SYBSc Chem II

(3 Hours) [Total Marks: 100]

Please check whether you have got the right question paper.

N.B. : 1. All Questions are compulsory.
2. Figures to the right indicate full marks.
3. Use of log-table/nonprogrammable calculator is allowed.
4. Answers for the same question as far as possible should be written together.

1. (A) Select the correct option and complete the following sentences. (any twelve) 12

(i) There are _____ crystal system and _____ Bravais lattices.
(a) 7 ,14 (b) 14,7 (c) 7,7

(ii) The total number of effective atoms in body centered cubic system is ____.
(a) 4 (b) 2 (c) 3

(iii) A _____ accelerates a reaction by decreasing the energy of activation of the reaction.
(a) catalyst (b) inhibitor (c) pressure

(iv) The enzyme which can catalyse the conversion of _____ into glucose is maltase.
(a) maltose (b) invertase (c) zymase

(v) The _____ equation for diffraction of X-rays is $n\lambda = 2d\sin\theta$.
(a) Bragg's (b) Plank's (c) de-Broglie

(vi) The total number of effective atoms in _____ system is 2.
(a) face centred cubic (b) body centred cubic (c) simple cubic.

(vii) pKa range for strongly acidic cation is in between _____.
(a) 1 to 6 (b) 6 to 11.5 (c) -4 to 1

(viii) The cation is strongly acidic if z^2/r is in between _____.
(a) 0.1 to 0.16 (b) 0.01 to 0.04 (c) 0.04 to 0.1

(ix) Pure phosphoric acid is _____ crystalline solid.
(a) yellowish (b) greyish (c) white

(x) _____ acid is responsible for acid rain.
(a) H_2SO_4 (b) HCl (c) CH_3COOH

(xi) pKa values are greater than 14 for _____ cation.
(a) non acidic (b) weakly acidic (c) feebly acidic

(xii) _____ is called king of chemicals.
(a) HNO_3 (b) H_2SO_4 (c) H_3PO_4

(xiii) Two moles of _____ di one are required in Hantzsch synthesis of pyridine.
(a) 1,3- (b) 1,4- (c) 1,5-

(xiv) Electrophilic substitutio action in furan takes place at position _____.
(a) 2 and 5 (b) 3 and 5 (c) 3

(xv) Sulphonation of furan can be carried out by action of _____.
(a) H_2SO_4 (b) SO_3 and pyridine (c) oleum

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(xvi) Benzene diazonium chloride when reduced with $NaHSO_3$ gives _____.
(a) phenyl hydrazine (b) phenyl hydrazone (c) hydrazobenzene

(xvii) Nitration of aniline mainly gives _____ as major products.
(a) o- and p-nitroaniline (b) m- and o-nitroaniline (c) p- and m-nitroaniline

(xviii) Reaction of aniline with bromine water at room temperature gives _____.
(a) 2- bromoaniline (b) 4-bromoaniline (c) 2,4,6-tribromoaniline

(B) State whether the following statements are true or false. (any **three**) 3
(i) As temperature increases the rate of reaction decreases and the energy of activation increases.
(ii) Sodium chloride crystallises in the face centred cubic lattice form.
(iii) Hydrolysis of hydrated cation renders the solution basic.
(iv) Phosphoric acid is a mineral acid.
(v) Friedel - Crafts reaction of the furan can be carried out by using $AlCl_3$.
(vi) Pyrrolidine is a stronger base than pyrrole.

(C) Match the column. (any **five**) 5

(i) Inhibitor	(a) Zn^{2+}
(ii) Promoter	(b) Al^{3+}
(iii) Weakly acidic cation	(c) $K_b = 54 \times 10^{-5}$
(iv) Moderately acidic cation	(d) Increases activity of catalyst
(v) Dimethyl amine	(e) Ba^{2+}
(vi) Aniline	(f) Face centred cubic
	(g) $K_b = 3.8 \times 10^{-10}$
	(h) $K_b = 37 \times 10^{-5}$
	(i) Retards rate of reaction

2. Attempt any **four** of the following. 20
(A) What are (100), (110) and (111) planes for the body-centred cube?
(B) How are X-rays used to determine the interplanar distances in cubic crystals?
(C) Derive Michalis-Menten equation for enzyme catalysis.
(D) Explain characteristic features of a catalysis.
(E) An inorganic salt of molecular weight 74.36 and density 1.874×10^3 $Kg.m^{-3}$ crystallises in a form like NaCl. Calculate the length of the edge of the unit cell if Avogadro's number is 6.023×10^{23} molecules mol^{-1}.
(F) Explain the kinetics of acid-base catalysis.

3. Attempt any **four** of the following. 20
(A) Explain the process of hydration of cation with suitable diagram. How can cation render acidity to the solution?
(B) Explain the relationship between pK_a, acidity and Z^2/r ratio of monoatomic cations by means of graphical presentation.
(C) With the help of predominance diagrams explain non acidic cations and feebly acidic cations with suitable examples.

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(D) Write Latimer equation to calculate hydration energy of anion and explain the terms involved in it. Using this equation, calculate ΔH_{hyd} for F^- ion. (Given radius of F^- ion is 119pm.)
(E) Write physical properties of sulphuric acid.
(F) Write a note on uses of phosphoric acid.

4. Attempt any **four** of the following.
(A) (i) Give the preparation of a) 2-chlorothiophene, b) 2-nitrothiophene and c) thiophene-2-sulphonic acid from thiophene. 3
(ii) Discuss aromaticity of furan. 2
(B) (i) Explain Chichibabin reaction of pyridine. 3
(ii) Give the carbylamine reaction of primary amines. 2
(C) (i) 'Pyridine gives nucleophilic substitution at 2,4 and 6 positions'. Explain. 3
(ii) How is primary amine obtained by reductive amination of aldehyde and ketone? 2
(D) (i) Write a note on Hofmann exhaustive methylation (HEM). 3
(ii) Give Paal-Knorr synthesis for the preparation of pyrrole. 2
(E) (i) How will you distinguish between ethyl amine, diethyl amine and triethyl amine using nitrous acid? 3
(ii) Explain Vilsmeier-Haack reaction of pyrrole. 2
(F) (i) Give azo-coupling reaction of benzene diazonium chloride with a) Phenol and b) N,N-dimethyl aniline. 3
(ii) How is hydrazobenzene prepared from nitrobenzene? 2

5. Attempt any **four** of the following.
(A) Sodium chloride has a face centred cubic lattice and the length of the cube edge is 6.56 A°. Calculate d_{110} and d_{111}. 5
(B) Write a note on activity of nanoparticles as a catalyst. 5
(C) With the help of suitable predominance diagram, explain the behaviour of F^- and S^{2-} in aqueous solution. 5
(D) Write a note on acid rain. 5
(E) (i) Describe Hofmannn degradation of amides. 3
(ii) How is chlorobenzene obtained by Sandmeyer reaction? 2
(F) (i) Explain Diel's-Alder reaction of furan. 3
(ii) Why is pyridine more basic than pyrrole? 2

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NCC IV

Time: 2:30 hrs **Total Marks: 75**

Note: 1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Question No. 5 should attempt by Army, Navy and Air wing Cadets respectively.

Q.1.A) State the following sentences are True or False (Any **Eight**). (08)

1. Cadets takes 120 steps in per minute in 'Daud Ke Chal'.
2. General is the highest rank in Indian Army.
3. General Bipin Rawal is Defence Minister of India.
4. Effective range of 0.22 Delux Rifle is 25 yards.
5. There are 5 commands in Indian Navy.
6. Children's day is celebrated on 11th December.
7. Adha Bahe Mur involves 45^0 turn.
8. Indo-China war was occurred in 1962.
9. There are two types of compass.
10. Kargil Conflict was occurred in 1997.

Q.1. B) Fill in the blanks (Any **Seven**) (07)

1. -------- is the Defense Minister of India.
2. The word of command consist of ---------- parts.
3. Sanjay Gandhi National Park is located at ----------.
4. The speed of marching in Girls battalion is ---------- steps per minutes.
5. Southern Naval command is located at ----------.
6. ---------- is the capital of Maharashtra.
7. The word of command 'Thum' is given on --------- foot.
8. There are ---------- bones in human body.
9. 'Army Day' is celebrated on --------- every year in India.
10. The total strength of cadets in an Army contingent is ---------.

Q.2 a) Explain the role of NCC cadets during and after the disaster. (08)

b) Discus the various fire fighting equipments. (07)

OR

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a) Explain the importance of NGO for youth development. (08)

b) Give an account on Drug Abuse and Trafficking. (07)

Q.3 a) Describe various types of Fractures. (08)

b) What are the different types of Wounds? Explain the mode of treatment for various wounds. (07)

OR

a) Discuss the disadvantages of drunk and drive. (08)

b) List the items included in First Aid Box. (07)

Q.4 a) Describe in brief the lying position of firing. Give the three basic essentials of effective firing. (08)

b) Explain the various types of shooting targets. (07)

OR

a) Explain the Theory of Group and Snap Shooting. (08)

b) What precautions should take on firing range. (07)

Q.5 Write Short note on any **Three** of the following (ONLY FOR ARMY) (15)

1. Setting a Map
2. Camouflage and Concealment
3. Types of Field Signals
4. Methods of finding North
5. Prismatic Compass

OR

Q.5 Write Short note on any Three of the following (ONLY FOR NAVY) (15)

1. Phonetic Alphabets
2. Wearing of National Flag
3. Types of Anchor
4. Parts of Sailing
5. Securing and Towing a Boat

OR

Q.5 Write Short note on any Three of the following (ONLY FOR AIR) (15)

1. Main and Tail Plain
2. Importance of RADAR
3. Flying of Aeromodels.
4. Fuselage
5. Advance technology in Air Force

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(मराठी भाषांतर)

वेळ: २ १/२ तास गुण: ७५

सुचना : १. सर्व प्राशणे सोडविणे आवश्यक आहे.

