# INSTITUTE FOR EXCELLENCE IN HIGHER EDUCATION, **BHOPAL (M.P.)** DEPARTMENT OF FORENSIC SCIENCE

A Question Bank on

# **SEC/Vocational Course**

Under NEP 2020

For

**B.Sc. IV Semester (Forensic Science)** 

Paper Title: Tools and Techniques in Criminal Investigation



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**Under the Aegis of Vocational Cell NEP** IEHE, Bhopal (M.P.) **(February 2023)** 

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# Module 1: General Considerations and Microscopy (Multiple Choice Questions)

1. The toner used in ESDA while deciphering indented writing is charged.
(a) Negatively
(b) Positively
(c) Neutral
(d) None of these
(d) None of these  Ans. (a) Negatively  2. The following is the most acceptable method for revealing indented writing.
2. The following is the most acceptable method for revealing indented writing.
(a) Oblique lighting
(b) Comparison Microscope
(c) Rubbing with a pencil lead
(d) Electrostatic Detection Apparatus
Ans. (d) Electrostatic Detection Apparatus
3microscopy is responsible for detailed imaging of sub cellular
organelles like nucleus and chromosome.
(a) Optical microscopy
(b) X-ray microscopy
(c) Electron microscopy
(d) Compound microscopy
Ans. (b) X-ray microscopy
4. Microscope that uses light rays to produce a dark image against a bright background is
known as a
(a) Darkfield microscopy
(b) Brightfield microscopy
(c) Phase contrast microscopy
(d) Electron microscopy
Ans. (b) Brightfield microscopy
5. TEM uses to focus on the specimen to produce an image.
(a) Beam of protons
(b) Light rays
(c) Beam of electrons

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(d) Beam of 1	neutrons
Ans. (c) Bear	m of electrons
6	microscope uses a single lens for magnification.
(a) Compoun	d microscope
(b) Phase con	ntrast microscope
(c) Simple m	icroscope
(d) Light mic	roscope
Ans. (c) Sim	ple microscope
7	is a measure of the clarity of an image, how clear the details ar
(a) Magnifica	ation
(b) Resolutio	n
(c) Total mag	nification
(d) None of t	hese
Ans. (b) Res	olution
8. The main 1	microscope lens that focuses the image is
(a) Ocular	
(b) Base	
(c) Objective	65
(d) Binocular	
Ans. (c) Obj	ective
9. Oil immers	sion objective lens has an NA value
(a) 0.75	₹ <sup>©</sup>
(b) 0.33	
(c) 1.33	
(d) 1.75	
Ans. (c) 1.33	
10	image formed by an objective of a compound microscope is
(a) Real and	enlarged
(b) Real and	small
(c) Real and	diminished
(d) Virtual ar	nd diminished

Ans. (d) Virtual and diminished

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Q.11. an alternative light source (ALS) is useful when searching for:
(a) Semen stains
(b) Saliva stains
(c) Blood stains
(d) Both (a) and (b)
Ans. (d) Both (a) and (b)
Q12. While searching for saliva stain at a crime scene you employ an alternative light source
(ALS). What wavelength should you use?
(a) 300-455nm
(b) 100-220nm
(c) 850-1100nm
(d) None of these
Ans. (a) 300-455nm
Q13. Video Spectral Comparator (VSC) works in the basic principle of
(a) Light
(b) Electron
(c) Neutron
(d) None of these
Ans. (a) Light
Q14. The visible portion of the electromagnetic spectrum extends form:
(a) 100-400nm
(b) 210-370nm
(c) 380-740nm
(d) 570-891nm
Ans. (c) 380-740nm
Q15. Which of the following is used in electron microscope?
(a) Electron beams
(b) Magnetic fields
(c) Light waves
(d) Electron beams and magnetic field
Ans. (d) Electron beams and magnetic field

Q16. Electron microscope can give a magnification up to\_\_\_\_\_

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- (a) 400,000X
- (b) 100,000X
- (c) 15000X
- (d) 100X

# Ans. (a) 400,000X

- Q17. Which among the following helps us in getting a three-dimensional picture of the specimen?
- (a) Transmission Electron Microscope (TEM)
- (b) Scanning Electron Microscope (SEM)
- (c) Compound Microscope
- (d) Simple Microscope

