

## UNIT - VIII APPLIED BIOLOGY

### AQUACULTURE

- The practice of capturing and culturing of aquatic organisms to obtain maximum yield from water sources is the objective of the popular concept  
- **Blue Revolution**
- Fresh water habitat with flowing waters is called  
- **Lotic Habitat**
- Fresh water habitat with standstill waters is referred to as  
- **Lentic Habitat**
- Fishery involving capture of fish and other related organisms using suitable craft & gear from their natural resources is referred to as  
- **Capture Fishery**
- Capture from the sea  
- **Marine Fishery**
- Capture from open sea waters  
- **Offshore Fishery**
- Capture from coastal waters  
- **Inshore Fishery**
- Capture from estuaries and fresh water bodies  
- **Inland Fishery**
- Culturing selected aquatic organisms under regulated conditions  
- **Culture Fishery / Aquaculture**
- Culturing of Fishes  
- **Pisciculture**
- Capturing and culturing of 'fin fishes'  
- **Fin Fish Fishery**
- Capturing and culturing of Crabs, oysters etc.  
- **Shell Fish Fishery**
- Number of Maritime states in India - 9

#### Important Fresh Water Fishes:

- *Catla catla* catla / Krishna bocche, *Labeo rohita* (Rohu / Ragandi), *Cirrhinus mrigala* (Mrigal / Erramosu),  
*Cyprinus carpio* (common carp / China carp),  
*Ctenopharyngodon idella* (Grass carp / gaddi chepa), *Hypophthalmichthys molitrix* (Silver fish), *Clarias batrachus* (Cat Fish / Marpu),  
*Heteropneustes fossilis* (Singhi / Pamujella),  
*Tilapia mossambica* (Tilapia Guraka).

#### Important Brackish water Fishes :

- *Chanos chanos* (milk fish), *Lates calcarifer* (Sea Perch / Pandugoppa), *Mugil cephalus* (Grey Mullet / Bontalu),

#### Important Crustaceans:

- *Penaeus monodon* (Tiger shrimp / Katla Royya),

*Penaeus indicus* (White shrimp / Tella Royya),  
*Macrobrachium rosenbergi* (Giant River Prawn / Scamper), *Macrobrachium malcomsoni* (Monsoon River Prawn),

#### Important Crabs:-

- *Scylla tranquibarica* (Green crab / Mud crab), *Scylla serrata* (Red crab / Mud crab), *Scylla oceanica* (Mud crab).

#### Important Oysters :

- *Pinctada fucata*, *Pinctada vulgaris*

#### Important Sea weeds:

- \* *Gelidiella*, *Gelidium*, *Gracillaria* (Red Algae)  
*Sargassum*, *Laminaria*, *Macrocystis*, *Turbinaria* (Brown Algae)  
*Excepting Cyprinus*  
*Ctenopharyngodon*,  
*Hypophthalmichthys*, *Macrobrachium-malcomsoni*, *Scylla oceanica*, *Pinctada vulgaris*, all the others  
are useful for Culture and Capture Fishery

#### Organisations Concerned with Aquaculture in India :

- **CMFRI** ( Central Marine Fishery Research Institute –HQ-Cochin )
- **CIFA** (Central Institute of Fresh water Aquaculture –HQ-Kausalyaganga, Orissa )
- **CIBA** (Central Institute of Brackish water Aquaculture –HQ-Chennai)
- **CICFRI** (Central Inland Capture Fisheries Research Institute -HQ-Barrackpore, Kolkata).
- **MPEDA** ( Marine Products Export Development Authority ) - Promotes culture fishery in India
- **SIFT** ( State Institute of Fishery Technology ) - Kakinada, A.P.

#### Nutritional and Commercial values of Aquatic organisms :

- 100 gms. of fish meat contains 15 to 22 % of proteins and **100 to 900 k.cal.** of energy
- Fish meat is rich in essential amino acids such as **Methionine** and **Lysine** [ important for brain ]
- **Shark liver oil** contains Vit. **A** and **Cod liver oil** contains Vit. **D**
- Tuna and oil of sardines are rich in **Omega 3 fatty acid** which reduces cholesterol
- Oil of sardines and tuna has industrial importance
- **Fish Guano** (solid waste) is useful as fertiliser
- **Fish Meal** made of scrap fish is a source of rich animal protein in poultry feed

- **Shagreen** (skin of shark ) is used as an ‘abrasive’