२. उजवीकडील अंक त्या प्रश्नाचे गुण दार्शवितात.

३. प्रश्न क्रमांक ५ हा भुदल, नौदल, आणि हवाईदलाच्या छात्रांनी आपआपल्या विभागानुसार सोडवावा.

प्रश्न क्रं. १. (अ) खलील विधाने चूक की बरोबर ते लिहा. (कोणतेही ८) (०८)

१) दौड के चल मध्ये छात्र प्रतिमिनीटास १२० पाऊले घेतात.

२) जनरल हे भारतीय भूदालात उच्च श्रेणी आहे.

३) जनरल बिपिन रावल हे भारताचे संरक्षणमंत्री आहेत.

४) ०.यार्ड आहे २५डिलक्स रायफलची प्रभावी रेंज २२.

५) भारतीये नौदलाच्या पाच कमांड आहेत.

६) ११ डिसेंबर रोजी बालदिन साजरा केला जोतो.

७) अर्धे डावीकडे वळण घेताना ४५° मध्ये वळन घेतात.

८) भारत.मध्ये झाले १९६२चीन युद्ध -

९) कंपासचे दोन प्रकार आहेत.

१०)कारगिल संघर्ष १९९७ या वर्षी झाला.

ब) रिकाम्या जागा भरा (कोणतेही सात) (०७)

१) ------ हे भारताचे संरक्षणमंत्री आहेत.

२) वर्ड ऑफ कमांड ------ भाग आहेत.

३) संजय गांधी राष्ट्रिय उद्यान ----- या ठिकाणी आहे.

४) मुलींच्या बाटलीयांमध्ये त्यांच्या संचालनात प्रती मिनिट ----- पाऊले होतात.

५) दक्षिणीय नौदल कमांड ------- या ठिकाणी आहेत.

६) ------ ही महाराष्ट्राची राजधानी आहे.

७) वर्ड ऑफ कमांड थम ही ------ पायावर दिली जाते.

८) मानवी शरीरात ------ हाडे असतात.

९) भारतामध्ये दरवर्षी ------ या दिवशी आर्मी दिन साजरा करतात.

१०) एक आर्मी कंटिन्जन्ट मध्ये छत्रांची संख्या ------ असते.

प्रश्न क्र.२ अ) नैसगिक आपत्तिपूर्वि, मध्ये आणि नंतर रा. छा. सेनेच्या छात्रांचे कार्य स्पष्ट करा. (०८)

ब) विविध अग्निरोधक उपकरणांवर चर्चा करा. (०७)

किंवा

अ) युवकांच्या विकासासाठी गैरसरकारी संघटनाचे कार्य काय यावर चर्चा करा. (०८)

ब) आमली पदार्थांची विक्री आणि वापर या विषयी माहिती द्या. (०७)

प्रश्न क्र.३ अ) वेगवेगळ्या प्रकारच्या फ्रॅक्चरचे वर्णन करा. (०८)

भ) जखमांचे विविध प्रकार सांगुन त्यावरील उपचार करण्याच्या पद्धतींची माहिती द्या. (०७)

किंवा

अ) दारू पिउन गाडी चालविण्याचे तोटे काय यावर चर्चा करा. (०८)

ब) प्रथमेपचार पेटीमध्ये कोणती साधने असतात याची यादी द्या. (०७)

प्रश्न क्र.४ अ) झोपून फायरीग करण्या पद्धत विषद करा आणि प्रभाविपणे फायरिंग करण्यासाठीची तिन मुलभूत तत्वे सांगा. (०८)

ब) शूटिगच्या टार्गेटचे विविध प्रकार सांगुन ते स्पष्ट करा. (०७)

किंवा

अ) गट आणि स्नॅप शुटींगची सिद्धांत काय ते स्पष्ट करा. (०८)

ब) फायरिंग रेंजवर आपण काय दक्षता घेणार ते सांगा. (०७)

प्रश्न क्र.५ टिपा लिहा (कोणत्याहि तीन) (भूदल विभाग.) (१५)

१ नकाशा सेट करणे.

२ छलावराण आणि दृष्टीस.

३ फिल्ड सिग्नलचे प्रकार.

४ उत्तरदिशा शोधण्याच्या पद्धति.

५ प्रिझमॅटीक होकायंत्र.

किंवा

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(१५)

टिपा लिहा (कोणत्याहि तीन) (नौदल विभाग.)

१ ध्वन्यात्मक मुळाक्षरे.

२ वेअरीग ऑफ नॅशनल फ्लॅग

३ नांगरचे प्रकार

४ सेलिंगचे पार्ट.

५ सिक्युअरीग आणि टोईंग बोट.

किंवा

टिपा लिहा (कोणत्याहि तीन) (वायुदल विभाग.) (१५)

१ मेन आणि टेल प्लेन.

२ रडारचे महत्व.

३ फ्लाईग ऑफ एरोमॉडेल.

४ विमानाचा सांगाडा.

५ वायुदलातिल अद्ययावत तंत्रज्ञान.

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वेळ: २ तास ३० मिनिटे गुण:७५

सूचना: १. सर्व प्रश्न अनिवार्य आहेत.
२. उजवीकडील अंक पूर्ण गुण दर्शवितात.

प्रश्न.१ अ) खालील संकल्पना स्पष्ट करा.(कोणत्याही पाच) १५

१. उत्पादन उत्तरदायित्व
२. उपस्थानाधिकार
३. प्रदुषकाने भरपाई देणे तत्व
४. दूर संवेदन
५. सर्वांगीण विचार
६. शाब्दिक क्षमता
७. कृत्रिम आहार
८. निसर्गकेंद्रित दृष्टीकोण

किंवा

ब. पायाभूत अभ्यासक्रम (सत्र-४) साठी तुम्ही सादर केलेल्या प्रकल्पावर व्यापक टीप लिहा. १५

२.अ) ग्राहक संरक्षण कायदा,१९८६ ची विविध वैशिष्ट्ये संविस्तर स्पष्ट करा. १५

किंवा

ब. माहितीचा अधिकार कायदा,२००५ च्या वैशिष्ट्यांची चर्चा करा.

३.अ) परिस्थितीकीशास्त्राच्या आकलनासाठीच्या विविध दृष्टीकोणांवर टिपण्णी करा. १५

किंवा

संयुक्त राष्ट्रसंघ शाश्वत विकास शिखर परिषद,२०१५ मध्ये शाश्वत विकासासाठी स्वीकारलेल्या शाश्वत विकासाच्या विविध उद्देशांची चर्चा करा.

४.अ) जैवतंत्रज्ञानाच्या कृषीमधील विविध उपयोगांवर टिपण्णी करा. १५

किंवा

ब) अंतराळ तंत्रज्ञानाच्या क्षेत्रातील भारताच्या कामगिरीची चर्चा करा.

५.अ)नोकरीत प्रवेश मिळविण्यासाठीच्या कोणत्याही तीन स्पर्धात्मक परीक्षेच्या स्वरुपाची चर्चा करा. १५

किंवा

ब) अभिप्रेरणेच्या वेगवेगळ्या कोणत्याही तीन सिद्धांतांची चर्चा करा.

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Q. P. Code: 34266

(2 ½ hours) Total marks: 75

N. B. (1) All questions are compulsory
(2) All questions have internal choice
(3) Figures to the right indicate full marks.

1) A. Explain the following concepts: **(any five)** (15)
1. Product liability
2. *Locus Standi*
3. Polluter Pays Principle
4. Remote sensing
5. Lateral thinking
6. Verbal Ability
7. Synthetic food
8. Eco-centrism

OR

B Write a comprehensive note on the Foundation Course (Semester IV) project submitted by you.

2) A. Explain in detail, the various features of Consumer Protection Act, 1986. (15)

OR

B. Discuss the features of the RTI Act, 2005.

3) A. Comment on the various approaches to understanding ecology. (15)

OR

B. Discuss the various goals of sustainable development as adopted in the UN Sustainable Development Summit, 2015.

4) A. Comment on the various applications of biotechnology in agriculture. (15)

OR

B. Discuss India's achievements in the field of satellite technology.

5) A. Discuss the format of any three competitive exams conducted for entry into jobs. (15)

OR

B. Discuss any three different theories of motivation.

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Time: 3 Hours Marks: 100

N.B : (1) All questions are compulsory.
(2) Figures to the right indicate maximum marks.
(3) Use of non-programmable calculators is permitted.
(4) Symbols used have their usual meaning

Q1. A) Select correct answer (12)

1 The area of each half period zone of a plane wavefront is equal to

a) $\pi b\lambda$ b) $4\pi b\lambda$ c) $2\pi b\lambda$ d) $\frac{\pi b\lambda}{2}$

2 The width of the central maximum formed in Fraunhoffer diffraction pattern, due to a single slit is

a) $\frac{2f\lambda}{a}$ b) $\frac{2a}{f\lambda}$ c) $\frac{2\lambda}{af}$ d) $\frac{2af}{\lambda}$

3 Elliptically polarized light consists of two perpendicular waves of unequal amplitude which differ in phase by

a) 90° b) 180° c) 0 d) 270°

4 Huygens explained the phenomenon of double refraction on the basis of

a) Interference b) Secondary wavelets c) Reflection d) Diffraction

5 The Decimal equivalent of the hexadecimal number E2 is

a) 262 b) 822 c) 228 d) 226

6 The race around condition occurs in JK flip flop if

a) J = 1, K=0 b) J = 1, K=1 c) J = 0, K = 0 d) J=0, K=1

B) Answer in One sentence (3)

1 How do we increase the distance between the source and the slit in Fraunhoffer diffraction pattern?

2 State the law of Malus.

3 What is meant by latch?

C) Fill in the Blanks (5)

1 _____ of the narrow wire can be measured from its diffraction pattern.

