PART 1

OLYMPIAD WALLAH

ADVANCED BIOLOGY

FOR BIOLOGY OLYMPIAD 2025

FOR 11th STANDARD STUDENTS

Ultimate Resource for NSEB Preparation

CONTENTS

EXERCISE-1

1. The nuclear pores are the passages through which movement of RNA and protein molecules takes place
(A) In one direction i.e. from the nucleus to the cytoplasm only
(B) In both directions between the nucleus and cytoplasm
(C) Only inside of the nucleus
(D) In uncontrolled manner

2. Read the following statements
(i) The eukaryotic cells have membrane bound nucleus
(ii) All living organisms are composed of cells and products of cells
(iii) All cells arise from pre-existing cells
(iv) Prokaryotic cells are represented by bacteria and blue green algae
Which of the above statements are considered to be part of the cell theory as understood today?
(A) (i) and (ii) only
(B) (ii) and (iii) only
(C) (ii) and (iv) only
(D) (i), (ii), (iii) and (iv)

3. Identify the following statements as **true(T)** or **false(F)** and select the option accordingly.
A. In prokaryotes, ribosomes are associated with the plasma membrane of the cell
B. Several ribosomes on a single mRNA form a structure called polysome
C. Polysome translates the protein into mRNA

	A	**B**	**C**
(A)	T	F	T
(B)	F	T	T
(C)	T	T	F
(D)	T	F	F

4. If a gamete has 23 chromosomes & 3.3 pg DNA. Then find the number of chromosomes & DNA content at G_2 phase respectively.
(A) 23, 3.3 pg (C) 46, 6.6 pg
(C) 46, 13.2 pg (D) 46, 3.3 pg

5. A bacterium divides in every 20 minutes. A suspension culture of these bacteria containing 10^3 cells/ml is grown for 160 minutes. Find out cell concentration per ml after 160 minutes.
(A) 8×10^3 (B) 10^8
(C) 2.56×10^5 (D) 160×10^3

6. Read the following statements.
a. Golgi apparatus is the important site of formation of glycoproteins and glycolipids
b. Enzymes of lysosomes are optimally active at basic pH.
c. Plant vacuole is bound by a single membrane called tonoplast.
d. Endoplasmic reticulum is involved in protein synthesis only
The **correct** statements are
(A) a and b
(B) a and c
(C) b and d
(D) All except b

7. Chromatin contains
(A) DNA and RNA only
(B) DNA and some basic proteins only
(C) DNA, histones, non-histones proteins and RNA
(D) Only DNA

8. How many of the given features is/are exclusive to mitochondria and absent in chroloroplast?
(a) Presence of dsDNA
(b) Aerobic respiration
(c) Surrounded by double membrane
(d) Carbohydrate synthesis
(A) 2 (B) 3
(C) 1 (D) 4

9. Which of the given is not an essential structure of all the chromosomes?
(A) Telomere
(B) Centromere
(C) Satellite
(D) Chromatid

10. Which of the following features are common in both G_1 and G_2 stages of interphase?
(i) Metabolically active
(ii) Duplication of centrioles
(iii) Deoxyribonucleotide synthesis
(iv) Cytoplasmic growth
(A) (i) and (iii) only
(B) (i) and (iv) only
(C) (i), (ii) and (iv)
(D) (i), (iii) and (iv)

11. **Statement-I:** Nucleolus is the site of ribosome synthesis in all organisms.
Statement-II: Nucleoli are larger and more numerous in cells actively involved in protein synthesis.
(A) Both statement-I and statement-II are correct
(B) Statement-I is incorrect and statement-II is correct
(C) Statement-I is correct and statement-II is incorrect
(D) Both statement-I and statement-II are incorrect

12. A meiocyte has 15 bivalents at prophase-I. How many chromosomes and chromatids respectively will be there in each daughter cell after completion of meiosis?
(A) 15, 30 (B) 15, 15
(C) 30, 15 (D) 30, 30

13. 'A student observed a plant cell under microscope containing more than two complete sets of chromosomes'. What would be the possible reason of above phenomenon?
(A) Prolonged interphase
(B) Failure of cytokinesis after karyokinesis
(C) Absence of cell plate formation
(D) Both (B) and (C)

14. The content of DNA in a male gamete is 24 pg. Then the content of DNA in G_2-phase, Anaphase-I respectively for a meiocyte
(A) 48pg, 48pg (B) 24pg, 48pg
(C) 96pg, 96pg (D) 48pg, 96pg

15. Metaphase-I is different from metaphase-II as in former
(A) Bivalents align at equator
(B) Each chromosome is attached to the spindle fibres from both the poles
(C) Single equatorial plate is formed
(D) Each chromosome has single chromatid

16. **Statement-I:** Complete disintegration of the nuclear envelope marks the start of the second phase of mitosis.
Statement-II: Each metaphasic chromosome is made up of one sister chromatid.
(A) Both statement-I and statement-II are correct
(B) Statement-I is incorrect and statement-II is correct
(C) Statement-I is correct and statement-II is incorrect
(D) Both statement-I and statement-II are incorrect

17. Select the correct statement
(A) Human cells divide once in approximately every 48 hours
(B) In onion, each root tip cell has 16 chromosomes
(C) In plants, mitosis occurs in diploid cells only
(D) Virus are smallest living cells

18. Identify the mismatched pair:

(A)	Chromosomes become visible only under electron microscope	Leptotene
(B)	Appearance of recombination nodule	Pachytene
(C)	Transition to metaphase-I	Diakinesis
(D)	Formation of synaptonemal complex	Zygotene

19. Consider the following four statements (I-IV) related to cell cycle, and select the correct option stating them as **true [T]** and **false [F]**.

I. Cell growth in terms of cytoplasmic increase is a continuous process.

II. Interphase is the phase of actual cell division.

III. The number of chromosomes doubles in S phase

IV. The cells that do not divide further exit G_1-phase to enter an inactive stage.

	I	II	III	IV
(A)	T	F	F	F
(B)	F	T	T	T
(C)	F	F	T	T
(D)	T	F	F	T

20. Choose the odd one w.r.t significance of meiosis

(A) Conservation of specific chromosome number of each species

(B) Increases genetic variability

(C) Able to regenerate part or whole of the organism

(D) Introduces new combination of traits

21. Match the following

Column-I		Column-II	
(P)	ER	(1)	Packaging of material
(Q)	Cytoskeleton	(2)	Ribonucleo protein granules
(R)	Golgi complex	(3)	Synthesis of steroidal hormones
(S)	Ribosome	(4)	Proteinaceous structure

(A) (P)-(3), (Q)-(4), (R)-(1), (S)-(2)

(B) (P)-(4), (Q)-(2), (R)-(3), (S)-(1)

(C) (P)-(1), (Q)-(3), (R)-(4), (S)-(2)

(D) (P)-(3), (Q)-(2), (R)-(1), (S)-(4)

22. Select the incorrect statement

(A) Perinuclear space is of 10 nm -50 nm width

(B) Basal body of cilia or flagella is similar to centriole by structure in eukaryotes

(C) Telocentric chromosome has one long and one short arm

(D) Microbodies are present in plant cells also

23. A number of proteins synthesized by ribosomes on the endoplasmic reticulum are modified in the _____ of the Golgi apparatus before they are released from its trans face.

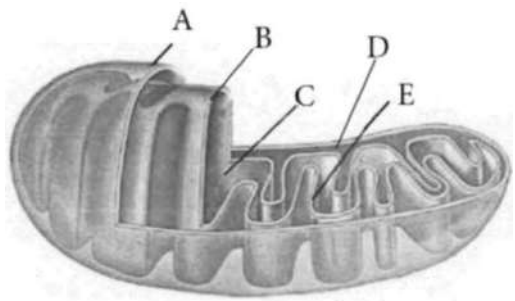
(A) Tubules

(B) Vesicles

(C) Cisternae

(D) More than one option is correct

24. Which of the following statement is **correct** for the given diagram?



(A) 'C' possesses DNA molecule, RNA molecule and 80S ribosomes

(B) 'A' and 'B' have their own specific enzymes

(C) 'E'-made by inner membrane towards the inter- membrane space

(D) 'B' forms the continuous limiting boundary of the organelle

25. Correct statement in relation to vacuoles is

(A) It is a triple membrane bound space found in cytoplasm containing sap

(B) It can occupy 90% of cell volume in plants

(C) Its membrane allows transport of materials along the concentration gradient only

(D) Concentration of ions is significantly lesser in vacuole than cytoplasm

26. Middle lamella is first structure formed in between the newly formed daughter cells
(i) At the time of cytokinesis
(ii) And is composed of cellulose provided by ribosomes
(iii) Which is common wall between adjacent cells
(iv) May be traversed by plasmodesmata
(A) All are correct
(B) Only (ii) is incorrect
(C) Both (ii) and (iii) are incorrect
(D) Both (i) and (iv) are incorrect

27. **Assertion (A):** Centriole is non-membranous cell organelle as ribosome.
Reason (R): Both play an important role in compartmentalization in eukaryotic cells.
(A) A is correct, R is wrong
(B) A & R both are correct and R is correct explanation of A.
(C) A & R both are correct but R is not correct explanation of A.
(D) A is wrong, R is correct.

