

University of Baghdad
College of Science
Department of Biotechnology
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Competition examination for Ph.D candidates in
Biotechnology 2018-2019

Q1: Choose the correct answer : (60 mark)

Bioseparation

1- In SDS-PAGE, separation is based on :

- a. Molecular weight b. Shape c. Charge d. All of the above

2- Primary steps in protein purification includes:

- a. Homogenization b. Differential centrifugation
c. Solubilization d. All of these

3- The following technique makes use of the difference in net charges of proteins at a given pH::

- a. Thin layer chromatography b. Ion exchange chromatography
c. HPLC d. Paper chromatography

4- A cation exchange resin linked to cellulose backbone is ::

- a. CM-cellulose b. PEAE-cellulose c. Starch d. Biogel

5- The ratio of distance moved by a compound to the distance moved by solvent front is known as it is:

- a. PI value b. Linking number c. Rf value d. Gold number

6- Frequently employed materials for the adsorption chromatography of proteins include:

- a. High capacity supporting gel
b. Starch block
c. Calcium phosphate gel, alumina gel and hydroxy apatite
d. All of these

Advanced biochemistry

7-Oxidation of which substrate in the body yields the most calories :

- a. Glucose b. Glycogen c. Protein d. Lipid

8- Mitochondrial DNA is:

- a. Circular double stranded b. Circular single stranded
c. Linear double Helix d. Non of these

9-The power house of the cell is::

- a. Nucleus b. Cell membrane c. Mitochondria d. Lysosomes

10- Abnormal chain of amino acids in sickle cells anaemia is :

- a. Alpha chain b. Beta chain c. Both (a) and (b) d. None of these

11- A tripeptide functioning as an important reducing agent in the tissues is:

- a. Bradykinin b. Kollidin c. Tyrocidin d. Glutathione

Plant Biotechnology

12-Elicitors are molecules that:

- a. Induce cell division
b. Stimulate production secondary metabolites
c. Stimulate hairy root formation that accumulate secondary metabolites
d. None of these

13-Why drying temperature and time should be less?

- a. To prevent degradation of the bioactive compounds
b. To prevent evaporation of the bioactive compounds
c. To prevent condensation of the bioactive compounds
d. None of these

14-Which of the following steroids has primary function in plants:

- a. Cholesterol b. Sitosterol c . Ponasterone-A d. Non of these

15-Which of the following statements is not correct?

- a. All organic compounds containing nitrogen and heterocyclic ring are alkaloids

- b. Alkaloids are bitter in taste and soluble in most of organic solvents
- c. Most alkaloids are colourless, crystalline non-volatile solids and are optically active
- d. Many alkaloids exhibit important pharmacological properties

16-Castor oil is obtained from:

- a. *Sesamum indicum*
- b. *Linum spp*
- c. *Brassica campestris*
- d. *Ricinus communis*

Advanced Genetic engineering

17-The very first vector utilized for cloning DNA were -----

- a. Phages
- b. Plasmids
- c. Cosmids
- d. Phasmids

18-In protoplast fusion method,----- must be used as fusing agent:

- a. Ligase
- b. PEG
- c. SDS
- d. NaCl

19-Eukaryotic mRNAs can be readily reverse transcribed into cDNA since they have ----- :

- a. 5⁻ - poly (T) tails
- b. 3⁻ - poly (A) tails
- c. 3⁻ - poly (T) tails
- d. 5⁻ - poly (A) tails

20-In total RNA isolation , ----- must be used to get rid of Rnase enzyme :

- a. PEG
- b. EDTA
- c. Tris
- d. DEPC

21-The most common method of DNA sequencing is :

- a. Maxam and Gilbert method
- b. Grunstein method
- c. Griffith method
- d. Sanger enzymatic method

Advanced molecular biology

22- Transfer RNA's bind during translation by the

- a. Codon
- b. Anticodon
- c. Template .

23- Of the ----- different possible codons----- specify amino acids and ----- signal stop.

