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B.Sc. (Part - III) (Semester - V) Examination, April - 2014
BOTANY (Paper - IX) (Under Restructed Course)
Biology of Cryptogams (Revised)
Sub. Code : 54898

Day and Date : Thursday, 03 - 04 - 2014 **Total Marks : 40**

Time : 3.00 p.m. to 5.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Draw neat labelled diagrams wherever necessary.**
3) **Figures to right indicate full marks.**

Q1) Rewrite the following sentences by choosing appropriate alternatives: **[8]**

a) Plurilocular sporangia found in ———.

i) Ectocarpus ii) Chara

iii) Nostoc iv) Sargassum

b) Chloroplasts of Chara are ——— shaped.

i) reticulate ii) stellate

iii) discoid iv) cup

c) Cleistothecium in Uncinulla is characterised by ——— appendages.

i) straight ii) branched

iii) forked iv) curved

d) Albugo is commonly called as ———.

i) brown rust fungus ii) black rust fungus

iii) white rust fungus iv) orange

e) Simplest sporophyte present in ————.

i) Riccia ii) Anthoceros

iii) Funaria iv) Porella

f) Gametophytic plant body in plagiochasma is ————.

i) colonial form ii) thalloid form

iii) filamentous iv) leafy form

g) Marsilea rhizome shows ———— type of stele.

i) haplostele ii) amphiphloicsiphonostele

iii) protostele iv) plectostele

h) A membranous outgrowth around sporangium called indusium is present in ————.

i) angiosperms ii) pteridophytes

iii) algae iv) bryophytes

Q2) Attempt any two of the following: **[16]**

a) Describe evolution of sex in algae.

b) Describe sexual reproduction in Plagiochasma.

c) Describe alternation generations in pteridophyte.

Q3) Attempt any four of the following: **[16]**

a) Mushroom cultivation.

b) Cleistothecium in Uncinulla.

c) Basidiocarp of Agaricus.

d) Nucule of Chara.

e) Alternation generations in bryophytes.

f) V.S. of Marsilea sporocarp.

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Total No. of Pages : 3

B.Sc. (Part - III) (Semester - V) Examination, April - 2014

CHEMISTRY (Paper - IX)

Physical Chemistry

Sub. Code : 54892

Day and Date : Thursday, 03 - 04 - 2014 **Total Marks : 40**

Time : 3.00 p.m. to 5.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Neat and labelled diagrams must be drawn wherever necessary.**
4) **Use of log table and calculator is allowed.**

Q1) Choose the correct alternative for each of the following and rewrite the sentences: **[8]**

a) Einstein photoelectric equation is ----------.

i) $E = h\nu$ ii) $h\nu = \phi + \frac{1}{2}mv^2$

iii) $E = h\nu/c$ iv) $E = h\nu - \phi$

b) Rotational spectra of diatomic molecules are observed in ------- region.

i) X-ray ii) visible

iii) far IR iv) microwave

c) Raman spectroscopy studies light ---------- by a sample

i) scattered
ii) absorbed
iii) emitted
iv) reflected

d) In Stark - Einstein equation $E = h\nu$ h is known as ----------.

i) Avogadro's number
ii) Faraday's constant
iii) Rydberg constant
iv) Plank's constant

e) Various photophysical processes are depicted by ----------.

i) Phase diagram
ii) Jablonski diagram
iii) Andrew's experiment
iv) P-T diagram

f) According to Konowaloff rule, the vapour always contains relatively more proportion of the ---------- volatile component than does the liquid phase.

i) less
ii) equally
iii) more
iv) zero

g) Triethyl amine - water system is also known as ---------- solution temperature system.

i) maximum
ii) maximum - minimum
iii) minimum
iv) minimum - maximum

h) The temperature coefficient $\left(\frac{dE}{dT}\right)_p$ is expressed in the units ----------.

i) VK^{-1}
ii) Joules
iii) Volt - Coulomb
iv) JK^{-1}

Q2) Answer the following (Any two): **[20]**

a) What is de Broglie equation? Give its equation, proof and importance. Calculate the energy in joules per quantum and joules per mole of photons of wavelength 530 nm.

b) Explain vibrational spectra of diatomic molecule with a permanent dipole and considering as a simple harmonic oscillator. Explain overtones and how it is used to determine force constant.

c) What are concentration cells? Derive an expression for emf of an electrolyte concentration cell with transference which is reversible to cation.