28. Demerits of two kingdom classification is/are
(A) It did not distinguish between eukaryotes & prokaryotes.
(B) It did not distinguish between unicellular & multicellular organisms.
(C) It did not distinguish between photosynthesis & non-photosynthetic organisms.
(D) All of the above

29. Find correct option:

	Characters	**Monera**	**Protista**	**Fungi**
I.	Cell wall	A	Present in some	Present with chitin
II.	Nuclear membrane	B	Present	C
III.	Body organisation	Cellular	Cellular	D

(A) A – Non-cellular (Polysaccharide + amino acid) C – Present
(B) B - Absent, D – Tissue/organ
(C) C – Present, D – Tissue/Organ/Organ system
(D) A – Absent, B – Absent

30. "Earlier classification systems included bacteria, blue green algae, fungi, mosses, ferns, gymnosperms & angiosperms under plants".
Character that unified all these organisms under kingdom plantae is
(A) Phylogeny
(B) Body organisation
(C) Nutrition
(D) Presence of cell wall in their cells

31. Read following w.r.t. cyanobacteria
(i) Photosynthetic autotrophs
(ii) Unicellular, colonial or filamentous
(iii) Colonies are generally surrounded by gelatinous sheath.
(iv) All cyanobacteria can fix atmospheric N_2 in specialised cells called heterocysts.
Find the correct option.
(A) All (i), (ii), (iii) & (iv) are correct
(B) Only (i), (ii) & (iii) are correct
(C) Only (i) & (iii) are correct
(D) Only (ii) is correct

32. How many of below bacteria are autotrophic *Anabaena*, *Nostoc*, Nitrifying bacteria, *Lactobacillus*, *Streptomycin*, *Rhizobium*
(A) Four (B) Three
(C) Two (D) One

33. *Mycoplasma*:
(i) Lack cell wall
(ii) Smallest living cells
(iii) Can survive without oxygen
(iv) Pathogenic in animals only
(A) All are correct except (iv)
(B) (i) & (ii) are correct
(C) (iii) & (iv) are correct
(D) All are incorrect except (i)

34. Match the following

Column-I		Column-II	
(P)	Chrysophytes	(1)	Pellicle
(Q)	*Gonyaulax*	(2)	Infectious spore like stage
(R)	*Euglena*	(3)	Red tides
(S)	Sporozoans	(4)	Diatomaceous earth

(A) (P)-(4), (Q)-(3), (R)-(1), (S)-(2)
(B) (P)-(4), (Q)-(1), (R)-(3), (S)-(2)
(C) (P)-(4), (Q)-(3), (R)-(2), (S)-(1)
(D) (P)-(4), (Q)-(1), (R)-(2), (S)-(3)

35. Fruiting body of slime moulds is
(A) Formed during unfavourable conditions
(B) Formed by plasmodium during favourable conditions
(C) Responsible for formation of spores without cell wall
(D) Formed by spores during unfavourable conditions

36. Significance of mitosis includes
(i) Growth
(ii) Repair
(iii) To maintain nucleo-cytoplasmic ratio
(iv) To maintain surface area to volume ratio
(A) (i), (ii), (iii), (iv)
(B) (i), (ii), (iii)
(C) (i), (ii)
(D) (i) only

37. Find the correct sequence of events during sexual reproduction in fungi with an intervening dikaryotic stage (n + n)
(A) Karyogamy → Plasmogamy → Meiosis
(B) Plasmogamy → Dikaryophase → Karyogamy → Meiosis
(C) Plasmogamy Karyogamy Dikaryophase → Meiosis
(D) Meiosis → Karyogamy → Plasmogamy

38. Kingdom fungi is classified into various classes on basis of
(A) Morphology of mycelium
(B) Mode of spore formation
(C) Fruiting bodies
(D) All of the above

39. Read the following characters
(i) Mycelium is branched & septate
(ii) Thin walled, exogenously formed asexual spores called conidia formation.
(iii) Formation of endogenously formed sexual spores called ascospores.
(iv) Ascocarp fruiting body
Above characters will be present in
(A) *Aspergillus* (B) Bracket fungi
(C) Puff balls (D) *Puccinia*

40. Find odd w.r.t. Deuteromycetes
Agaricus, Colletotrichum, Trichoderma, Morels, Penicillum, Mucor, Smut fungi
(A) 7 (B) 5
(C) 3 (D) 2

41. **Statement-I:** A few members of kingdom plantae are partially heterotrophic eg. *Bladderwort*, Venus fly trap
Statement-II: Plants like *Bladderwort*, venus fly trap have both photosynthetic parts & predatory structures.
(A) Both I & II are correct & II is correct explanation of I
(B) Both I & II are correct but II does not explain I
(C) I is correct, II is incorrect
(D) Both I & II are incorrect

42. How many of the below are true for virus
A. They can pass through bacterial filters.
B. They are inert outside their specific host cell
C. Virus contain plasma membrane, cytoplasm, cell organelles & cell inclusions.
D. Virus show locomotion with the help of tail fibres.
(A) Four (B) Three
(C) Two (D) One

43. Find incorrect match:
(A) Viroids – Potato spindle tuber disease
(B) Prions – Abnormally folded protein
(C) Lichens – Good indicators of air pollution
(D) Mycorrhiza – Symbiotic association between algae & fungi.

44. Chromatophores in bacteria are responsible for
(A) Photosynthesis
(B) Chemosynthesis
(C) Parasitism
(D) Saprotrophic mode of nutrition

45. Find the option with correct difference

	Prokaryotic cell	**Eukaryotic cell**
(A)	Centriole present	Membrane bound organelles present
(B)	Flagella & cilia occur	True nucleus absent
(C)	Gas vacuole present	Cytoskeleton structures present
(D)	Only 70S ribosome occurs	Only 80S ribosome occurs

46. **Statement-I:** Meiosis, per se, paradoxically results in reduction of chromosome number by half.
Statement-II: Meiosis occurs in bacteria to produce gametes.
(A) Both I & II are correct
(B) I is correct, II is incorrect
(C) I is incorrect, II is correct
(D) I & II both are incorrect

47. Ribosomes are located in Eukaryotic cells in how many of given below locations:
A. Outer surface of membrane of ER
B. Outer membrane of nucleus
C. Inside mitochondria
D. Freely in cytoplasm
(A) Four (B) Three
(C) Two (D) One

48. Read the following statements:
(i) Transport of Na^+/K^+ is an example of Active transport.
(ii) Number of chloroplasts are higher per cell of mesophyll as compared to a cell of *Chlamydomonas*.
(iii) Chloroplast is responsible for formation of carbohydrate & protein
(iv) Nuclear pore is formed due to fusion of both membranes
How many of the above statement(s) is/are correct?
(A) Four (B) Three
(C) Two (D) One

49. Cytoskeleton structures are responsible for
(A) Spindle formation during cell division
(B) Centriole formation
(C) Cilia & flagella formation
(D) All

50. Above figure represents

(A) Splitting of centromere
(B) Separation of homologous chromosomes
(C) Crossing over
(D) Compaction of chromosomes

EXERCISE-2

1. According to widely accepted "fluid mosaic model" cell membranes are semi–fluid, where lipids and integral proteins can diffuse randomly. In recent years, this model has been modified in several respects. In this regard, which of the following statements is incorrect –
(A) Proteins can also undergo flip–flop movements in the lipid bilayer
(B) Many proteins remain completely embeded within the lipid bilayer
(C) Proteins in cell membranes can travel within the lipid bilayer
(D) Proteins can remain confined within certain domains of the membranes

2. Match the column-I and II select the correct option:

Column-I		Column-II	
(P)	Cisternae	(1)	Proteinaceous structure in cytoplasm
(Q)	Thylakoid	(2)	Infolding of inner mitochondrial membrane
(R)	Cristae	(3)	Flattened membranous sac
(S)	Microtubule	(4)	Membranous structure in Golgi complex

