

Review Questions – Choose one correct answer

Q1: What part of the atom do neutrons interact with?

- (a) electrons (b) nucleus (c) protons (d) dipoles

Q2: Neutrons are characterized by what property?

- (a) high flux (b) right wavelength (c) strong interaction (d) low charge

Q3: What is the useful range of cold neutron wavelengths?

- (a) 4 Å to 10 Å (b) 0.4 μm to 0.7 μm (c) 1 to 10 fm (d) 1 mm to 10 mm

Q4: The neutron wavelength monochromation is performed for SANS at NIST using...

- (a) a velocity selector (b) a crystal monochromator (c) a chopper (d) a neutron guide

Q5: Neutron area detectors use the following nuclear reaction:

- (a) He-3(n,p)T-3 (b) B-10(n,α)Li-7 (c) Li-6(n,α)T-3 (d) U-235 fission

Q6: Why are neutron guides used?

- (a) to focus neutrons (b) to reflect neutrons
(c) to “bottle” neutrons (d) to avoid neutron losses

Q7: Name a material used to make neutron windows (very transparent to neutrons).

- (a) transparent glass (b) cadmium (c) silicon (d) quartz

Q8: Name a neutron absorber material.

- (a) sapphire (b) boron (c) lead (d) steel

Q9: What is the typical thickness of a SANS sample?

- (a) 1 to 2 mm (b) 1 to 2 cm (c) 1 to 2 μm (d) 1 to 2 inches

Q10: What is the momentum transfer Q?

- (a) neutron velocity (b) neutron energy (c) scattering angle (d) scattering variable

Q11: What characterizes incoherent neutron scattering?

- (a) Q-dependent (b) Q-independent (c) model-dependent (d) Bragg peak

Q12: Which of the deuteration schemes is more appropriate for dilute polymer solutions?

- (a) d-polymer in h-solvent (b) h-polymer in d-solvent
(c) d-polymer in d-solvent (d) h-polymer in h-solvent

Q13: What information is obtained from a Guinier plot?

- (a) persistence length (b) radius of gyration (c) gas constant (d) Steve's constant

Q14: What information is obtained from a Porod plot?

- (a) size (b) chi parameter (c) dipole moment (d) surface-to-volume ratio

Q15: A Zimm plot is used for:

- (a) magnetism (b) complex fluids (c) polymer solutions (d) genomics

Q16: What is the difference between a scattering run and a transmission run?

- (a) beamstop position (b) measurement sequence (c) empty beam (d) label

Q17: The sample transmission depends on:

- (a) neutron wavelength (b) detector position (c) number of guides (d) aperture

Q18: What are the units of an absolute cross section?

- (a) Angstroms (b) barns (c) cm (d) cm^{-1}

Q19: What is the spin of a neutron?

- (a) 1 (b) $\frac{1}{2}$ (c) 0 (d) $\frac{3}{2}$

Q20: The instrumental resolution is improved for:

- (a) long wavelength (b) high flux (c) small spot size (d) large samples