Reg. No.										

MANIPAL UNIVERSITY

FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – JUNE 2007

SUBJECT: GENERAL ANATOMY AND OCULAR ANATOMY

Thursday, June 07, 2007

Time: 3 Hrs. Max. Marks: 80

✍ **Answer all questions. Draw diagrams wherever necessary.**

1. Draw a neat labelled diagram of the sagittal section of the eyeball. Describe the fibrous coat.

(4+8 = 12 marks)

2. Write short notes on:

2A. Parts, blood supply and relations of stomach.

2B. Ciliary body.

2C. Right kidney.

(6×3 = 18 marks)

3. Write notes on:

3A. Coronary arteries.

3B. Testis.

3C. Ciliary ganglion.

(5×3 = 15 marks)

4. Write briefly on:

4A. Structure of a synovial joint.

4B. Paranasal air sinuses.

4C. Oesophagus.

4D. Suprarenal gland.

4E. Spinal cord.

(4×5 = 20 marks)

5. Write briefly on:

5A. Optic chiasma.

5B. Parts of large intestine.

5C. Uterine tube.

5D. White fibro cartilage.

5E. Epithelium.

(3×5 = 15 marks)

Reg. No.										

MANIPAL UNIVERSITY

FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – JUNE 2007

SUBJECT: GENERAL PHYSIOLOGY AND OCULAR PHYSIOLOGY

Friday, June 08, 2007

Time available: 3 Hours. Max. Marks: 80

1A. Describe the mechanism of contraction in skeletal muscle.

1B. Describe the functions of the following structures of brain:

i. Hypothalamus ii. Cerebellum

(10+(5+5 = 20 marks)

2. Write short notes on each of the following:

2A. Lung volumes and capacities.

2B. Regulation of cardiac output in exercise.

2C. Digestive enzymes that act on carbohydrates in diet.

2D. Visual pathway.

2E. Nerve action potential.

2F. Functions of platelets.

2G. Lactation.

2H. Functions of renal tubules.

(5×8 = 40 marks)

3. Write brief answers to the following:

3A. Mention two conditions leading to bradycardia.

3B. Give the location of respiratory centers. Mention their functions.

3C. Mention two functions of smooth muscles.

3D. Name the receptors for

i. Colour vision ii. Hearing

3E. Mention two components of gastric juice.

3F. Mention the location and function of vestibular apparatus.

3G. Mention two functions of plasma proteins.

3H. Name any two hormones of adrenal cortex.

3I. Mention the normal body temperature and method of measuring it.

3J. Mention two factors affecting spermatogenesis.

(2×10 = 20 marks)

Reg. No.										

MANIPAL UNIVERSITY

FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – JUNE 2007

SUBJECT: GENERAL BIOCHEMISTRY AND OCULAR BIOCHEMISTRY

Saturday, June 09, 2007

Time: 3 Hrs. Max. Marks: 80

- **ANSWER SECTION 'A' AND SECTION 'B' IN TWO SEPARATE ANSWER BOOKS.**
- **Draw diagrams wherever necessary.**

SECTION – A: GENERAL BIOCHEMISTRY: 40 MARKS

- Answer **ALL** questions.

1. Define glycolysis. Write the reactions of aerobic glycolysis mentioning the enzymes and coenzymes at each step.

(1+7 = 8 marks)

2. Define the term carbohydrates. Classify carbohydrates and give two examples for each class.

(5 marks)

3. Name lipoproteins and write one function each of the lipoproteins.

(4 marks)

4. Define BMR and list the factors affecting it.

(4 marks)

5. With the help of a graph explain the effect of substrate concentration and temperature on enzyme activity.

(6 marks)

6. Discuss urea cycle under the following headings:

6A. Site and subcellular site.

6B. Reactions.

(1+5 = 6 marks)

7. What are essential fatty acids? Give **TWO** examples.

(2 marks)

8. Write the coenzyme form of thiamine and pyridoxine. Write two reactions each in which coenzyme form of the above vitamin takes part.

(5 marks)

SECTION – B : OCULAR BIOCHEMISTRY: 40 MARKS

✍ Draw diagram where necessary

9. Explain the photochemistry of retina.

(10 marks)

10. Write short notes on any **SIX** of the following:

10A. Biochemistry of tear film.