- a. 20, 17, 3
- b. 180, 20, 60
- c. 64, 61, 3
- d. 61, 60, 1

24- In the Meselson-Stahl DNA replication experiment, if the cells were first grown for many generations in N15 containing media, and then switched to N14 containing media, what percent of the DNA had 1 light strand and 1 heavy strand after 2 generations of growth in N15 growth media?

- a.(0)
- b.(25)
- c.(50)
- d.(75)
- e.(100)

25- Which of the following enzymes is used during cellular replication to separate the two DNA strands thereby alleviating the need to raise the temperature to such high levels.

- a. DNA polymerase
- b. Topoisomerase I
- c. DNA helicase
- d. Single Stranded Binding Protein (SSBP)

26- The process of copying a gene's DNA sequence into a sequence of RNA is called :

- a. Replication.
- b. Transcription
- c. Translation
- d. PCR.

Advanced mycology

27- The factors which affected mycotoxin production are:

- a. Environmental factors
- b. Genetic factors
- c. Both factors above

28- F2 toxin is:

- a. Ochratoxin
- b. Zearalenone
- c. Trichothecene

29- Aflatoxin M1 is:

- a. 4-hydroxylated B1
- b. 3-hydroxylated B1
- c. non-hydroxylated B1

30- Aflatoxin Q1 is:

- a. 4-hydroxylated B1
- b. 3-hydroxylated B1
- c. 2-hydroxylated B1

31- The major types of aflatoxins are:

- a. B1 and B2
- b. B1, B2, G1, and G2
- c. B1, B2, G1, G2, M1 and M2.

Microbial fermentation technology:

32. Some microbial primary products include -----.

- a. Pigments
- b. Polysaccharides
- c. Both of them

33. In large scale fermentation, the component of fermenter is sterilized as -----

- a. *In situ* sterilization
- b. *Ex situ* sterilization
- c. Both of them

34. In the ----- virtually no growth occurs and the microbial population remains relatively constant.

- a. Log phase
- b. Stationary phase
- c. Lag phase.

35. Foam production in bioreactors is often a major problem, particularly in aerated fermentations. Formation of foam is due to the presence of -----.

- a. Proteins b. Fats c. Some bubbles.

36. Lactic acid can be produced by lactic acid bacteria as -----.

- a. Homo and hetro-lactic acid fermentation
b. Homo – fermentation
c. Hetro-fermentation.

Advanced pathogenic bacteria

37- Which of the following enzymes activates the plasma plasminogen systems ?

- a. Lipase b. Dnase c. Staphylokinase

38- Brucella organisms are

- a. Acid fast rods b. Gram- positive rods c. Gram- negative coccobacillary forms

39-Pneumococci can be differentiated from *S. viridans* by

- a. Hanging - Drop preparation b. Fermentation of glucose c. Optochin sensitivity

40- *Listeria monocytogenes* shows which of the following characteristics?

- a. It can grow at 4°C
b. It is an extracellular pathogen
c. It is a Gram- negative coccus

41- *Helicobacter pylori* is:

- a. The presumed cause of colon cancer
b. The cause of most cases of acute food poisoning
c. The cause of about 90% of peptic ulcer

Immunotechnology:

42- Immune disorder include:

- a. Hypersensitivity b. Autoimmune disease
c. Immunodeficiency d. All of these

43-Which of following Ig is involve in mediating allergic reactions

- a. IgG b. IgM c. IgA d. IgE

44- Majority of autoimmune diseases are

- a. Cell mediated,
- b. Antibodies mediated
- c. Macrophage mediated
- d. Mast cell mediated

45- B lymphocytes synthesize and express immunoglobulin:

- a. Containing multiple epitope specificities
- b. In cytoplasmic phagosomes.
- c. In membrane complexes also containing CD3.
- d. On their cell membrane surface.
- e. Only after leaving the bone marrow.

46- Which of the following molecules is expressed by a mature T cell that functions as a helper T cell?

