to IUPAC, \_\_\_\_\_ carbon chain selected as parent chain.  
a) Longest b) Shortest c) Medium
- 14 Functional group of amine  
a) -CHO b) -NH<sub>2</sub> c) -COOH
- 15 Bond angle of sp  
a) 109°28' b) 120° c) 180°
- 16 The C-C bond length is maximum in \_\_\_\_\_ hybridized molecules  
a) sp<sup>3</sup> b) sp<sup>2</sup> c) sp
- 17 The carbanion has \_\_\_\_\_ shape  
a) linear b) Tetrahedral c) Trigonal
- 18 Based on inductive effect, tertiary carbanion is \_\_\_\_\_ stable.  
a) Most b) Least c) Equal



- Q1 B Match the following (any 4) 04M**
- |   |                             |                                  |
|---|-----------------------------|----------------------------------|
| 1 | Enthalpy                    | a) R-CHO                         |
| 2 | 1 $\mu\text{g/L}$           | b) $120^\circ$                   |
| 3 | $d_{x^2-y^2}$               | c) orbitals lie between the axes |
| 4 | $d_{xy}$                    | d) orbitals lie on the axes      |
| 5 | Bond angle of $\text{sp}^2$ | e) parts per million             |
| 6 | Aldehyde                    | f) $U + V$                       |

- Q1 C True or False (any 4) 04M**
- $\Delta E$  and  $\Delta H$  are related as  $\Delta H = \Delta E + P \Delta V$
  - 1 ml of 1 M solution = 1 milli mole
  - $d_{z^2}$  orbital is a dumb-bell shaped around z-axis and ring-like collar in xy plane
  - Ionisation energy of B > Be
  - Bond angle is maximum in sp hybridization.
  - Heterolytic fission results in the formation of free radicals

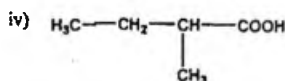
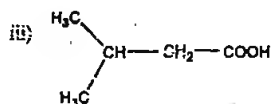
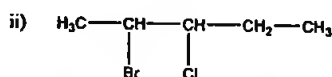
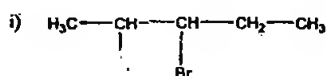
- Q2 Attempt any 4 20M**
- A Define:**
- The first law of thermodynamics
  - Internal energy
  - Enthalpy
- B Define**
- Open system
  - Isothermal process
  - Isobaric process
  - Path function
- C Calculate change in internal energy and change in enthalpy of a system when 96 g of oxygen is heated from  $0^\circ\text{C}$  to  $95^\circ\text{C}$ . (Given:  $C_v=20.92 \text{ JK}^{-1}\text{mol}^{-1}$ ,  $C_p=29.29 \text{ JK}^{-1}\text{mol}^{-1}$ ,  $O=16$ )**
- D Derive Kirchhoff's equation.**
- E Define Normality.**  
How many grams of solute are required to prepare one litre of 0.2N solution of
- NaOH
  - $\text{Pb}(\text{NO}_3)_2$
- [At. Wt. of Na=23, O=16, H=1, Pb=207, N=14]
- F Calculate the amount in grams of  $\text{Na}_2\text{CO}_3$  present in  $100 \text{ cm}^3$  of 0.5N solution. (Given Molecular Weight of  $\text{Na}_2\text{CO}_3=106$ )**

- Q3 Attempt any 4 20M**
- A Describe Rutherford's atomic model. Explain Rutherford's experiment of  $\alpha$ -particle scattering.**
- B Explain the terms (i) Shells (ii) Subshells (iii) Orbitals (iv) Degenerate orbitals**
- C Explain (i) Aufbau Principle (ii) Pauli Exclusion Principle**
- D What is atomic radius? Explain its types. How does atomic radius vary (i) across the period and (ii) down the group**
- E Write a note on electronegativity. Discuss the factors affecting electronegativity. How does it vary (i) across the period and (ii) down the group?**
- F Explain Slater rule in brief. Calculate the effective nuclear charge experienced by 4s electron in Iron ( $Z=26$ )**

**Q4 Attempt any 4**

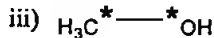
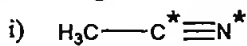
**20M**