#### Craft and Gear :

- Vessels used for capturing and transport fish are called -‘**Craft**’
- Fishing craft includes - Raft, dugout canoes and boats
- Simple craft with - Circular frame work of bamboo or cane -**Coracle**
- Dugout canoe - **donga, sangadam, odam**
- Catamaran, masula boat, kakinada nava, dhingi, padhva (bar boat) theppa are used  
- **in Inshore and Inland Fishing**
- Trawlers are used in - **Offshore Fishing**
- Different types of nets used in capturing fish constitute the - **Gear**
- Traps are used **inland waters**
- Mostly cast nets, stake nets are used in  
- **Inland Fishing**
- Darts, spears and barbed heads are used in  
- **Game fishery**
- Lines with hooks are used in -**Inland fishery**
- Bag nets are useful for capturing -**small fish**
- Long Lines are used to capture - **Tunas**
- Gill nets are used to capture - **Oil sardines**
- Boat seines, inshore seines, drift nets, wall nets are used in  
- **Inshore Fishing**
- Dip nets are used in capturing - **Hilsa in rivers**
- Scoop nets are used in capturing - **Shrimp seed in estuary**
- Gumcha is used in capturing  
- **fish Spawn in flowing water**
- Trawl nets are used in - **Mechanised Craft** (to capture bottom dwelling fish)
- Stake nets are used to capture fish in  
- **Brackish water**

#### Fish Culture Practices:

- Culture of a single sps. in a pond is called  
- **Monoculture**
- Culture of compatible strains together in one pond is called -**Polyculture**. For example Indian major carps such as **Catla ,Rohu and Mrigal** or Exotic carps such as **Common carp , Silver carp and Grass carp** are used in **Polyculture** as they have different feeding habits ( surface feeding ,column feeding and bottom feeding ) and are thus not a competition to one another .Moreover there is optimum utilization of food at various levels in the pond .
- **Integrated Culture** is a multi commodity Farming of two or more economically important organisms together e.g. Fish - Poultry Farming

#### Management Methods :

- **Traditional Method** : Non-scientific ;Water ,feed management practices not followed; Stocking density and production are low
- **Extensive Method** : Water and feed management are followed at a low level; Ponds are fertilised for promoting growth of plankton ;
- **Semi – Intensive Method** : Water Management Methods like Aeration and Water exchange are followed ; formulated feed is provided along with natural food
- **Intensive Method** : Efficient Aeration and water exchange are done ;Completely formulated feed is supplied ;Stocking Density and production are high
- **Murrels ( Channa punctatus ,C.maruleus ,C.striatus )** are now-a-days not intensively cultured because of  
- **Epizootic Ulcerative Syndrome**
- Fish used for ‘seed production’  
-**Brood Fish**
- Brooders collected from natural sources are kept in  
- **Hapas**
- Induced breeding is done by injecting Pituitary extracts and this technique is called  
- **Hypophysation technique**
- Pituitary extract has -**gonadotropins (FSH & LH)**
- Chemical used in artificial breeding  
- **Ovaprim**
- Breeding of fish is done in  
- **Chinese circular hatcheries or Jar hatcheries**
- "Hatchlings" are grown for the first fifteen days or until they reach 5-7mm. in - **Nursery pond**
- Older Hatchlings are grown into Fry ( 2.5 cm ) and Fingerlings( 4 to 5 cm. )in  
-**Rearing pond**
- Time required for the growth of fingerlings  
-**2 to 3 months**
- Marketable fish are produced in 8-12 months in the pond called - **Stocking pond**
- "Liming" of pond , eradication of weeds etc  
-**Pre stocking Management**
- Introducing Fingerlings of judiciously selected varieties of fish - **Stocking Management**
- Maintenance of optimum water parameters, supplying supplementary feed etc.-  
- **Post Stocking Management**
- Penaeid prawn cultured is - **Penaeus monodon**
- Ablation of one eye stalk is the practise in  
- **prawn culture**
- Ablation of one eye stalk induces **gonad maturation and spawning**

- The giant Fresh water prawn or **Scampy** is  
- *Macrobrachium rosenbergi*
- Euryhaline, Eurythermal, fast growing prawn is  
- *Macrobrachium rosenbergi*
- Mature males have large 2nd pair of walking legs in  
- *Macrobrachium rosenbergi*
- Fast growth in artificially fed crabs is called  
- **Fattening**
- Oysters and Mussels are grown on  
- **Rafts**
- Larvae of mussels and oysters which settle on rafts are called  
- **Spat**
- Quality pearl oysters are  
- *Pinctada* sps.
- Culturing of pearl oysters in India is mostly concentrated in  
- **Tuticorin**
- Culturing of pearls from Lamellidens is tried by -  
**CIFA**
- **Agar** is mostly obtained from – **Red algae** such as  
- *Gelidium*, *Gelidiella* & *Gracillaria*
- **Algin** is obtained from – **Brown algae** (*Sargassum*, *Turbinaria*, *Macrocystis*, *Laminaria*).
- **Single celled proteins** are obtained from  
- *Ulva* (marine alga), *Spirulina* (freshwater alga)