2 The intensity of the central maximum in diffraction pattern due to a double slit is _____ times that of the central maximum in the diffraction pattern due to a single slit.

3 Two perpendicular waves of equal amplitude which have constant phase difference, the resultant light wave is _____ polarized light.

4 E -Ray in double refraction, vibrates _____ to the principal section.

5 In a _____ type of shift register, data is entered into register one bit at a time and all data out at a time.

Q2. A) Attempt any **One** (8)

1 Explain the theory of Fresnel diffraction at a straight edge and show that the bands produced are not equally spaced.

2 Explain intensity distribution in Fraunhoffer diffraction pattern due to a single slit.

B) Attempt any **One** (8)

1 Write a note on: - Fresnel Diffraction pattern due to a narrow slit.

2 Explain Fraunhoffer diffraction pattern due to a double slit.

C) Attempt any **One** (4)

1 A narrow slit illuminated by light of wavelength 4500 A is placed at a distance of 20 cm from a straight edge. Calculate the distance between the second and third diffraction maxima formed on a screen placed at a distance of 60 cm from a straight edge.

2 Deduce the missing orders for a double slit Fraunhoffer diffraction pattern, if the slit widths are 0.16 mm and they are 0.8 mm apart.

Q3. A) Attempt any **One** (8)

1 What is meant by polarization of light? Explain the phenomenon of production of linearly polarized light.

2 Explain the construction and working of Quarter wave plate. Determine the thickness and explain what will happen if it placed in the path of plane polarized beam.

B) Attempt any **One** (8)

1 Describe in brief the following methods for producing plane polarized light
a) Selective absorption b) Scattering of light

2 Describe the process of production of plane polarized light by reflection method.

C) Attempt any **One** (4)

1 Calculate the thickness for which the E- ray and O- ray combine to produce a plane polarized light. A light of wavelength 5×10^{-5}cm is incident on quartz crystal with face parallel to the axis. ($\mu_E = 1.55$ and $\mu_O = 1.54$).

2 A light of wavelength 6000 A^0 passes through 1.47×10^{-2} cm thick double refractive plate. The plate produces a path difference of $\lambda / 2$ between the ordinary and extraordinary ray. Calculate the difference in their refractive indices.

S4BSC

S.Y BSc
18/04/19

Q.2 B) Answer **any two** of the following: **10**
a) Describe Neo-Darwinism
b) Describe chemical evolution with Haldane & Oparin theory.
c) Write a note on vestigial organs.
d) Give an account of embryological evidences in favour of organic evolution.

Q.3 A) State Hardy Weinberg law and explain how mutation and migration modify Hardy Weinberg's equilibrium. **10**

OR

A) Differentiate between allopatric and sympatric speciation. **10**

Q.3 B) Answer **any two** of the following: **10**
a) Describe **any two** patterns of macroevolution.
b) Give an account of post zygotic isolating mechanisms.
c) Explain the concept of stabilizing selection with suitable example.
d) Describe the sources of variations within a population.

Q.4 A) Give an account of two broad approaches of scientic reasoning. **10**

OR

A) Define scientific research. Give an account on different types of research. **10**

Q.4 B) Answer **any two** of the following: **10**
a) Write a note on report writing.
b) Describe the role of critical thinking in scientific research.
c) Describe the process of approval for conduction research in protected areas.
d) Elaborate on application of knowledge gained by research.

Q.5 Write short notes on **any four**: **20**
a) Recapitulation theory
b) Types of fossils
c) Biological species concept
d) Role of natural selection in evolution
e) Informed consent in clinical research
f) Role of computers in research

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[Time: 3 Hours] **[Marks: 100]**

Please check whether you have got the right question paper.

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

Q.1 A) Fill in the blanks by choosing the correct option given in the brackets: 05

a) Animals and plants possessing characteristics of two different successive groups of organisms are known as _____.
(connecting links, Fossils, Vestigial organs)

b) Development of antibiotic resistance in bacteria is an example of _____ selection.
(directional, disruptive, ploidy)

c) When similar species reproduce in different seasons or at different times of day it is termed _____ isolation. (mechanical, temporal, behavioural)

d) Wildlife (Protection) Act was enacted in the year _____. (1972, 1982, 1992)

e) In ICMR, 'C' stands for _____. (Commission, Centre, Council)

Q.1 B) Match the columns I and II and **rewrite**: 05

Column A	Column B
a) Diploblastic	1) Genetic drift
b) Leonardo-da-Vinci	2) Genetic polymorphism
c) Bottleneck effect	3) 1998
d) Human blood groups	4) Founder of Modern Palaentology
e) Schedule Y of Drugs and Cosmetics Act	5) Organisms with two layers of tissues

Q.1 C) State whether **True or False**: 05

a) DNA sequencing has helped in tracing the evolutionary lineage.
b) Legends are the captions for the tables and figures.
c) Microevolution always occurs above the species level.
d) Forms of species that show gradual differences in their phenotypes over a geographical area are called clines.
e) ICAR stands for Indian Council of Animal Research.

Q.1 D) Answer the following in **one sentence**:

a) Define compression.
b) What is the full form of CPCSEA?
c) Define Founder effect.
d) What is Parapatric speciation?
e) Define research hypothesis.

Q.2 A) Explain Mutation theory and Weisman's germ plasm theory of evolution.

OR

A) Discuss anatomical evidences in favour of organic evolution.

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SYBSc. Chem I

25/04/2019

[Time : 3 Hours] **[Total Marks : 100]**

Please check whether you have got the right question paper.

N.B. : 1. All Questions are compulsory.
2. Figures to the right indicate full marks.
3. Use of log-table/non-programmable calculator is allowed.
4. Answers for the same question as far as possible should be written together.

1. (A) Select the correct option and complete the following sentences. (any **twelve**) **12**

(i) Substances with higher reduction potentials are strong _____ .
(a) reducing agents (b) oxidising agents (c) acids

(ii) All metals lying above in electrochemical series can liberate H_2 gas by reaction with _____ .
(a) bases (b) covalent compounds (c) acids

(iii) In galvanic cell, electrons are given off _____ electrode.
(a) by anode (b) at cathode (c) by platinum

(iv) A system with zero degrees of freedom is known as _____ .
(a) bi-variant (b) non variant (c) mono-variant

(v) The eutectic temperature of lead silver system is _____ .
(a) 762K (b) 576K (c) 726K

(vi) All metals lying above hydrogen in electrochemical series can liberate H_2 gas by reaction with _____ .
(a) acids (b) bases (c) covalent compounds

(vii) In first transition series _____ element has its 3d level exactly half filled.
(a) Sc (b) Cr (c) Co

(viii) Solution containing hydrated Ti^{3+} is ___ in colour.
(a) purple (b) red (c) yellow

(ix) ____ among following shows ferromagnetism.
(a) Ti (b) V (c) Ni

(x) The complex $[NiCl]_4^{2-}$ has _____ structure
(a) tetrahedral (b) square planar (c) square pyramidal

(xi) Fe^{2+} salts give blue colour with _____
(a) KOH (b) K- ferrocyanide (c) K –ferricyanide

(xii) The molecular formula of chromium carbonyl is_____
(a) $Cr(CO)_4$ (b) $Cr(CO)_5$ (c) $Cr(CO)_6$

(xiii) e to presence of electron withdrawing group strength of carboxylic acid _____.
(a) increases (b) decreases (c) remains Same

(xiv) Aromatic carboxylic acid on heating with soda lime forms _____.
(a) alkane (b) arene (c) aldehyde

(xv) Carboxylic acid is prepared from grignard reagent by action of _____.
(a) H_2SO_4 (b) CO_2 (c) HCl

(xvi) _____ are salts of sulfonic acids.
(a) Detergents (b) Paints (c) Perfumes

(xvii) Naphthalene on reaction with concentrated H_2SO_4 at 160° C forms _____.
(a) 1- naphthalene sulphonic acid
(b) 2- naphthalene sulphonic acid
(c) 7- naphthalene sulphonic acid

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(xviii) Nitro Benzene on reaction with oleum forms _____.
(a) m-nitro sulphonic acid (b) o-nitro sulphonic acid
(c) p-nitro sulphonic acid

(B) State whether the following statements are true or false. (any **three**) 3
(i) Any uni-univalent type of salt can be used in preparation of salt bridge
(ii) Aqueous salt solution is an classic example of single phase system.
(iii) With the increase in covalent character, acidic character of transition compound increases.
(iv) Ionisation isomerism is a form of stereoisomerism in coordination compounds
(v) Acetic acid is stronger than chloro acetic acid.
(vi) In IPSO substitution – SO_3H group is replaced by NO_2 group

(C) Match the column. (any **five**) 5

(i)	Salt bridge	(a)	Crossed Claisen condensation
(ii)	Clpyeron equation	(b)	Ambidentate ligand
(iii)	SCN^-	(c)	To connect two half cells
(iv)	Mo	(d)	Half filled state
(v)	Acyl nucleophilic subsitution	(e)	$dP/dT = \frac{\Delta H_f}{T(V_{liq.} - V_{vapour})}$
(vi)	Reaction of different esters	(f)	To minimize liquid junction potential
		(g)	Forms tetrahedral intermediate
		(h)	$dP/dT = \frac{\Delta H}{T\Delta V}$
		(i)	Hydrolysis reaction

