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# MANIPAL UNIVERSITY

## FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – AUGUST 2008

### SUBJECT: GENERAL ANATOMY AND OCULAR ANATOMY

Monday, August 11, 2008

Time: 3 Hrs. Max. Marks: 80

1. Describe the different parts of the retina in detail. Add a note on its blood supply.

(8+4 = 12 marks)

2. Write short notes on:

2A. Extent and internal features of pharynx

2B. Diaphragm

2C. Iris

(6×3 = 18 marks)

3. Write notes on:

3A. Testis

3B. Ovary

3C. Structure of upper eyelid

(5×3 = 15 marks)

4. Write notes on:

4A. Hyaline cartilage

4B. Fourth ventricle of brain.

4C. Skeletal muscle

4D. Thoracic duct.

4E. Pancreas

(4×5 = 20 marks)

5. Write briefly on:

5A. Uterine tube

5B. Posterior mediastinum

5C. Ureter

5D. Typical thoracic vertebrae

5E. Classification of synovial joints.

(3×5 = 15 marks)

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# MANIPAL UNIVERSITY

## FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – AUGUST 2008

### SUBJECT: GENERAL PHYSIOLOGY AND OCULAR PHYSIOLOGY

Tuesday, August 12, 2008

Time available: 3 Hours. Max. Marks: 80

1. Explain neuromuscular transmission in skeletal muscle. Give the cause for myasthenia gravis and mention two clinical features of it.

(10 marks)

2. Define cardiac output and give its normal value in an adult. Write the formula for calculating it. Describe the regulation of cardiac output.

(10 marks)

**3. Write short notes on the following:**

3A. Erythropoiesis

3B. Mechanism of quiet inspiration and expiration

3C. Proximal convoluted tubule of nephron

3D. Image formation in human eye and its common defects

3E. Changes in the ovary during menstrual cycle

3F. Deglutition

3G. Parathyroid hormone

3H. Properties of cardiac muscle

(5×8 = 40 marks)

**4. Write brief answers to the following questions:**

4A. Mention the cause and two clinical features seen in acromegaly.

4B. Define 'Tidal volume' and 'Vital capacity'. Give their normal values.

4C. Mention four factors affecting venous return.

4D. Name the photoreceptors in the eye. Mention their functions.

4E. List four functions of stomach.

4F. Give the normal values for arterial $PO_2$ and $PCO_2$.

4G. Define 'anaemia'. Mention two causes for it.

4H. List four clinical features seen in cerebellar disease.

4I. Define ovulation. Name the hormone responsible for it.

4J. Draw a neat labelled diagram of normal Electrocardiogram (ECG).

(2×10 = 20 marks)

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# MANIPAL UNIVERSITY

## FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – AUGUST 2008

### SUBJECT: GENERAL BIOCHEMISTRY AND OCULAR BIOCHEMISTRY

Wednesday, August 13, 2008

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

1. Describe with the help of graphs, the effect of substrate concentration, temperature and pH on enzyme activity.

(5 marks)

2. Classify lipoproteins and mention their site of synthesis and functions.

(5 marks)

3. Describe calcium metabolism including sources, RDA, absorption, functions, serum levels and regulation.

(5 marks)

4. Define and classify acidosis. Mention ONE cause for each type and mention the biochemical findings.

(5 marks)

5. Name the key enzymes of gluconeogenesis and write the reactions catalyzed by them.

(4 marks)

6. Outline the biosynthesis of mature collagen.

(5 marks)

7. List the differences between DNA and RNA.

(2 marks)

8. Describe the digestion of dietary carbohydrates

(4 marks)

9. Write the reactions of urea cycle.

(5 marks)

## SECTION – B : OCULAR BIOCHEMISTRY: 40 MARKS

10. Explain about aqueous humor, biochemistry and it's role in the maintenance of IOP.

(10 marks)

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

11A. Draw the diagram of nasolacrimal system and list the structures.

11B. Corneal transparency.

11C. Lens metabolism.

11D. Accommodation.

11E. Physiochemical properties of vitreous.

11F. Vitamin A.

11G. Photoreceptors of the retina.

(5×6 = 30 marks)

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# MANIPAL UNIVERSITY

## FIRST YEAR B. Sc. OPTOMETRY DEGREE EXAMINATION – AUGUST 2008

### SUBJECT: PHYSICAL OPTICS

Thursday, August 14, 2008

Time: 3 Hrs. Max. Marks: 80

**1. State whether the following statements are TRUE or FALSE and justify your answer. Answer any TEN only.**

1A. The phase difference between electric and magnetic field vectors in the electromagnetic waves is $\pi/4$.

