Choose the best answers and write them in your answer sheet model (1).

1. The automated process of locating and encoding distinctive characteristics from a biometric sample in order to generate a template refers to_____.

 A) Verification.   C) Feature Extraction.   B) Encoding.
D) Template identification.

 2. The process used to recognize an individual's handwritten signature refers to_____.

 A) Signature Dynamics.   B) Keystroke Verification.

C) Keystroke Dynamics.   D) Signature Verification.

 3. A biometric modality that uses the individual's typing pattern for recognition refers to_____.

 A) Signature Dynamics.   B) Keystroke Verification.

 C) Keystroke Dynamics.   D) Signature Verification.

 4. A type or class of biometric, such as face, fingerprint, and iris is called_____.

A) Nodal Points.   C) Model.   B) Modality.

 D) Both (B) and (C) are true.

5. Synonym for verification is_____.

A) One-to-one.   B) Comparison.   C) One-to-many.
D) Extraction.

6. Iris recognition has _____false acceptance rate than fingerprint.

A) more.   B) Same.   C) Lower.
D) A or B.

7. Which of the following biometrics is considered the least acceptable?

A) Face.   B) Fingerprint.   C) Retina.   D) Signature.

8. Use more than one source of information for biometric recognition refers to_____.

A) Characteristics.   B) Verification.

C) Multimodal biometrics.   D) None of these.

9. What is called the percentage of invalid subjects that are falsely accepted?

A) Type I error.   B) Type II error.   C) Type III error.
D) EER.

10. What is true for equal error rate?

A) Lower the equal error rate, higher the accuracy.

C) Lower false negative, higher equal error rate.

B) Higher false positive make lower equal error rate.   D) None of these.

11. _____is a fixed value used to make decision to accept or reject the biometric user.

A) Accept rate.   B) Matching score.

C) Reject rate.   D) Matching threshold.

12. Which biometric has lower distinctiveness?

A) Face   B) Hand geometry.   C) Iris.
D) Fingerprint.

13. Which biometric has higher performance?

A) Face.   B) Hand geometry.   C) Iris.   D) Signature.

14. _____is to confirm that a user is not enrolled in the biometric system.

 A) Positive Identification.   B) Enrollment.

C) Negative Identification.   D) Extraction.

15. Which biometric has lower circumvention?

 A) Face.   B) Signature.   C) Iris.   D) Voice.

16. Synonym for identification is_____.

A) One-to-one.   B) Comparison.   C) One-to-many.
D) Extraction.

17. 100 individuals try to use a biometric system. There are 38 genuine individuals accepted, 8 genuine individuals rejected, 44 imposter rejected and 10 imposter accepted. What is the value of FAR?

A) 0.19   B) 0.17   C) 0.1   D) None of these values

18. 100 individuals try to use a biometric system. There are 38 genuine individuals accepted, 8 genuine individuals rejected, 44 imposter rejected and 10 imposter accepted. What is the value of FRR?

 A) 0.19   B) 0.17   C) 0.08
D) None of these values.

19. A value returned by a biometric algorithm that indicates the correlation between a biometric sample and a reference is_____.

A) Comparison.   B) Modality.   C) Difference Score.
D) Similarity Score.

20. Biometric authentication_____.

A) is inexpensive.   C) Can use a person's face as a unique trait.

B) Is used only for security applications.

D) Only uses physical traits as a measurement.

21. A security engineer has recently installed a biometric system and needs to tune it. Currently the biometric system is rejecting too many valid registered users. What adjustment does the security engineer need to make?

A) Increase the False Accept Rate.   C) Increase the False Reject Rate.

B) Reduce the False Accept Rate.   **D) Reduce the False Reject Rate.**

22. You are comparing biometric systems. Security is the top priority. A low _____is most important in this regard.

A) FAR.   B) FRR.   C) ERR.
D) FTA.

23. What physical characteristics does a retinal scan biometric device measure?

A) The amount of light reaching the retina.

C) The size, curvature, and shape of the retina.

B) The amount of light reflected by the retina.

D) The pattern of blood vessels at the back of the eye.

24. The similarities between Forensics and Biometrics science is_____.

A) Applications.   B) Goals.   C) Outcomes.
D) Technology.

25. _____is the failure of the technology to extract adequate distinguishing features.

A) FAR.   **B) FTE.**   C) FRR.
D) EER.

26. _____occurs when null hypothesis is false but is accepted.

A) Type I error.   B) Type II error.   C) Type III error.
D) EER.

27. Standard plot for biometric evaluation is _____.

A) ROC.   B) FTE.   C) ERV.
D) REC.

28. All of the following are advantages of Multimodal biometric systems EXCEPT_____.

A) Increase accuracy.   C) Few enrollment problems.

B) Enhanced security.   D) Many enrollment problems.

29. Systems using _____ for recognition use infrared light transmitted or reflected through a biometric sample.

A) Face.   B) Voice.   C) Hand geometry.
D) Veins.