(A) (P)-(4), (Q)-(3), (R)-(2), (S)-(1)
(B) (P)-(2), (Q)-(4), (R)-(3), (S)-(1)
(C) (P)-(1), (Q)-(2), (R)-(4), (S)-(3)
(D) (P)-(4), (Q)-(3), (R)-(1), (S)-(2)

3. Which of the following are correct for the cell which has naked ds circular DNA?
(i) Both 70S and 80S ribosomes
(ii) Histone absent
(iii) Compartmentalisation of cytoplasm absent
(iv) Always diploid
(A) (i) and (iv) (B) (ii) and (iii)
(C) (i) and (iii) (D) (ii) and (iv)

4. If a meiocyte has 20 tetrads in its pachytene stage then what will be the numbers of total chromatids in its metaphase II stage.
(A) 40 (B) 20
(C) 80 (D) 10

5. A researcher made an observation about a protein made by ribosome and eventually used to build a cell's plasma membrane. The protein in the membrane was actually slightly different from the protein made by ribosome, the protein was probably pass through -
(A) Rough endoplasmic reticulum
(B) Golgi apparatus
(C) Smooth endoplasmic reticulum
(D) Ribosomes

6. A student coming out cell fractionation of a tissue and forgot to label his tubes. The contents of one tube when studied showed organelles bounded by membrane with activity of catalase enzyme. These organelles could be:
(A) SER (B) Chloroplast
(C) Lysosome (D) Peroxisome

7. Which of the following options gives the correct sequence of events during mitosis?
(A) Condensation → nuclear membrane disassembly → arrangement at equator → centromere division → segregation → telophase
(B) Condensation → crossing over → nuclear membrane disassembly → segregation → telophase
(C) Condensation → arrangement at equator → centromere division → segregation → telophase
(D) Condensation → nuclear membrane disassembly → crossing over → segregation → telophase

8. Anaphase Promoting Complex (APC) is a protein degradation machinery necessary for proper mitosis of animal cells. If APC is defective in a human cell, which of the following is expected to occur?
(A) Chromosomes will be fragmented
(B) Chromosomes will not segregate
(C) Recombination of chromosome arms will occur
(D) Chromosomes will not condense

9. Arrange the following events of meiosis in the correct sequence –
A. Terminalisation of chiasmata
B. Crossing over
C. Synapsis
D. Disjunction of chromosomes
E. Dissolution of synaptonemal complex
The correct sequence is
(A) A → B → C → D → E
(B) E → D → C → B → A
(C) C → B → D → E → A
(D) C → B → E → A → D

10. A cell has 46 chromosomes at each pole in mitotic telophase. In this division the number of chromatids at the metaphase was:

(A) 23 (B) 46
(C) 92 (D) 69

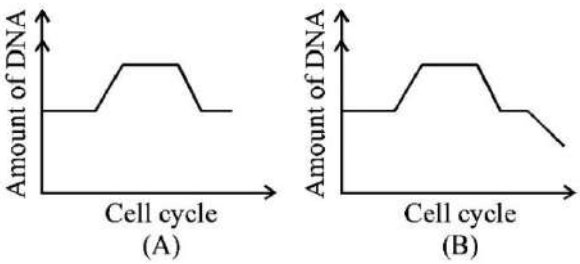
11. A mouse cell is treated with a chemical that interferes with the activity of microfilaments. Which of the following will probably be affected the most?

(A) Formation of spindle fibres
(B) Division of cytoplasm
(C) Chromosome duplication
(D) Pairing of homologous chromosomes

12. How many meiotic divisions are required during the formation of 500 zygotes, if in males one meiotic division resutls in formation of four male gametes and in females one meiotic division results in formation of one female gamete?

(A) 625 (B) 500
(C) 1000 (D) 2500

13. The following graphs (A and B) depicts changes in DNA Content during cell cycle. Identify the cell division from A and B:



(A) A → Meiosis–II, B → Meiosis–I
(B) A → Mitosis, B → Meiosis–I
(C) A → Meiosis–I, B → Mitosis
(D) A → Mitosis, B → Meiosis

14. In a diploid cell before S-phase quantity of DNA is 20 pico gram (pg) after meiosis I what will be the quantity of DNA in each daughter cell?

(A) 10 pg (B) 20 pg
(C) 5 pg (D) 40 pg

15. Which of the following statement of a bacterial cell is/ are correct?

(i) Mesosome is formed by the extensions of plasma membrane into the cell.
(ii) The pili are elongated tubular structures made up of a protein.
(iii) Flagellum is composed of filament, hook and basal body.
(iv) Ribosomes are about 30 nm by 50 nm in size.

(A) (i), (ii) and (iii)
(B) All of the above
(C) (ii) and (iv)
(D) None of the above

16. Study the following statements on cilium or flagellum and answer the question.

(i) Cilium / Flagellum contains an outer ring of nine doublet microtubules surrounding two singlet microtubules.
(ii) Cilia are smaller which work like oars, causing the movement of either the cells or surrounding fluid.
(iii) Flagella are comparatively longer and responsible for cell movement.
(iv) Cilium and flagellum are covered with plasma membrane.

Which of the above statements are correct?

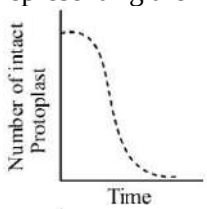
(A) Only (i) and (ii)
(B) All (i), (ii), (iii) and (iv)
(C) Only (i) and (iv)
(D) Only (ii) and (iii)

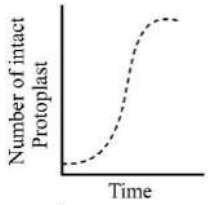
17. Which of the following statements are incorrect?

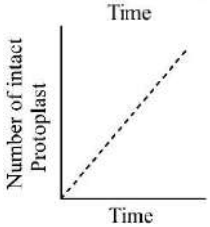
(i) Plant cells have centrioles which are absent in almost all animal cells.
(ii) Ribosomes are the site of protein synthesis.
(iii) The middle lamella is a layer mainly of calcium carbonate which holds the different neighbouring cells together.
(iv) In animal cell, steroidal hormones are synthesized by smooth endoplasmic reticulum.

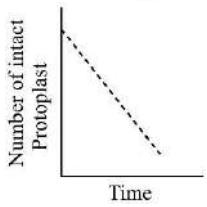
(A) (i) and (iii) (B) (iii) and (iv)
(C) (ii) and (iv) (D) (i) and (iv)

18. If protoplasts are placed in distilled water, they swell and burst as a result of endosmosis. The plot representing the kinetic of burst is

(A) 

(B) 

(C) 

(D) 

19. An organism has 27 pairs of homologous chromosomes. In each daughter cell after completion of mitosis and in each gamete after completion of meiosis II, _____ and _____ chromosomes would be present respectively.

(A) 27 and 27 (B) 54 and 27
(C) 108 and 54 (D) 54 and 108

20. Given below are four statements.

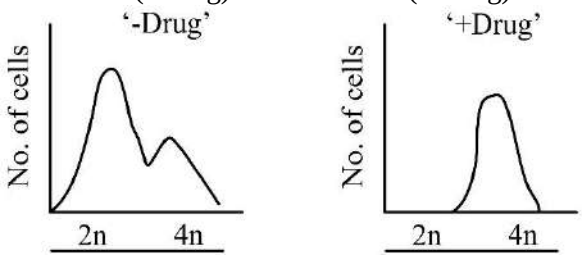
(i) Prokaryotic cells are unicellular while eukaryotes are always multicellular.
(ii) Histones are present in eukaryotes and absent in prokaryotes.
(iii) The nucleoid contains the genetic material in prokaryotes and eukaryotes.
(iv) Prokaryotic flagellum is composed of flagellin while eukaryotic flagellum is composed of tubulin.

Identify which amongst these are false.

(A) (i) and (ii) (B) (iii) and (iv)
(C) (ii) and (iii) (D) (i) and (iii)

EXERCISE-3

1. To assess the impact of a newly identified drug when added to a culture of subconfluent HeLa cells, a researcher analyzes the fluorescence activated cell sorting (FACS) profile of untreated (- Drug) versus treated (+ Drug) cells.



Based on the FACS profile shown above, this drug inhibits

(A) G_1 phase of the cell cycle
(B) S phase of the cell cycle
(C) G_2/M phase of the cell cycle
(D) G_0 phase of cell cycle

2. A Bacillus sp. divides every 30 min. If a culture is inoculated with 1000 cells, how many cells will be generated after 3 hrs?

(A) 30,000 (B) 64,000
(C) 90,000 (D) 128,000

3.