1B. A particle is subjected to two simple harmonic oscillations in the same direction having equal amplitude and same frequency. If the resultant amplitude is equal to that of the individual motions, then the phase difference between the two oscillations is $\pi/4$.

1C. In a certain region of a thin film, we get six fringes with light of wavelength 500 nm. If the light wavelength 600 nm is used, in the same region we get five fringes.

1D. The amplitude of the light waves emerging from the two slits in young's experiment is in the ratio of 2:3. The intensity of the minimum to that of the consecutive maximum will be in the ratio of 1:25.

1E. An instructor slips a thin sheet of a transparent material with an index of refraction only slightly larger than air over one of the slits in double slit demonstration experiment. As a consequence of this the fringes will shift position with no change in band width.

1F. All periodic motions are simple harmonic in nature.

1G. Division of amplitude is the technique used for the production of coherent sources in Fresnel's biprism experiment.

1H. In a Newton's rings experiment, if the sodium yellow light is replaced by blue monochromatic light, radii of the dark rings will decrease.

1I. Intensity of the central maximum in single slit diffraction is proportional to the slit width.

1J. Resolving power of a plane transmission grating increases as the total number of lines on the grating increases.

1K. Rayleigh scattering is independent of wavelength of light.

1L. A vertically oriented, ideal polarizing sheet transmits 50% of the incident polarized light. The polarizing sheet is now rotated through $45^{\circ}$. Then the fraction of intensity that passes is 0% or 100.

(2×10 = 20 marks)

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

2A. Define the following terms in Radiometry with units

i) Radiant exitance ii) Radiant intensity and iii) Radiance.

2B. Explain briefly: i) Wave theory of light and ii) Quantum theory of light.

2C. Show that the interference bands are equidistant in (i) Young's double experiment and (ii) Air wedge experiment.

2D. With the help of a neat diagram, explain the construction of a Michelson interferometer. Explain how it is used to determine the wavelength of the given monochromatic radiation.

2E. Define and derive expressions for Dispersive and Resolving powers of a plane transmission grating.

2F. Explain how polarization is achieved by reflection. Derive Brewster's law.

2G. Derive an expression for the focal length of a Zone plate. Mention any two differences between a zone plate and a converging lens.

2H Explain briefly Rayleigh's scattering of light.

(6×6 = 36 marks)

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

3A. A transparent film of glass of refractive index 1.5 is introduced normally in the path of one of the interfering beams of a Michelson interferometer which is illuminated with light of wavelength 480.0 nm. This causes 500 dark fringes to sweep across the field. Determine the thickness of the film.

3B. A parallel beam of light of wavelength 589.0 nm is incident on a thin glass plate of refractive index 1.5 such that the angle of refraction in to the glass plate is $60^{\circ}$. Calculate the smallest thickness of the glass plate which will appear dark by reflection

3C. The diameter of the tenth dark ring in Newton's rings system viewed normally by reflected light of wavelength 589.3 nm is 0.4 cm. Calculate the thickness of the air film at the tenth dark ring and the radius of curvature of the lens surface.

3D. If the distance between the first and tenth minima of a double slit pattern is 18 mm and the slits are separated by 0.15 mm, with the screen 50.0 cm from the slits, what is the wavelength of the light used?

3E. Monochromatic light of wavelength 441.0 nm falls on a narrow slit. On a screen 2.16 m away, the distance between the second minimum and the central maximum is 1.62 cm (i) Calculate the angle of diffraction of the second minimum (ii) Calculate the width of the slit.

3F. A ray of light is incident on the surface of a glass plate of refractive index 1.53 at the polarizing angle. Calculate the angle of refraction.

3G. A 20 cm long tube containing 48.0 $cm^3$ of sugar solution produces an optical rotation of $11^{\circ}$ when placed in a polarimeter. Calculate the quantity of sugar contained in the tube in the form of a solution. Given: Specific rotation of sugar = 0.66 degree $kg^{-1}m^{-1}$.

3H. A light bulb emits 100w of radiant power is positioned 2.0m from a surface. The surface is oriented perpendicular to a line from the bulb to the source. Calculate the irradiance at the surface. If all the 100w is emitted from a red bulb emitting light of wavelength 650.0 nm, calculate the illuminance at the surface. Given: luminous efficiency = 0.1 (Note: Luminous efficacy = 685 x luminous efficiency).