**A** Write the IUPAC names of the following structures.



**B** Explain sp hybridization with an example.

**C** Mention the state of hybridization of atoms which are marked "\*" in the following molecules.



**D** Explain the influence of hybridization on bond properties.

**E** Difference between inductive effect and electromeric effect.

**F** Explain stability of carbocation based on hyperconjugation.

**Q5 Attempt any 4**

**20M**

**A** What is bond energy? Calculate C-C bond energy from the following data

Heat of sublimation of graphite = 714.36 KJ

H-H bond energy = 435.54 KJ

Heat of formation of ethane = -84.85 KJ

C-H bond energy = 413.82 KJ

**B** Define equivalent weight. Explain equivalent weight with respect to redox reactions.

**C** With diagrammatic representation explain shapes of s and p orbitals. How does the shape of  $2p_x$  differ from  $3p_x$

**D** Write a note on electron gain enthalpy. Discuss the factors affecting electron gain enthalpy. How does it vary (i) across the period and (ii) down the group?

**E** Draw the structures of the following

1. 2-chloro-3,4-dimethyl pentane
2. But-2-en-1-ol
3. 4-amino-2-butanone
4. Ethyl ethanoate
5. Petanedioic acid

**F** Explain types of organic reactions based on changes occurring in the substrate

02/12/22

FY B.S.C F.C

FASC-101

Rizvi College of Arts/Science /Commerce (Bandra-West)

**Foundation Course –Paper I**

**FYBA/COM/ BSC SEM I**

**Duration: 2 ½ hours**

**Marks: 75**

**Note: 1) All the questions are compulsory.**

**2) Figures to the right indicate full marks.**

**Q.1.A. Fill in the blanks with correct options. (Any Eight) 08 Marks**

i) \_\_\_ language belongs to Indo-European group of languages.

(Bengali, Santhali, French, Marathi)

ii) Rural people in India are mostly engaged in \_\_\_ sector.

(Industrial/Agricultural/Technological/Private)

iii) Due to the efforts of Raja Ram Mohan Roy \_\_\_ practice was abolished in India.

(Sati, Devdasi, Prostitution, Dowry)

iv) \_\_\_ is the serious form of Conjunctivitis.

(Glaucoma, Trachoma, Cataract, Astigmatism)

v) There is a water dispute over \_\_\_ river in the Indian states of Andhra Pradesh, Karnataka and Maharashtra.

(Kaveri, Krishna, Koyna, Ganga)

vi) \_\_\_ arises out of religious fundamentalism.

(Casteism, Communalism, Regionalism, Linguism)

vii) There are \_\_\_ schedules in the Indian constitution.

(11, 12, 13, 14)

viii) Article 51 of the Indian constitution list down \_\_\_ fundamental duties of the citizens.

(11, 12, 13, 14)

ix) \_\_\_ is a national political party.

(Biju Janata Dal, Telugu Desam, Indian National Congress, MNS)

x) \_\_\_ was the first state to establish Panchayati Raj system in India.

(Rajasthan, Maharashtra, Gujarat, Karnataka)

**B) State whether the following statements are True or False. (Any Seven) 07 Marks**

i) Zend Avesta is the holy book of Jews.

ii) Kerala has the lowest literacy rate.

- iii) Prostitution is illegal in India.
- iv) Polio is caused by a virus called poliovirus.
- v) Christian community is divided in to six classes known as varnas.
- vi) There is no border dispute over Belgaum.
- vii) Fundamental duties are the general guidelines meant for the good conduct of citizens.
- viii) Peace refers to freedom from disturbances and violence.
- ix) Tolerance does not expect people to co-exist .
- x) Chief Minister is the first citizen of the city.

Q.2) India is a multi- religious and multi-lingual country. Discuss in detail. **15 Marks**

**OR**

Q.2) Write a detailed note on racial groups and tribal communities in India.

Q.3) What kind of atrocities are committed on women in India? How can they be protected?  
**15 Marks**

**OR**

Q.3) Discuss the problems of any three categories of disabled persons. What kind of treatment and facilities are available to them?

Q.4) Describe the causes and effects of communalism in India .what measures can be taken to tackle this problem? **15 Marks**

**OR**

Q.4) Explain in detail the regional and lingual conflicts in India.