Concepts	Descriptions/Functions
(P) Signal Recognition Particle (SRP)	(1) Cleaves the signal peptide from nascent proteins
(Q) Chaperone proteins	(2) Directs ribosomes to the endoplasmic reticulum (ER)
(R) Ubiquitination	(3) Assists in proper protein folding and prevents aggregation
(S) Signal peptidase	(4) Marks proteins for degradation via the proteasome

Match the following with their function.

(A) (P)-(1) (Q)-(2) (R)-(3) (S)-(4)
(B) (P)-(4) (Q)-(2) (R)-(1) (S)-(3)
(C) (P)-(2) (Q)-(3) (R)-(4) (S)-(1)
(D) (P)-(4) (Q)-(2) (R)-(3) (S)-(1)

4. A human cell passes through 4 phases called A, B, C and D, each phase lasting for different lengths of time. At the end of D the cell returns to A to continue this cycle. In an experiment, a static snapshot of 106 unsynchronized cells was taken, and it was found that 300,000 cells were in phase A, 400,000 cells were in phase B, 200,000 were in phase C and the rest in phase D.

If the total time spent by one cell in the four phases is known to be 24 hours, which of the following statements is true?

(A) The time spent in phase A is 5.2 hours.
(B) The time spent in phase B is 9.6 hours.
(C) The time spent in phase C is 3.8 hours.
(D) The time spent in any one phase cannot be obtained from the given information.

5. Which one of the following statements correctly applies to proteins which are translated to the rough endoplasmic reticulum?

(A) Cytoplasmic proteins which are targeted to the nucleus in response to hormones stimuli.

(B) Proteins targeted to lysosomes, plasma membrane and cell exterior.

(C) Proteins which are targeted to the nucleus through endoplasmic reticulum lumen has a direct connection with the inter membrane space of the nucleus.

(D) All proteins which get targeted to peroxisomes.

6. In the process of meiosis, several mechanisms are critical for ensuring the proper separation of sister chromatids during meiosis II. Consider the following features:

(i) Dissolution of the synaptonemal complex prior to metaphase II.

(ii) Separation of sister chromatids is facilitated by the retention of cohesins at the centromeres.

(iii) Orientation of sister chromatids towards opposite poles during anaphase II.

(iv) Retention of cohesins along the chromatid arms until anaphase II.

Which of the following options correctly identifies all essential features for sister chromatid separation in meiosis II?

(A) (i) and (iii) only

(B) (ii) and (iv) only

(C) (i), (iii), and (iv) only

(D) (i), (ii), (iii), and (iv)

7. Signal Recognition Particle (SRP) plays an essential role in protein import in the endoplasmic reticulum (ER). In mammalian cells, SRP is a rod-like ribonucleoprotein complex containing six protein subunits and one RNA molecule. SRP stalls protein translation by blocking:

(i) elongation of the polypeptide chain

(ii) mRNA loading onto the ribosomes.

(iii) assembly of 605 and 405 ribosome particles.

(iv) binding of the initiation factors.

Which one of the following represents the correct statement/s?

(A) (i) only (B) (i) and (ii)

(C) (ii) and (iii) (D) (i) and (iv)

8. Chromatin condensation is driven by protein complexes called condensins which are members of a family of "structural maintenance of chromatin" (SMC) proteins that play a key role in the organization of eukaryotic chromosomes. Condensins along with another family of SMC proteins called cohesins significantly contribute to chromosome segregation during mitosis. If the cells are treated with an inhibitor of cdk1 phosphorylation immediately before the cells enter M phase, which of the following statements is most likely to be true?

(A) Sister chromatids are held together by condensins along the entire length of the chromosome

(B) Sister chromatids are held together by cohesins along the entire length of the chromosome

(C) Sister chromatids are held together by condensins and attached to each other only at the centromere

(D) Sister chromatids are held together by condensins and attached to each other only at the telomere

9. Which membrane pump is specifically responsible for generating and maintaining the electrochemical gradient necessary for neurotransmitter release at synaptic terminals?

(A) The proton pump (H^+-ATPase), which acidifies intracellular compartments to facilitate neurotransmitter vesicle fusion.

(B) The sodium-potassium pump (Na^+/K^+-ATPase), which establishes the resting membrane potential and regulates intracellular sodium and potassium levels.

(C) The calcium pump (Ca^{2+}-ATPase), which removes calcium ions from the cytoplasm to enable vesicle fusion and neurotransmitter release.

(D) The chloride-bicarbonate exchanger (Cl^-/HCO_3^-), which maintains pH balance in the synaptic terminal.

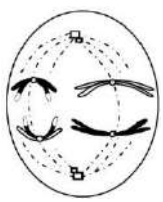
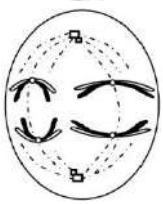
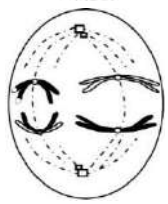
10. Match the following prokaryotic cell features with their descriptions:

Features	Descriptions
(P) Outer Membrane	(1) A network of polysaccharides and peptides that provides structural support to the cell wall.
(Q) Peptidoglycan	(2) A double layer found in Gramnegative bacteria, containing lipopolysaccharides.
(R) Cytoplasm	(3) The gel-like substance where metabolic activities and ribosomes are located.
(S) Ribosomal RNA (rRNA)	(4) A component of the ribosome that is involved in protein synthesis.

(A) (P)-(2), (Q)-(1), (R)-(3), (S)-(4)
(B) (P)-(1), (Q)-(2), (R)-(4), (S)-(3)
(C) (P)-(3), (Q)-(4), (R)-(1), (S)-(2)
(D) (P)-(4), (Q)-(3), (R)-(2), (S)-(1)

NSEB PYQ

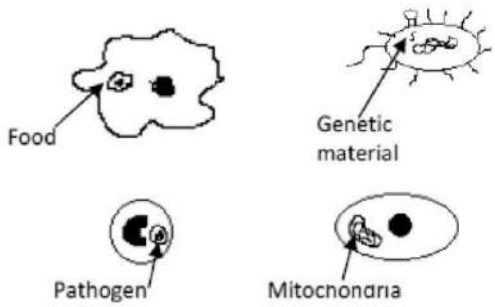
1. Which of the following figures correctly depicts Anaphase I ? **[NSEB 2015]**

(A) 
(B) 
(C) 
(D) 

2. Above 40°C most living cells synthesize heat shock proteins (HSP). The beat strategy for HSPs to protect the cell would be to : **[NSEB 2015]**

(A) envelope vital proteins to prevent their denaturation
(B) absorb more water to achieve cooling of the cells
(C) achieve cooling by promoting evaporation of water from the cells
(D) lower the general metabolic rate of the cells to conserve energy

3. Which of the following is an example of endosymbiosis ? **[NSEB 2015]**



(A) Amoeba (B) Bacteria
(C) Macrophage (D) Eukaryotic cell

4. Which of the following enzymes involved in Krebs cycle is **not present** in the mitochondrial matrix ? **[NSEB 2015]**

(A) Aconitase
(B) Malate dehydrogenase
(C) Fumarase
(D) Succinate dehydrogenase

5. When *Hyas araneus*, a sea crab, is place din dilute sea water, for some time it swells and gains weight. Thereafter it slowly starts losing weight. While losing weight, if it is transferred back to normal sea water, it will : **[NSEB 2015]**

(A) further lose weight
(B) sell again
(C) die as it is a non-conformer
(D) remain iso-osmotic to external medium by losing salts

6. All of the following organelles are surrounded by one or more membranes, **except:** **[NSEB 2015]**

(A) Peroxisomes (B) Vacuoles
(C) Ribosomes (D) Mitochoncria

7. Which of the following descriptions correctly apply to the amino acid distribution in a typical transmembrane protein ? **[NSEB 2015]**

(A) Hydrophobic amino acids towards the outer sides of bilayer while hydrophilic amino acids in the interior of the bilayer

(B) Hydrophilic amino acids towards the outer sides of bilayer while hydrophobic amino acids in the interior of the bilayer

(C) Hydrophilic amino acids towards the extracellular and interior of bilayer whereas hydrophobic amino acids in the cytoplasmic side

(D) Hydrophilic amino acids towards cytoplasmic side of bilayer while extracellular side has hydrophobic amino acids

8. Which of the following structures facilitate the transport of materials between two cells? **[NSEB 2015]**

(i) Desmosome (ii) Tight junction
(iii) Gap junction (iv) Plasmodesmata

(A) (i) and (ii) only
(B) (ii) & (iv) only
(C) (i), (iii) & (iv) only
(D) (i), (ii) and (iii) only