(4×6 = 24 marks)

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# MANIPAL UNIVERSITY

## FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – AUGUST 2008

### SUBJECT: GEOMETRICAL OPTICS

Saturday, August 16, 2008

Time: 3 Hrs. Max. Marks: 80

- **Answer any TEN questions from Part A, EIGHT from Part B & any FIVE from Part C.**
- **Write question numbers clearly on the left margin.**
- **Any missing data may suitably be assumed.**

**Physical Constants:**

| | | | |
|---|---|---|---|
| Speed of light in vacuum | $= 3.00 \times 10^{8}$ m/s | Electron charge | $= 1.60 \times 10^{-19}$ C |
| Electron mass | $= 9.11 \times 10^{-31}$ kg | Boltzmann constant | $= 1.38 \times 10^{-23}$ J/ K |
| Planck's constant | $= 6.63 \times 10^{-34}$ J.s | 1°C = 273 K | |

## PART – A

**1. State whether the following statements are TRUE or FALSE. Briefly explain/ justify your answer.**

1A. Snell's law of refraction is not valid for normal incidence.

1B. When light travels from a denser medium to rarer medium, speed of light increases?

1C. Critical angle of a medium is 45° if the refractive index for the material of the medium is $\sqrt{2}$.

1D. Angle of minimum deviation due to refraction through the given prism is the least for violet and greatest for red in the visible spectrum.

1E. When the thickness of the lens is comparable to the focal length, the lens must be treated as a thick lens?

1F. When two lenses are in contact, the power of the combination is the sum of the powers of individual lenses?

1G. In an ABCD system matrix, when B = 0, all rays from a point in the object input plane arrive at the same point in the output plane.

1H. Numerical aperture of an optic fiber is a measure of its light gathering capacity.

1I. Ruby laser is a *cw* laser.

1J. The focal lengths in a thick lens are measured from the focal points to their respective vertices of the spherical surfaces.

1K. Aperture of the objective lens in a telescope is smaller than that of the eye-piece.

1L. *Hg* Vapor lamp produces continuous emission spectra.

(2×10 = 20 marks)

## PART – B

2A. Define normal shift. Derive an expression for the normal shift when an object in a denser medium is viewed from a rarer medium.

2B. Derive the relation $n = \dfrac{\sin\left[\frac{A+D}{2}\right]}{\sin\frac{A}{2}}$, where the symbols have their usual significance. Draw the angle of deviation Vs angle of incidence graph.

2C. What is meant by a thin lens? Deduce the lens maker's formula for a thin lens. Mention the assumptions and Cartesian sign convention used.

2D. Illustrate the parallel- ray method for graphically locating the image formed by a thick lens.

2E. Explain what is meant by entrance and exit pupil. Show how an aperture stop and its image can become the exit and entrance pupils of a system.

2F. Deduce the ray transfer refraction matrix for refraction at a spherical surface.

2G. With the help of an energy level diagram, explain the working of a He- Ne laser. Why discharge tube diameters can not be made very large in this laser.

2H. Explain briefly the chromatic aberration, coma, curvature and distortion.

2I. Write Einstein's equation for photo electric effect and explain the same. How this effect supports the particle nature of light.

2J. Explain the working of a compound microscope. Obtain an expression for its magnification.

(5×8 = 40 marks)

## PART – C

3A. A small object is placed in air 0.50 m from a convex spherical surface of radius of curvature 0.10 m. Find the image position if refractive index of glass is 1.50. What is the power of the refracting surface?

3B. Where should an object be placed in front of a convex lens of focal length 0.120 m, so that an image magnified 4 times is obtained?

3C. Two thin convex lenses of focal lengths 4 cm and 8 cm are separated by 2 cm. Calculate the equivalent focal length and power of the combination.

3D. A thin lens with an aperture of 4.80 cm and a focal length of +3.50 cm has a 3.0 cm stop located 1.50 cm in front of it. An object 1.50 cm high is located with its lower end on the axis 8.0 cm in front of the lens. Calculate the position and size of the exit pupil.

3E. A thick convex lens is located at the end of a tank containing a liquid of refractive index 1.420. The lens, with radii $r_1 = 3.80$ cm and $r_2 = 1.90$ cm, is 4.60 cm thick and has a refractive index of 1.620. If $r_2$ is in contact with the liquid, find (a) the primary and secondary focal lengths and (b) the power of the lens.

3F. Calculate the energy difference in eV between the two energy levels of the Ne atoms of a He-Ne laser, the transitions between which results in the emission of a light of wavelength 632.8 nm. Also find the ratio of population in these energy levels for an ambient temperature of 27°C.

3G. A plano –convex lens of refractive index 1.5 in air has a radius of 10 cm and is 1 cm thick. Determine the system matrix and the determinant of the system matrix.

(4×5 = 20 marks)