Q.5) What are the characteristics and importance of the Indian constitution.? **15 Marks**

**OR**

Q.5) Write short notes on (Any three)

- a) Rural-Urban differences
- b) Casteism an intergroup conflict in India
- c) Fundamental Duties of the Indian citizens
- d) Role of Municipality /Gram Panchayat
- e) Role of women in politics

FS107

## Botany - III

07/12/2022

Semester - I

Botany: Paper II

3 Hours

Marks: 100

- i. N.B.: All questions are compulsory
- ii. Figures to the right indicate full marks
- iii. Draw neat and labeled diagrams whenever necessary

**Q.1.A. Choose the correct option from the following and rewrite the sentence** **10**

1. Cells of \_\_\_\_\_ have no cell wall.  
a. *Chlorella*                      b. *Amoeba*                      c. *E.coli*                      d. *Mangifera*
2. The closest connection of endoplasmic reticulum is with \_\_\_\_\_.  
a. Lysosome                      b. Vacuole                      c. Mitochondrion                      d. Nucleus
3. \_\_\_\_\_ helps in connecting adjacent cells in a plant tissue.  
a. fibrous lamina                      b. lateral connections                      c. equatorial links                      d. plasmodesmata
4. 50S & 30S units of Ribosomes are seen in \_\_\_\_\_ cell.  
a. Prokaryotic                      b. Eukaryotic                      c. Plant cell only                      d. Animal cell only
5. According to Odum, \_\_\_\_\_ is not the functional component in an ecosystem?  
a. air                      b. microbes                      c. sun                      d. moon
6. \_\_\_\_\_ are considered as primary consumers.  
a. Plants                      b. Herbivores                      c. Carnivores                      d. Decomposers
7. Terrestrial ecosystem does not include \_\_\_\_\_.  
a. Cold deserts                      b. Temperate rain forest                      c. Estuarine                      d. Tropical grassland
8. Dihybrid ratio is obtained by involving a cross with \_\_\_\_\_ of contrasting characters.  
a. one pair                      b. two pairs                      c. three pairs                      d. four pairs
9. Alleles are correctly represented as \_\_\_\_\_.  
a. p,q                      b. p,Q                      c. P,q                      d. P,p
10. \_\_\_\_\_ illustrates the selfing of F<sub>1</sub> hybrid.  
a. TT × tt                      b. Tt × Tt                      c. TT × TT                      d. Tt × tt

**Q.1.B. Answer the following questions in one to two lines.**

**10**

- a. Functions of Endoplasmic reticulum.
- b. What is food chain?
- c. Comment on Energy pyramid?
- d. State the ratios of duplicate dominant epistasis and duplicate recessive epistasis.
- e. Mention contrasting characters of pea plant.

- Q.2. Answer any two of the following question. 20**
- Draw and describe neat and labeled diagram of Chloroplast.
  - Explain Fluid Mosaic model of Plasma membrane. Comment on its functions.
  - Discuss the types of Endoplasmic reticulum with suitable diagram.
  - How does cell wall differentiate its layers? Explain with ultra-structure cell wall.
- Q.3. Answer any two of the following questions. 20**
- What are Energy Pyramids? Explain its types with suitable diagrams.
  - Explain biotic and abiotic components in detail.
  - Give an account on forest ecosystem and discuss any three types in detail.
  - Describe food web and food chain with suitable examples.
- Q.4. Answer any two of the following questions. 20**
- Explain incomplete dominance in detail with suitable examples.
  - State the law of Segregation. Elaborate with the help of valid cross.
  - Discuss Multiple alleles in detail. Comment on ABO blood group system.
  - Explain Test cross and back cross in detail.
- Q.5. Write short notes on any four of the following questions. 20**
- Typical eukaryotic cell
  - Phagocytosis and Pinocytosis
  - Energy flow model
  - Freshwater ecosystem
  - Law of independent assortment
  - Codominance

Semester - I

Botany: Paper I

3 Hours

Marks: 100

- i. N.B.: All questions are compulsory
- ii. Figures to the right indicate full marks
- iii. Draw neat and labeled diagrams whenever necessary