10B. Corneal transparency.

10C. Physio chemical properties of vitreous

10D. Accomodation.

10E. Presbyopia.

10F. What is aqueous humor? List the factors affecting aqueous formation?

10G. Metabolism of retina.

(5×6 = 30 marks)

Reg. No.										

MANIPAL UNIVERSITY

FIRST YEAR B. Sc. OPTOMETRY DEGREE EXAMINATION – JUNE 2007

SUBJECT: PHYSICAL OPTICS

Monday, June 11, 2007

Time: 3 Hrs. Max. Marks: 80

Physical constants

Speed of light (C)	$= 3\times10^{8}$ m/s
Electron charge (e)	$= 1.6\times10^{-19}$C
Electron mass (m)	$= 9.11\times10^{-31}$Kg
Planck's constant (h)	$= 6.63\times10^{-34}$ Js
Boltzmann's Constant (k)	$= 1.38\times10^{-23}$ J/K
Permittivity of vacuum (ε_0)	$= 8.85\times10^{-12}$ F/m

1. Explain with reasons whether the following statements (ANY **TEN**) are true or false.

1A. One of the important conditions for sustained interference is that the superposing waves should be coherent.

1B. The central fringe in the Lloyd's single mirror experiment is always bright.

1C. Interference of the light reflected from a uniform thin film is complimentary to the interference of the transmitted light.

1D. The central spot in the circular fringe pattern from a Michelson's interferometer may either be dark or bright.

1E. A zone plate is an application of Fraunhofer diffraction.

1F. The principal maxima of the single slit diffraction pattern are slightly shifted towards the central maximum.

1G. As the number of diffracting slits increases, the intensities of the principal maxima decrease.

1H. Resolving power of a grating increases with slit separation.

1I. Inverse square law of radiation states that the illuminance at a point varies inversely as the square of the intensity of the source.

1J. Sterance is constant in any direction.

1K. The sky looks black as seen from the Moon.

1L. Rayleigh scattering is the scattering from particles whose size is bigger than the wavelength of light.

(2×10 = 20 marks)

2. Answer any **SIX** of the following:

2A. Explain the terms (a) coherent sources (b) interference of light waves. Find the positions of the maxima and minima in the double slit interference pattern in terms of the slit separation d and the wavelength of light λ.

2B. Derive the condition for the constructive interference of the light reflected from a thin film of uniform thickness. How does this condition change in the transmitted system? Based on the above expression how would you explain the formation of colours in films?

2C. Based on Fresnel's theory of half period zones, obtain an expression for the resultant intensity due to a plane wave front at an external point. Distinguish between a zone plate and a convex lens.

2D. Obtain an expression for the intensity of the diffraction pattern as a function of the diffraction angle. Indicate the position of maxima and minima.

2E. Assuming the formula used, describe the procedure to determine wavelength of a monochromatic source of light using a diffraction grating in minimum deviation position.

2F. Describe construction of a nicol prism. Explain how you would use a nicol prism to produce linearly polarized light?

2G. State the Lambert's cosine law of radiation. Write a note on luminous efficiency curve.

2H. Write a note on: i) Rayleigh scattering and ii) Raman scattering.

(6×6 = 36 marks)

3. Answer any **SIX** of the following:

3A. Monochromatic light of wavelength 554nm illuminates two parallel narrow slits 7.7μm apart. Calculate the position of the third order principal maximum.

3B. A bi-prism is placed at 5cm from a slit illuminated by light of wavelength 589nm. The fringe width is measured to be $9.424X10^{-2}$cm on a screen placed 75cm from the bi-prism. What is the distance between the coherent sources?

3C. A broad source of light (λ =680nm) illuminates normally two glass plates 120mm long that touch at one end and are separated by a wire 0.048mm in diameter at the other end. How many bright fringes appear over the 120mm distance?

3D. When the moveable mirror in Michelson's interferometer is moved through a distance of 0.233mm, 792 fringes are counted. Calculate the wavelength of light.

3E. The two headlights of an approaching automobile are 1.42m apart. At what angular separation will the eye with a pupil diameter 5.00mm resolve them? Assume the wavelength of light to be 562nm.