9. Cell inclusions like calcium carbonate or oxalate crystals found in plant cells occur in : **[NSEB 2015]**

(A) Mityochondria (B) Chloroplasts
(C) Golgi bodies (D) Vacuoles

10. No virus can evolve to target mammalian red blood cells because of the: **[NSEB 2015]**

(A) small size with a biconcave shape
(B) high concentration of oxygen
(C) lack of aerobic pathway to generate ATP
(D) lack of nuclear material

11. Which of the following organelles are involved in fatty acid catabolism ? **[NSEB 2015]**

(i) Mitochondria
(ii) Peroxisomes
(iii) Granular endoplasmic reticulum
(iv) Lysosomes

(A) (ii) and (iii) (B) (i) and (ii)
(C) (i) only (D) all the four

12. A few examples of transport across cell membranes are listed below. Which of them occurs by direct passive diffusion ? **[NSEB 2016]**

(A) Movement of oxygen molecules into cells
(B) Movement of sodium against its concentration gradient
(C) Uptake of cholesterol by cells
(D) Secretion of mucus by cells

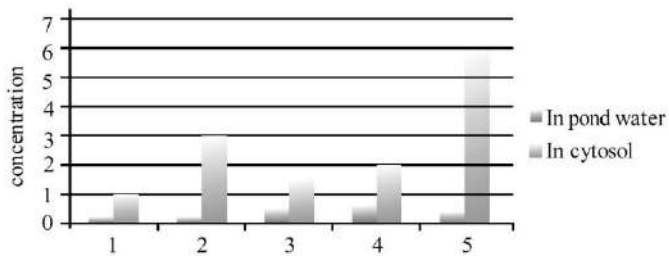
13. Which of the cellular organelles mentioned below have to import all the proteins they contain? **[NSEB 2016]**

(A) Nucleus (B) Lysosomes
(C) Chloroplast (D) Mitochondria

14. A few cells and associated entities are listed. Which of them represents the correct ascending order of the sizes relative to each other ? **[NSEB 2016]**

(A) Mitochondrion < Paramecium < Human erythrocyte < E. coli
(B) Protein < Virus < Mitochondrion < Paramecium
(C) Chloroplast < protein < human sperm < frog egg
(D) Nucleus < protein < Paramecium < Chloroplast

15. In the accompanying figure, relative concentrations of certain ions in water and in cytosol of the green alga *Nitella* has been shown. If 5 represents Cl^-, which of the numbered bars in the figure represent Ca^{+2}, Mg^{+2}, Na^+ and K^+ respectively ? **[NSEB 2016]**



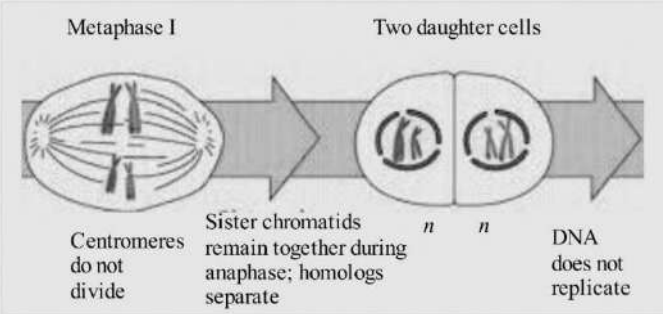
(A) 2, 3, 4 and 1 (B) 1, 2, 3 and 4
(C) 3, 2, 1 and 4 (D) 3, 4, 1 and 2

16. Which of the following structures is not found in a prokaryotic cell **[NSEB 2016]**

(i) Plasma membrane
(ii) Ribosomes
(iii) Endoplasmic reticulum
(iv) Golgi bodies

(A) (i) and (ii) (B) (ii) only
(C) (iii) only (D) (iii) and (iv)

17. Study the given illustration of a cell division
In which organ of the human body would this process take place ? **[NSEB 2016]**



(A) Liver (B) Spleen
(C) Bone marrow (D) Gonad

18. Arrange the following biomolecules in an increasing order of rate of passing through plasma membrane: **[NSEB 2016]**

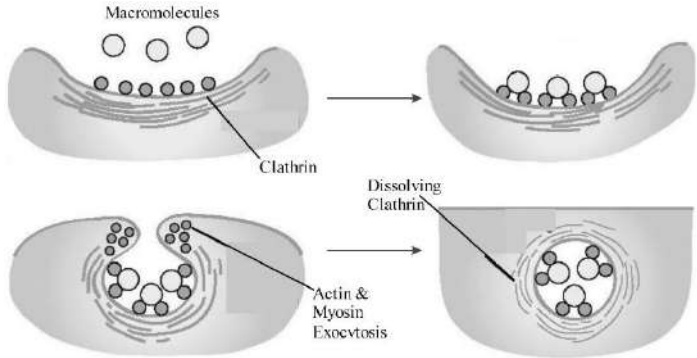
(i) Triglycerides (ii) Fructose
(iii) Na^+ (iv) Urea

(A) (ii) < (iv) < (i) < (iii)
(B) (iii) < (ii) < (iv) < (i)
(C) (i) < (ii) < (iv) < (iii)
(D) (ii) < (iii) < (iv) < (i)

19. If a fluorescing protein is attached to many free ribosomes in a cell and the cell is photographed after a time interval, the colour will appear: **[NSEB 2016]**

(A) in cytoplasm only
(B) in cytoplasm and along rough endoplasmic reticulum
(C) in cytoplasm, along rough endoplasmic reticulum and along wall of nucleus
(D) in cytoplasm, along rough endoplasmic reticulum, along wall of nucleus and in the matrix of mitochondria

20. Which process of cell ingestion is shown in diagram below ? **[NSEB 2017]**



(A) Exocytosis
(B) Pinocytosis
(C) Phagocytosis
(D) Macrophage engulfing an infectious agent

21. Which of following characters are found in prokaryotes ? **[NSEB 2017]**

(i) presence of DNA
(ii) presence of flagella
(iii) presence of cytoskeleton
(iv) presence of cell wall
(v) presence of pili

(A) (i), (ii), (iii), (iv) and (v)
(B) only (i), (iii), and (v)
(C) only (ii), (iii) and (iv)
(D) only (i), (ii), (iv) and (v)

22. Correct arrangement of the following in increasing size is : **[NSEB 2017]**

(i) Width of biological membrane
(ii) Diameter of E. coli DNA
(iii) Human ribosome
(iv). Length of *E. coli* DNA
(v) Diameter of human liver cell

(A) (i), (iii), (ii), (iv), (v)
(B) (ii), (i), (iii), (v), (iv)
(C) (i), (iii), (v), (ii), (iv)
(D) (ii), (iii), (i), (iv), (v)

23. Which of the following statements about human disorders caused by different organelles is true ? **[NSEB 2017]**

(A) Peroxisomal disorders are due to mutations in nuclear genes

(B) Mitochondrial disorders are always due to mutations in maternally inherited mitochondrial genes

(C) Person can suffer from lysosomal storage diseases even if lysosomal hydrolases are synthesized in sufficient quantities

(D) Inefficient recycling of long chain fatty acids is likely to be a result of mitochondrial disorder

24. Select the correct match for items in part A to that in part B among the following :**[NSEB-2018]**

PART A		PART B	
(P)	Receptor mediated endocytosis	(1)	Entry of maternal antibodies across placenta
(Q)	Phagocytosis	(2)	Entry of HIV in helper T cell.
(R)	Bulk phase endocytosis / Pinocytosis	(3)	Vital defence mechanism
(S)	Transcytosis	(4)	Absorptive cells of kidneys & intestine.

(A) (P) – (2), (Q) – (1), (R) – (3), (S) – (4)

(B) (P) – (1), (Q) – (2), (R) – (4), (S) – (3)

(C) (P) – (2), (Q) – (3), (R) – (4), (S) – (1)

(D) (P) – (3), (Q) – (4), (R) – (2), (S) – (1)

25. Glyoxysomes are single membrane-bound cytoplasmic organelles in eukaryotes. Which of the following statements is NOT true for glyoxisomes? **[NSEB-2018]**

(A) glyoxysomes are specialised type of peroxisomes

(B) they play a major role in the mobilisation and utilisation of stored nutrients in germinating seeds

(C) they are found in vertebrates liver and play a major role in converting glucose to glycogen

(D) they play a major role in the conversion of fatty acids in to carbohydrates

26. When a small piece of fresh liver is dropped into a beaker of hydrogen peroxide solution, it results in rapid generation of gas bubbles. This can be attributed to: **[NSEB-2018]**

(i) action of an enzyme catalase that breaks down H_2O_2 into H_2O and O_2.