# Ans. (b) Scanning Electron Microscope (SEM)

- Q18. Where do we obtain the magnified image of the specimen in Scanning Electron Microscope (SEM)?
- (a) Cathode ray tube
- (b) Phosphorescent screen
- (c) Anode
- (d) Scanning generator

# Ans. (a) Cathode ray tube

- Q19. The full form of ESDA is-
- (a) Electrostatic detection apparatus
- (b) Electron detection apparatus
- (c) Enzyme linked detection assay
- (d) Easily linked detection assay

# Ans. (a) Electrostatic detection apparatus

- Q20. A crime scene investigator needs crime scene investigation kit which includes:
- (a) Crime Scene sketch template
- (b) Vials with paper adhesive
- (c) Disposable latex gloves
- (d) All of the above

# Ans. (d) All of the above

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# (Short Answer Type Questions)

- Q1. Why are the crime investigators kits essential for any crime scene investigation?
- Q2. What can alternate light source (ALS) detect?
- Q3. What is the principle of light microscope?
- Q4. What is comparison microscope?
- Q5. Explain forensic applications of microscope?

# (Long Answer Type Questions)

- Q1. What is the Video Spectral comparator (VSC)? Explain its principle and working?
- Q2. What is Electrostatic Detection Apparatus (ESDA)? How does an ESDA work?
- Q3. What is in a crime scene investigation kit? What is the use of investigation kit?
- Q4. What is electron microscope? Explains its principle and working?
- on Api
  on Api
  chining
  roots and rechniques in chining Q5. What are the advantages of Electrostatic Detection Apparatus (ESDA) and Video

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# Module 2: Sample Preparation Techniques and Chromatography

# (Multiple Choice Questions)

- Q.1. What should be the temperature difference between two miscible liquids to perform simple distillation?
- (a) 30°C
- (b) 25°C
- (c) 15°C
- (d) 10°C

# Ans. (b) 25°C

- Ques in Criminal Investigation Q.2. The quantitative analysis is related to-
- (a) Concentration of constituent
- (b) pH of constituent
- (c) Charge of constituent
- (d) Molecular weight of constituent

# Ans. (a) Concentration of constituent

- Q.3. The full form of SPE is
- (a) Solid phase extraction
- (b) Solid partition extraction
- (c) Soluble phase extraction
- (d) Soluble phase extract

# Ans. (a) Solid phase extraction

- Q.4. To extract metallic poisons from sample matrix which f the following method will be preferred
- (a) Stassotto method
- (b) Dialysis method
- (c) Dry ashing method
- (d) SPME technique

# Ans. (c) Dry ashing method

- Q.5. In centrifugation techniques molecules are generally separated on the basis of
- (a) Gravitational force
- (b) Magnetic force
- (c) Centrifugal force

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(d) Contact force

# Ans. (c) Centrifugal force

- Q.6. Who have invented chromatographic technique?
- (a) Michael Tswett
- (b) Martin and Synge
- (c) Izmaylov and Shrayber
- (d) Martin and James

# Ans. (a) Michael Tswett

- Q.7. Among the following which chromatographic technique is known as partition chromatography
- (a) Paper chromatography
- (b) High performance liquid chromatography
- (c) Ultra high performance liquid chromatography
- (d) Size exclusion chromatography

# Ans. (a) Paper chromatography

- Q.8. Among the following which one is not a validation parameter of chromatographic techniques?
- (a) Capacity factor
- (b) Efficiency
- (c) Asymmetry factor
- (d) Particle size

# Ans. (d) Particle size

- Q.9. In thin layer chromatography the mobile phase is-
- (a) Always liquid
- (b) Always gas
- (c) Always water
- (d) Always mixture of solvents

# Ans. (a) Always liquid

- Q.10. Among the following which can be the mobile phase in the chromatography?
- (a) Solid only
- (b) Gas only

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- (c) Liquid or gas
- (d) Liquid only

# Ans. (b) Gas only

- Q.11. 1A° is equals to-
- (a)  $10^{-6}$  cm
- (b) 10<sup>-8</sup> cm
- (c)  $10^{-10}$  cm
- (d)  $10^{-12}$  cm

# Ans. (b) 10<sup>-8</sup> cm

- Q.12. Among the following which one is the non-destructive chromatographic technique?
- (a) TLC
- (b) HPLC
- (c) GC
- (d) SEC

