

**REGULATIONS AND CURRICULUM  
M.Sc – Clinical Embryology**

**2016**



**JSS UNIVERSITY**

(Established under section 3 of UGC Act, 1956)

**JSS Medical Institutions Campus,  
Sri Shivarathreeshwara Nagara,  
Mysore - 570 015, Karnataka, India**

# **M.Sc CLINICAL EMBRYOLOGY COURSE**

## **JSS University**

### **1) BRANCH OF STUDY**

#### **Post graduate Degree Courses**

The following courses and studies may be pursued

M.Sc in

- Anatomy
- Biochemistry
- Microbiology
- Pharmacology
- Physiology
- Clinical Embryology

### **2) Eligibility for Admission**

A candidate having bachelor degree under recognized university can apply under the General category.

### **3) Qualifications**

The candidate must have passed B. Sc with at least one subject of biological Sciences or B. Sc Biotechnology or MBBS from a recognized university.

### **4) Course of Study**

Duration- The course of study shall be for a period of 2 years.

## **5) Method of Training**

Training should include involvement in laboratory and experimental work, and research studies.

## **6) Attendance**

Every candidate is required to have a minimum of 80% attendance during each academic year of the post graduate course. Any student who fails to complete the course in the manner stated above shall not be permitted to appear for the University Examinations.

## **7) Monitoring Progress in Studies :**

Periodic tests: The concerned department will conduct internal exams after the first six months of theory course on Modules 1, 2 & 3 and internal after the first year of training which will include subjects of Andrology and Biochemistry. The test may include written. Records and marks obtained in such tests will be maintained by the Head of the Department and sent to the University, when called for. A Mock exam will be held three months before the final exams to see if students are eligible to attend the final exams. The pass percentage will be 50% in this internal. Students who fail to reach the mark will be given another attempt to enable them to sit the finals.

## **8) Project**

Every candidate pursuing M.Sc Degree course is required to carry out work on a selected research project under the guidance of a recognized post graduate teacher in their respective subjects. The results of such a work shall be submitted in the form of a project.

The project is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, and comparison of results and drawing conclusions.

Every candidate shall submit to the Registrar (Academic) of the University in the prescribed proforma, a synopsis containing particulars of proposed project work within six months from the date of commencement of the course on or before the dates notified by the University. The synopsis shall be sent through the proper channel. Such synopsis will be reviewed and the project topic will be registered by the University. No change in the project topic or guide shall be made without prior approval of the University.

The Project should be written under the following headings

- i. Introduction
- ii. Aims of Objectives of study
- iii. Review of Literature
- iv. Material and Methods
- v. Results
- vi. Discussion
- vii. Conclusion
- viii. Summary
- ix. References
- x. Tables
- xi. Annexure

Four copies of project thus prepared shall be submitted to the Registrar (Evaluation), six months before final examination on or before the dates notified by the University.

The project shall be valued by examiners appointed by the University. Approval of project work is an essential precondition for a candidate to appear in the University examination.

A co-guide may be included provided the work requires substantial contribution from a sister department or from another medical institution recognized for teaching/training by J.S.S University. The co-guide shall be a recognized post graduate teacher of J.S.S University.

Change of Guide: In the event of a registered guide leaving the college for any reason or in the event of death of guide, guide may be changed with prior permission from the University.

## **9) Schedule of Examinations**

The University Examination for M.Sc Clinical Embryology shall be held at the end of second academic year.

## **10) Scheme of Examination**

I Year M.Sc (preliminary) exam:

### **INTERNAL ASSESSMENT:**

One internal assessment will be held at the end of six months. The second internal assessment will be held at the end of one year and the third internal at the end of 21 months. The candidates should get 50% in the internals to be able to take up the University exams at the end of two years.

### **UNIVERSITY EXAMINATION**

The internal exams at the end of 6 months will be for 100 marks. It will comprise of

- MCQ for 20 marks
- 2 long questions for 20 marks each &
- 8 short notes for 5 marks each.

It will be pertinent to the topics covered in Modules 1, 2, & 3.

Second internal exam will be held at 1 year of completion of course. It will comprise of subjects covered in Modules 4.

Andrology, Biochemistry & Animal Laboratory- It will be divided into 20 marks MCQ, 50 , marks Essay questions & 30 marks practical exam.

### **THE FINAL UNIVERSITY EXAMINATION**

Shall consists of a written paper (Theory), Practical, Viva Voce and discussion on project work.

Written Examination (Theory): Shall consists of three question papers, each of three hours duration.

Paper I - Basic sciences, Physiology, Embryology & Biochemistry (Modules 1,2 & 3)

Paper II – Andrology, Embryology & Genetics

Paper III - Ethics, Best Practices, Quality Controls & Third Party Reproduction

Each paper shall carry 100 marks.