(ii) action of peroxisomes in hepatocytes, whose enzymes break down H_2O_2 to release oxygen.

(iii) Increased H_2O_2 production by superoxide dismutase activity in peroxisomes.

(iv) H_2O_2 acting on glycogen from liver cells releasing CO_2.

(A) (iv) and (ii)

(B) (iv) only

(C) (iii) only

(D) (ii) and (iii)

27. Function of non-kinetochore microtubules is;

(i) To help the chromosomes to get arranged at the equator

(ii) To elongate the cell during anaphase

(iii) To help the separation of chromatids during anaphase

Which of the statement/s is/are correct? **[NSEB-2018]**

(A) (i) only

(B) (ii) only

(C) (iii) only

(D) (i) and (iii)

28. From a culture of mammalian cells, a cell in M phase is made to fuse with a second cell in G1 phase. The second cell will go into: **[NSEB-2018]**

(A) S phase instantly

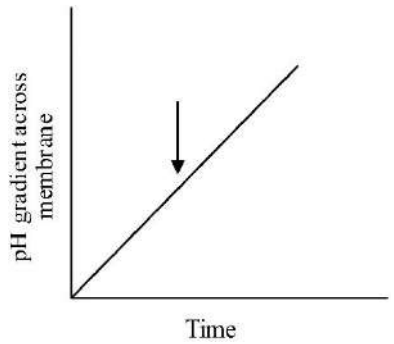
(B) M phase skipping S phase

(C) M phase after quickly completing S phase

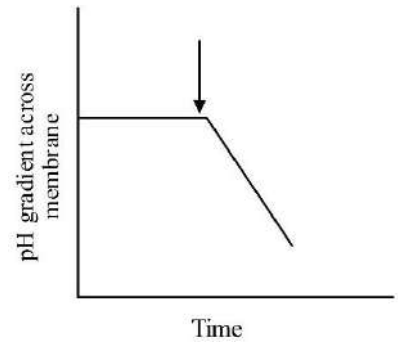
(D) G2 phase after quickly completing S phase

29. In an experiment to study the effect of a certain compound 'X', actively respiring plant cells were treated with 'X' after some time of the start of the experiment. The pH gradient across the mitochondrial membrane was monitored throughout the experiment. Compound X was known to specifically target mitochondrial ATP synthase and lead to complete inhibition of the enzyme. Which of the following graphs would be the expected outcome of this experiment? The arrow in the graph indicates the time of addition of compound 'X'. **[NSEB-2018]**

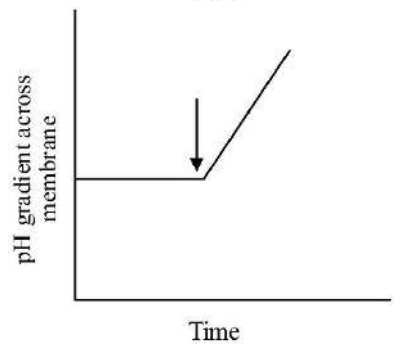
(A)



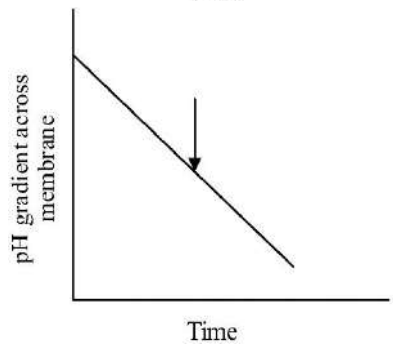
(B)



(C)



(D)



30. The function of contractile vacuole is to pump out excess water from the cell. In Paramecium, the activity of contractile vacuole was found to increase when transferred from one medium to another. Hence it can be concluded that the transfer was from: **[NSEB-2019]**

(A) isotonic to hypotonic solution
(B) hypotonic to isotonic solution
(C) hypotonic to hypertonic solution
(D) isotonic to hypertonic solution

31. The compartmentalization of the cytoplasm by the membranes of the endoplasmic reticulum (ER) results in: **[NSEB-2019]**

(A) increasing the surfuce area available for biochemical synthesis
(B) providing a structural framework
(C) facilitating cell mobility
(D) maintaining cell fluidity and cell dynamics

32. Cells of E.coli are placed in a solution with 12% NaCl. Which effect would be visible after 24h of incubation? **[NSEB-2019]**

(A) Plasmolysis
(B) Plasmoptysis
(C) Osmotic lysis
(D) Swelling of cells

33. Which part of the cell is in continuity with the nucleus? **[NSEB-2019]**

(A) Golgi
(B) Mitochondria
(C) endoplasmic reticulum
(D) Cell membrane

34. Nisha was observing a pond sample using 15 X eyepiece. She measured one of the protist using a micrometer and found it to be approximately 0.2 cm in size under the microscope. Her friend told her that the actual size of this protist is known to be 3μ. Thus Nisha was observing the organism using an objective lens of _____ magnification. **[NSEB-2019]**

(A) 4 X (B) 10 X
(C) 45 X (D) 100 X

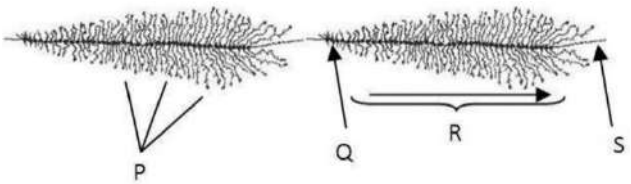
35. In a diploid organism the total DNA content of a sperm was found to be 'C'. What will be the DNA content of its cell that is at Metaphase I of meiosis? **[NSEB-2019]**

(A) C (B) 0.5C
(C) 2C (D) 4C

36. Peroxisomes are often noticed in proximity of mitochondria. This is due to the fact that the products can be transported to mitochondria. Which of the following functions is most relevant to this explanation? **[NSEB-2019]**

(A) Peroxisomes use oxygen to break fatty acids down into smaller molecules that are then used as fuel for cellular respiration
(B) Peroxisomes oxidise alcohol to detoxify it in liver
(C) Peroxisomes transfer hydrogen from toxins to oxygen rendering them harmless
(D) Peroxisomes produce H_2O_2 and also convert it to water

37. Transcription of multiple genes of rRNA is represented below. P, Q, R and S in the figure respectively indicate. **[NSEB-2021]**

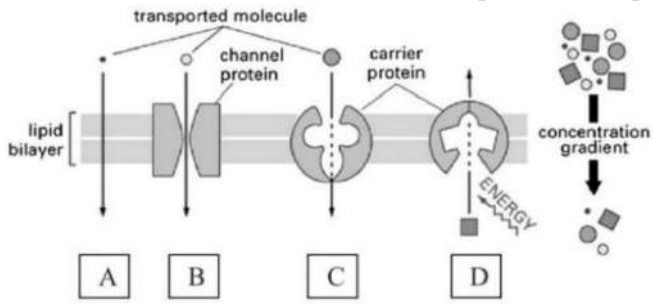


(A) DNA; start of transcription; RNA elongation and rRNA strands
(B) mRNA strands; RNA elongation; start of transcription and DNA
(C) rRNA strands; start of transcription; RNA elongation and DNA
(D) Start of transcription; RNA elongation; rRNA and DNA strands

38. Na^+-K^+ ATPase is essential for maintaining various cellular functions and its inhibition could result in diverse pathologic states. Ca^{2+} transport in cardiac muscles is also linked to Na^+-K^+ ATPase. Cardiac glycosides such as digoxin directly inhibit the Na^+-K^+ ATPase. With respect to cardiac muscles, which of the following statements are correct events after digoxin inhibition of Na^+-K^+ ATPase? **[NSEB-2022]**

(A) Build-up of excessive K^+ extracellularly, and depletion of intracellular Na^+.
(B) Build-up of Ca^{2+} intracellularly leading to increased cardiac contractility.
(C) Inhibition Na^+ -K^+ ATPase stimulates the vagus nerve, causing an increase in heart rate.
(D) Changes in Na^+ ion concentration increases conduction of atrioventricular node causing stimulation of the sinoatrial node.

39. In the figure given below identify the type of transport across membrane (marked A, B, C, and D) that needs maximum energy. **[NSEB-2022]**



(A) A (B) B
(C) C (D) D

40. Even in passive diffusion, energy is required for the solute to cross a bilayer membrane. This energy is related to the energy of hydration for the solute. Listed below are some solutes, in the context of which, choose the correct statement(s) from the following; **[NSEB-2022]**

Solute

Glycol ($HO - CH_2 - CH_2 - OH$)
Glycerol ($HO - CH_2 - CH(OH) - CH_2 - OH$)
Erythritol ($HO - CH_2 - CH(OH) - CH(OH) - CH_2 - OH$)

(A) Glycol will diffuse fastest through a bilayer membrane amongst the three solutes listed
(B) Erythritol will diffuse fastest through a bilayer membrane amongst the three solutes listed
(C) The solute must first lose its waters of hydration, diffuse across the bilayer membrane, and then regain its waters on the opposite side.
(D) As the number of waters of hydration increases the activation energy for diffusion decreases.