Q3) Answer the following (Any three): **[12]**

a) What is Heisenberg's uncertainty principle? How it is used to explain concept of probability? Give its applications.

b) Explain photochemical equilibrium with suitable example.

c) Discuss vapour pressure and distillation of immiscible liquids.

d) What is liquid-liquid junction potential and how it is eliminated?

e) The emf of cell,

$$Ag(s)|Agcl(s)|Kcl(m=0.03,\gamma=0.8)||AgNo_3(m=0.1,\gamma=0.7)|Ag(s)$$

is 0.455 v at 298 k. Calculate solubility and solubility product of silver chloride in water at 298 k.

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B.Sc. (Part - III) (Semester - V) Examination, April - 2014

ELECTRONICS (Paper - IX)

Linear Integrated Circuits

Sub. Code : 54928

Day and Date : Thursday, 03 - 04 - 2014 **Total Marks : 40**

Time : 3.00 p.m. to 5.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**
4) **Use of logtable and calculator is allowed.**

Q1) Select most correct alternative. **[8]**

a) An integrated circuit offers .....
   i) Low power consumption ii) improved performance
   iii) High speed iv) All (i), (ii), (iii)

b) The main advantage of differential amplifier is that it rejects .....
   i) Common mode signal ii) Distortion
   iii) Differential mode signal iv) Noise

c) The IC LM 331 is .....
   i) Comparator ii) V to F converter
   iii) F to V converter iv) Both ii) & iii)

d) O/P impedance of ideal op amp is .....
   i) 0Ω ii) 2MΩ
   iii) Infinite Ω iv) none of these

e) Which of the following is a FET I/P Op-amp.
   i) LF 356 ii) 701
   iii) μA 741 iv) LM 308

P.T.O.

f) As temperature increases the slew rate of an op - amp .....

i) Remains constant ii) Gradually increases

iii) Gradually decreases iv) becomes zero

g) The Q-factor of narrow band pass filter is .....

i) Zero ii) Greater than 1

iii) Less than 1 iv) It's band width

h) If gain bandwidth product of op-amp is 1 MHz and corner frequency is 10 KHz then closed loop gain is .....

i) 10^6 ii) 10^3

iii) 10^2 iv) 10

Q2) Attempt any two: **[16]**

a) Draw the circuit of emitter coupled differential amplifier with emitter resistance and obtains the expressions for Ad, Ac and CMRR.

b) Explain the use of OP - AMP as an integrator and differentiator. Show the different waveforms in each case.

c) State the advantages of active filters over passive filters and design first order low pass filter using op-amp.

Q3) Attempt any four: **[16]**

a) Explain the formation of monolithic NPN Transistor.

b) Explain the effect of temperature on offset voltages and currents.

c) Explain universal balancing technique used in an op-amp.

d) Op-amp as an antilog amplifier.

e) Op-amp as an adder.

f) Low pass chebyschev filter.

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Total No. of Pages : 2

B.Sc. (Part - III) (Semester - V) Examination, April - 2014

MICROBIOLOGY (Paper - IX)

Virology

Sub. Code : 54923

Day and Date : Thursday, 03 - 04 - 2014 **Total Marks : 40**

Time : 3.00 p.m. to 5.00 p.m.