3F. When monochromatic light is incident on a slit 0.022mm wide, the first diffraction minimum is observed at an angle of 1.8° from the direction of the incident beam. Find the wavelength of the incident light.

3G. Determine the specific rotation of an optically active substance if the plane of polarization is rotated by 13.2°. The length of the tube containing 10% solution of the substance is 20cm.

3H. A search light projects 0.012 lm of light on a billboard one km away forming a disk of light 3.2m in diameter. Find the intensity of the source.

(4×6 = 24 marks)

Reg. No.										

MANIPAL UNIVERSITY

FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – JUNE 2007

SUBJECT: GEOMETRICAL OPTICS

Tuesday, June 12, 2007

Time: 3 Hrs. Max. Marks: 80

✍ **Write legibly. Write the question numbers in the margin.**

Physical constants:

Velocity of light in vacuum=$3\times10^{8}ms^{-1}$

Boltzmann constant = $1.38\times10^{-23}JK^{-1}$

Electron mass = $9.1\times10^{-31}kg$

Electron charge =$1.6\times10^{-19}c$

Planck constant = $6.63\times10^{-34}Js$.

1. State whether the following statements are 'True' or 'False'. Briefly explain/justify your answer for any '**TEN**'.

1A. Optical polarization can be explained by assuming light as a longitudinal wave.

1B. Fermat's principle states that light in traveling from one point to another takes the shortest path.

1C. Refractive index of a material for blue light is more than that of red light.

1D. An achromatic prism produces dispersion but no deviation.

1E. Angular magnification increases with increase of focal length of the lens.

1F. Light travels in the straight line inside a graded index lens.

1G. Rays directed towards nodal points suffers no deviation.

1H. In an ABCD matrix element D = 0 signifies that the input plane coincides with the primary focal plane.

1I. Field stop determines the amount of light reaching any given point in the image.

1J. The condition for ray propagation in an optical fiber is that the incident ray must be within the acceptance cone.

1K. He-Ne laser is a pulsed laser.

1L. Astigmatism is the result of having different focal lengths for rays passing in tangential and sagittal planes.

(2×10 = 20 marks)

2. Answer any **EIGHT** of the following:

2A. State the laws of refraction and write a note on Snell's law.

2B. Explain the refraction through prism and hence obtain prism equation.

2C. Illustrate the formation of images in convex and concave lenses by parallel ray method.

2D. Write a note on cardinal points.

2E. Obtain the refraction matrix for a ray refracting across a spherical surface from refractive index n_1 to n_2

2F. Write a note on spherical aberration.

2G. Explain the concept of entrance and exit pupils.

2H. Explain the construction and working of a astronomical telescope. Obtain an expression for its angular magnification.

2I. Write a note on photoelectric effect.

2J. Obtain an expression for the numerical aperture of an optical fiber.

(5×8 = 40 marks)

3. Solve any **FIVE** of the following:

3A. Calculate the lateral displacements of rays of light incident on a block of glass with parallel sides at an angle of incidence of 30^0. Assume the glass thickness to be 5cm and index of refraction 1.5.

3B. A parallel beam of light enters a clear plastic bead 2.5cm in diameter and index 1.44. At what point beyond the bead are these rays brought to focus.

3C. Two lenses with focal lengths f_1=5cm and f_2= +10cm are located 5cm apart. If an object 2.5cm high is located 15cm in front of the first lens, find a) the position and b) the size of the final image.

3D. A positive thin lens of focal length 10cm is separated by 5cm from a thin negative lens of focal length-10cm. Find the equivalent focal length of the combination and the position of the foci and principal planes using the matrix approach.

3E. Collimated light is focused by a sphero cylinder into two line images 20cm and 25cm away from the lens. If then a -1.0D sphere is placed in contact with the sphero cylinder, how long will the interval of sterm be?

3F. A thin Plano convex lens has a refractive index of 1.523. The second surface has a radius of -10cm. If light is incident at a height of 2cm on the flat surface, parallel to the axis, find a) the position factor b) the shape factor and c) Longitudinal spherical aberration.

3G. A hypothetical atom has energy levels spaced by 1.2ev in energy. For a temperature of 2000k, calculate the ratio of the number of atoms in the 13^{th} excited state to the number in the 11^{th} excited state.

(4×5 = 20 marks)