

BIT SINDRI
2ND Mid Semester Exam -2019
2ND Semester (1ST Year) Chemical Engineering
Paper-Physics II (Optics and fibre optics)

Time: 1½ hrs

B.

Full Marks: 20.

Answer five questions from group A and group B. Group A is compulsory.

Group A (Multiple choice questions)

Answer any four questions.

1×4=4.

Q1. (i) The expression for the resolving power of a grating is

(a) $\lambda/d\lambda = Nn$ (b) $d\lambda/\lambda = Nn$ (c) $d\lambda/\lambda = t d\mu/d\lambda$ (d) None of these

(ii) Which of the phenomenon is not exhibited by the sound waves.

(a) Reflection (b) Interference (c) Diffraction (d) Polarisation

(iii) Brewster's law is

(a) $i_p = \tan \mu$ (b) $\mu = \tan i_p$ (c) $i_p + r = \tan \mu$ (d) $i_p = r$

(iv) The angle between the plane of vibration and the plane of polarisation of a polarised light is

(a) 0° (b) 90° (c) 180° (d) 45°

(v) A calcite crystal is placed over a dot on a piece of paper and rotated. On seeing through the calcite, one will see

(a) two rotating dots (b) two stationary dots (c) one dot only

(d) one dot rotating about the other.

(vi) when a light ray is incident on a thick glass plate ($\mu = \sqrt{3}$), the reflected light is plane polarised.

The angle of incidence is

(a) 45° (b) 57° (c) 60° (d) 68°

Group B (Long answer questions)

Answer any four questions.

4×4=16

Q2. How would you determine the wavelength of light with a plane transmission grating? Find the conditions for absent spectra and maximum number of orders with a diffraction grating.

Q3. What is Rayleigh's criterion for the limit of resolution? How would you determine the resolving power of a plane transmission grating?

Q4. What do you understand by polarisation of light? State Brewster's law and use it to prove that when light is incident on a transparent substance at the polarising angle, the reflected and refracted rays are at right angles to each other.

A ray of light is incident on the surface of glass plate of refractive index 1.732 at the polarising angle. Calculate the angle of refraction of the ray.

Q5. Define plane of polarisation and plane of vibration. State and explain Malus' law.

Four polarising sheets are placed one above the other such that the direction of polarisation of each sheet makes an angle of 30° with the direction of polarisation of its preceding sheet. If an unpolarised light is incident on this system what fraction of it will emerge out of it?

Q6. Explain the principle, construction and working of a Nicol Prism. What are parallel and crossed Nicols.

Q7. Find the superposition of two plane polarised waves having perpendicular vibrations. Discuss the conditions for elliptically polarised light and circularly polarised light.