**Practical Examination:**

In case of practical examination, it should be aimed at assessing competence and skills of techniques and procedures as well as testing students ability to make relevant and valid observations, interpretations and inference of laboratory or experimental work relating to his/ her subject.

The total marks for Practical examination shall be 200

Viva Voce: Viva Voce Examination shall aim at assessing depth of knowledge, logical reasoning, confidence and oral communication skills. The total marks shall be 100 ad the distribution of marks shall be as under:

- |      |   |           |
|------|---|-----------|
| (i)  | For examination of all components of syllabus | - 80marks |
| (ii) | Discussion on Project Work                    | - 20marks |

Examiners: There shall be at least four examiners in each subject. Out of them two shall be external examiners and two shall be internal examiners.

2 external examiners – 1 from outside city, 1 from outside state.

Any professor with M.D. Degree with 10 years of teaching experience or professor with Ph.D degree with 5 years of experience can become examiners.

Criteria for declaring as pass in University Examination:

A candidate shall secure not less than 60% marks in each head of passing which shall include (1) Theory, (2) Practical and viva voce examination.

A candidate securing less than 60% of marks as described above shall be declared to have failed in the examination. Failed candidate may appear in any subsequent examination upon payment of fresh fee to the Registrar (Evaluation).

Declaration of Distinction: A successful candidate passing the University examination in first attempt will be declared to have passed the examination with distinction, if the grand total aggregate mark is **75% and above**. 1<sup>st</sup> class, if the grand total aggregate mark is **65% and above**.

Distinction and 1<sup>st</sup> class will not be awarded for candidates passing the examination in more than one attempt.

## **GOALS AND GENERAL OBJECTIVE OF POST GRADUATE M.Sc IN MEDICAL SCIENCE**

### **GOAL**

The goal of postgraduate M.Sc in medical sciences shall be to produce competent Medical teachers.

- i. Who shall have acquired a spirit of scientific inquiry and is oriented to the Principles of research methodology and
- ii. Who shall have acquired the basic skills in teaching of the medical and paramedical professionals.

### **GENERAL OBJECTIVES**

At the end of the postgraduate training in the discipline concerned the student shall be able to:

- i. Demonstrate competence in basic concepts of research methodology and be able to critically analyze relevant published research literature.
- ii. Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students and paramedical health workers.

### **COMPONENTS OF THE POSTGRADUATE CURRICULUM:**

The major components of the Postgraduate curriculum shall be:

- Theoretical knowledge
- Practical skills
- Thesis skills
- Attitudes including communication skills
- Training in research methodology

## **M.Sc in Clinical Embryology**

**Goal:** The postgraduate course M.Sc (Clinical Embryology) should enable a medical graduate to become a competent embryologist, acquire knowledge and skills in educational technology and conduct research in bio-medical sciences.

**Objectives:** At the end of the course, a Postgraduate in Clinical Embryology shall be able to:

- 1) Demonstrate comprehensive knowledge and understanding of gross and microscopic structure of the human cell and its organelles.
- 2) Comprehend normal anatomy and physiology of the male and female reproductive system.
- 3) Demonstrate knowledge of basic and systemic embryology including human genetics, genetic inheritance, gene regulation, immunology and stem cell therapy.
- 4) Develop a basic understanding of biochemistry, endocrinology, and pharmacology.
- 5) Independently handle semen and its processing for both techniques – Intrauterine Insemination (IUI) and in – vitro fertilization (IVF).
- 6) Be acquainted with mouse anatomy and physiology
- 7) Should be also to identify and handle human oocyte in embryology laboratory
- 8) Competently handle human gametes in the scenario of IVF and ICSI.
- 9) Assess viability of embryos and their developmental competence with fair accuracy.
- 10) Cryopreserve human gametes and embryos, thaw them and subsequently develop them to transfer into the uterus.
- 11) Understand the basic concepts of.
- 12) Should be well versed setting up an IVF laboratory according to standards available and well versed in quality control measures.