# Ans. (a) TLC

- Q.13. WCOT, PLOT and SCOT is associated with which of the following?
- (a) Paper chromatography
- (b) Gas chromatography
- (c) High performance liquid chromatography
- (d) Chiral chromatography

# Ans. (b) Gas chromatography

- Q.14. Paper chromatography is-
- (a) Qualitative method
- (b) Quantitative method
- (c) Semi quantitative method'
- (d) None of the above

# Ans. (a) Qualitative method

- Q. 15. Among the following which chromatographic technique is known as miniaturized chromatographic technique?
- (a) TLC
- (b) GC
- (c) HPLC

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# (d) UHPLC

# Ans. (d) UHPLC

- Q. 16. Which technique is best suited for analysis of volatile components?
- (a) Chiral chromatography
- (b) Gas chromatography
- (c) Size exclusion chromatography
- (d) Column chromatography

# Ans. (b) Gas chromatography

- 17. Among the following which detector is used in HPLC?
- (a) Photocell
- (b) Photovoltaic cell
- (c) Fluorimeter
- (d) Barrier cell

# Ans. (c) Fluorimeter

- Q.18. Which detector monitor the bulk property of eluent
- (a) Ultraviolet detector
- (b) Fluorescence detector
- (c) Refractive index detector
- (d) Photo diode array detector

# Ans. (c) Refractive index detector

- Q.19. GC-MS is applied for the detection of
- (a) Flavonoid
- (b) Proteins
- (c) Inorganic components
- (d) Metallic components

# Ans. (a) Flavonoid

- Q.20. What is the work of interface in hyphenated chromatographic technique?
- (a) It transport the effluent efficiently from GC/LC to MS
- (b) It provides the medium to mix carrier gas and analyte
- (c) It decomposes the analyte before reaching to MS
- (d) Only pass the mobile phase

# Ans. (a) It transport the effluent efficiently from GC/LC to MS

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# (Short Answer Type Questions)

- Q.1. Write down the law of distribution with suitable example?
- Q.2. What is centrifugation and which factors influence it?
- Q.3. Write down about different methods of TLC preparation.
- Q.4. What do you understand by adsorption and partition chromatographic techniques?
- Q.5. Write down about solid phase extraction.

# (Long Answer Type Questions)

- Q.1. What is distillation? Explain simple distillation along with suitable diagram?
- Q.2. Write down the classification of chromatographic techniques.
- Q.3. Write down about the different validation parameter of chromatographic techniques?
- ny?
  And rechniques in Chilling Q.4. Explain in detail about different detectors which are used in HPLC?

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# **Module 3: Spectroscopy**

# (Multiple Choice Questions)

- 1. Spectroscopy is-
- A. Interaction between two materials
- B. Interaction between material and electromagnetic radiation
- C. Both (A) and (B)
- D. None of the above

# Ans. B. Interaction between material and electromagnetic radiation

- 2. The physical property on which spectrophotometry based is-
- A. Absorption and emission of radiations
- B. Emission of radiations
- C. Rotation of radiations
- D. Electrical potential

# Ans. A. Absorption and emission of radiations

- 3. Energy is absorbed or emitted by the nature in discrete amount called as-
- A. Radio amount
- B. Quanta
- C. Frequency
- D. None of the above

#### Ans. B. Quanta

- 4. The visible region of the spectrum stands between-
- A. Blue and red color region
- B. Orange and violet color region
- C. Violet and red color region
- D. Green and red color region

# Ans. C. Violet and red color region

- 5. UV-Visible spectrophotometry is mainly used for-
- A. Qualitative analysis
- B. Quantitative analysis
- C. Selection analysis
- D. All of the above

# Ans. B. Quantitative analysis

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- 6. Monochromator is used as-
- A. For wavelength selection
- B. To increase visibility
- C. To increase intensity
- D. For interference

# Ans. A. For wavelength selection

- 7. UV-Visible spectroscopy follows the principal of-
- A. Beer Law
- B. Lamberts law
- C. Beer and Lamberts law
- D. None of the above

# Ans. C. Beer and Lamberts law

- 8. Vibrational frequency of a bond can be calculated accurately by the application of-
- A. Boyle's law
- B. Charl's law
- C. Hooke's law
- D. All of the above