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

Q1) Select correct options from i, ii, iii, iv for filling the blanks in the questions given below: **[8]**

a) Nucleocapsid of TMV is --------- in shape.

i) flexible and helical ii) rigid and helical

iii) enveloped and isometric iv) nonenveloped and isometric

b) Isocahedral nucleo capsids show ---------- rotational symmetry.

i) 2, 4, 6 ii) 12, 20, 32

iii) 1, 2, 3 iv) 5, 3, 2

c) Envelope of viruses is a membranous covering of ----------.

i) proteins ii) lipids

iii) bi-layered phospholipids iv) exopolysaccharides

d) Latent period during multiplication of phages is time period required for ----------.

i) formation of first phage in the cell

ii) lysis of the cell for releasing phage progeny

iii) next infection to fresh cell

iv) adsorption entry of phage genome in cell

e) Transcription of late genes of T4 phage during multiplication needs ----.
   i) unmodified transcriptase of host cell
   ii) first modified transcriptase of host cell
   iii) second modified transcriptase of host cell
   iv) viral transcriptase

f) Product of gene ---------- of lambda phage is a repressor protein.
   i) N ii) C-II
   iii) C-III iv) C-I

g) Replication of adenoviral genome takes place by ---------- mode.
   i) symmetric and semiconservative
   ii) asymmetric and semoconservative
   iii) symmetric and conservative
   iv) asymmetric and conservative

h) Lock washer formation is a step of ---------- ocuring during TMV multiplication.
   i) transcription of viral genome
   ii) translation of viral RNA
   iii) replication of viral genome
   iv) assembly

Q2) Answer the following (**ANY TWO**): **[16]**

a) Define lysogeny. Explain in brief the process of lamba lysogeny.

b) Explain in brief the lytic cycle of T4 phage.

c) Describe in brief multiplication of adenoviruses.

Q3) Write short notes on (**ANY FOUR**): **[16]**

a) Icosahedral capsids.

b) Viral envelope.

c) Structure of HIV.

d) One step growth experiment.

e) Virus purification by density gradient centrifugation.

f) Defective immunity hypothesis.

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Total No. of Pages : 4

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B.Sc. (Part - III) (Semester - V) Examination, April - 2014

MATHEMATICS (Paper - IX)

Real Analysis

Sub. Code : 54876

Day and Date : Thursday, 03 - 04 - 2014 **Total Marks : 40**

Time : 3.00 p.m. to 5.00 p.m.

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

Q1) Select the correct alternative for each of the following: **[8]**

a) The test that if $\{a_n\}_{n=1}^{\infty}$ is a decreasing sequence of positive numbers and if $\sum_{n=0}^{\infty} 2^n a_{2^n}$ converges, then $\sum_{n=1}^{\infty} a_n$ converges is called _____.

i) Abel's test ii) Dirichilet's test

iii) Cauchy condensation test iv) Leibnitz's test

b) If f and g are two real valued functions then max $(f, g) =$ _____.

i) $\dfrac{|f+g|+f-g}{2}$ ii) $\dfrac{|f-g|+f-g}{2}$

iii) $\dfrac{-|f-g|+f+g}{2}$ iv) $\dfrac{|f-g|+f+g}{2}$

c) If the sequence $\{s_n\}_{n=1}^{\infty}$ converges to '0', then the sequence $\{(-1)^n . s_n\}_{n=1}^{\infty}$ converges to _____.

i) 1 ii) -1

iii) 2 iv) 0

d) If $s=\{s_n\}_{n=1}^{\infty} \in l^2$ then $\|s\|_2 =$ _____.

i) $\left(\sum_{n=1}^{n} s_n^2\right)^{2/3}$ ii) $\left(\sum_{n=1}^{\infty} s_n\right)^{1/2}$

iii) $\left(\sum_{n=1}^{n} s_n\right)$ iv) $\left(\sum_{n=1}^{\infty} s_n^2\right)^{1/2}$

e) If a function f is bounded and integrable in $[a, b]$ and k is a number such that $|f(x)| \le k, \forall x \in [a,b]$ then $\left|\int_a^b f(x)\,dx\right| \le$ _____.