41. Molecular machines present in the eukaryotic cell perform several functions to ensure the optimum functionality of the cell and they are found in specific locations in the cell. A student had preparations of 3 such molecules – Chaperonin; Spliceosome and calcium dependent kinases. The cellular locations wherein these molecules would most predominantly be present respectively are:

[NSEB-2023]

(A) Nucleus; Cytoplasm; Nucleus

(B) Cytoplasm; Mitochondria; Cytoplasm

(C) Nucleus; Cytoplasm; Cytoplasm

(D) Cytoplasm; Nucleus; Cytoplasm

42. 100 bacterial cells are inoculated in a growth medium. Each cell takes 30 minutes to duplicate. Select the number of cells present in the broth after 20 hours of incubation, assuming no cell death. **[NSEB-2023]**

(A) 10^{14} (B) 10^{12}

(C) 10^{112} (D) 100^{40}

43. Which of the following statements is correct about the G_0 phase of the cell cycle?

[NSEB-2023]

(A) The G_0 phase arrests the cell division and does not allow it to continue cell division ever again.

(B) Once cells come out of the G_0 phase, they directly start DNA synthesis.

(C) The G_0 phase is a preparatory phase.

(D) Cells enter the G_1 phase post the G_0 phase

44. A cell suspension has a concentration of 10^{12} cells/mL. An analyst diluted the suspension to a concentration of 10^6 cells/mL. How much reduction in concentration did the analyst achieve? **[NSEB-2023]**

(A) 50%

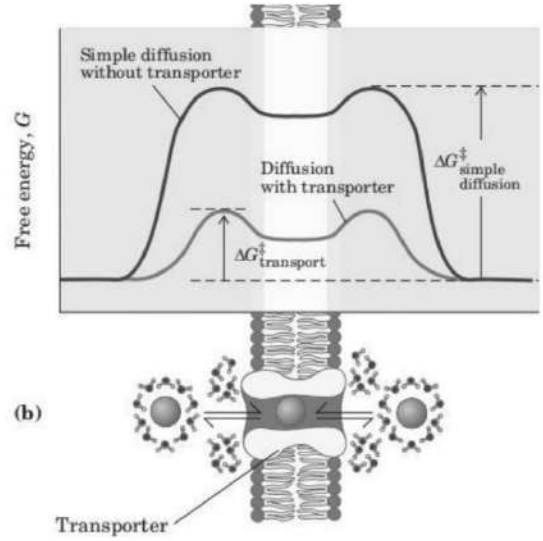
(B) 6 log

(C) 5 log

(D) 2 log

45. Following is the diagram representing transport of hydrophilic molecules across the membrane, mediated through transporter protein. What can you conclude from the given diagram?

[NSEB-2023]



(A) Transporter protein irreversibly converts the substrate to a transportable form.

(B) Transporter protein increases the free energy (G) for transmembrane diffusion of the solute.

(C) Transporter protein provides a hydrophobic passageway for the movement of molecules.

(D) Transporter protein removes the hydration shell and prepares the molecule to move across the membrane.

46. Which of the following is true about protein translocation? **[NSEB-2023]**

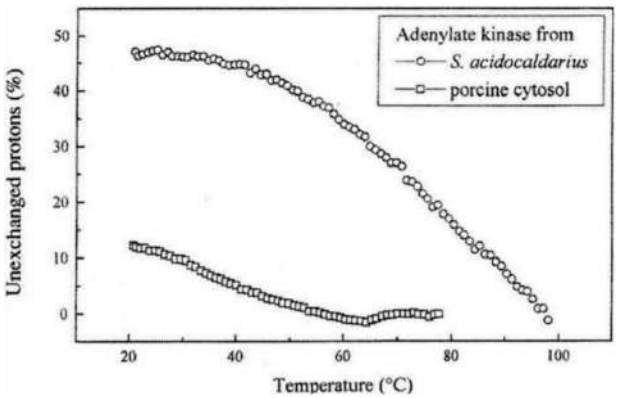
(A) Ribosomes can recognize the signal sequence in the protein and dock them on endoplasmic reticulum (ER).

(B) Protein translocation into the endoplasmic reticulum (ER) takes place simultaneously along with translation.

(C) A fully folded protein can enter the endoplasmic reticulum (ER) from the cytosol.

(D) Protein synthesis may involve free ribosomes, which are eventually docked to the endoplasmic reticulum (ER).

47. Enzymes from Hyperthermophiles, which grow optimally at temperatures between 80°C and 110°C show unique structure-function properties of high thermostability and optimal activity at temperatures above 70°C. The figure below illustrates the Hydrogen-deuterium exchange recorded in Sulfolobus acidocaldarius and porcine muscle cytosol adenylate kinases observed during a temperature gradient experiment. **[NSEB-2023]**



Which of the following statements are correct in this context?

(A) At 20°C a much smaller fraction of the amide protons in S. acidocaldarius adenylate kinase are exchanged than in the porcine cytosolic enzyme indicating that more amide protons are involved in stable hydrogen bonds in the thermophilic enzyme.

(B) Lesser rigidity explains why hyperthermophilic enzymes are often inactive at low temperatures (i.e., around 20 to 37°C).

(C) Hyperthermophilic enzymes are less rigid than their mesophilic homologues at mesophilic temperatures and that rigidity is a prerequisite for high protein thermostability.

(D) Temperatures of greater than 90°C are needed before S. acidocaldarius adenylate kinase can show an exchange level as compared to the catalytically active mesophilic enzyme.

48. Which of the following are TRUE about the peroxisomes found in yeast? **[NSEB-2023]**

(A) They are not very active when yeast is cultured in the presence of glucose.

(B) They can multiply only by fission.

(C) They are very active when yeast is cultured in the presence of methanol.

(D) They grow in size by incorporating proteins and lipids synthesized in the endoplasmic reticulum.

49. If one starts with 10,000 (10^4) bacterial cells in a culture that has a generation time of 2 hours, what would be the magnitude (ten-fold) of increase in cell number at 4 hours, 24 hours and 48 hours respectively? **[NSEB-2024]**

(A) Less than 1, 4, and 7

(B) 1, 3, and 7

(C) Less than 1, 5, and 9

(D) 4, 16 and 49

50. Consider a germ cell having 3 pairs of homologous chromosomes. After meiotic division, how many possible combinations of chromosomes will be found in egg cells? **[NSEB-2024]**

(A) 8 (B) 16

(C) 6 (D) 9

51. Primary spermatocytes undergo meiotic division to give rise to sperm cells. Nondisjunction of sex chromosomes during this division can lead to male gamete formation with abnormal number of chromosomes. If such a sperm cell fuses with a normal egg cell, which one of the following genotypes will not be found in the offsprings? **[NSEB-2024]**

(A) XXY (B) XXX

(C) XYY (D) YO

52. Under normal circumstances, lipid bilayer of cell membrane allows certain molecules to readily pass through it. Which one is the correct order of molecules with respect to increasing permeability across the membrane? **[NSEB-2024]**

(A) Vit. A < Ca^{2+} < Glycerol < Glucose

(B) Ca^{2+} < Glucose < Glycerol < Vit. A

(C) Glucose < Glycerol < Vit. A < Ca^{2+}

(D) Glycerol < Vit. A < Ca^{2+} < Glucose

53. Pulse-chase analysis is a commonly used technique to study proteins in the cell. Cultured cells expressing the protein of interest are allowed to take up radioactively labelled amino acids for a brief interval (pulse) during which all the newly synthesized proteins incorporate the label. In an experiment 3H-leucine was added to a cell culture to label secretory proteins in the cell and radioactivity at different locations in the cell was recorded at 5, 10 and 45 minutes after addition. Which organelles respectively will show maximum radioactivity at these time points respectively? **[NSEB-2024]**

(A) Golgi apparatus; endoplasmic reticulum and secretory granules
(B) Secretory granules; endoplasmic reticulum and Golgi apparatus
(C) Endoplasmic reticulum; secretory granules and Golgi apparatus
(D) Endoplasmic reticulum; Golgi apparatus and secretory granules

54. Which among the following statements about chloroplast is false? **[NSEB-2024]**

(A) Proteins found in chloroplast are either encoded by the chloroplast DNA or the nuclear DNA.
(B) Chloroplast genes exhibit Mendelian pattern of inheritance.
(C) Photosystems I and II are spatially separated in the thylakoid membrane of the chloroplast.
(D) Chemiosmotic mechanism converts the energy stored in chemical and electric potential to ATP similar to mitochondria.