# Ans. C. Hooke's law

- 9. The IR spectrum of a chemical substance is a-
- A. Equivalents with identification
- B. Fingerprints for its identification
- C. Shows band intensity
- D. None of the above

# Ans. B. Fingerprints for its identification

- 10. Atomic absorption spectroscopy is given by-
- A. Alan Walsh
- B. Roentgen
- C. Tswett
- D. None of the above

#### Ans. A. Alan Walsh

11. IR spectroscopy is used in the analysis of-

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- A. Explosives
- B. Paints
- C. Pigments
- D. All of the above

#### Ans. D. All of the above

- 12. NMR stands for-
- A. Nuclear Magnetic Resonance
- B. Non Magnetic Resonance
- C. Nuclei Magnetic Resonance
- D. Normal Magnetic Resonance

# Ans. A. Nuclear Magnetic Resonance

- edhniques in Criminal Investigation 13. In NMR Radiation absorbs in the region-
- A. Microwave
- B. Radiowave
- C. X-Ray
- D. UV

#### Ans. B. Radiowave

- 14. X-ray were discovered by-
- A. Roentgen
- B. Henery Becquerel
- C. Glodstein
- D. Bohr

# Ans. A. Roentgen

- 15. X-ray diffraction pattern is named as-
- A. X-ray flows
- B. X-ray lines
- C. X-ray band
- D. Diffractogram

# Ans. D. Diffractogram

- 16. AAS is mostly employed in-
- A. Poisoning cases
- B. Hit and run

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- C. Lost and found
- D. All of the above

## Ans. A. Poisoning cases

- 17. The units to express the position of IR peaks is –
- A. Wave number
- B. Microns

- 18. When two atoms approach each other the type of bending is called as-A. Rocking
  B. Twisting
  C. Wagging

- D. Scissoring

# Ans. D. Scissoring

- 19. Which of the following is not used as a radiation source in far infrared region?
- A. Nernst glower
- B. Glober
- C. Mercury arc
- D. Incandescent lamp

# Ans. D. Incandescent lamp

- 20. Which of the following techniques can be used for the characterization of all the three phases' viz solid, liquid, gases?
- A. UV-Visible spectrophotometry
- B. AAS
- C. Infrared
- D. None of the above

#### Ans. C. Infrared

# (Short Answer Type Questions)

- 1. What are UV Visible spectroscopy & its principle?
- 2. How does IR spectroscopy instrument works?
- 3. Explain advantages and disadvantages of different types of spectroscopy?

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- 4. Write short notes on the followings-
  - A. NMR Spectroscopy
  - B. AAS Spectroscopy

# (Long Answer Type Questions)

- 1. Explain in brief how Atomic absorption spectroscopy works with special reference to Forensic Application
- 2. Brief Explain sample preparation and examination of different types of forensic evidence Tools and Lechniques in Criminal Investigation of the second seco under UV and IR spectroscopy techniques.
  - 3. Explain in detail application of spectroscopy in the field of forensic science.

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# Module 4: Forensic Photography and Modern Methods in Criminal Investigation (Multiple Choice Questions)

- a) Alexa Brown
- b) Bill Jonas
- c) Neon Mask
- d) Alex Jeffreys

# Ans. d) Alex Jeffreys

- Q.2 Which of the following can be biological samples for DNA fingerprinting?
- a) Blood
- b) Hair
- c) Saliva
- d) All of them

# Ans. d) All of them

- Q.3 The process where DNA fragments are transferred to nylon sheet on the gel for soaking is called as-
- a) Southern blotting
- b) Blood clotting
- c) Northern blotting
- d) Nitro Blot

# Ans. a) Southern blotting

- Q.4 Lie detector measures the following parameter of an individual:
- a) Pulse rate
- b) Blood pressure
- c) Galvanic Skin Resistance
- d) All of the above

#### Ans. d) All of the above

- Q.5 Which of the following is associated with Brain Mapping?
- a) EDTA
- b) RNA
- c) MERMER
- d) MDOPA

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#### Ans. C-MERMER

- Q.6 P-Waves are associated with which of the following?
- a) Brain fingerprinting
- b) Narco analysis
- c) Polygraph
- d) DNA fingerprinting

# Ans. a) Brain fingerprinting

- Q.7 Which drug is used in carrying out 'Narco analysis'?
- a) LSD
- b) Sodium Pentothal
- c) Amphetamine
- d) Sodium Narcol

# Ans. b) Sodium Pentothal

- Q.8 Polygraph was introduced by-
- a) John Wick
- b) Leonarde Keeler
- c) Mark Jonathan
- d) Galvanni

# Ans. b) Leonarde Keeler

- Q.9 The basic purpose of crime scene photography is-
- a) To record the entire crime scene
- b) To support the sketch
- c) To show the benefits of color film
- d) Both a and b.