## **Outline of course contents**

### **Theory**

- 1) Basic concepts of cell biology, molecular biology
- 2) Description of the cell
- 3) Cell-Cell Interaction
- 4) Embryonic Stem Cells
- 5) Embryology of the Reproductive System – Male & Female
- 6) Embryology of the Male & Female Reproductive tract
- 7) Physiology of the Male & Female Reproductive System
- 8) Spermatogenesis
- 9) Oogenesis
- 10) The oocyte – markers of competence
- 11) Embryo development – from first cleavage to implantation
- 12) Implantation
- 13) Post Implantation embryology
- 14) Biochemistry including steroid metabolism
- 15) Endocrinology concerning reproductive system
- 16) Genetics
- 17) Basic gene regulation
- 18) Basic genetics
- 19) Genetic analysis
- 20) Stem Cell Therapy
- 21) Immunology concerning reproductive tract
- 22) Pharmacology
- 23) Counselling
- 24) Reproductive Physiology & Anatomy of Mouse
- 25) Stimulation Techniques
- 26) Embryo development & early pregnancy
- 27) Early pregnancy failures
- 28) Infertility, reasons, work –up & treatment
- 29) Patient screening
- 30) Type and choice of treatment
- 31) Ovarian hyper stimulation
- 32) Natural cycle and minimal stimulation cycle
- 33) Quality assessment, statistics, handling data, ethics, legislation.
- 34) Patient Data
- 35) Quality Assurance

- 36) Statistical analysis
- 37) Legislation
- 38) The EU-Directive
- 39) Non – routine methods
- 40) Staff protection
- 41) Adverse events, back- up strategies
- 42) Trouble shooting

### **Practical Schedule**

- 1) Hands on experience in Andrology & Biochemistry Laboratory
- 2) Hands on experience in Animal Laboratory
- 3) Introduction into the IVF laboratory
- 4) Laboratory procedures – practicals from Ovum pick up to transfer
- 5) The sperm sample – preparation methods
- 6) In – Vitro Fertilization & ICSI
- 7) Embryo Scoring
- 8) Culture Conditions
- 9) Equipments
- 10) Microscopes
- 11) Embryo transfer
- 12) Cell Biopsy
- 13) Cryopreservation programme & quality assurance
- 14) Sperm freezing/thawing
- 15) Oocyte freezing/thawing or vitrification/warming
- 16) Embryo freezing/thawing or vitrification/warming
- 17) Ovarian freezing/thawing or vitrification/warming
- 18) Testicular freezing/thawing
- 19) Frozen Embryo Transfer
- 20) Equipments
- 21) Innovative techniques in human embryo viability assessment
- 22) Risks in the IVF Laboratory

**Method of Training:**

The candidates shall attend all the undergraduate Theory and Practical Classes regularly.

**Seminars & Journal Review Meetings**

The postgraduate students should actively participate in departmental seminars and journal reviews.

**Periodical Assessment and Progress Report**

The postgraduate students have to be assessed periodically by conducting written, practical and viva voce examination. The assessment should be based also on participation in seminars, journal review, and performance in the teaching and use of teaching aids and progress in dissertation work.

The assessment will be done by all the recognized P.G teachers of department and the progress records be maintained by the head of the department.

**Project work:**

During the course of study every candidate has to prepare a project individually, on a selected topic under the direct guidance and supervision of a recognized postgraduate teacher.

The suggested time schedule for dissertation work is:

1. Preparation work for dissertation synopsis including pilot study and submission of the synopsis to the University within 6 months from the commencement of course or as per the dates notified by the University from time to time.
2. Data collection for project and writing the project.
3. The candidates shall report the progress of the project work to the concerned guide periodically and obtain clearance for the continuation of the project work.
4. Submission of the project six months prior to the final examination or as dates notified by the University from time to time.

# PRACTICAL SESSIONS

## ANATOMY

- EMBRYOLOGY
- HISTOLOGY – TESTES, OVARY
- DISSECTION OF PELVIS

## BIOCHEMISTRY

Basics of:

- ELISA
- IMMUNOFLORESCENCE
- CHEMILUNINESCENCE
- REAGENTS
- MACHINES
- HORMONAL ASSAYS

## ANIMAL LABORATORY

- DISSECTION OF MOUSE PELVIS
- STIMULATION OF MOUSE OVARIES BY HORMONES
- RETRIEVAL OF OOCYTES
- IDENTIFICATION OF SPERM

- SHORT STINT AT GARC IN BATCHES

## **Syllabus**

### **MODULE I**

- Basic concepts of cell biology, molecular biology
- Embryology of the Reproductive System including
  - Male Reproductive System
  - Female Reproductive System
- Anatomy of Male & Female Reproductive System including accessory system & History
- Physiology of the Male & Female Reproductive System.