Q.1.A. Choose the correct option from the following and rewrite the sentence 10

1. Akinetes in *Nostoc* are known as \_\_\_\_\_.  
a) Zygosporangium      b) Resting spore      c) Aplanospore      d) Zoospore
2. The spiral shaped chloroplast is seen in \_\_\_\_\_.  
a) *Volvox*      b) *Nostoc*      c) *Spirogyra*      d) *Zygnema*
3. The sea lettuce *Ulva*, a chlorophyta, is used as \_\_\_\_\_.  
a) Biofuel      b) Fungi      c) Sewage disposer      d) Diatomites
4. The sub-class of *Rhizopus* is \_\_\_\_\_.  
a) Aflagellate      b) Euscomycetae      c) Phycomycetae      d) Ascomycetae
5. The female sex organ in *Aspergillus* is known as \_\_\_\_\_.  
a) Carposporium      b) Ascogonium      c) Archegonium      d) Trichogyne
6. The fungi obtaining nourishment from cow dung are called \_\_\_\_\_ fungi.  
a) Autotrophic      b) Parasitic      c) Coprophilous      d) Facultative Saprophytic
7. *Riccia* is a \_\_\_\_\_ type of Bryophyte.  
a) Liverworts      b) Hornwort      c) Moss      d) Fern
8. *Riccia fluitans* is the \_\_\_\_\_ species.  
a) Terrestrial      b) Aquatic      c) Amphibian      d) Arboreal
9. Which of the following structure is not found in Hepaticae?  
a) Phylloid      b) Cauloid      c) Rhizoid      d) Columella
10. *Riccia* shows formation of rosette type of thallus with \_\_\_\_\_ branching.  
a) Monochotomous      b) Dichotomous      c) Erect      d) Pseudo

Q.1.B /Answer the following in one sentence. 10

- a) What is heterocyst in *Nostoc*?
- b) Give the names of fungi used in Industry.
- c) Which Algae are used as food?
- d) Name the type of rhizoids found in *Riccia*
- e) Name the stages of reproduction in *Riccia*

**Q.2 Answer any two from the following**

20

1. Discuss Chlorophyta in reference to distribution, range of thallus and reserve food.
2. Explain significance of algae in food, agriculture and industries.
3. Give the systematic position of *Spirogyra*. Add a note on conjugation.
4. Explain asexual reproduction in *Nostoc* and classify it.

**Q.3. Answer any two from the following:**

20

1. Draw and describe in detail the thallus structure of *Rhizopus*.
2. Sketch and discuss the life cycle of *Aspergillus*.
3. Why fungi are important? Explain the role of fungi in medicine and Industries.
4. How do achlorophyllous fungi manage their nutrition?

**Q.4. Answer any two from the following:**

20

1. Discuss in detail external or internal morphology of *Riccia* thallus.
2. Draw and describe neat and labeled diagrams of sex organs in *Riccia*.
3. Explain alternation of generation in *Riccia*.
4. How does *Riccia* reproduce?

**Q.5. Write short notes on (any four)**

20

1. *Nostoc* colony and filament
2. Cell structure of *Spirogyra*.
3. Reproduction in Phycmycetae
4. Alternation of generation in *Rhizopus*
5. Germination of *Riccia* spore
6. General characters of Hepaticae



## FYBSC SEM I MATHS II

Marks: - 75

Time Duration: - 2 hrs. 30 min.

NOTE: -

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Use of calculator is not allowed.

Q.1 Attempt any four.

20

- i. Using principle of finite induction prove that, 7 divides  $8^n - 1$ ,  $\forall n \in \mathbb{N}$ .
- ii. Prove that  $2^{40} \equiv 3 \pmod{13}$
- iii. a) If  $a \mid b$  and  $b \mid a$  then prove that  $a = \pm b$   
b) If  $a \mid b$ ,  $c$  then  $a \mid mb \pm nc$ ,  $m$  and  $n \in \mathbb{Z}$
- iv. Find the GCD of the integers 1357, 1166 and express it as the linear combination of these integers.
- v. Prove that  $\sqrt{5}$  is not rational.

Q.2 Attempt any four.

20

- i. Prove that, the function  $f: \mathbb{R} - \{1\} \rightarrow \mathbb{R} - \{-1\}$  defined as  $f(x) = \frac{x+5}{1-x}$  is a bijection.
- ii. Verify whether the binary operation '.' Defined on  $\mathbb{Z}$  as  $a.b = a + b - 6$ ,  $a$  &  $b$  in  $\mathbb{Z}$ , is commutative or associative.
- iii. Verify whether the binary relation defined on the set of integers  $\mathbb{Z}$  as  $aRb$  if and only if  $4a + 5b$  is divisible by 5,  $a$  &  $b$  in  $\mathbb{Z}$ .
- iv. If  $f: X \rightarrow Y$  and  $g: X \rightarrow Y$  are two functions, prove that  $f$  and  $g$  are injective implies that  $g \circ f$  is also injective.
- v. If  $f: X \rightarrow Y$  is a function and  $A$  and  $B$  are two non-empty subsets of  $X$  and  $Y$  respectively. Prove that  $A \subseteq f^{-1}(f(A))$ , the equality holds if and only if  $f$  is injective.