## **AQUACULTURE**

### **LEVEL-I**

01. The nets used for the capture of oil sardines are  
1) Bag nets                      2) Stake nets  
3) Shore seines                4) Gill nets
02. Correct match from the following  
1) *Scylla serrata* - Green crab  
2) *Penaeus indicus* - Tiger shrimp  
3) *Gracellaria* - Brown algae  
4) *Mugil cephalus* - Grey mullet
03. Edible shell fish having high export value are  
1) Crabs & Mussels    2) Shrimps & Scampy  
3) Oysters & Sharks    4) Prawns & Mudcrabs
- 04.. Nets used to capture shrimp seed & fish spawn are respectively  
1) Dip nets & Scoop nets  
2) Cast nets & stake nets  
3) Scoop nets & Gamcha  
4) Drift nets & Gill nets.
05. In aquaculture operations 'spat' are used for culturing  
1) Prawns                      2) Crabs  
3) Mussels                      4) Sea weeds
06. Judicious combination of different kinds of culture fish and their ratios according to the size of the pond is the prime objective of  
1) Stocking management  
2) Poststocking management

- 3) Prestocking management  
4) Rearing pond management
07. Formulated food along with natural food is made available in the pisciculture management method called  
1) Extensive method  
2) Intensive method  
3) Semi-intensive method  
4) Traditional method
08. "Singhi" a fresh water fish is zoologically known as  
1) *Tilapia mossambica*  
2) *Heteropneustes fossilis*  
3) *Hypophthalmichthys molitrix*  
4) *Cirrhinus mrigala*
09. CIBA & CIFA are located in ..... & ..... respectively.  
1) Barrackpore, Kausalyaganga  
2) Cochin, Chennai  
3) Chennai, Kausalyaganga  
4) Kausalyaganga & Barrackpore
10. The fish whose culture is discontinued due to epizootic ulcerative syndrome is  
1) *Clarias*                      2) *Channa*  
3) *Cyprinus*                      4) *Catla*
11. Which of the following is an exotic fish ?  
1) *Cirrhinus mrigala* 2) *Chanos Chanos*  
3) *Cyprinus carpio* 4) *Catla Catla*
12. The institute which is concerned with the culture of pearls from *Lamellidens marginalis* is  
1) CIBA                              2) CMFRI  
3) CIFA                              4) CICFRI
13. Pearl Oyster culture is common in the coast of  
1) Cochin, Kerala  
2) Tuticorin, Tamilnadu  
3) Visakhapatnam, A.P.  
4) Rann of kutch, Gujarat.
14. Which of the following is not included under prestocking management of fish culture ?  
1) Liming of ponds    2) Drying of ponds  
3) Eradication of weed plants & Weed fish  
4) Fertilisation of pond water.
15. The shell fish which can be exported in live condition  
1) *Penaeus monodon*  
2) *Macrobrachium rosenbergii*  
3) *Scylla serrata*  
4) *Lamellidens marginalis*
16. Which of the following is generally **not** cultured in coastal shallow sea water, estuaries, lagoons & back waters ?  
1) Pearl Oyster                      2) Green mussel  
3) Scampy                              4) Red algae