### **MODULE. 2**

- Biochemistry with steroid metabolism
- Endocrinology
- Genetics
- Stem Cell Therapy
- Immunology

### **MODULE. 3**

- Basic Pharmacology
- Pharmacology related to the Reproductive System including the Hormones
- Hands on experience in Andrology & Biochemistry Laboratory

### **MODULE. 4**

- Hands on experience in Andrology & Biochemistry Laboratory
- Animal Laboratory / ICSI Workstations

### **MODULE 5, 6 & 7**

- In Gunasheela Assisted Reproduction Centre Pvt. Ltd.,

### **MODULE 5**

- Embryo development & early pregnancy
- Infertility, reasons, work-up & treatment
- Introduction into the IVF laboratory

### **MODULE 6**

- Laboratory procedures – practicals from Ovum pick up to transfer

### **MODULE 7**

- Cryopreservation programme & quality assurance
- Risks in the IVF laboratory

## **SYLLABUS IN DETAIL**

### **MODULE I**

- Basic concepts of cell biology, molecular biology

#### **THE CELL**

- Organelles
- Internal organization
- Cell cycle control, checkpoints
- Mitosis and meiosis
- The reproductive cells: spermatozoa and oocytes

**10 hours**

## **CELL –CELL INTERACTION**

- Membrane receptors; function, type, regulation
- Signalling
- Junctions

**2 hours**

## **EMBRYONIC STEM CELLS**

- Origins. Definitions. Characteristics

**2 hours**

## **EMBRYOLOGY OF THE REPRODUCTIVE SYSTEM INCLUDING**

### **Male Reproductive System**

- The foetal testis
- Factors regulating development
- Primordial cell
- Cell migration
- Time scale(days/week)

**12 hours**

### **Female Reproductive System**

- The foetal ovary
- Factors regulating development
- Primordial cells
- Cell migration
- Time scale (days/week)

**12 hours**

## **Embryology of the Male & Female Reproductive tract**

### **Physiology of the Male & Female Reproductive System**

- Spermatogenesis
- Regulating factors
- CNS, pituitary
- FSH,LH,T, feedback
- Leydig & Sertoli cells
- Maturation

- Biochemistry and metabolism of sperm cell
- Sperm morphology/ structure
- Function of each structure

### **The sperm sample- assessment**

**26 hours**

- Functional analysis
- Microscopical analysis
- WHO guidelines
- CASA system etc

### **Oogenesis**

- Oogenesis
- Regulating factors
- CNS, pituitary
- FSH, LH,E, feedback
- Theca & granulose cells
- Maturation Biochemistry and metabolism of the oocyte
- Oocyte morphology/ structure
- Function of each structure

### **The oocyte- markers of competence**

**29 hours**

- Nuclear maturity
- Cytoplasm
- Polar bodies
- Zona pellucida
- Cumulus cells

### **Embryo development- from first cleavage to implantation**

- Metabolism, cell positions, embryonic axis
- Kinetics, timing , regulation
- Apoptosis

**3 hours**

### **Implantation**

- Hatching, adhesion ,invasion, endometrium

**2 hours**



## **Post Implantation embryology**

**6 hours**

- Gastrulation
- Organogenesis
- Sex differentiation

## **MODULE 2**

### **Biochemistry including steroid metabolism**

**12 hours**

#### **Genetics**

- Basic genetics of the cell
- DNA Chromatin Chromosomes
- Concept of a gene.
- Mutations
- Epigenetics

#### **Basic gene regulation**

**6 hours**

- Translation.
- Transcription
- Expression
- Imprinting

#### **Basic genetics**

- Genotype. Phenotype
- Basic Mendelian inheritance patterns
- Monogenic diseases
- Chromosomal abnormalities: numerical, structural
- Interpretation of a pedigree

**6 hours**

#### **Genetic analysis**

**6 hours**

- How and Why
- Basic methods: Cytogenetics (karyotyping, FISH,), Molecular genetics (PCR,...)

## **Stem Cell Therapy**

### **Immunology concerning reproductive tract**

**4hours**

- Embryo & endometrial dialogue

### **MODULE 3**

#### **Endocrinology concerning reproductive system**

**12hours**

#### **Pharmacology**

- Basic
- Pharmacology related to the Reproductive System including the Hormones

**7 hours**

### **MODULE 4**

#### **Hands on experiences in Andrology**

- Counselling
- Sperm parameters
- The sperm sample – assessment
- Functional analysis
- Microscopical analysis
- WHO guidelines
- CASA systems etc
- Hormonal assays

**8 hours**

#### **Hands on experience in Biochemistry Laboratory**

- Hormones – definition, essential of hormones, role in human body, importance of hormones and its function
- Summary and explanation of hormones
- Different types of hormones
- Preparation of reagents
- Principle of Hormones (Assay)
- Different hormones test and specimen collection and handling
- Different hormone calibration
- Procedure of different hormones
- Specificity and sensitivity of different hormones
- Instrument – types of chemiluninescence

**5 hours**

## **Animal Laboratory**

- Mouse Reproductive Physiology
- Mouse Reproductive Anatomy **10hours**
- Techniques of Stimulation
- Retrieval of mouse oocytes
- Hands on experience with IVF & ICSI with mouse oocytes and human sperm