2. Attempt any **four** of the following.
(A) Differentiate between concentration cells and chemical cells. 05
(B) Explain any two applications of Nernst equation in the study of galvanic cells? 05
(C) The emf of a cell $Zn \mid ZnSO_4 \parallel CuSO_4 \mid Cu$ at 25°C is 0·3 V and the temperature coefficient of emf is $-1{\cdot}4 \times 10^{-4}$ V per degree. Calculate the heat of reaction per mole for the reaction that taking place inside the cell. 05
(D) Justify the number of phases and components present in the following system – $CaCO_3$ (solid) ⇋ CaO (solid) + CO_2 (gas) 05
(E) Derive Gibbs phase rule thermodynamically. 05
(F) The boiling point of a given solvent is 352·2K at $1{\cdot}013 \times 10^5$ N m^{-2}. Calculate the boiling point of the given solvent at $0{\cdot}63 \times 10^5$ N m^{-2}. (molar heat of vaporization of a solvent at 352.2 K is 31·8 kJ mol^{-1}; R= 8·314 JK^{-1} mol^{-1}) 05

3. Attempt any **four** of the following.
(A) Explain the terms with suitable examples:- 05
(i). Primary and secondary valency (ii). Geometrical isomerism.
(B) Name the important oxides of titanium and vanadium. Give properties of any two oxides of vanadium. 05
(C) Explain in brief different evidences for the formation of co-ordination compounds. 05
(D) Comment on the colour property of transition metals. 05

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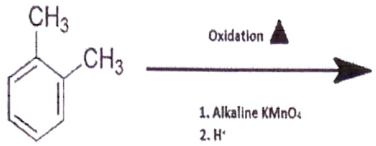
(F) Complete the following reactions-- 05

a)



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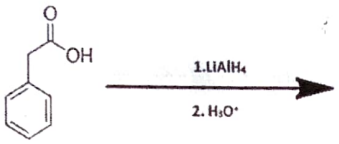
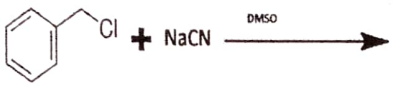
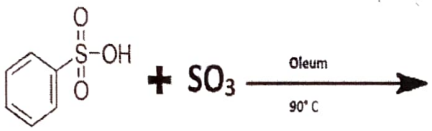


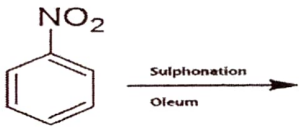
c)



d)



e)



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(E) Give an account of Werner's theory of coordination compounds. 05
(F) Write a note on" Variable oxidation states of transition elements' 05

4. Attempt any **four** of the following.

(A) a) How will you prepare –
i) benzamide from benzoic acid 02
ii) benzoyl chloride from benzoic acid?
b) Explain Claisen condensation with mechanism. 03

(B) a) Give preparation of Benzoic acid from- 03
a) toluene b) Grignard reagent.
b) Explain oxidation of 1-propanol. 02

(C) a) Explain sulphonation of naphthalene at different temperatures. 03
b) How will you convert :
a) bromobenzene to benzoic acid.
b) salicylic acid to methyl salicylate? 02

(D) a) What is IPSO substitution? Explain with example. 03
b) What is decarboxylation? Give an example. 02

(E) a) What is the effect of substituents on acid strength of aliphatic acids? 04
b) Draw structure of 2-methyl butanoic acid. 01

(F) Discuss HVZ reaction giving mechanism and applications. 05

5. Attempt any **four** of the following.

(A) What are the advantages and disadvantages of quinhydrone electrode in the determination of pH? 05

(B) Ether boils at 306K at 1.00×10^5 Pa pressure. At what temperature will it boil at a pressure of 9.85×10^3 Pa? Given that the molar enthalpy of vaporization of ether is 2.74×10^4 J mol^{-1}. 05

(C) Represent the electronic configuration of 3d transition elements and mention the names of elements with special stability. 05

(D) What are the different rules for nomenclature of coordination compounds? Explain with examples. 05

(E) Explain following reactions with example. 05
i) Fischer's Esterification
ii) Ammonolysis

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25/04/2019

(3 Hours) [Total Marks: 100]

Note: (*i*) All questions are compulsory.
(*ii*) Figures to the right indicate marks for respective parts.

Q.1 Choose correct alternative in each of the following (20)

i. The norm of the partition P = { −6, −5.5, −5, −4.8, −3} is
(a) 0.5 (b) 1.8
(c) 0.2 (d) None of these

ii. Let $f: [0,1] \to \mathbb{R}$ is defined as $f(x) = 1$, $if\ x \in [0,1] \cap \mathbb{Q}$
$= 0$, $o,w.$

Then for any partition P of $[0,1]$,
(a) $L(P,f) = \frac{1}{2}$ and $U(P,f) = 1$
(b) $L(P,f) = 0$ and $U(P,f) = 0$
(c) $L(P,f) = 0$ and $U(P,f) = 1$
(d) None of these

iii. Let f and g be functions such that the function $f + g$ is integrable on I , then
(a) Both f and g must be integrable on I (b) At least one of f and g must be integrable on I
(c) f and g may or may not be integrable on I (d) None of these

iv. If $F: [0,1] \to \mathbb{R}$ is defined by $F(x) = \int_0^x sin(t^2)dt$,then
(a) $F'(x) = \sin(x^2)$ (b) $F'(x) = \cos(x^2)$
(c) $F'(x) = \sin x$ (d) None of these

v. The improper integral $\int_1^\infty \frac{x+1}{x^5+5} dx$ is
(a) Type I and Converges (b) Type I and diverges
(c) Type II and Converges (d) None of these

vi. If $f: \left[0, \frac{\pi}{2}\right] \to \mathbb{R}$ is defined by $f(x) = \int_{sinx}^{cosx} e^{-t^2} dt$,then $f'(\pi/4)$ equals
(a) $\sqrt{\frac{1}{e}}$ (b) $-\sqrt{\frac{2}{e}}$
(c) $\sqrt{\frac{2}{e}}$ (d) $-\sqrt{\frac{1}{e}}$

vii. Length of the curve $y = 2x$ between $x = 0$ & $x = 1$ is
(a) $\sqrt{5}$ (b) $\sqrt{3}$
(c) $\sqrt{2}$ (d) 1

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Q3. Attempt any **TWO** questions from the following: (12)

b) i. Let $f:[0,1] \to \mathbb{R}$ be defined by $f(x) = \begin{cases} 1-2x & if\ 0 \le x \le 1/2 \\ 2x-1 & if\ 1/2 < x \le 1 \end{cases}$

And $F:[0,1] \to \mathbb{R}$ be defined by $F(x) = \int_0^x f(t)dt$ then discuss the continuity of f at $x = \frac{1}{2}$ and differentiability of $x = \frac{1}{2}$..

ii. If $x = \int_0^y \frac{dt}{\sqrt{1+t^2}}$, $y \ge 0$.Find $\frac{d^2y}{dx^2}$.

iii. State Abel's and Dirichlet's Tests for the conditional convergence of type 1 improper integral and discuss convergence of $I = \int_0^\infty \frac{\sin x}{\sqrt{x}} dx$

iv. Prove that $\int_a^\infty \frac{1}{x^p}\, dx$,a> 0,converges if and only if $p > 1$.

Q4. Attempt any **ONE** question from the following: (08)

a) i. Using induction on n, show that $\beta(x,y) = \frac{\beta(x,y+n)\beta(y,n)}{\beta(x+y,n)}$.

ii. State Cylindrical shell method for finding volume of solid generated by revolving a region bounded by$y = f(x) \& y = g(x)$ with $f(x) \ge g(x), x \in [a,b]$ about Y-axis. Hence find volume of solid of revolution of region bounded by the curves$y = 2x - 1, x = 0 \& y = \sqrt{x}$ about Y-axis.

Q4. Attempt any **TWO** questions from the following: (12)

b) i. With the usual notation of beta function, show that

$\beta(m,n) = 2\int_0^{\frac{\pi}{2}} (sin\theta)^{2m-1}(cos\theta)^{2n-1} d\theta$.

ii. Define gamma function and show that $\Gamma(1) = 1$.

iii. Find surface area of the solid obtained by revolving the curve $x = 3t - t^3, y = 3t^2, 0 \le t \le 1$ about X-axis.

iv. Using disk method, find volume of solid generated by revolving the region bounded by parabola $y = x^2$ and the line $y = 2x$ in the 1st quadrant about the Y-axis.

Q5. Attempt any **FOUR** questions from the following: (20)

a) Let P = { 0, 0.5, 1, 1.75, 2.1,3 } be a partition of [0, 3] and $f : [0, 3] \longrightarrow \mathbb{R}$ is a function such that $f(x) = 1 - x$ then find the lower sum $L(P, f)$ and upper sum $U(P, f)$.

b) Show that every constant function is Riemann integrable on [a, b].

c) Evaluate $\lim_{x\to\infty} \frac{1}{x^3}\int_0^x \frac{t^2}{1+t^4} dt$.

d) Discuss convergence of each of the following:

$I) \int_1^\infty \frac{1}{x^{1.001}} dx.$ (II) $\int_0^1 \frac{dx}{\frac{1}{x^2}(1+x^2)}$

e) The solid lies between planes perpendicular to X-axis at $x = 0 \& x = 4$. The cross-section perpendicular to X-axis between these planes run from the parabola $y = -\sqrt{x}$ to $y = \sqrt{x}$. Using Slicing method, find volume of solid if cross-sections are squares with bases in XY-plane.

f) Evaluate:$\int_0^\infty x^3 e^{-4x}\, dx$.