- a. CD4
- b. CD8
- c. GlyCAM-1
- d. IgG

47- The mannan binding lectin complement pathway is initiated by:

- a. Cell-surface constituents that are recognized as foreign to the host.
- b. Mannose-containing residues of glycoproteins on certain microbes.
- c. Stimulation of killer activation receptors on NK cells.
- d. The formation of antibody-antigen complexes.

Fermentation technology

48- In the fermentation process, the product is preferred to be:

- a. Intracellular because it is easy to harvest
- b. Extracellular to reduce the downstream process cost
- c. Intracellular due to its high production
- d. Extracellular due to its high production

49- Microorganisms have proved to be particularly useful to provide a vast range of products and services because of:

- a. The ease of their mass cultivation.
- b. Use of cheap substrates (which in many cases are wastes)
- c. The diversity of potential products.
- d. All the above

50-At steady state in the continuous culture:

- a. Formation of new biomass by the culture is balanced by the loss of cells from the vessel
- b. The rate of change in the residual substrate is equal to zero
- c. Both a and b
- d. None of the above

51-Which of the statement is true for continuous reactor at steady state?

- a. The rates of biomass, substrate and product concentrations are zero
- b. Biomass, substrate and product concentrations are zero
- c. Biomass, substrate and product concentrations do not change with time
- d. Biomass, substrate and product concentrations change with time

52-Establish the aeration and agitation conditions suitable for a fermentation process is usually investigated in:

- a. Microtitre / Minidish Scale Process Stage (10–1000 μL)
- b. Shake flask fermentation
- c. Stirred Tank Reactor Process Stage (1 litre – 500 + litre)
- d. None of the above

53- The main reason for production of penicillin in fed batch reactors is:

- a. The presence of high level of precursor is often toxic to the cells
- b. Higher yields when cells enter the stationary phase
- c. Higher yields when cell growth slows
- d. All of the above

54-In small scale fermentor, Glass is useful for vessel construction because it gives:

- a. Corrosion proof.
- b. Is non-toxic.
- c. Smooth surfaces and it is usually easy to examine the interior of the vessel.
- d. All the above.

Advanced cytogenetics

55-The cells that can be used for chromosome analysis from adult (human) are

- a. Skin
- b. Lymphocytes
- c. Bone marrow
- d. All of them

56- The phase that the process of crossing over occurs in cell is -----

- b. Anaphase
- b. Telophase
- c. Prophase
- d. Metaphase

57- If a normal cell of one genus of mammalian is $2N$ (40 chromosomes), the number of chromosomes content in the gamete cells are :

- a . Monosomic b . Haploid c . Diploid d . Disomic

58- The chromosomes classified according to centromer position and chromosome arms length to groups , except one group that cannot found in human ,it is -----

- a. Telocentric b. Submetacentric c. Metacentric d. Acrocentric

59- Down syndrome thought to be genetic disease because their cells have -----

- a . Barr bodies b . Polyploidy c . Trisomy

60-According to chromosome classification the males (Human) have----- types of chromosome

- a. 22 b. 23 c. 24

Q2/Answer the following questions: (40 mark)

Bioseperation

1-Distinguish between ultrafiltration and dialysis methods for protein purification?

Plant Biotechnology

2-What are the secondary metabolites have a primary role in growth and development of plants?

Advanced Genetic engineering

3-Define 2 only of the followings?

- Taq DNA polymerase
- RFLP
- cDNA

Advanced molecular biology

4-List four of main features of the genetic code .

Advanced mycology

5-Briefly describe the confirmatory tests for aflatoxin detection.

Microbial fermentation technology:

6-Enumerate the major roles of microbial polysaccharides in nature.

Advanced pathogenic bacteria

7-What is the distinction between **Food infection** and **Food intoxication**? Give example on each.

Immunotechnology:

8- What is :

- 1- Inflammation
- 2- Pus

Fermentation technology

9-The objective of inoculum development is to produce an active inoculum which will give as short a lag phase as possible, why? Elucidate how inoculum should be prepared so that the lag phase can be minimized?

Advanced cytogenetics

10-Mention three syndromes that caused by autosomal an euploidy.