## **MODULE 5**

### **Embryo development & early pregnancy**

- IVF outcome
- hCG production, pregnancy test **2 hours**
- Implantation rate, ultrasound (sacs, heartbeat)

### **Early pregnancy failures**

- Extra uterine pregnancies,
- Spontaneous abortions **2 hours**
- Embryo factors vs. uterine factors

### **Infertility, reasons, work – up & treatment**

- The infertile couple
- Reasons, medical, genetic, hormonal, physical **5 hours**
- Causes and effects
- Definitions, primary infertility, secondary infertility, female vs. male

### **Patient screening**

- Physical / Serological
- What tests are used? What to look for? **1 hours**
- Screening of donors

### **Type and choice of treatment**

- Surgical
- Hormone stimulation
- Insemination IVF / ICSI **4 hours**
- Sperm donation
- Egg donation

## **Ovarian hyperstimulation**

- Basic principles
- Types of medication
- Stimulation regimes (types , rationales)
- OHSS

**4 hours**

## **Natural cycle and minimal stimulation cycle**

- Natural cycle and modified natural cycle
- Minimal stimulation cycle
- IVM

**4 hours**

## **Outcome**

- The health of the children
- Risk factors
- Maternal factors
- Paternal factors
- Multiple pregnancies
- Chromosomal factors
- Malformations
- Imprinting etc

**4 hours**

## **Introduction into the IVF laboratory**

- Strategies for choosing fertilization procedures
- IVF or ICSI , criteria
- IVM
- PESA,TESA,TESE, micro- TESE
- Donor sperm Relation to serological tests (different handling and storage)

**8 hours**

## **MODULE 6**

### **Laboratory procedures – practicals from Ovum pick up to transfer**

#### **The sperm sample – preparation methods**

- Centrifugation , swim – up , “ swim – out”, etc
- Functional

**2 hours**

- When to use What , Why, differences

## **IVF**

- Practicalities for IVF and ICSI **1 hour**
- Pick- up, oocyte handling, insemination

## **ICSI**

- Denudation
- Set up the ICSI needles **1 hour**
- Injection procedure

## **Embryo scoring, Day 1 – 6**

- PN scoring,
- Morphology criteria
- Kinetics, genetics, physiology (eg. AA:s, oxygen metabolism) **4 hours**
- Consequences (freeze, transfer)

## **Culture conditions**

- Media
- Culture systems
- Requirements for consumables **4 hours**
- Physiochemical parameters (Temp, pH, osmolality)
- Stage specific requirements

## **Equipment**

- Calibrations
- Validation, monitoring, logbooks, maintenance and control. **2 hours**

## **Microscopes**

- Principles of optical system, calibrations, maintenance and control

## **Embryo transfer**

- Identity check

- Number of embryos **2 hours**
- Catheter loading and checking

### **Cell biopsy**

- Zona opening (pro' and con's)
- Different biopsy types, number of cells **2 hours**

## **MODULE 7**

### **Cryopreservation programme & quality assurance**

- Principles for freezing and thawing of cells
- Basic cryobiology
- Cryoprotectants , additives **1 hour**
- Slow freezing
- Vitrification, timing
- Advantages/ disadvantages with different methods

### **Sperm freezing / thawing**

- Theory and practice **1 hour**

### **Oocyte freezing / thawing or vitrification /warming**

- Theory and practice **1 hour**

### **Embryo freezing / thawing or vitrification /warming**

- Theory and practice

### **Ovarian freezing /thawing or vitrification/warming**

- Theory and practice **1 hour**

### **Testicular freezing / thawing**

- Theory and practice **1 hour**

### **Equipment**

- Machines
- Straws/ampoules
- Media, contamination from storage medium (what and why) **1hour**
- Minimul safety requirements

- Security

### **The FET treatment cycle**

- Monitoring and timing of the FET – cycle
- Natural cycles

**1 hour**

### **Quality assessment, statistics, handling data, ethics, legislation**

#### **Patient data**

- Identity check
- Confidentiality
- Keeping records
- Safety
- Coding

**1 hour**

#### **Quality assurance**

- Identification procedures
- Monitoring of performance , index variables
- SOP's
- Traceability
- Validations
- Monitoring, use of key performance indicators
- Logbooks
- If /how/ when to bring in new methods

**3 hours**

#### **Statistical analysis**

- Sample size evaluation
- Study design
- Statistical variance
- Interpretation of results

**2 hours**

#### **Legislation**

- National legislation (what is allowed in your country).
- Ethical consideration

**2 hours**

- Code of practice

### **The EU- Directive**

- Examples of what the directive covers **2 hours**
- Implementation in own country

### **Non – routine methods**

- Natural cycle/ modified natural cycle
- Minimal stimulation cycle
- IVM **3 hours**
- PGS
- LAH