i) $k|b-a|$ ii) $\frac{(b+a)}{k}$

iii) $\frac{(b-a)}{k}$ iv) $k|b+a|$

f) If $\{s_n\}_{n=1}^{\infty}$ is a sequence of real numbers that are not bounded above then $\lim_{n\to\infty} \sup s_n =$ _____.

i) ∞ ii) l.u.b. $\{s_n, s_{n+1}, s_{n+2,\ldots}\}$

iii) g.l.b. $\{s_n, s_{n+1}, s_{n+2,\ldots}\}$ iv) $-\infty$

g) If $f(x) = x^2$, for all $x \in [0,3]$ and $p = \{0, 1, 2, 3,\}$ be a partition sub - division of [0, 3], then L $[p, f]$ and U $[p, f]$ are respectively _____.

i) 3, 6 ii) 5, 14

iii) 6, 3 iv) 14, 5

h) If f is a function from A into B and if range of f = B then f is called _____ function.

i) one - one but not onto ii) one - one & onto

iii) one - to - one iv) onto

Q2) Attempt any **two** of the following: **[16]**

a) If $\{s_n\}_{n=1}^{\infty}$ is a bounded sequence of real numbers, then prove that $\{s_n\}_{n=1}^{\infty}$ has a convergent subsequence.

b) Define Riemann integral. If f is monotonic in $[a, b]$, then prove that f is integrable in $[a, b]$.

c) If $\{a_n\}_{n=1}^{\infty}$ is non increasing sequence of positive numbers and if $\sum_{n=1}^{\infty} a_n$ converges, then $\lim_{n\to\infty} na_n = 0$.

Q3) Attempt any **four** of the following: **[16]**

a) Show that every continuous function is integrable.

b) If $f:A \to B$ and $X \subset B$ and $Y \subset B$ then prove that

$$f^{-1}(X \cap Y) = f^{-1}(X) \cap f^{-1}(Y).$$

c) If $s = \{s_n\}_{n=1}^{\infty}$ and $t = \{t_n\}_{n=1}^{\infty}$ are in l^2, then prove that $s + t = \{s_n + t_n\}_{n=1}^{\infty}$ is in l^2 and $\left[\sum_{n=1}^{\infty}(s_n + t_n)^2\right]^{1/2} \le \left(\sum_{n=1}^{\infty} s_n^2\right)^{1/2} + \left(\sum_{n=1}^{\infty} t_n^2\right)^{1/2}$.

d) If c is a constant then show that a function $f(x) = c, \forall x \in [a,b]$ is R - integrable.

e) Prove that countable union of countable set is countable.

f) Show that the sequence –1, 1, –1, 1, –1, 1, ... is (C,1) summable to 0.

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Total No. of Pages : 3

B.Sc. (Part - III) (Semester - V) Examination, April - 2014

PHYSICS (Paper - IX) (New)

Mathematical & Statistical Physics

Sub. Code : 59870

Day and Date : Thursday, 03 - 04 - 2014 **Total Marks : 40**

Time : 3.00 p.m. to 5.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figure to the right indicates full marks.**
3) **Neat diagram must be drawn wherever necessary.**
4) **Use of calculator or logarithmic table is allowed.**

Q1) Select the correct alternative: **[8]**

a) In spherical polar coordinate system, h_r = ----------.

i) r ii) 1

iii) r sin θ iv) 0

b) In orthogonal curvilinear coordinate system, the coordinate surfaces are in general ----------.

i) plane ii) curved

iii) spherical iv) cylindrical

c) If w is the probability of state of the system, then which of the following relation between entropy and probability?

i) s = kw ii) s = w log k

iii) s = k ln w iv) $s = \log\left(\frac{k}{w}\right)$

P.T.O.

d) According to the principle of equipartition of energy, the energy associated with each degree of freedom is ----------.

i) KT
ii) $\sqrt{KT}$
iii) $\frac{1}{2}KT$
iv) $\frac{1}{3}KT$

e) Rayleigh - Jean's formula agrees well with the experimental results at ---- wavelengths.