17. Fresh water alga useful for the production of single celled proteins is  
1) Sargassum                      2) Spirulina  
3) Macrocystis                    4) Laminaria
18. Which of the following are used for artificial breeding of fish ?  
1) Hapa                              2) Jar hatchery  
3) Incubator                        4) Nursery.
19. The ponds in which spawn are grown into fingerlings are  
1) Nurseries                        2) Rearing ponds  
3) Stocking ponds                4) Hapas
20. The nets that are used to capture fish in both inland waters and brackish waters are  
1) Trawl nets                        2) Wall nets  
3) Stake nets                        4) Gill nets
21. Which of the following is a “dugout canoe”?  
1) Coracle                            2) Donga  
3) Catamaran                        4) Odam
22. If the fishery resource is obtained from estuaries , it is called.  
1) Marine fishery                  2) Inshore fishery  
3) Offshore fishery                4) Inland fishery.
23. A simple craft with circular frame work of bamboo or cane is called  
1) donga                              2) catamaran  
3) coracle                            4) sangadam.
24. The management method of fishculture in which ponds are fertilized for the planktonic growth , but no formulated feed is given is  
1) Traditional method            2) Extensive method  
3) Intensive method               4) Semi-intensive method
25. The giant fresh water prawn is : (*EAMCET-2005*)  
1) White shrimp                  2) Tiger shrimp  
3) Scampy                            4) Sardine
26. If the fishery resource is obtained with the use of suitable craft and gear from the natural body of water it is  
1) Culture fishery                  2) Aquaculture  
3) Capture fishery                4) Mariculture
27. If fishery resource is captured from the sea, it is called  
1) Marine fishery                  2) Offshore fishery  
3) Inland fishery                  4) Mariculture
28. If the fishery resource is captured from the open waters of the sea , it is called  
1) Inshore fishery                2) Offshore fishery  
3) Inland fishery                  4) Brackish water fishery
29. Percentage of proteins in fish meat  
1) 4 to 20                            2) 0.5 to 20  
3) 15 to 22                          4) 23 to 70
30. Percentage of fats in fish meat  
1) 4 to 20                            2) 0.5 to 20  
3) 15 to 22                          4) 23 TO 70
31. Amount calcium per 100gms of fish meat  
1) 150 to 800 mg                2) 230 to 700 mg  
3) 4 to 20 mg                      4) 100 to 900 mg
32. Amount of phosphorous per 100gms of fish meat  
1) 150 to 800 mg                2) 230 to 700 mg  
3) 100 to 900 mg                4) 4 to 20 mg
33. Oil extracted from this fish is used industrially  
1) Oil sardine                        2) Tuna  
3) Shark                              4) Cod
34. Culture of only cat fish in a pond is  
1) Monoculture                    2) Polyculture  
3) Integrated culture              4) Traditional culture
35. Identify the exotic carps from the following  
1) Grass carp, rohu and silver fish  
2) Silver fish, grass carp and common carp  
3) Grass carp, silver carp and common carp  
4) Catla , mrigal and common carp
36. Culture of Indian major carps in the same pond is  
1) Extensive culture  
2) Integrated culture  
3) Intensive culture  
4) Polyculture
37. Culture of Indian major carps along with exotic carps is  
1) Integrated culture              2) Polyculture  
3) Semi intensive culture        4) Traditional culture
38. These organisms are not native to the referred region  
1) Rare organisms                2) Exotic organisms  
3) Endemic organisms            4) Epidemic organisms
39. Multicommodity farming is  
1) Intensive culture                2) Integrated culture  
3) Poly culture                      4) Extensive culture
40. Poultry, Fish culture is  
1) Integrated culture              2) Poly culture  
3) Extensive culture                4) Intensive culture
41. No water or feed management practices are followed in this fish culture  
1) Semi-intensive method  
2) Intensive method  
3) Traditional method  
4) Extensive method
42. The total food is supplied in the formulated form in this fish culture practice  
1) Extensive method  
2) Semi-intensive method  
3) Intensive method  
4) Traditional method

43. This breeding technique is followed in artificial breeding in fishes  
 1) Inbreeding                      2) Out breeding  
 3) Cross breeding                4) Induced breeding
44. This prawn is more common in the lower to upper reaches of rivers where there is tidal influence  
 1) Palaemon  
 2) Penaeus monodon  
 3) Macrobrachium rosenbergii  
 4) Macrobrachium malcomsoni
45. These are constructed for the culture of mussels and oysters  
 1) Rafts                              2) Catamarans  
 3) Dugout canoes                4) Trawlers
46. These algae are cultured for agar  
 1) Blue green algae               2) Green algae  
 3) Brown algae                   4) Red algae
47. Algin is produced from  
 1) *Gelidiella*                      2) *Gelidium*  
 3) *Gracillaria*                   4) *Laminaria*
48. This alga of sea waters is used for the production of single celled proteins  
 1) *Ulva*                              2) *Spirulina*  
 3) *Sargassum*                    4) *Laminaria*

### LEVEL-II

49. The following statements refer to craft and gear in fishery operations :  
 i) Stake nets are commonly used in brackish water fish capture.  
 ii) Gill nets are most suitable craft for capturing oil sardine.  
 iii) Mechanised fishing craft use trawl nets for capturing fish.  
 Choose the correct statements  
 1) All                                  2) only i & ii  
 3) only i & iii                      4) only ii & iii
50. Identify the correct combination from the following.  
 A) Trawl nets are used in mechanised craft.  
 B) Mechanised craft are used in offshore fishing.  
 C) Trawl nets are to capture the bottom fishes.  
 D) Capturing fish from coastal waters is called offshore fishery.  
 1) A,B&C are correct    2) B,C,D are correct  
 3) A,B&C are true        4) B,C&D are true.
51. Identify the correct combination .  
 A) Culture of compatible species in one pond is called polyculture.  
 B) Culture of Indian major carps along with exotic carps is called integrated culture.  
 C) Culture of Only exotic carps in one pond is called monoculture.  
 D) Culture of mussels is discontinued due to epizootic ulcerative syndrome.