**Q.3 Attempt any four.**

20

- i. Find all rational roots and their multiplicity of the polynomial  $6x^3 - 49x^2 + 51x - 14$ .
- ii. If  $r_1, r_2, r_3$  are the roots of polynomial  $x^3 - 2x^2 + 5 = 0$  without calculating  $r_1, r_2, r_3$ , find the polynomial whose roots are  $5r_1, 5r_2, 5r_3$ .
- iii. If  $p(x)$  is an irreducible polynomial in  $R[x]$  and  $p(x)$  does not divide  $a(x)$ , prove that  $(p(x), a(x)) = 1$
- iv. If  $f(x)$  is a polynomial in  $R[x]$  and  $\alpha \in C$  is a root of  $f(x) = 0$  prove that the conjugate of  $\alpha$  is also root of  $f(x) = 0$ .
- v. Find all Fourth roots of Unity.

**Q.4 Attempt any three.**

15

- i. If  $a \equiv b \pmod{n}$  then prove that
  - a)  $a+x \equiv b+x \pmod{n}$
  - b)  $a-x \equiv b-x \pmod{n}$
- ii. Prove that, the number of primes is infinite.
- iii. Verify whether the binary operation  $\cdot$  Defined on  $\mathbb{Z}$  as  $a \cdot b = a + \mathbb{Z} b$ ,  $a$  &  $b$  in  $\mathbb{Z}$ , is commutative or associative.
- iv. Verify whether the binary relation defined on the set of integers  $\mathbb{Z}$  as  $aRb$  if and only if  $a - b$  is divisible by 4,  $a$  &  $b$  in  $\mathbb{Z}$ .
- v. If  $f(x)$  and  $g(x)$  are associates in  $R[x]$  then prove that  $f(x) = c \cdot g(x)$  where  $c$  is a suitable constant in  $R$ .
- vi. Find the g.c.d of the polynomials  $x^4 - 5x^3 + 5x^2 - 15x + 6$ ,  $x^2 + 3$

F.Y. B.Sc. SEMESTER - I EXAMINATION: DECEMBER - 2022

MATHEMATICS PAPER -I: CALCULUS - I

Time:  $2\frac{1}{2}$  Hours

Maximum Marks: 75

NOTE: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

**Qn. (1) Attempt any FOUR questions from the following. ( $4 \times 5 = 20$  Marks)**

- Show that the additive identity in  $\mathbb{R}$  is unique.
- Show that  $|xy| = |x||y|$  for all  $x, y \in \mathbb{R}$ .
- State and prove the Arithmetic - Geometric mean inequality.
- If  $S$  is a set bounded above, show that the set  $S$  cannot have two suprema.
- State and prove Archimedean property of real numbers.

**Qn. (2) Attempt any FOUR questions from the following. ( $4 \times 5 = 20$  Marks)**

- Prove that every convergent sequence is bounded.
- If  $(x_n)$  and  $(y_n)$  are two sequences such that  $x_n \rightarrow p$  and  $y_n \rightarrow q$  then show that  
$$x_n + y_n \rightarrow p + q$$
- Show that a monotone increasing sequence which is bounded above is convergent.
- Show that a sequence  $x_n = \frac{2}{n}$  for all  $n \in \mathbb{N}$  is a Cauchy sequence.
- Show that if a sequence converges then it converges to a unique limit.

**Qn. (3) Attempt any FOUR questions from the following. ( $4 \times 5 = 20$  Marks)**

- Solve the differential equation  $\frac{dy}{dx} + \frac{y}{x} = -x^2$
- Solve the differential equation  $\frac{dy}{dx} + xy = xy^3$
- Solve the differential equation  $(x - 2y)dx - 2xdy = 0$
- Solve the differential equation  $\left[x + \frac{1}{y}\right]dx - \left[\frac{x}{y^2} - y\right]dy = 0$
- Solve the differential equation  $[x^2 - 3xy + 2y^2]dx + [3x^2 - 2xy]dy = 0$

Qn. (4) Attempt any THREE questions from the following. ( $3 \times 5 = 15$  Marks)

(a) Prove: (i)  $a + b = a + c \Rightarrow b = c$

(ii)  $b + a = c + a \Rightarrow b = c$

(b) If  $A$  and  $B$  are bounded subsets of  $\mathbb{R}$ , show that  $A \cup B$  is also bounded.