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Q3. Attempt any **TWO** questions from the following: (12)

b) i. Let $f:[0,1] \to \mathbb{R}$ be defined by $f(x) = \begin{cases} 1-2x & if\ 0 \le x \le 1/2 \\ 2x-1 & if\ 1/2 < x \le 1 \end{cases}$

And $F:[0,1] \to \mathbb{R}$ be defined by $F(x) = \int_0^x f(t)dt$ then discuss the continuity of f at $x = \frac{1}{2}$ and differentiability of $x = \frac{1}{2}$..

ii. If $x = \int_0^y \frac{dt}{\sqrt{1+t^2}}$, $y \ge 0$.Find $\frac{d^2y}{dx^2}$.

iii. State Abel's and Dirichlet's Tests for the conditional convergence of type 1 improper integral and discuss convergence of $I = \int_0^\infty \frac{\sin x}{\sqrt{x}} dx$

iv. Prove that $\int_a^\infty \frac{1}{x^p}\, dx$,a> 0,converges if and only if $p > 1$.

Q4. Attempt any **ONE** question from the following: (08)

a) i. Using induction on n, show that $\beta(x,y) = \frac{\beta(x,y+n)\beta(y,n)}{\beta(x+y,n)}$.

ii. State Cylindrical shell method for finding volume of solid generated by revolving a region bounded by$y = f(x)$& $y = g(x)$ with $f(x) \ge g(x), x \in [a,b]$ about Y-axis. Hence find volume of solid of revolution of region bounded by the curves$y = 2x - 1, x = 0$ & $y = \sqrt{x}$ about Y-axis.

Q4. Attempt any **TWO** questions from the following: (12)

b) i. With the usual notation of beta function, show that

$\beta(m,n) = 2\int_0^{\frac{\pi}{2}} (sin\theta)^{2m-1}(cos\theta)^{2n-1}\, d\theta$.

ii. Define gamma function and show that $\Gamma(1) = 1$.

iii. Find surface area of the solid obtained by revolving the curve $x = 3t - t^3, y = 3t^2, 0 \le t \le 1$ about X-axis.

iv. Using disk method, find volume of solid generated by revolving the region bounded by parabola $y = x^2$ and the line $y = 2x$ in the 1st quadrant about the Y-axis.

Q5. Attempt any **FOUR** questions from the following: (20)

a) Let P = { 0, 0.5, 1, 1.75, 2.1,3 } be a partition of [0, 3] and $f : [0, 3] \longrightarrow \mathbb{R}$ is a function such that $f(x) = 1 - x$ then find the lower sum $L(P, f)$ and upper sum $U(P, f)$.

b) Show that every constant function is Riemann integrable on [a, b].

c) Evaluate $\lim_{x\to\infty} \frac{1}{x^3}\int_0^x \frac{t^2}{1+t^4} dt$.

d) Discuss convergence of each of the following:

I) $\int_1^\infty \frac{1}{x^{1.001}} dx$. (II) $\int_0^1 \frac{dx}{\frac{1}{x^2}(1+x^2)}$

e) The solid lies between planes perpendicular to X-axis at $x = 0$ & $x = 4$. The cross-section perpendicular to X-axis between these planes run from the parabola $y = -\sqrt{x}$ to $y = \sqrt{x}$. Using Slicing method, find volume of solid if cross-sections are squares with bases in XY-plane.

f) Evaluate:$\int_0^\infty x^3 e^{-4x}\, dx$.

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Paper 2 Set I
Time: 3Hrs

Marks:-100

S4 BSc
P1 B
26/4/2019

N. B : (1) All questions are compulsory.
(2) Figures to the right indicate maximum marks.
(3) Use of non-programmable calculators is permitted.
(4) Symbols used have their usual meaning

Q1. A) Select correct answer (12)

1 For a particle restricted to move in x- direction ,kinetic energy operator is :

a) $-\frac{\hbar^2}{2m}\frac{d^2\psi}{dx^2}$ b) $-\frac{\hbar^2}{2m}\frac{d^2}{dx^2}$ c) $-\frac{\hbar^2}{2m}\frac{d^2}{dt^2}$ d) $-\frac{\hbar^2}{2m}\frac{d^2p}{dx^2}$

2 Which of the following is an eigen function of kinetic energy operator

a) ae^{ikx^2} b) x^2 c) ae^{ikx} d) ax^2

3 The penetration depth of a particle of energy E incident on a potential step of height V, (E < V) depends on

a) only the mass of the particle
b) only the energy of the particle
c) both mass and energy of the particle
d) neither energy nor mass of the particle

4 The potential energy of a free particle is

a) positive b) negative c) zero d) none of these

5 Freezing of liquid helium at atmospheric pressure is explained by _____

a) zero-point energy b) tension-point energy
c) infinite energy d) undefined energy

6 Energy levels of harmonic oscillators are _____spaced.

a) evenly b) unevenly c) randomly d)unsatisfactorily

B) Answer in one sentence (03)

1 State one dimensional Schrodinger's time independent equation
2 What do you mean by bound states of particle?
3 Give one example of tunneling effect.

C) Fill in the Blanks (5)

1 Quantum mechanics is ---------- in nature
2 The most fundamental equations of wave mechanics are called -------- equations
3 Probability that the incident particle is reflected is called .....
4 In case of step potential if energy of the particle is less than barrier potential then penetration depth ..... with increase in the mass of the particle.
5 For higher values of 'n', quantum behavior matches with the classical behavior. This is termed as _____.

Q2. A) Attempt any one (8)

1 What is wave function? Choose a suitable expression for wave function and derive Schrodinger's Time Dependent Equation (STDE).
2 What is 'Well behaved Wave function'? Discuss the requirements of Well-behaved wave function.

B) Attempt any one (8)

1 Starting from a one dimensional simple harmonic progressive wave, derive classical wave equation and comment on it.

2 What is eigen value equation? What are eigen functions and eigen values? Explain it with one example.

C) Attempt any one (4)

1 If the normalized wave function of an oscillator is given by $\Psi = Aye^{-y^2/2}$, $-\infty < y < \infty$, find A

2 Find the expectation value of momentum for a wave function

$$\psi(x) = \sqrt{\frac{2}{l}} \sin\frac{\pi x}{l} \; ; \; 0 < x < l$$

Comment on result.

Q3. A) Attempt any one (8)

1 Consider an electron of energy E incident on the potential step defined by

$V(x) = 0$ for $x \leq 0$

$V(x) = V_0$ for $x \geq 0$

Derive the expressions for reflection and transmission coefficients when $E > V_0$.

2 Write down the Schrodinger's time independent wave equation for a particle in an infinite rectangular potential well and obtain normalized solutions.

B) Attempt any one (8)

1 Show that the energy eigenvalues of a particle confined to a three dimensional box depends on three quantum numbers.

2 Set up Schrodinger's equation for a free particle. Solve the equation to obtain the eigen function. Find the expectation value of momentum and comment on it.

C) Attempt any one (4)

1 Consider a rectangular potential barrier of height 10 eV and width 5×10^{-10} m. Electrons of energy 1 eV are incident on it. Calculate the transmission probability.

2 A neutron of kinetic energy 5 MeV tries to enter a nucleus and its potential energy drops at the nuclear surface very rapidly from a constant external value V = 0 to a constant internal value V = – 50 MeV. Estimate the probability that the neutron will be reflected at the nuclear surface.

Q4. A) Attempt any one (8)

1 One - dimensional rectangular potential barrier is given by:

$V(x) = 0; \; x \leq 0$

$= V_0; \; 0 \leq x \leq a$

$= 0; \; c \geq a$

A particle with energy E_0 is incident on the barrier from the left. $E_0 > V_0$, write down the STIE for the particle.

Solve it and obtain expressions for reflection coefficient.

S4BSC

Paper / Subject Code: 78849 / Zoology : Paper II

26/4/2019 **Q. P. Code:32049**

Time: 3 Hours Marks: 100

N. b.

1. All questions are compulsory and carry equal marks.
2. Figures to right indicate full marks.
3. Draw neat labeled diagrams wherever necessary.
4. Attempt the questions in order.
5. Please check whether you have got the right question paper.

Q.1 A) Fill in the blanks by choosing the correct options given below. 05

a) Diffusion is different than osmosis because_____
(Former is a active and latter is a passive process, Former is a passive and latter is a active process, former is responsible for endocytosis and latter for exocytosis.)

b) Nucleus of the cell is connected with the endomembrane system with the help of ----------. (Gogli complex, Mitochondria, rough endoplasmic reticulum)

c) Rough Endoplasmic reticulum are studded with_____ on their surface.
(Amino acids, Monosaccharides, Ribosomes)

d) The cell organelle responsible for digestion of broken mitochondria is _____
(Gogli complex, lysosomes, mitochondria)

e) α- helix and β- strand of polypeptides without the side chains are responsible for formation of ---------- (Monosaccharides, Primary proteins, Secondary proteins)

B) Match the columns I and II and rewrite. 05

Column I	Column II
a) Robert Hook	i. Mitochondria
b) Singer and Nicolson	ii. Amino Acid
c) Ergastoplasm	iii. Cell
d) F1 particles	Iv Fluid Mosaic Model
e) Leucine	v. RER

C) State whether True or False. 05

a) Chromatin network is present in the cytoplasm of eukaryotic cell.
b) Mitochondria possesses a molecule of circular DNA in its matrix
c) Lysosomes are responsible for protein synthesis.
d) Fundamental energy yielding molecules of living system are carbohydrates
e) A polypeptide chain has two ends namely C-terminal and N-Terminal

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D) **Define the following.** 05

a) Active Transport.
b) Osmosis
c) Autophagy
d) Lipid
e) Monosaccharaides

Q.2 A) Give an account on nuclear pore complex. 10

OR

A) Enlist the types of junctional complexes and describe desmosomes, hemidesmosomes and microvilli. 10

B) **Explain any Two from the following.** 10

a) Write a note on cell theory.
b) Draw neat and labeled diagram of Fluid Mosaic Model.
c) Write a note on classification of membrane receptors.
d) What are the functions of Microtubules?