- 1) A & B are true                2) A & D are true  
 3) A,B&C are true              4) B, C & D are true.

### DIRECTIONS : FOR QNO 52-57

#### SI- STATEMENT-I;

#### SII-STAMENT-II

- 1) SI and SII are correct and SII explains SI  
 2) SI and SII are correct and SII does not explain SI  
 3) SI is correct and SII is incorrect  
 4) SI is incorrect & SII is correct
52. **SI :** Hypophysation technique is useful in fish culture practices .  
**SII :** Pituitary hormones contain gonadotropins which can induce spawning.
53. **SI :** Polyculture of fish is advantageous over monoculture.  
**SII :** In polyculture the fish raised are compatible species and there is better utilisation of food in the culture pond at different levels.
54. **SI:** Cartilaginous fishes are not generally used as food fishes.  
**SII:** The exhibit physiological uraemia to overcome the problem of exosmosis.
55. **SI:** Fish meat is considered as “ brain food ”  
**SII:** Fish meat is rich in Omega 3 fatty acid
56. **SI:** Culture of murels is discontinued in recent times.  
**SII:** Meat of mussels emits foul smell due to the retention of urea in their tissues.
57. **SI:** Scamper is the most suitable shell fish for culture.  
**SII:** Scamper grows faster and can tolerate wide range fluctuations in temperature and salinity.
58. Match the following :

#### List-I

#### List-II

- |                                    |                 |
|------------------------------------|-----------------|
| A) <i>Lates calcarifer</i>         | i) Red crab     |
| B) <i>Scylla serrata</i>           | ii) "Marpu"     |
| C) <i>Clarias batrachus</i>        | iii) Scamper    |
| D) <i>Macrobrachium malcomsoni</i> | iv) Sea perch   |
|                                    | v) Tiger shrimp |
- |    | A   | B  | C   | D   |
|----|-----|----|-----|-----|
| 1) | iv  | i  | iii | i   |
| 2) | iii | iv | i   | i   |
| 3) | iv  | i  | i   | iii |
| 4) | v   | iv | i   | iii |

59. Match the following

#### List - I

#### List - II

- |                                  |                |
|----------------------------------|----------------|
| A. Tuna                          | i. Trawl net   |
| B. Sardine                       | ii. Gamcha     |
| C. Inland fishing                | iii. Gill net  |
| D. Capture of bottom living fish | iv. Long lines |
|                                  | v. Stake net   |

- |    | A  | B   | C   | D   |
|----|----|-----|-----|-----|
| 1) | iv | iii | i   | v   |
| 2) | iv | iii | v   | i   |
| 3) | iv | v   | iii | i   |
| 4) | v  | iv  | i   | iii |
60. Match the following
- | <b>List - I</b>                    |  | <b>List - II</b> |  |
|------------------------------------|--|------------------|--|
| A) <i>Penaeus monodon</i>          |  | i) Pearl oyster  |  |
| B) <i>Macrobrachium rosenbergi</i> |  | ii) Tiger shrimp |  |
| C) <i>Scylla oceanica</i>          |  | iii) Scamper     |  |
| D) <i>Pinctada vulgaris</i>        |  | iv) Green crab   |  |
|                                    |  | v) Mud crab      |  |
- |    | A   | B   | C  | D  |
|----|-----|-----|----|----|
| 1) | i   | iii | v  | iv |
| 2) | i   | iii | v  | i  |
| 3) | iii | i   | v  | i  |
| 4) | i   | iii | iv | i  |
61. Match the following
- | <b>List I</b>  |  | <b>List II</b>                         |  |
|----------------|--|--|--|
| A) Silver carp |  | i) <i>Chanos chanos</i>                |  |
| B) Milk fish   |  | ii) <i>Tilapia mossambica</i>          |  |
| C) "Guraka"    |  | iii) <i>Mugil cephalus</i>             |  |
| D) Sea perch   |  | iv) <i>Hypophthalmichthys molitrix</i> |  |
|                |  | v) <i>Lates calcarifer</i>             |  |
- |    | A  | B   | C   | D |
|----|----|-----|-----|---|
| 1) | i  | iv  | iii | v |
| 2) | iv | iii | v   | i |
| 3) | iv | i   | i   | v |
| 4) | iv | i   | i   | v |
62. Match the following :
- | <b>Name of the organisation</b> | <b>Head quarters</b>      |
|---------------------------------|---------------------------|
| A. C M F R I                    | I) Kakinada , A.P         |
| B. C I B A                      | II) Chennai               |
| C. C I C F R I                  | III) Cochin               |
| D. C I F A                      | IV) Kausalyaganga, Orissa |
| W. S I F T                      | V) Barrack pore ,Kolkata. |
|                                 | VI) Visakhapatnam ,A.P.   |
- |    | A   | B   | C   | D  | E  |
|----|-----|-----|-----|----|----|
| 1) | II  | III | IV  | V  | VI |
| 2) | III | II  | IV  | V  | VI |
| 3) | III | II  | V   | IV | I  |
| 4) | II  | IV  | III | V  | I  |
- 63 Match the following
- | <b>List - I</b> |  | <b>List - II</b>        |  |
|-----------------|--|-------------------------|--|
| A) Shagreen     |  | I) Induced breeding     |  |
| B) Fish guano   |  | II) Essential for brain |  |

