RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR SCREENING TEST FOR THE POST OF SENIOR SCIENTIFIC OFFICER - PHOTO DIVISION
(STATE FORENSIC SCIENCE LABORATORY, RAJASTHAN, JAIPUR)

UNIT-I

Elementary geometrical optics in the paraxial approximation. Refractive index; reflection and refraction at a plane boundary from Huygens' principle and Fermat's principle; Snell's Law; total internal reflection. Image formation by reflection at a spherical boundary; concave and convex mirrors. Real and virtual images. Magnification.

UNIT-II

Image formation by refraction at a spherical boundary and by converging and diverging thin lenses. Derivation of the expression for the focal length of a thin lens. Non-examinable: Image formation by systems of thin lenses or mirrors as illustrated by: a simple astronomical telescope consisting of two convex lenses, a simple reflecting telescope, a simple microscope.

UNIT-III

Simple two-slit interference (restricted to slits of negligible width). The diffraction grating, its experimental arrangement; conditions for proper illumination. The dispersion of a diffraction grating. (The multiple-slit interference pattern and the resolution of a diffraction grating are excluded.) Fraunhofer diffraction by a single slit. The resolution of a simple lens.

UNIT-IV

Oscillations, simple harmonic motion, damped harmonic motion, forced oscillation and resonance. Wave equation, harmonic solutions, plane and spherical waves, superposition of waves, beats, stationary waves Doppler's Effect, phase and group velocities. Conditions of interference, Newton's rings and Michelson's interferometer. Diffraction-Fresnel and Fraunhofer, diffraction by plain transmission grating, Rayleigh criterion, resolving power of grating and telescope.

UNIT-V

Black body radiations, De Borglie waves. Photo-electric effect, Compton effect, wave-particle duality, Uncertainty principle and its applications (like - size of H-atom, zero point energy, wave packet, finite width of energy levels).

UNIT-VI

Basics of Light sources, Mirrors, lens, Focal length, Image formation, Newton's laws on motion, Callers' law, Bernuli principals, Doppler's Principal and effects.

UNIT-VII

Photographic Optics and Equipments: History of B/W Photography: Early experiments and later developments. Photographic, Chromatic and spherical aberration, curvature of field, distortion and astigmatism, methods of reducing the above defects. Aperture of diaphragm, its function, f notation, different kinds of aperture and their construction, dependence of depth of field and focus on distance and f number. Types of camera lenses: Single (meniscus), achromatic, symmetrical and unsymmetrical lenses, telephoto, zoom, macro, supplimentry and fish-eye lenses.

UNIT-VIII

Concept of Digital imaging, Concept of the megapixels, optical and digital zoom, image size, file size, concept of frame, perception and composition. Photographic camera types: Pin-hole, box, folding, large and medium format cameras, single lens reflex (SLR) and twin lens reflex (TLR), miniature, subminiature and instant camera, choice of camera and sizes, rising, falling, cross movements and swing back devices. Principal parts of Photographic cameras: (a) Lens (b) Aperture (c) Shutters, various types and their functions, focal plane shutter and in-between the lens shutter, shutter synchronization, self-timer. View-finders and focusing systems: Direct vision and ground glass view finders, frame view finder, plane mirror and penta-prism view-finder, fresnel prism focusing, split image focusing, range finders and range finder focusing , mechanism focusing distance scale. Film chamber: Exposure counter, self-timer, tripod stand, panning tilt head, lens hood, cable release.

UNIT-IX

Photographic Light Sources: (a) Natural source, the Sun, nature and intensity of the sunlight at different times of the day, different weather conditions. (b) Artificial light sources: nature, intensity of different types of light sources used in photography namely.

UNIT-X

Printing: Contact printing, projection printing using an enlarger, enlargement on Bromide paper, selection of papers, technique of enlargement – Burning, dodging, vignetting, flashing, diffusion or soft focus, distortion creation and correction, making cartoon and multiple photograph on the same paper, making giant enlargements, glazing and drying. Trick Photography: Methods, effect box, photomontage, wire screen-star effect, use of diffraction grating, texture effect, photolith, Bas-relief, solarization and photo grams. Photomicrography: Photography using a microscope, essential equipments and methods, use of polarized light. Colour Photography: Basic principle, idea of colour, primary and secondary colours, colour and colour temperature.

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Pattern of Question Papers:

1. Objective Type Paper
2. Maximum Marks : 100
3. Number of Questions : 100
4. Duration of Paper : Two Hours
5. All Questions carry equal marks
6. There will be Negative Marking

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