i) all
ii) longer
iii) short
iv) shorter

f) For the distribution to be most probable, ----------.

i) $w = 0$
ii) $\log w = 0$
iii) $\delta(\log w) = 0$
iv) $\frac{1}{w} = 0$

g) The average density of diffused radiation coming from all possible directions is given by ----------.

i) $\frac{4\pi k}{c}$
ii) $\frac{2\pi k}{c}$
iii) $\frac{3\pi k}{c}$
iv) $\frac{\pi k}{c}$

h) What is momentum of a photon of frequency ν ----------.

i) $p = \frac{h\nu}{c}$
ii) $p = \frac{hc}{\nu}$
iii) $p = \frac{1}{h\nu}$
iv) $p = \frac{c}{h\nu}$

Q2) Attempt any two: **[16]**

a) Obtain an expression for the divergence of a vector field in orthogonal curvilinear coordinate system. Extend the above formula in Spherical polar coordinate system.

b) What are the characteristics of particles obeying Fermi-Dirac statistics? Assuming the thermodynamic probability derive the Fermi - Dirac distribution law.

c) Derive expressions for most probable speed, average speed and root mean square speed of gas molecules. Hence show that $V_{Mp} < \overline{V} < V_{rms}$.

Q3) Attempt any four: **[16]**

a) Obtain an expression for Laplacian operator ∇^2 in orthogonal curvilinear coordinate system.

b) Describe a micro canonical and canonical ensemble.

c) Deduce Stefan's law from Planck's radiation formula.

d) Write note on radiation pressure.

e) Deduce Wein's displacement law from Planck's radiation formula.

f) Write note on phase space.

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Total No. of Pages : 3

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B.Sc. (Part - III) (Semester - V) Examination, April - 2014

STATISTICS (Paper - IX)

Probability Distribution - I

Sub. Code : 54910

Day and Date : Thursday, 03 - 04 - 2014 **Total Marks : 40**

Time : 3.00 p.m. to 5.00 p.m.

Instructions : **1) All questions are compulsory.**

2) Figures to the right indicate full marks.

Q1) Select the most correct alternative: **[8]**

a) If X and Y are i.i.d. exponential variates with mean θ then variance of $(X-Y)$ is ----------.

i) θ^2 ii) $\frac{1}{\theta^2}$

iii) $2\theta^2$ iv) $\frac{1}{2\theta^2}$

b) If $X \sim N(0,1)$ then $E(e^x)$ is ----------.

i) e ii) $\sqrt{e}$

iii) 0 iv) $e^2 - e$

c) The famility of parametric distributions, for which mean and variance does not exists, is ----------.

i) Double Exponential distribution

ii) Lognormal distribution

iii) Cauchy distribution

iv) Weibull distribution

d) If (X, Y) follows BN (0, 0, 1, 1, ρ) then E (XY) is ----------.

i) $1+\rho^2$ ii) $1+2\rho^2$

iii) $1-2\rho^2$ iv) ρ

e) If (X, Y) ~ BN (1, 2, 9, 16, 0.5) then $P(X \geq 3)$ is ----------.

[Given : Φ (0.67) = 0.24537]

i) 0.74537 ii) 0.25463

iii) 0.24537 iv) 0.75463

f) For following probability function is to be p.m.f. of truncated Poisson at X = 0 $P(X=x)=k\frac{e^{-\lambda}\lambda^x}{x!}$; $x = 1, 2$ ---------- the value of k is ---------.

i) λ ii) $\frac{1}{\lambda}$

iii) $1-e^{-\lambda}$ iv) $\frac{1}{1-e^{-\lambda}}$

g) If X is exponential variate with parameter θ truncated to the left at X = a then variance of X is ----------.

i) $\frac{1}{\theta}$ ii) $\frac{a}{\theta^2}$

iii) $\frac{1}{\theta^2}$ iv) $a+\frac{1}{\theta}$

h) Let Y_1 be first order statistic based on random sample of size n from exponential distribution with mean 0.2 then E (Y_1) is ---------.