C) Ovaprim III) reduces Cholesterol levels in blood.

D)  $\omega_3$  fattyacid IV) Abrasive

E) Lysine V) Fertiliser.

- |    | A   | B   | C   | D   | E  |
|----|-----|-----|-----|-----|----|
| 1) | IV  | V   | I   | III | II |
| 2) | V   | IV  | III | II  | I  |
| 3) | IV  | III | II  | I   | V  |
| 4) | III | IV  | V   | I   | II |

64. Match the following :

<b>Type of net</b>	<b>Useful for the capture of</b>
A. Long lines	I) Hilsa in rivers
B. Gamcha	II) Fish spawn from flowing waters.
C. Gill nets	III) Oil sardines.
D. Dip nets	IV) Tunas.

- |    | A   | B   | C   | D   |
|----|-----|-----|-----|-----|
| 1) | III | IV  | I   | II  |
| 2) | II  | IV  | I   | III |
| 3) | IV  | II  | III | I   |
| 4) | IV  | III | II  | I   |

65. Arrange the following practices in correct sequence from prestocking management to post stocking management .

A) Judicious combination of different species.  
B) Supplementary feeding  
C) Drying of ponds  
D) Liming of pond.

- 1) C - D - A - B      2) A - B - C - D  
3) A - C - B - D      4) D - A - C - B

66. Arrange the following management methods of aquaculture in the order of their production from lower to higher.

A) Extensive method B) Intensive method  
C) Semi-intensive method D) Traditional method

- 1) D - C - B - A      2) D - C - A - B  
3) A - C - B - D      4) B - C - D - A

67. Choose the correct combination from the following.

<b>Name</b>	<b>Culture method</b>	<b>Process</b>
A. Scylla	Mari culture	Fattening
B. Penaeus	Prawn culture	Exported in live condition
C. Pinctada	Mariculture	Rafts are used.
D. Clarias	Monoculture	Culture of single species.

- 1) A and B are true  
2) B and C are true.  
3) C and D are true  
4) A and C are true.

68. Match the following

Name	Product obtained.			
A. Laminaria	I) Pearls			
B. Ulva	II) Single celled protein			
C. Lamellidens	III) Agar			
D. Gracellaria	IV) Algin			
	V) Shagreen.			

	A	B	C	D
1)	V	III	I	II
2)	IV	II	I	III
3)	V	IV	III	II
4)	IV	III	II	I

69. Match the following and select the correct option regarding fish culture methods.

**List - I**

**List - II**

- A) Extensive method I) Ponds are more like natural ecosystems
- B) Semi intensive Method II) Ponds are fertilised to promote the growth of plankton
- C) Traditional method III) The total food is supplied in the formulated form.
- D) Intensive method IV) Formulated feed is provided along with natural food
- V) Fish cum poultry culture

	A	B	C	D
1)	II	IV	I	III
2)	II	IV	I	III
3)	III	I	IV	II
4)	II	IV	III	I

70. Match the following and select the correct option

**List - I**

**List - II**

- A) Jar hatchery I) Marketable fish is produced
- B) Rearing pond II) Fry and finger lings are produced
- C) Nursery pond III) Used for fish breeding
- D) Stocking pond IV) Brooders are kept
- V) Fish spawn is grown for first fifteen days

	A	B	C	D
1)	IV	III	II	I
2)	III	IV	V	I
3)	III	II	V	I
4)	III	II	I	IV

71. Match the following and select the correct option.

**List - I**

**List - II**

- A. Gracellaria I. Freshwater blue-green alga cultured for single celled proteins
- B. Ulva II. Marine algae cultured for single celled proteins
- C. Lamellidens III. Fresh water mussel cultured for pearls
- D. Spirulina IV. Marine oyster cultured for pearls
- E. Laminaria V. Cultured for agar
- VI. Cultured for algin

	A	B	C	D	E
1)	VI	II	III	I	V
2)	V	II	IV	I	V
3)	V	I	III	II	VI
4)	V	II	III	I	VI

**DIRECTIONS : FOR QNO 72-75**

**A- ASSERTION;**

**R - REASON**

- 1) A & R are correct and R explains A
- 2) A & R are correct and R does not explain A
- 3) A is correct and R is incorrect
- 4) A is incorrect & R is correct

72. **Assertion (A) :** Common carp, silver carp and grass carp are exotic carps.