Q.3 A) Explain the ultrastructure of endoplasmic reticulum 10

OR

A) Explain the functions of Mitochondria. 10

B) **Explain any Two from the following.** 10

a) Write a note on Chemical Composition of Mitochondria.
b) Write a note on role of lysosome as labilizers and stabilizers.
c) Write a note on polymorphism in lysosome.
d) Write a note on any three components of Golgi Complex.

Q.4 A) Describe the clinical significance of Proteins 10

OR

A) Explain Vitamin 'C' and its Clinical significance. 10

B) **Explain any Two from the following.** 10

a) Write a note on Deficiency Manifestations of Vitamin 'A'
b) Write a note on Primary structure of protein
c) Write a note on Saturated Fatty Acids.
d) Write the properties of carbohydrates.

Q.5 **Write short notes on any Four** 20

a) Functions of microfilament
b) Gap function.
c) Draw neat and labeled diagram of endomembrane system
d) Smooth endoplasmic reticulum
e) Write a note on Fructose
f) Peptide bond and its formation by condensation process

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(3 Hours) [Total Marks: 100]

Note: (*i*) All questions are compulsory.

(*ii*)Figures to the right indicate marks for respective parts.

Q.1 Choose correct alternative in each of the following (20)

i. Let $a, b \in D_3$, where a and b denotes rotation and reflection then $|ab| =$

(a) 2 (b) 3

(c) 6 (d) None of the above

ii. Let H and K be the subgroups of a group G. Then $H \cup K$

(a) Is always a subgroup of G

(b) Is never a subgroup of G

(c) Is a subgroup of G if and only if $H \subseteq K$ or $K \subseteq H$

(d) None of the above

iii. The set $\mathbb{Z}_n$ forms a group under the binary operation

(a) '+' (b) '$-$'

(c) '$\cdot$' (d) None of the above

iv. In the group $(\mathbb{Z}_{18}, +)$, order of $\overline{10}$ is

(a) 10 (b) 9

(c) 6 (d) 18

v. Let H is a proper subgroup of $\mathbb{Z}$ under addition and 12, 14, 18 $\in$ H then

(a) $H = 756\mathbb{Z}$ (b) $H = 2\mathbb{Z}$

(c) $H = 4\mathbb{Z}$ (d) $H = \mathbb{Z}$

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vi. Let a be an element of a group G and let order of a in G be infinite then how many generators does the group $< a >$ have?

(a) Only one (b) Exactly 2

(c) Infinitely many (d) None

vii. If $G = (\mathbb{Z}, +)$ and $H = \{0, \pm 3, \pm 6, \pm 9, \cdots\cdots\}$ then

(a) $11 + H = 17 + H$ (b) $11 + H = 7 + H$

(c) $7 + H = 23 + H$ (d) None of these

viii. Let G be a group of order 8 then G must have an element of order

(a) 2 (b) 4

(c) 8 (d) None of these

ix. Let $\phi: \mathbb{C}^* \longrightarrow \mathbb{C}^*$ given by $\phi(x) = x^4$ be a homomorphism then $ker\phi =$

(a) $\{1, -1\}$ (b) $\{1, -1, i, -i\}$

(c) $\{i, -i\}$ (d) None of these

x. Let G be an abelian group which has no element of order 2 and $\phi: G \longrightarrow G$ given by $\phi(x) = x^2$, then

(a) ϕ is an automorphism.

(b) ϕ is a group homomorphism which may not be one $-$one.

(c) ϕ is an automorphism if G is finite.

(d) ϕ is not a group homomorphism.

Q2. Attempt any **ONE** question from the following: (08)

a) i. Show that $U(n) = \{\bar{a} \in \mathbb{Z}_n \mid 1 \le a \le n-1, (a,n) = 1\}$, form a group under the binary operation '$\cdot$'.

ii. Define Centre of Group G. Hence or otherwise prove that the Centre of any group is a subgroup of the group.

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Q.2 Attempt any **TWO** questions from the following: (12)

b) i. Let G be a group. Prove that $(aba^{-1})^n = ab^n a^{-1}$, $\forall\, a, b \in G$ and $\forall\, n \in \mathbb{Z}$

ii. Let G be a group and $a \in G$. Show that $H = \{a^{2n} | n \in \mathbb{Z}\}$ is a subgroup of G.

iii. Let G be a group and $a \in G$ with $O(a) = n$ then show that if and only if $a^m = e$ then $n|m$.

iv. Let $\alpha = (1\,2\,5)(6\,13\,5)$ and $\beta = (1\,3\,4)(2\,6\,5)(2\,3\,4)$ .Write α and β as a product of disjoint cycles. Further, verify the following.

p) $o(\alpha) = o(\alpha^{-1})$

q) $o(\alpha\beta) = o(\beta\alpha)$

r) $o(\alpha\beta\alpha^{-1}) = o(\beta)$

Q3. Attempt any **ONE** question from the following: (08)

a) i. Prove that $\mathbb{Z}_n$ the set of residue classes modulo n is a group under addition. Also determine all the generators for $\mathbb{Z}_n$

ii. Let G be a finite cyclic group of order n then prove that G has a unique subgroup of order d for every divisor d of n.

Q3. Attempt any **TWO** questions from the following: (12)

b) i. Let $G = \langle a \rangle$ be a finite cyclic group of order 12 then what are all the generators of G. Also determine all the generators of the subgroup $H = \langle a^3 \rangle$.

ii. Determine all the subgroups of the cyclic group $\mathbb{Z}_{11}^*$.

iii. Show that $H = \left\{ \begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix} / n \in \mathbb{Z} \right\}$ is a cyclic subgroup of $GL_2(\mathbb{R})$.

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iv. Consider the set $\{\overline{4}, \overline{8}, \overline{12}, \overline{16}\}$. Show that this set is a group under multiplication modulo 20 by constructing a Cayley table. What is the identity element?

Q4. Attempt any **ONE** question from the following: (08)

a) i. Let H is a subgroup of a group G then $aH = H$ if and only if $a \in H$. Further aH is subgroup of G if and only if $a \in H$.

ii. Let $f: G \longrightarrow G'$ is onto group homomorphism. Prove that

(p) If H is subgroup of G then $f(H) = \{f(h)/h \in H\}$ is subgroup of G'.

(q) If H' is subgroup of G' then $f^{-1}(H') = \{a \in G/f(a) \in H'\}$ is subgroup of G and $kerf \subseteq f^{-1}(H')$.

Q4. Attempt any **TWO** questions from the following: (12)

b) i. State Lagrange's theorem for finite group. If H and K are subgroups of G such that $o(H) = 12$ and $o(K) = 35$ then show that $H \cap K = \{e\}$.

ii. Let G be a finite group then show that

(p) $o(a)|o(G)\,, \forall a \in G$ (q) $a^{o(G)} = e\,, \forall a \in G$

iii. Show that $f: G \longrightarrow G$ given by $f(x) = x^{-1}$ is a automorphism if and only if G is abelian.

iv. Show that $G = \{a + b\sqrt{2} \,/\, a, b \in \mathbb{Q}\}$ and $H = \left\{\begin{pmatrix} a & 2b \\ b & a \end{pmatrix} / a, b \in \mathbb{Q}\right\}$ are isomorphic groups under addition.

Q5. Attempt any **FOUR** questions from the following: (20)

a) Construct composition table of $\mathbb{Z}_5^*$ under multiplication modulo 5. Also find the order of each of its elements.

b) Define Abelian group. If $(ab)^2 = a^2b^2$ for every a, b in a group G, show that G is Abelian.

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c) Prove that a group of order 3 must be cyclic.

d) Let G be a group and let 'a' be an element of G.

(i) If $a^{12} = e$, what can you say about order of a.

(ii) Suppose that G is cyclic and o(G) = 24 . Further if $a^8 \neq e$ and $a^{12} \neq e$ then show that $< a >$=G.

e) Give an example of a group G and a subgroup H of G such that $aH = bH$ but $Ha \neq Hb$ for some $a, b \in G$.

f) Find the number of group homomorphism from $\mathbb{Z}_{12}$ to $\mathbb{Z}_{30}$.

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SyBSc. Maths III
03/05/2019

(3 Hours) [Total Marks: 100]

Note: (i) All questions are compulsory.
(ii) Figures to the right indicate marks for respective parts.