### **Innovative techniques in human embryo viability assessment**

- Transcriptomics
- Proteomics, Metabolomics **3 hours**
- Time – lapse embryo development monitoring system

### **Risk in the IVF Laboratory**

- Contaminated samples
- Processing and storage of sample known / suspected to be contaminated **3 hours**
- With contagious agents

### **Staff protection**

- Hygiene,
- Rules and regulations,
- Protective measurements (gloves, masks etc) **3 hours**
- Actions upon injury

### **Adverse events, back – up strategies**

- How to avoid, what to do?
- E.g. Mix – up of gametes , loss or damages during handling
- Transfer of wrong embryos **3 hours**
- Breakdown of equipment, back – up strategies

### **Trouble shooting**



# M.Sc in Clinical Embryology

## Paper 1

**Time:** 3 hours

**Maximum:** 100Marks

**Section:** A (1x20=20 Marks)

A. MCQs:

1. The sensitivity of the uterine musculature is:
  - a) Enhanced by progesterone
  - b) Enhanced by Oestrogen
  - c) Inhibited by Oestrogen
  - d) Enhanced by oestrogen and inhibited by progesterone

Ans: d
  
2. Primary oocyte:
  - a) Is formed after single meiotic division
  - b) Maximum in number in 10 month fetus
  - c) Is in prophase arrest
  - d) Also called as Blastocyst

Ans: c
  
3. Ovary develop from:
  - a) Mullerian duct
  - b) Genital ridge
  - c) Genital tunercle
  - d) Mesonephric duct
  - e) Sinovaginal bulbs

Ans: b
  
4. Invitro fertilization is indicated in:
  - a) Tubal pathology

- b) Uterine dysfunction
- c) Ovarian pathology
- d) Azoospermia

Ans: a

5. Life of a sperm for fertilization is:

- a) 24 hours
- b) 48 hours
- c) 72 hours
- d) 96 hours

Ans: c

6. In semen banks, semen is preserved at low temperature using:

- a) Dry ice
- b) Deep freeze
- c) Liquid Nitrogen
- d) Liquid air

Ans: d

### **Section – C (2x20=40 Marks)**

B. Write Essays on the following:

- 1) Describe the ICMR Regulations surrounding surrogacy Mention the methods that encompass assisted reproductive techniques and specify the indications.
- 2) Who can consent to gamete and embryo storage? In your answer, discuss the following:
  - a) The particular implications for gamete storage in minors.
  - b) Issues relating to gamete and embryo donation, with reference to the point up to which consent may be withdrawn.
  - c) Issues arising when one partner withdraws consent to embryo storage.

7. In azoospermia, the diagnostic test which can distinguish between testicular failure and obstruction of Vas deferens is :

- a) Estimation of FSH level
- b) Estimation of testosterone level
- c) Karyotyping

Ans:a

d) FNAC testes

8. Male infertility occurs if the sperm count is less than:

- a) 100 mill/ml
- b) 75 mill/ml
- c) 50 mill/ml
- d) 20 mill/ml

Ans: d

9. During cell division there are three types of check points one of them (M checkpoint) to ensure

- a) Chromosomes are attached to the spindle
- b) Complete DNA replication
- c) DNA not damage or broken
- d) All of the above

Ans: a

10. A----- Made inside the nucleus of a cell, associates with proteins to form ribosomes.

- a) mRNA
- b) rRNA
- c) tRNA
- d) All the above

Ans: b

11. Which of the following is correct with regard to aneuploidy?

- a) Inversion
- b)  $2n+1$
- c) All aneuploid individuals die before birth
- d)  $4n$

Ans: b

12. All of the cells within an individual are genetically identical.

- a) True
- b) False

Ans: b

13. Serum progesterone level during pregnancy is

- a) <12 ng/ml
- b) >12ng/ml
- c) <20ng/ml
- d) >24ng/m

Ans: d

14. Androgens are produced by:

- a) Cells of sertoli
- b) Leydig cells
- c) Rete testis
- d) Rete testis
- e) Efferent ductules

Ans: b

15. The serum estradiol level in women 11- 20 days of menstrual cycle is:

- a) 5-30 pg/ml
- b) 50-300 pg/ml
- c) 500-900 pg/ml
- d) 1000 pg/ml

Ans: b

16. Down regulation is:

- a) Increased destruction of a hormone
- b) Feedback inhibition of hormone secretion
- c) Decreased concentration of a hormone in blood
- d) Decrease in number of receptors for a hormone

Ans: d

17. The cell organelle which increase their number by self replication are:

- a) Endoplasmic reticulum.
- b) Golgi apparatus
- c) Lysosomes.
- d) Mitochondria
- e) Nuclei.