**Reason (R) :** Common carp, silver carp and grass carp are introduced from other geographical regions into India.

73. **Assertion (A) :** In the traditional method of fish culture production is very less.

**Reason (R) :** Traditional method of fish culture is

nonscientific and stocking density is very low.

74. **Assertion (A)** : In intensive method of fish culture production is very high.

**Reason (R)** : In intensive method of fish culture stocking density is very high, water management methods are efficient and total food is supplied in the formulated form.

75. **Assertion (A)**: Scamper shows sexual dimorphism

**Reason (R)**: In scamper mature females are larger than males with enlarged second pair of walking legs.

## POULTRY

- The term **poultry** is applied to rearing of a wide variety of birds for meat and eggs
- Poultry birds consume 1.9 kg of feed to convert into 1 kg of protein
- The first Poultry Farm in India was established in  
- **U.P in 1912**
- India ranks Fifth in the world's egg production and A.P ranks  
- **First in India**
- Per capita consumption of eggs in India per year is  
- **20**
- Central Poultry Breeding Farms at Mumbai, Bhubaneswar, Hasserghata developed hybrid strains of  
- **Layers**
- The Indian Veterinary Institute in Izatnagar developed fast growing  
- **Broiler** varieties
- National Egg Coordination Committee monitors  
- **the marketing of poultry products in India**
- Poultry vaccines are produced by  
- **IVRI**
- National Bank for Agriculture and Rural Development (NABARD)  
- **provides financial assistance to poultry farmers**
- Padmasri B. V. Rao strived for the growth of poultry in India
- Fowl belongs to the genus  
- **Gallus**
- The zoological name of domestic fowl in India is  
- **Gallus domesticus**
- A group of 'Breeds' that evolved in a certain geographical area is called a  
- **'Class'**
- American Class**: Rhode Island red (meat bird), Plymouth Rock (dual purpose bird), New Hampshire (dual purpose bird), Wyandotte (dual purpose bird).
- Asiatic Class** : Brahma and Cochin (both meat birds)
- English Class** : Sussex (meat bird), Australorp

(dual purpose bird), Cornish (meat bird)

- Mediterranean Class** : White Leghorn, Minorca, Ancona (all layers).

### Foundation Stocks and hybrids

- Breeds selected for crossing are called  
- **Foundation stocks**.
- Hybrid Layer birds are produced by crossing dam (female) of White Leghorn with sire (male) of  
- **Rhode Island Red**
- Babcock**, **Hyline**, **Hisex** are the important hybrid  
- **Layers** raised in India
- Broiler hybrids are produced by crossing dams of Plymouth Rock or New Hampshire with sire of  
- **Cornish**
- Vencobb**, **Hubbard**, **Ross** are important hybrid  
- **Broilers** raised in India

### Nutritional Values of poultry products

- 100 gms. of egg contain  
- **173 k.cal.** of energy
- Egg contains vitamins **A, D** and **Riboflavin**
- 100 gms. of chicken meat contains **109 k.cal.** energy
- The percent of nitrogen of the food retained by the body for maintenance and growth is called **Biological Value**
- $B.V = \frac{\text{Retained nitrogen}}{\text{Absorbed Nitrogen}} \times 100$
- Retained Nitrogen = nitrogen intake – Nitrogen lost through faeces and urine
- Absorbed Nitrogen = Nitrogen intake – Nitrogen lost through faeces
- The ratio between the weight gained by a growing organism and the protein absorbed is called **Protein Efficiency Ratio (PER)**.
- $PER = \frac{\text{weight gain}}{\text{Protein intake}}$
- Biological value of egg (94%) and Protein Efficiency Ratio (3.9) are the highest
- BV of milk is 84%, fish 76%, meat 74%, rice 68% and wheat 65%
- PER of milk is 3.1, fish 3.5, meat 2.3, rice 2.2 and wheat 1.5

### Poultry Management :

- Clipping of upper beak to prevent injury due to 'pecking' is called Debeaking; first debeaking is done on the tenth day and the second at the age of about  
- **13 to 14 weeks**
- Pecking sometimes results in **cannibalism**
- Pruning of combs and wattles is called  
- **Dubbing**