# Ans. d) Both a and b

- Q.10- What type of camera is recommended in most cases while taking Forensic Photos?
- a) Colposcope
- b) Digital
- c) Polaroid
- d) 35 mm

# Ans. b) Digital

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Q.11 The word photography is derived from which word-
a) Greek
b) Latin
c) English
d) French
Ans. a) Greek
Ans. a) Greek  Q.12 GSR stands for?  a) Galvanic skin reflex  b) Galvanic spectrogram reflex  c) Galvanic spectro reflection  d) Galvanic skin reflexogram  Ans. a) Galvanic skin reflex  Q.13 Full form of DSLR is?  a) Digital Single-Lens reflex camera  b) Dual reflex camera
a) Galvanic skin reflex
b) Galvanic spectrogram reflex
c) Galvanic spectro reflection
d) Galvanic skin reflexogram
d) Galvanic skin reflexogram  Ans. a) Galvanic skin reflex  Q.13 Full form of DSLR is?  a) Digital Single-Lens reflex camera  b) Dual reflex camera  c) Duplex Single-Lens reflex camera
Q.13 Full form of DSLR is?
a) Digital Single-Lens reflex camera
b) Dual reflex camera
c) Duplex Single-Lens reflex camera
d) Deteriorate Single-Lens reflex camera
Ans. a) Digital Single-Lens Reflex Camera
Q.14 Aperture is?
a) Opening of eye
b) Opening of cornea
c) Opening in the camera that lets in the light
d) Closure in the camera that don't allow the light in
Ans. c) Opening in the camera that lets in the light
Q.15 Who is known as a father of Brain Fingerprinting technique?
a) Alex Jeffreys
b) Dr. Farwell
c) Watson and crick
d) Keeler
Ans. b) Dr. Farwell
Q.16 ISO stands for?
a) Internal Standard Organization

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b) International Standards Organization
c) Internal Standard Organ
d) International Stunt Organization
Ans. b) International Standards Organization
Q.17 Types of photographs taken at the Crime Scene:
a) Overall Photographs
b) Mid-range Photographs
c) Close-up Photographs
d) All of the above
e) None of the above
Ans. d) All of the above
b) Mid-range Photographs c) Close-up Photographs d) All of the above e) None of the above Ans. d) All of the above Q.18 factors are necessary to yield proper photographs.
a) Shutter
b) Aperture
c) ISO
d) Flash
Q.19 Meaning of "PHOTOS" and "GRAPHOS" in the word of photography are?
a) Light and write
b) Sight and fight
c) Writing with ink
d) Writing with powder
Ans. a) Light and write
Q.20 Methods of Documentation of crime scene are?
a) Photography
b) Videography
c) Only a
d) Both a and b
Ans. d) Both a and b
(Short Answer Type Questions)
Q.1 Write down the basic equipment for crime scene photography?
Q.2 Write down the applications of photography to different crime scene?
Q.3 What is the basic principle of lie detection method?

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- Q.4 Write a short note on Narco analysis technique?
- Q.5 Write down the basic steps of DNA profiling?

# (Long Answer Type Questions)

- Q.1 What is the basic principle behind the photography? Write in brief about certain factors those are necessary to yield proper photographs? Enlist the certain rules to be followed to obtain proper photographs of the crime scene?
- Q.2 What is DNA polymorphism? Describe the procedure and Forensic significance of DNA Fingerprinting?
- Q.3 What is Brain Fingerprinting Testing? What is the difference between Polygraphy and Brain Fingerprinting technology?
- Q.4 What is Narco analysis test? What is the procedure and side effects of Narco analysis test? How effective is a Narco analysis test?
- Q.5 What is Lie detection technique? How does a Lie detector work? How accurate this technique is and what are the limitations for this analysis?