Q.1 Choose correct alternative in each of the following **(20)**

i. The order and degree of differential equation $y = x^2\frac{dy}{dx} + \sqrt{1+\left(\frac{dy}{dx}\right)^5}$ is

(a) 1 and 2 (b) 1 and 5
(c) 2 and 5 (d) 5 and 5

ii. Orthogonal trajectories of the family of curves $xy = k$ represents a family of
(a) Parabolas (b) Straight lines
(c) Hyperbolas (d) Circles

iii. The integrating factor of $\frac{dy}{dx} + \frac{y}{1+x^2} = \frac{e^{tan^{-1}(x)}}{1+x^2}$ is
(a) $\frac{1}{1+x^2}$ (b) $\frac{e^{tan^{-1}(x)}}{1+x^2}$
(c) $e^{tan^{-1}(x)}$ (d) None of these

iv. Which of the following is an exact differential equation?
(a) $(x^2+1)dx - xydy = 0$ (b) $xdy + (3x-2y)dx = 0$
(c) $2xydx + (x^2+2)dy = 0$ (d) $x^2ydy - ydx = 0$

v. Which of the following functions are linearly independent?
(a) $y_1 = 2x; y_2 = 1-x$ (b) $y_1 = logx; y_2 = logx^3$
(c) $y_1 = x; y_2 = x^2$ (d) $y_1 = x^2; y_2 = 5x^2$

vi. The general solution of $4y'' + 12y' + 9y = 0$ is
(a) $c_1e^{-\frac{3}{2}x} + c_2xe^{-\frac{3}{2}x}$ (b) $c_1 + c_2e^{-\frac{3}{2}x}$
(c) $c_1cosx + c_2sin\left(-\frac{3}{2}x\right)$ (d) None of these

vii. If $y_1(x) = cos\,\pi x$ *and* $y_2(x) = sin\,\pi x$, value of Wronskian $W(y_1, y_2)$ is
(a) π (b) 2π
(c) 0 (d) None of these

viii. The Wronskian of two solutions $(e^{2t}, 2e^{2t})$ and $(e^{3t}, 2e^{3t})$ of a homogeneous linear system of differential equations, is equal to

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(a) 0 (b) $4e^{5t}$

(c) $2e^{2t}$ (d) None of these

ix. One of the solutions of the system $\frac{dx}{dt} = y - x, \frac{dy}{dt} = 3x + y$ is

(a) $x = 3e^{2t}, y = e^{2t}$ (b) $x = e^{2t}, y = 3e^{2t}$

(c) $x = e^{t}, y = 3e^{t}$ (d) None of these

x. If (e^{4t}, e^{4t}) and $(e^{-2t}, -e^{-2t})$ are linearly independent solutions of $\frac{dx}{dt} = x + 3y, \frac{dy}{dt} = 3x + y$ then particular solution for which $x(0) = 5$, $y(0) = 1$ is

(a) $(3e^{4t} + 2e^{4t}, 3e^{-2t} - 2e^{-2t})$ (b) $(4e^{4t} + e^{4t}, 4e^{-2t} - 3e^{-2t})$

(c) $(3e^{4t} + 2e^{-2t}, -2e^{4t} + e^{-2t})$ (d) $(3e^{4t} + 2e^{-2t}, 3e^{4t} - 2e^{-2t})$

Q2. Attempt any **ONE** question from the following: **(08)**

a) i. When a differential equation $M(x,y)dx + N(x,y)dy = 0$ is said to be exact? State and prove the necessary and sufficient condition for the above differential equation to be exact.

ii. Obtain a method to solve the Bernoulli's differential equation $\frac{dy}{dx} + P(x)y = Q(x)y^n (n \neq 0,1)$ where $P(x), Q(x)$ are functions of x and hence solve $\frac{dy}{dx} - ytanx = sin(x)cos^2(x)y^2$.

Q.2 Attempt any **TWO** questions from the following: **(12)**

b) i. When a differential equation $M(x,y)dx + N(x,y)dy = 0$ is said to be homogeneous? Solve the homogenous differential equation

$$x\frac{dy}{dx} - y = \sqrt{x^2 - y^2}.$$

ii. The population of a village increases at a rate proportional to the population at that time. In a period of 10 years, the population grew from 10 thousand to 15 thousand. What will be the population after 20 years? $(ln1.5 = 0.405, e^{0.81} = 2.248)$

iii. Find the solution to the differential equation $3x^2y^2dx + 4(x^3y - 3)dy = 0$

iv. Solve $(1 + y^2)dx = (tan^{-1}(y) - x)dy$

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Q3. Attempt any **ONE** question from the following: **(08)**

a) i. Show that a second order homogenous differential equation $y'' + P(x)y' + Q(x)y = 0$ is completely determined by two linearly independent solutions $y_1(x)$ and $y_2(x)$. However, the converse is not true, that is $y_1(x)$ and $y_2(x)$ are not uniquely determined by the differential equation.

ii. Let $y'' + ay' + b = 0$ be a homogeneous differential equation with constant coefficients and let $m^2 + am + b = 0$ be the corresponding auxiliary equation with roots $m_1 and\ m_2$. Discuss the general solution of the differential equation when:
$(p) m_1 and\ m_2$ are real and equal $(q) m_1 and\ m_2$ are complex.

Q3. Attempt any **TWO** questions from the following: **(12)**

b) i. Show that $y = ax^2 + bx + 3$ is the general solution of $x^2y'' - 2xy' + 2y = 6$. Further find a particular solution of this differential equation satisfying $y(1) = 0, y'(1) = 1$.

ii. Check whether the following functions are linearly dependent (on any interval not containing 0) by finding their Wronskian.
(p) $y_1 = x^2; y_2 = \sqrt{x}$ (q) $y_1 = x^4; y_2 = x^4 log x$

iii. Using method of variation of parameters find a particular integral of the differential equation $y'' + y = secx$.

iv. Solve the differential equation $y'' + 3y' - 10y = 6e^{4x}$, by the method of undetermined coefficients.

Q4. Attempt any **ONE** question from the following: **(08)**

a) i. Find the general solution of system $\begin{cases} \frac{dx}{dt} = a_1x + b_1y \\ \frac{dy}{dt} = a_2x + b_2y \end{cases}$ where $a_1, a_2, b_1\ and\ b_2$ are constants when the roots of auxiliary equation are complex.

ii. Define Wronskian $W(t)$ of the two solutions $\begin{cases} x = x_1(t) \\ y = y_1(t) \end{cases}$ and $\begin{cases} x = x_2(t) \\ y = y_2(t) \end{cases}$ of the homogeneous system $\begin{cases} \frac{dx}{dt} = a_1(t)x + b_1(t)y \\ \frac{dy}{dt} = a_2(t)x + b_2(t)y \end{cases}$
where $a_1(t), a_2(t), b_1(t), b_2(t)$ are continuous functions on $[a, b]$. Show that their Wronskian is either identically zero or nowhere zero on $[a, b]$.

Q4. Attempt any **TWO** questions from the following: **(12)**

b) i. Show that $x = e^{3t}, y = e^{3t}$ and $x = e^{2t}, y = 2e^{2t}$ are linearly independent solutions to the homogeneous system $\frac{dx}{dt} = 4x - y$, $\frac{dy}{dt} = 2x + y$. Hence find the general solution.

ii. Find the general solution to the following system $\frac{dx}{dt} = 7x + 6y$, $\frac{dy}{dt} = 2x + 6y$.

iii. Find the particular solution to the following system $\frac{dx}{dt} = 2x - 8y$, $\frac{dy}{dt} = x + 6y$ with $x(0) = 4, y(0) = 1$.

iv. Let $\begin{cases} x = x_1(t) \\ y = y_1(t) \end{cases}$ and $\begin{cases} x = x_2(t) \\ y = y_2(t) \end{cases}$ of the homogeneous system $\begin{cases} \frac{dx}{dt} = a_1(t)x + b_1(t)y \\ \frac{dy}{dt} = a_2(t)x + b_2(t)y \end{cases}$ where $a_1(t), a_2(t), b_1(t), b_2(t)$ are continuous functions on $[a, b]$.Then $\begin{cases} x(t) = c_1x_1(t) + c_2x_2(t) \\ y(t) = c_1y_1(t) + c_2y_2(t) \end{cases}$, is also a solution of the above system of equation for $t \in [a, b]$

Q5. Attempt any **FOUR** questions from the following: **(20)**

a) Solve the differential equation $(4x + 3y + 1)dx + (3x + 2y + 1)dy = 0$

b) Find the orthogonal trajectories of $y = ke^x$ where k is a parameter.

c) Solve $y'' - 4y' + 4y = 0$.

d) Find another linearly independent solution for the differential equation $(1 + x^2)y'' - 2xy' + 2y = 0$, given that $y_1 = x$ is a solution.

e) Show that $x = e^{3t}, y = e^{3t}$ and $x = e^{-t}, y = -e^{-t}$ are solutions of the system $\begin{cases} \frac{dx}{dt} = x + 2y \\ \frac{dy}{dt} = 2x + y \end{cases}$.

f) Define a system of homogeneous linear differential equations of order 1. State the condition for two solutions (x_1, y_1) and (x_2, y_2) to be linearly independent. Also write the general solution.

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SYBSC

Paper / Subject Code: 78877 / Physics - Paper III

02/05/2019

SEII (PIII)

(Time:3 Hours) (Total Marks:100)

N.B : (1) All questions are compulsory.
(2) Figures to the right indicate maximum marks.
(3) Use of non-programmable calculators is permitted.
(4) Symbols used have their usual meaning

Q1. A) Select correct answer (12)

1 Which is the characteristic of mid-ocean ridges?
(a) shallow focus earthquakes b) High heat flow
(c) Basalt eruption (d) All of these

2 The relation between the acceleration due to gravity (g) and the universal gravitation constant (G),expressed as
(a) $g=\frac{GM}{r}$ (b) $g=\frac{Gr}{M}$ (c) $g=\frac{GM^2}{r}$ (d) $g=\frac{GM}{r^2}$

3 Which is a data transfer instruction in the following?
a) ADD B b) MOV B,C c) CMP M d) ANA D

4 What is the content of Accumulator after the instruction XRA A?
a) 00h b) FF h
c) depends on the data in accumulator
d) same as before the execution of the instruction

5 If the electromagnetic waves are arranged ENEGRY wise, Identify the correct order from the following
a) Radio Waves > Micro Waves > Infrared Waves
b) Radio Waves < Micro Waves < Infrared Waves
c) Radio Waves > Infrared Waves > Micro Waves
d) Radio Waves < Infrared Waves < Micro Waves

6 Radioactivity was discovered by _____.
a) Rutherford b) Becquerel c) Curie d) Roentgen

B) Answer in one sentence (03)
1 Define Medical Geology.
2 State the condition for the zero flag to be set (ie Z = 1).
3 What is amplitude modulation?