30. _____undertake testing in simulated but controlled environment that is as close to operational.

A) Technology Evaluation.   B) Scenario Evaluation.
C) Operational Evaluation.   D) All of these.

Define the following Terms:

1. Biometric reference.

Some book that was written by Scientists specialized in biometric science such as:

1- "Biometric System and Data Analysis Design, Evaluation, and Data Mining". By Ted Dunstone, Neil Yager, 2009.

2-Jain, A.K., Dass, S.C., Nandakumar, K.: Soft biometric traits for personal recognition systems. In: Proc. of ICBA, pp. 731–738 (2004)

3- Kittler, J., Hatef, M., Duin, R.P.W., Matas, J.: On combining classifiers. IEEE Trans. Pattern Anal. Mach. Intel. 20(3), 226–239 (1998).

4- Ross, A., Jain, A.: Multimodal biometrics: an overview. In: Proc. of the 12th European Signal Processing Conference, pp. 1221–1224 (2004)

5- Ross, A.A., Nandakumar, K., Jain, A.K.: Handbook of Multibiometrics. Springer (2006)

6- Schuckers, M.: Estimation and sample size calculations for correlated binary error rates of biometric identification rates. Proceedings of the American Statistical Association: Biometrics Section (2003).

7-Maio, D., Maltoni, D., Cappelli, R.,Wayman, J.L., Jain, A.K.: FVC2000: Fingerprint verification competition. IEEE Trans. Pattern Anal. Mach. Intell) 2002).

8- "FVC2000: Fingerprint verification competition", Maio, D., Maltoni, D., IEEE Trans. Pattern Anal. Mach. Intell. 2002

9- "Face recognition algorithms surpass humans matching faces over changes in illumination", O'Toole, A.J., Phillips, P.J., Jiang, F., Ayyad. IEEE Transactions on Pattern and Machine Intelligence, (2007).

10- Maio, D.,Maltoni " Indexing fingerprint databases for efficient 1:N matching. In: Proceedings of ICARCV2000 (2000)

11- Zhu, Y., Jain, A" Validating a biometric authentication system: Sample size requirements. IEEE Trans. Pattern Anal. Mach. Intell.2006.

2. Enrollment.

Enrollment is the process of collecting biometric samples from a person by taking three samples of the same biometric by using device and then averages them to produce an enrollment template.

3. FTE.

Failure to Enroll: Users having difficultly using the sensor, or have poor quality fingerprints, may not be able to enroll

4. Biometric template.

Template is the refined, processed and stored representation of distinguishing characteristics of individual, or it is the data that gets stored during an enrollment and later used for matching, or they are the data representing the enrollee's biometric.

They are created by the biometric device, which uses an algorithm to extract "features" appropriate to that technology from the enrollee's samples.

5. FAR.

False Accept Rate: Rate estimated to occur for random users

6. FRR.

The false reject rate: the estimate of probability that correct user is falsely rejected.

7. Positive identification.

Recognition systems that test to see if the individual is enrolled.

8. False Accept.

It means that an impostor allowed to access.

9. False Reject.

It means user is continually rejected.

1. Which of Biometric characteristics are considered not permanent?

Face - gait – voice

2. Which Biometric characteristics are most constant over time?

Fingerprint- Iris

3. In terms of the order of effectiveness, which Biometric characteristics is the LEAST effective?

Voice - gait

4. Which Biometric characteristics have the lowest user acceptance level?

Iris

5. What are the types of eye scan in use today?

Retinal scan and Eye vein verification

6. Which Biometric characteristics offer greater accuracy?

DNA- Iris/ Retina- Fingerprint

7. What is the difference between biometrics and forensics?

	biometrics	**forensics**
Definition	Biometrics is a science that applies statistical and mathematical methods to data analysis problems in the biological sciences.	The application of the natural and physical Sciences to questions of legal or public concern.
Event	pre-event	Post-event
Differences:	– Applications. – Research. – Funding sources. – Goals. – Outcomes.	

8. Out of the following, put in order from most accurate to least accurate

Iris/ Retina- Facial- DNA- Voice- fingerprint?

DNA- Iris/ Retina- Fingerprint- Facial- Voice

9. Which Biometric characteristics are the least commonly used?

<div align="center">Iris</div>

10. What is a biometric sample?

The biometric sample is data obtained by a biometric system's capture device- such as a facial image, voice recording or a fingerprint.

11. Which part of the iris is used to develop biometric data?

Retinal by making pattern of blood vessels at the back of the eye

12. What is a biometric template?

Template is the refined, processed and stored representation of distinguishing characteristics of individual, or it is the data that gets stored during an enrollment and later used for matching, or they are the data representing the enrollee's biometric.

They are created by the biometric device, which uses an algorithm to extract "features" appropriate to that technology from the enrollee's samples.