(c) Show that the sequence  $x_n = (-1)^n$  does not converge.

(d) Show that the sequence  $x_n = \frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{n+n}$  for all  $n \in \mathbb{N}$  is convergent.

(e) Solve the differential equation  $\left[3x^2y + \frac{y}{x}\right] dx + [x^3 + \log x] dy = 0$

(f) Find the orthogonal trajectories of the family of curves  $x^2 - y^2 = c$

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FS110

Set 1  
09/12/2022

F.Y.B.Sc. Sem - 1

Physics -Paper II USPH102

**Nuclear Physics and Modern Physics**

Time: (2 1/2 Hours)

[ Total Marks : 75]

**N.B. :** (1) All questions are **compulsory**.(2) **Figures** to the **right** indicate **full marks**.(3) Draw **neat** diagrams wherever **necessary**.

(5) Symbols have usual meaning unless otherwise stated.

(5) Use of **non-programmable** calculator is allowed.**List of Constants:**  $h = 6.63 \times 10^{-34}$  J-s,  $C = 3 \times 10^8$  m/s,  $m_e = 9.1 \times 10^{-31}$  Kg. $1 \text{ eV} = 1.6 \times 10^{-19}$  J, Mass of proton = 1.007277 a.m.u., $1 \text{ a.m.u} = 1.6605 \times 10^{-27}$  Kg1. Attempt any **Two of the following**.

(i)	Explain how to find the size of a nucleus on the basis of Rutherford's experiment.	10
(ii)	Draw a graph of B.E / nucleon Vs atomic mass number. Explain it's characteristics features.	10
(iii)	Define average life period of a radioactive sample. Derive a suitable expression for it.	10
(iv)	Give the necessary theory of a law of successive disintegration. Explain the graph of growth and decay.	10

2. Attempt any **Two of the following**:

(i)	Explain with suitable diagram interaction of particle with matter.	10
(ii)	Explain with diagram the working of pulse ionization chamber.	10
(iii)	Explain Nuclear fission with examples.	10
(iv)	What is meant by Q-value of a nuclear reaction? Obtain the necessary equation.	10

3. Attempt any **Two of the following**.

(i)	State and explain Heisenberg uncertainty principle, Give necessary proof.	10
(ii)	Explain with energy level diagram origin of characteristics line X- ray spectrum.	10
(iii)	Obtain an expression for the gravitational red shift.	10
(iv)	Describe the continuous X-ray spectra. State Duane and Hunt law . What is its significance?	10

4.	Attempt any <b>Three of the following</b>		
(i)	Radioactive material decays to 1% of its original in 30 years. Find its half life time.		<b>05</b>
(ii)	Find the radius, volume mass of a nucleus for Copper with atomic mass 63. Given: $r_0 = 1.4\text{fm}$ .		<b>05</b>
(iii)	Calculate the Q-value of the following reaction : ${}^6_1\text{Li} + {}^1_1\text{H} \rightarrow {}^4_2\text{He} + {}^4_2\text{He}$ The masses are Li = 7.018822 amu, H = 1.084 amu, He = 4.00385 amu		<b>05</b>
(iv)	Differentiate between proportional counter and GM counter.		<b>05</b>
(v)	Calculate the critical voltage required to stimulate the emission of characteristics line of K series in tungsten if K absorption edge is 0.178 AU.		<b>05</b>
(vi)	Find the wavelength of maximum intensity radiation radiated from a source at $2700^\circ\text{C}$ . Take constant $b = 2.498 \times 10^{-3} \text{ mK}$ .		<b>05</b>

FS111

09/12/2022

## FYBSC Semester I Zoology Paper II

Time: 3 Hrs

100 Marks

- N.B :**
1. All questions are compulsory.
  2. All questions carry equal marks.
  3. Draw neat and labelled diagrams wherever necessary.