55. Considering Meiosis II as an independent event, which one of the following phenomena makes Meiosis II different from Mitotic division? **[NSEB-2024]**

(i) Sister chromatids are held together by protein complex called cohesins in metaphase-II only.
(ii) Daughter cells may have sister chromatids with different genetic composition.
(iii) In meiosis II, chromosome number of daughter cells remains unchanged.
(iv) DNA replication does not take place before prophase II.

(A) Only (ii) (B) Only (i)
(C) (ii) and (iv) (D) (i) and (iii)

56. A few processes that occur in a cell are listed below. **[NSEB-2024]**

(i) Cholesterol uptake
(ii) Chemiosmotic generation of ATP
(iii) Movement of oxygen into cells
(iv) Movement of glucose into cells
(v) Secretion of mucous

Which of the following statements regarding these processes are true?

(A) (i) and (ii) are active processes while (iii), (iv) and (v) are passive processes.
(B) (i) occurs by carrier-mediated endocytosis while (v) occurs by exocytosis.
(C) (iii) and (v) occur by direct passage through the membrane.
(D) A membrane protein is involved in the processes (ii) and (iv).

57. Why would life not be possible if cells were bound by a layer of completely water soluble molecules instead of by phospholipids? **[NSEB-2024]**

(A) Because excess of hydrogen ions formed by water soluble molecules will interfere with exchange across the membrane.
(B) Because cells will not be able to maintain their contents and integrity.
(C) Because water being a universal solvent will facilitate unnecessary chemical reaction.
(D) Because the cell will lose water causing the death of the cell.

58. Observe the sequence of events that occur during cell cycle and arrange them in the correct order. **[NSEB-2024]**

(i) Division of centromeres
(ii) Centrioles separate and move to opposite poles
(iii) DNA replication occurs
(iv) DNA unwinding
(v) Centromeres line up along the equatorial plate

(A) (iv), (iii), (v), (ii), (i)
(B) (iii), (ii), (v), (iv), (i)
(C) (iii), (ii), (v), (i), (iv)
(D) (iii), (iv), (ii), (i), (v)

59. Which of the following cell types, when compared, have a greater number of mitochondria? **[NSEB-2024]**

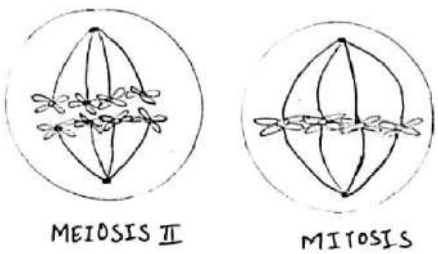
(A) Human epidermal cells
(B) Cells of the dormant seeds
(C) Leaf cells involved in photosynthesis
(D) Bark cells

60. The nuclear membrane disappears during cell division. After completion of cell division, it re-appears during the interphase. Which of the following contributes towards formation of the nuclear membrane? **[NSEB-2024]**

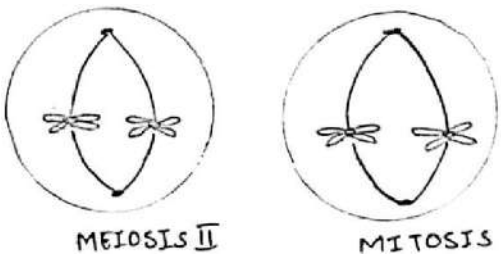
(A) Mitochondria
(B) Endoplasmic reticulum
(C) Golgi bodies
(D) Centrioles

61. If an organism having 2n = 4 chromosomes, then which diagram is appropriately showing metaphase in the meiosis II and mitosis respectively? **[NSEB-2024]**

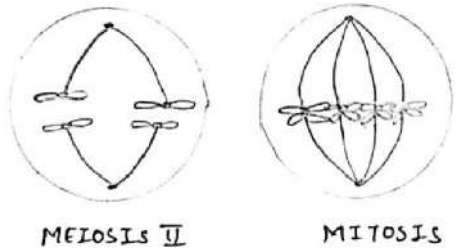
(A)



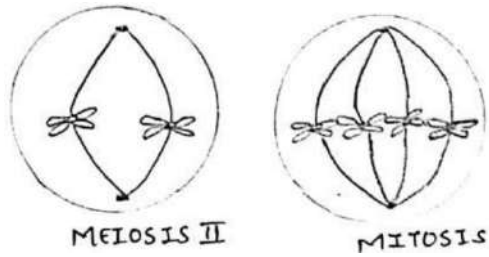
(B)



(C)



(D)



62. Few cells were cultured in artificial medium, having colchicine and allowed to divide. Microscopic preparation was done, and cells were observed under a light microscope. Which of the following observations is true in the context of the above information? **[NSEB-2024]**

(A) Cells were arrested at interphase and DNA replication did not take place.
(B) Chromosomes were clearly visible with two sister chromatids in each cell.
(C) Cells were dividing normally and slide showed various stages of mitosis.
(D) Chromatin material did not undergo condensation.

63. In mitosis the number of chromosomes in daughter cells depend on; **[NSEB-2024]**

(A) Splitting of centromere in anaphase.
(B) Separation of chromatids in metaphase.
(C) Proper attachment of chromosomes to the spindle poles.
(D) Separation of chromatids in anaphase.

Answer Key

EXERCISE-1

1. (B)	**2.** (D)	**3.** (C)	**4.** (C)
5. (C)	**6.** (B)	**7.** (C)	**8.** (C)
9. (C)	**10.** (B)	**11.** (B)	**12.** (B)
13. (D)	**14.** (C)	**15.** (A)	**16.** (C)
17. (B)	**18.** (A)	**19.** (D)	**20.** (C)
21. (A)	**22.** (C)	**23.** (C)	**24.** (B)
25. (B)	**26.** (B)	**27.** (A)	**28.** (D)
29. (A)	**30.** (D)	**31.** (A)	**32.** (B)
33. (A)	**34.** (A)	**35.** (A)	**36.** (A)
37. (B)	**38.** (D)	**39.** (A)	**40.** (B)
41. (A)	**42.** (C)	**43.** (D)	**44.** (A)
45. (C)	**46.** (B)	**47.** (A)	**48.** (A)
49. (D)	**50.** (A)		

EXERCISE-2

1. (A)	**2.** (A)	**3.** (B)	**4.** (A)
5. (B)	**6.** (D)	**7.** (A)	**8.** (B)
9. (D)	**10.** (C)	**11.** (B)	**12.** (A)
13. (D)	**14.** (B)	**15.** (A)	**16.** (B)
17. (A)	**18.** (A)	**19.** (B)	**20.** (D)

EXERCISE-3

1. (C)	**2.** (B)	**3.** (C)	**4.** (B)
5. (B)	**6.** (C)	**7.** (A)	**8.** (B)
9. (B)	**10.** (A)		

NSEB PYQ

1. (A) **2.** (A) **3.** (D) **4.** (D)

5. (A) **6.** (C) **7.** (B) **8.** (C)

9. (D) **10.** (D) **11.** (B) **12.** (A)

13. (B) **14.** (B) **15.** (D) **16.** (D)

17. (D) **18.** (B) **19.** (C) **20.** (B)

21. (D) **22.** (B) **23.** (A) **24.** (C)

25. (C) **26.** (A) **27.** (B) **28.** (B)

29. (C) **30.** (A) **31.** (A) **32.** (A)

33. (C) **34.** (C) **35.** (D) **36.** (A)

37. (C) **38.** (B) **39.** (D) **40.** (A, C)

41. (D) **42.** (A) **43.** (D) **44.** (B)

45. (D) **46.** (B, D) **47.** (A, D) **48.** (A, C, D)

49. (A) **50.** (A) **51.** (D) **52.** (B)

53. (D) **54.** (B) **54.** (C) **56.** (B, D)

57. (B) **58.** (A) **59.** (C) **60.** (B)

61. (D) **62.** (B) **63.** (A, C, D)

OLYMPIAD WALLAH

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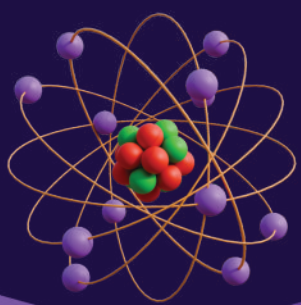

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