Ans: d

18. The plasma proteins are not involved in:

- a) Blood clotting.
- b) Blood viscosity.
- c) Plasma colloid osmotic pressure.
- d) Transport of oxygen.
- e) Transport of hormones.

Ans: d

19. During fetal life, the blood vessel having maximally oxygenated blood is:

- a) Aorta.
- b) Ductus arteriosus
- c) Inferior vena cava
- d) Pulmonary artery.
- e) Umbilical vein.

Ans: e

20. Normally about 65% of the total blood volume is present in:

- a) Capillaries.
- b) Arteries.
- c) Arteriovenous anastomes.
- d) Arterioles.
- e) Veins.

Ans: e

### **Section – B (8x5=40 Marks)**

B. Write Short Notes on the following:

- 1) Describe the normal sequel of oocyte maturation.
- 2) What is Trophoblast and its function?
- 3) What is LH surge? Give its physiology role.
- 4) What is prenatal diagnosis?
- 5) Principles and uses of ELISA
- 6) Control of testicular functions
- 7) Briefly describe the role of GnRH analogues.
- 8) Describe the reproductive cycle in Mouse

### Section – C (2x20=40 Marks)

C. Write Essays on the following:

- 1) Describe the endocrinology of natural and stimulated cycles
- 2) Explain the underlying causes and consequences of the decline in reproductive fitness as women get older. Discuss the efficacy of assisted conception in the treatment of older women.

## M.Sc in Clinical Embryology

### PAPER II

**Time: 3 hours**

**Maximum: 100Marks**

### Section –A (1x 20 = 20 Marks)

A. MCQs:

- 1) Intrauterine insemination means implantation of:
  - a) Semen
  - b) Washed Semen
  - c) Million of sperm
  - d) Fertilized ovaAns: b
- 2) Aspiration of sperms from testes is done in:
  - a) TESA
  - b) MESA
  - c) ZIFT
  - d) GIFTAns: a
- 3) According to WHO criteria, the minimum normal sperm count is:
  - a) 10 million/ml
  - b) 20 million/ml
  - c) 40 million/ml
  - e) 60 million/mlAns: b
- 4) Aspermia is the term used to describe:

- a) Absence of semen
- b) Absence of sperm in ejaculate
- c) Absence of sperm motility
- d) Occurrence of abnormal sperm

Ans:a

5) Supporting cells of spermatogenesis are called:

- a) Spermatid
- b) Secondary spermatocyte
- c) Sertoli cells
- d) All of the above
- e) None of the above

Ans:c

6) All are used in treatment of infertility except:

- a) Leuteinizing hormone(LH)
- b) Prolactin
- c) GnRH
- d) Clomiphene

Ans: b

7) Most common indication of in-vitro fertilization is an abnormality in:

- a) Uterus
- b) Fallopian tube
- c) Anovulation
- d) Azoospermia

Ans:b

8) Best test for diagnosis of tubal patency is :

- a) Laparoscopy
- b) Hysterosalpingography
- c) Endometrial biopsy
- d) Mantoux test

Ans: a

9) Luteal phase is best diagnosed by:

- a) Serum progesterone levels

- b) Endometrial biopsy
  - c) Basal body temperature
  - d) Ultrasonography
- Ans: b

- 10) As a fertilized egg develops into an embryo, it undergoes
- a) One meiotic cell division, only
  - b) Many meiotic cell divisions
  - c) One mitotic cell division, only
  - d) Many mitotic cell divisions
- Ans :d

- 11) Embryonic period is :
- a) 1-6 weeks
  - b) 2- 6 weeks
  - c) 2- 8 weeks
  - d) 3 -8 weeks
  - e) 4 – 8 weeks
- Ans:d

- 12)Regarding oogenesis, all statements are correct, EXCEPT:
- a) It starts during fetal life.
  - b) It is completed during puberty.
  - c) It continues till menopause.
  - d) Primary oocytes are formed after birth.
  - e) The second meiotic division is completed after fertilization.
- Ans:d

- 13) Interphase between first and second meiotic divisions is characterized by:
- a) Absence of DNA duplication.
  - b) Absence of centriole duplication
  - c) Absence of formation of nuclear membrane
  - d) Absence of protein synthesis
  - e) None of the above
- Ans:a

14)\_What are the repeating units of nucleic acids?