**Q1. A) Fill in the blanks by choosing correct option from the bracket** (05)

- Formula for conversion °F to °C is, °C = \_\_\_\_\_  
( $(^{\circ}\text{F}-32)\times 5/9$ ,  $^{\circ}\text{F}+32$ ,  $(^{\circ}\text{F}-32)+7$ )
- It denotes one part per 1000000000 parts.  
(ppt, ppm, ppb)
- \_\_\_\_\_ is ligated to the gene of interest as a reporter gene.  
(insulin, green fluorescent protein, glucagon)
- \_\_\_\_\_ means a physical attachment of the compound on the surface of the stationary phase  
(adsorption, absorption, diffusion)
- Combined glass electrode innermost tube contains an unchanging  $1\times 10^{-7}$  mol/L \_\_\_\_\_ solution  
(HCl, KCl, NaOH)

**Q1.B) Match the column I & II and rewrite** (05)

I		II	
a	Data	i	Electrophoresis
b	Medical biotechnology	ii	Wave number
c	Industrial biotechnology	iii	Vaccines
d	$1/\lambda$	iv	Set of observed values
e	AGE	v	Fermented foods

**Q1.C) State whether true or false** (05)

- One nanometre is equals to 1000000000m.
- 20% of KCl solution means 20gm KCl present per  $100\text{cm}^3$  of solution.
- Embryonic stem cells are undifferentiated.
- Colorimetric technique works on the basis of Beer Lambert's law.
- Stationary phase in TLC is a solvent.

**Q1.D) Answer in one sentence** (05)

- Give the full form of GLP.
- What are oxidising agents?
- What is the Human Genome Project?
- Define buffer solution.
- Define paper chromatography.

FS109

ZOOLOGY - I

08/12/2022

## FYBSC Semester I Zoology Paper I

Time: 3 Hrs

100 Marks

N.B : 1. All questions are compulsory.

2. All questions carry equal marks.

3. Draw neat and labelled diagrams wherever necessary.

Q1. (A) Fill in the blanks by choosing the correct option given in the brackets (05)

a) A \_\_\_\_\_ is the farthest from the coast.

(barrier reef, atoll, fringe reef)

b) In Batesian mimicry, the model is \_\_\_\_\_.

(noxious, palatable, neutral)

c) Panch marhi is located in \_\_\_\_\_.

(M.P., Assam, W.B)

d) The novel concept of 'Grain Bank' was started by

(Anna Hazare, Mrs. Shaw, Deepak Gadre)

e) \_\_\_\_\_ is the largest biotech company in Asia.

(AMUL, DHARA, BIOCON)

Q1. (B) Match the Column I and Column II and rewrite (05)

Column I	Column II
a) Brood pouch	i) Guppy fish
b) Ovovivipary	ii) Seahorse
c) Streptomycin	iii) Rajasthan
d) Ghana Bird Sanctuary	iv) Anandwan
e) Forest of bliss	v) Antibiotics

Q1. (C) Mention whether the given statements are True or False (05)

a) Camels have a short loop of Henle for water conservation.

b) In the case of midwife toad, male exhibits parental care.

c) Himalaya is included among 35 hotspots of the world.

d) 'Gadre Marine Export Pvt. Ltd.' was set up in Ratnagiri.

e) The greatest tribute to Khorana at University of Wisconsin was Symposium.

Q1. (D) Answer in one or two sentences only (05)

a) What is bioluminescence?

b) Define Biodiversity.

c) Give the full form of UNEP.



d) Who was Abhay Sandhak?

e) Name any two surimi based fish products.

**Q2. (A) Write a note on echolocation in bats and dolphins.**

**(10)**

**OR**

**(A) Discuss the three main types of coral reefs.**

**Q2. (B) Write notes on any two of the following**

**(10)**

a) Mullerian mimicry

b) Ovovivipary

c) Pearl formation

d) Advantages of bird migration

**Q3. (A) Write a note on Western Ghats as biodiversity hotspots.**

**(10)**

**OR**

**(A) Describe threats to biodiversity.**

**Q3. (B) Write notes on any two of the following**

**(10)**

a) Scope of biodiversity

b) Genetic diversity

c) Direct use values of biodiversity

d) In – situ conservation of biodiversity

**Q4. Answer any two of the following**

**(20)**

a) Elaborate on the work and achievements of Dr. Varghese Kurien.

b) Describe the life sketch of Dr. Salim Ali towards ornithology.

c) Give a detailed account of achievements and awards won by Anna Hazare.

d) Explain the project Hemalkasa.

**Q5. Write short notes on any four of the following**

**(20)**

a) Parental care in cuckoo

b) Bioluminescence in animals

c) Man – wild life conflict

d) NBAP

e) Biocom

f) Gadfile fisheries