i) 0.2 n ii) 2 n

iii) 5 n iv) $\frac{1}{5n}$

Q2) Attempt any two of the following questions: **[16]**

a) Define Laplace distribution. Obtain its distribution function. Hence obtain median.

b) Define Bivariate Normal distribution. Obtain distribution of $\frac{X}{Y}$, where

$(X, Y) \sim BN(0, 0, \sigma_1^2, \sigma_2^2, \rho)$

c) Define p.d.f. of truncated $N(\mu, \sigma^2)$ truncated to the left at $X = a$ and right at $X = b$. Obtain its mean.

Q3) Attempt any four of the following questions: **[16]**

a) Define Lognormal distribution with parameters μ and σ^2. Obtain its mode.

b) Define Weibull distribution with parameters α and β. If $X \sim W(\alpha, \beta)$ then obtain distribution of X^{β}.

c) If $(X, Y) \sim BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then find marginal distribution of X.

d) Define truncated Poisson distribution truncated at X = 0. Find its mean.

e) Derive the p.d.f. of ith order statistic in general.

f) Let $(X_1, X_2, X_3, X_4, X_5)$ be i.i.d. random variables having c.d.f.

$$F(x) = \begin{cases} 0 & ; \ x < \theta \\ 1 - e^{-x+\theta} & ; \ x \geq \theta \end{cases}$$

Find expected value of minimum.

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Total No. of Pages : 2

B.Sc. (Part - III) (Semester - V) (Revised) Examination, April - 2014

ZOOLOGY (Paper - IX) (New)

Functional Anatomy of Non-Chordates

Sub. Code : 59859

Day and Date : Thursday, 03 - 04 - 2014 **Total Marks : 40**

Time : 3.00 p.m. to 5.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Neat and labelled diagrams must be drawn wherever necessary.**

Q1) Select the correct alternative from the given options and rewrite the sentences: **[8]**

a) Syconoid canal system is evolutionary well developed canal system then ----------.

i) Asconoid canal system ii) Leuconoid canal system
iii) Rhagonoid canal system iv) Water vascular system

b) A ---------- a reef system that grows fairly close to the shore with an entirely shallow lagoon.

i) atoll ii) fringing reef
iii) barrier reef iv) plate form reef

c) Holotypic nutrition is restricted in protozoan those possessing ----------.

i) chloroplast ii) mitochondria
iii) nucleus iv) ribosomes

d) When unfertilized egg develop into young one, the process is termed as ----------.

i) hermaphrodite ii) parthenogenesis
iii) sexual reproduction iv) gemmule formation

e) Coral is a colony of ---------- animals living in a secreted skeleton of their own.

i) Coelenterate ii) Arthrpodan

iii) Molluscan iv) Echinoderm

f) Animal Velmen is belong to Phylum ----------.

i) Ctenophore ii) Colenterata

iii) Arthropoda iv) Echinodermata

g) In-complete metamorphosis --------- steps are occurs in insect.

i) naid, egg, adult ii) egg, nymph, adult

iii) egg, larva, pupa and adult iv) egg, larva, nymph and adult

h) A organism may be found in more than one form of individual which have different functions is called as ----------.

i) dimorphic ii) polymorphic

iii) trimorphic iv) multimorphic

Q2) Attempt any two of the following: **[16]**

a) Describe digestive system in sea star and add note of its food and feeding mechanisms.

b) Describe haemocoelomic system present in last ten (22 to 32) segments of leech.

c) Describe canal systems in sponges.

Q3) Attempt any four of the following: **[16]**

a) Describe salient features of Lingula.

b) Describe torsion in Gastropoda.

c) Describe salient features of tornaria larva.

d) Holozoic nutrition in protozoa.

e) Describe locomotion in leech.

f) Describe pedicellariae in sea-star.