- a) Phosphate molecules
- b) Nucleotides
- c) Bases
- d) Sugar molecules

Ans:b

15) Proteins are made of amino acids linked together by specific bonds called

- a) Peptide bonds
- b) Nitrogen bonds
- c) Hydrogen bonds
- d) Hydrogen & Nitrogen bonds

Ans:a

16) The enzyme which builds a mRNA strand complementary to the DNA transcription unit is called:

- a) DNA polymerase
- b) RNA polymerase
- c) Helicase
- d) DNA ligase

Ans:b

17) Those mutations that occur by environment damage or mistake during DNA replications are

- a) Acquired mutations
- b) Inherited mutations
- c) A and B
- d) None of them

Ans:a

18) An organism with two identical alleles of a gene in a cell is called:

- a) Homozygous
- b) Heterogeneous
- c) Hybrid
- d) Dominant

Ans:a

19) Genes do not occur in pairs in

- a) Body cells
- b) Gametes
- c) Fertilized egg
- d) Zygote

Ans:b

20) The term genome is used for

- a) Halpoid set of chromosome
- b) Diploid set of chromosome
- c) Polyploid set of chromosome
- d) Triploid set of chromosome

Ans:b

### **Section – B (8x5=40 Marks)**

B. Write Short Notes on the following:

1. How do you check sperm viability?
2. What should be the difference in incubation conditions for HEPES buffered and sodium bi- carbonate buffered media?
3. Explain the role of PCR in preimplantation genetic diagnosis
4. Describe the role of Anti – Mullerian Hormone in ART
5. What should be the constituents of an ideal medium for an embryo culture?
6. What are the different systems of culturing the embryos? Their advantages and disadvantages.
7. What are cumulus cells? How do they help in Maturation?
8. Prevention of OHSS – Role of In- vitro Maturation

### **Section – C (2x20=40 Marks)**

C. Write Essays on the following:

1. Describe the Genetics of Male infertility

2. Mention the methods that encompass assisted reproductive techniques and specify the indications

## **M.Sc in Clinical Embryology**

### **PAPER III**

**Time:** 3 hours

**maximum:** 100Marks

**Section –A** (1x 20 = 20Marks)

A. MCQs for 40 marks will be given on Ethics, Best Practice, Quality Controls & Third Party Reproduction.

### **Section – B (8x5 = 40 Marks)**

B. Write Short Notes on the following:

1. What is epigenetics
2. Describe the safety guidelines for Andrology Laboratory according to WHO Guidelines
3. Should there be an upper age limit for women wishing to have treatment with donated oocytes? Consider possible material risks, considerations relating to the welfare of the child and the scarcity possible of donated oocytes as a resource.
4. What should be included in the consent form when dealing with donar sperm?
5. Explain what is meant by the following terms and discuss them in the context of clinical IVF laboratory, providing, examples where appropriate:
  - a) Quality management
  - b) Quality assurance

c) Risk assessment

6. How do we proceed if you are required to undertake comprehensive audit of all cryopreserved material at your centre.

7. List the major risks that need to be managed in an IVF Laboratory.

8. Write a table to compare and contrast vitrification and slow freezing.

**Recommended Reading Books**

Sl. No	Name of the Book	Authors	Edition & Year
1	A – Z Encyclopedia on Infertility	Sulochana Ganasheela	2005
2	A Practical Guide to Setting Up an IVF Lab, Embryo Culture Systems and Running the Unit	Alex C Varghese, Peter Sjoblom, K. Jayaprakasan,	April 2013
3	Oogenesis	Giovanni Coticchio, David Albertini, Lucia De Santis	December 2012
4	Sperm Chromatin Biological & Clinical Applications in Male Infertility & Assisted Reproduction	Nini, Armand; Agarwal, Ashok (Eds.)	September 2011
5	Practical Manual of In Vitro Fertilization: Advanced Methods and Novel Devices	Nagy, Zsolt Peter; Varghese, Alex C; Agarwal, Ashok (Eds)	September 2011
6	Preservation of Human Oocytes	Dr. Andrea Borini & Dr. Giovanni Coticchio	December 2009
7	Human Preimplantation Embryo Selection	Kay Elder, Jacques Cohen	February 2008
8	In Vitro Fertilization: A Practical Approach	David K. Gardner	February 2008
9	Textbook of Assisted Reproductive Techniques	David K. Gardner, Ariel Weissman, Colin M. Howles, Zeev Shoham	November 2006
10	A Textbook of in Vitro Fertilization and Assisted Reproduction: the Bourn Hall Guide to Clinical and Laboratory Practice	Peter Brindsen	3 <sup>rd</sup> Edition 2004

11	Quality & Risk Management in the IVF Laboratory	David Mortimer	February 2008
12	A Color Atlas for Human Assisted Reproduction: Laboratory & Clinical Insights (Hardcover)	Pasquale Patrizio, Michael J Tucker, Vanessa Guelman	August 2006
13	The Developing Human: Clinically Oriented Embryology	Keith L. Moore,	7 <sup>th</sup> edition January 2003