C) Fill in the Blanks (5)
1 ---------- means the variation of climate in past geologic time.
2 Superconducting Quantum Interference device also called --------
3 Program counter is a ..... bit register.
4 In 8085 microprocessor, ALU is an abbreviation for .....
(write the full form of ALU)

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SE11

5 _____ is a device used to measure the absorbed dose received by a body through the exposure to an external ionizing radiation

Q2. A) Attempt any one (8)

1 What is Urbanization? Discuss impact of urbanization and disposal of Industrial Waste on Environment.

2 What is Seismology? What are seismic waves? What are the different types of seismic waves?

B) Attempt any one (8)

1 What is continental drift? Explain the various theories given for its cause.

2 What is Geophysics? What are the different branches of Geophysics .Explain any one of them in detail.

C) Attempt any one (4)

1 What is Polar Wandering? Explain

2 Draw a neat and labeled diagram of an absolute gravimeter.

Q3. A) Attempt any one (8)

1 Write short notes on different registers in 8085 microprocessor.

2 What are the different addressing modes used in 8085 programming language. Explain in brief with an example for each mode.

B) Attempt any one (8)

1 Five data bytes are stored in consecutive memory locations. Write an assembly language program for 8085 microprocessor for adding these data bytes and storing sum and carry (if any) in the next two consecutive locations.

2 Write 8085 instructions for the following.

i) Load the register C with the data 56 h

ii) Copy the data in accumulator

iii) Load HL register pair with the memory address 2050h

iv) Increment data in register C by 1

v) Add the data in register C to the data in accumulator

vi) Copy the sum in Accumulator in the memory location specified by HL register pair

vii) Increment the memory location by 1.(go to next memory location)

viii) Do not perform any operation

C) Attempt any one (4)

1 Write a program to subtract a data byte 37h from 48h. What is the status of carry (borrow) flag after subtracting?

2 State op-code , operand and number of bytes required in each of the following instructions

a) SUB A b) STA 4050h

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SE11

Q4. A) Attempt any one (8)

1 Explain the properties of α, β and γ radiations.

2 What is digital communication? What are the advantages of digital signals over analog signals?

B) Attempt any one (8)

1 What is Radiotherapy? Explain the different ways of Radiotherapy.

2 Explain Super-Heterodyne receiver along with suitable block diagram.

C) Attempt any one (4)

1 It is required to limit radiation dose of a radiation for the worker to 1 mSv. How long can he stay in mSv/hr radiation field?

2 What is the maximum length of antenna required for FM transmission which is between 88MHz and 108MHz.

Q5. Attempt any Four (20)

1 Draw a neat and labeled diagram of proton magnetometer.

2 Draw a neat diagram of Earth's four major layers.

3 Explain in brief address bus and data bus.

4 Explain the functions of following instructions with examples

a) RAR b) DCX H c) JNC , 4500h

5 Explain Ionization detector and Scintillation detector.

6 Explain the structure of simplex and duplex transmission.

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Paper / Subject Code: 78897 / Zoology : Paper III: Elective I

5YBSC

02/05/2019

[Time: 3 Hours] [Marks: 100]

Please check whether you have got the right question paper.

N.B:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Draw a neat labeled diagram wherever necessary.

Q.1 A) Fill in the blanks by choosing the correct options from the bracket. 05

a) The cells of blastula are known as _____.
(holoblast, blastomere, elutroplasm)

b) _____ eggs have moderate amount of yolk. (Mesolecithal, Macrolecithal, Microlecithal)

c) _____ regulates spermatogenesis by regulating FSH production by anterior pituitary through a negative feedback mechanism. (Progestin, Inhibin, Testosterone)

d) Absence of mensus in female is called as _____.
(gonorrhea, amnorrhea, menasrch)

e) _____ receives large amount of heat & may have very high temperature of about 1500^0C. (Troposphere, Thermosphere, Lithosphere)

f) _____ are considered as air pollutants. (CFC, CPCB, DO)

Q.1 B) Match the column I with column II & rewrite 05

Column I	Column II
a) Isolecithal eggs	i) Primitive groove
b) Hensen's node	ii) Female reproductive system
c) Cowper's gland	iii) PAN
d) Fallopian tube	iv) Male reproductive system
e) Pollutant	v) Echinoderms

Q.1 C) State whether true or false: 05

a) Tail of sperm is locomotary in function.
b) Sterilisation procedure in male is called as vasectomy.
c) The middle layer of uterus is made up of muscles & is called as endometrium.
d) Acid rain bring about changes in pH of lakes & rivers.
e) Decibel is unit of measurement of light intensity.

Q.1 D) Answer in one sentence: 05

a) What is vegetal pole in egg?
b) What is blastocoel?
c) What is andropause?
d) Name any one point source of water pollution.
e) What is pollution?

Q.2 A) Answer **any one** of the following: 10

a) Describe coelem with respect to its formation & types.
b) Describe basic structure of sperm.

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Marks: 100 Marks

Time: 3 Hours

Q.2 B) Answer **any two** of the following: 10

a) Describe types of cleavage based on symmetry

b) Describe movements in epiboly

c) Describe telolecithal eggs

d) Describe gastrulation in mammals

Q.3 A) Answer **any one** of the following: 10

a) Describe the hormonal regulation of female reproductive system in human.

b) Describe the method of cryopreservation of gametes & embryo.

Q.3 B) Answer **any two** of the following: 10

a) Describe barrier methods of contraception

b) Explain endometriosis

c) Give an account on PCOS

d) Describe impotence & idiopathic impotency

Q.4 A) Answer **any one** of the following: 10

a) Give a detail account on climate change & global warming.

b) Describe effects of solid waste pollution & its control measures.

Q.4 B) Answer **any two** of the following: 10

a) Describe radioactive pollution

b) Explain types & sources of Soil pollutants.

c) Describe effects of water pollution

d) Give an account on control measures of air pollution.

Q.5 Write short notes on **any four** of the following: 20

a) Discoblastula

b) Gastrulation in frog

c) Damage to uterus as a cause of female infertility

d) Azoospermia & Oligospermia

e) Types & Sources of water pollutants

f) Effects of noise pollution

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obtained in the replicate analysis of the samples

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03/05/2019

Time: 3 Hours **Marks: 100 Marks**

Note: 1. All questions are compulsory
2. Figures to right indicate full marks
3. The use of log-table/nonprogrammable calculator is allowed.

Q 1 A Select the correct option & complete the sentences (any TWELVE) **(12)**

i. Electrophoresis is a _____ method.
a. separation b. electroanalytical c. thermal

ii. _____ is a chemical method of separation.
a. Precipitation b. Centrifugation c. Filtration

iii. Solvent extraction is governed by _____ law.
a. Nernst Distribution b. Beer's c. Boyle's

iv. Chromatography consists of _____ phases.
a. three b. infinite c. two

v. In chromatography R_f value is _____ factor.
a. real b. rate c. retardation

vi. _____ is a planar chromatographic technique.
a. GLC b. TLC c. GSC

vii. Quinhydrone electrode is used as _____ electrode in acid base potentiometric titration
a. reference b. indicator c. counter

viii. When a strong base like NaOH is added to the solution of strong acid, pH of mixture _____
a. remains constant b. increases c. decreases

ix. The unit of conductance is _____.
a. Siemens b. ohms c. volts

x. In conductometric titrations, _____ is measured during the course of titration.
a. pH b. corrected conductance c. conductance

xi. If the pH of the aqueous solution is 11.2, then it will be _____
a. acidic b. neutral c. alkaline

xii. The plot of pH vs. volume of titrant added is _____ shaped.
a. "V" b. "U" c. "S"

xiii. Variance is _____.
a. s^2 b. s c. v^2

xiv. Mode of the following set of data is _____.
Data: 19.10, 19.12, 19.10, 19.11
a. 19.11 b. 19.12 c. 19.10

xv. In normal error curve _____ is plotted on Y - axis.
a. observation b. frequency of occurrence c. mean

xvi. Confidence limit using range can be obtained by _____ formula.

a. $\pm C_n R$ b. $C_v R$ c. $C_w R$

xvii. _____ is used as rejection of the doubtful observation from the set.

a. F – test b. T - test c. Q - test

xviii Null hypothesis is valid means _____.

a. $t_{cal} < t_{tab}$ b. $t_{cal} > t_{tab}$ c. $t_{cal} = t_{tab}$

Q 1 B State whether the following statements are true or false (any **THREE**) **(03)**

i. The partition coefficient and distribution ratio are always same.

ii. Batch extraction method is used for solvent with small "D" value.

iii. Potential of an indicator electrode remains constant.

iv. Glass electrode is a type of ion selective electrode.

v. The process of finding, how dependent variables are linked to independent variable is known as regression analysis. .

vi. Variance ratio test is also known as Q - test.

Q 1 C Match the columns (Any **FIVE**) **(05)**

Column A	Column B
1. Distillation	a. Rejection of result
2. Adsorbent	b. Volatilization
3. Saturated KCl	c. Centrifugation
4. Glass electrode	d. Salt bridge
5. Gaussian curve	e. pH – metry
6. 4.0 d rule	f. Al_2O_3
	g. Conductometry
	h. Bell - shaped

Q 2 Answer Any **FOUR** of the following **(20)**

a. What are the different types of separation methods? Explain any two of them in detail.

b. Prove that multiple extractions using small volume of extractant are more efficient than carrying out a single extraction involving same total volume.

c. i. Explain the term "separation factor".

ii. When 0.1 dm^3 of an aqueous solution containing 0.2 g of a substance "S" is extracted with 0.5 dm^3 of ether; the ether layer was found to contain 0.186 g of "S". Calculate distribution ratio ($D_{o/w}$) in favour of ether

d. Describe the preparation of plates used in TLC. What are the other steps involved in TLC?