- The instinct of female to brood the eggs, without laying eggs is called **Broodiness**; it can be controlled by injecting hormones such as  
-**Estrogens**
- Oversized eggs and diet rich in fat and poor in fibre causes **prolapse of the uterus**
- Removal of unproductive birds is called  
-**Culling**
- Expulsion of worms from the intestine of birds is called **Deworming** ; first deworming is done in the *eighth week* and every eight weeks then onwards
- Egg develops into a chick in **21** days by incubation
- Rearing of one day old chicks till the eighth week by providing supplemental heat is called  
-**Brooding**
- Artificial brooding is done in temperature controlled **Basket Brooders** ( for a small number of chicks ) and **Battery Brooders** ( for large number of chicks ).
- Basket Brooders have 'hanging brooding hovers' fitted with electrical bulb to provide supplemental heat and '*Chick Guards*' to retain chicks
- Battery brooders have thermostatic heat regulators and each Brooder can accommodate about  
- **30 chicks**
- The temperature in a brooder house is to be maintained at **95°F, 90°F** in the second week , **85°F** during the third week and **80°F** from the fourth week to the eighth week , for the *Layers*
- Aggregation of chicks under the Brooding Hover indicates that the temperature is 'low' and moving away from the Hover indicates that the temperature is 'high'
- 1 day old chicks are vaccinated against  
-**Marek's disease**
- 5 day old chicks are vaccinated against  
- **Ranikhet disease**
- 16 day old chicks are vaccinated against  
- **Fowl pox**
- 6 week chicks are given 'Booster Dose' against  
- **Fowl pox**
- 8-10 week chicks are given 'Booster Dose' against  
- **Ranikhet Disease**
- A young hen ( pullet ) starts laying eggs from  
- **17 to 20 weeks of age**
- One laying 'nest' is required for every  
- **4 Layer birds**
- '*Pre-Layer Mash*' is given from 17-20 weeks
- '*Layer Mash*' is given after 17 to 20 weeks
- Compared to pre layer mash , Layer mash has more  
- **Calcium (37 to 3.8 %)**
- **Good Layer birds** show - Thick ,waxy ,red combs

- ; long breast bone;widely placed pubic bones ;soft ,oily skin; moist vent ;shedding of feathers late and rapid ;laying of eggs at the time of shedding feathers
- **Poor layers** show – Thin combs and wattles ; small breast bones ;closely placed pubic bones ;dry and rough skin ;not laying eggs at the time of shedding feathers ;dry vent; shedding feathers early and slow.
- The most intensive system of poultry farming is the  
- **Cage system** or **Battery system**
- Birds raised in cage system suffer from  
- **Cage Fatigue** and **Fatty Liver Syndrome**
- In Deep Litter System the number of birds grown in each '*pen*' is  
- **250**
- Each layer bird in deep litter system requires a floor space of  
- **1.8 to 2 sq. feet**
- Deep litter systme helps in maintaining  
**constant temperature**
- The disease which is less common in deep litter system is  
**coccidiosis**
- Iron grills are used to prevent  
- '**roosting**' of birds on 'feeders'

## BROILERS

- A young chicken of 8to10 weeks age used for meat purpose is called  
- **Broiler / Fryer**
- A bird older and heavier than a broiler is called  
- **Roaster**
- Deep litter system of housing is followed in India mostly for raising Broilers
- For raising broilers an initial temperature of 95°F is required ; it is reduced at the rate of 5° per week to 70°F.
- Floor space requirement for a broiler bird is  
- **1.0 to 1.2 sq. feet**
- Broiler Starter Mash containing 25 % protein and 3200 k.cals. energy is provided upto the end of  
- **sixth week**
- Broiler Finish Mash containing 19 % protein and 3400 k. cals.of energy is given to birds of the age group  
- **7 to 10 weeks**

## POULTRY DISEASES:

- **RANIKHET** or **NEW CASTLE DISEASE**: caused by a *Paramyxovirus*; common in all age groups ;causes mass mortality; complete or partial paralysis and coughing are the common symptoms
- **Vaccination for Ranikhet disease**:  
Layers: First dose - 5th day to 7th day  
Booster dose - 30th day  
Broilers: First dose - 3rd day to 5th day  
Booster dose - 24th day to 26th day
- **MAREK'S DISEASE** : caused by a *Herpes group virus* ; affects mostly **2 to 4 month** old chicks

- **GUMBORO DISEASE** : caused by *IBD virus* ( Infectious Bursitis Disease ) ; affects mostly **2 to 12 week** old chicks ;spreads through contaminated food and water ; enlargement of Bursa of Fabricius and *white diarrhoea* are common.
- **Vaccination for Gumboro disease:**  
Layers - First dose - 14th to 16th day  
Booster dose - 20th to 26th day  
Broilers- First dose - 7th day to 9th day  
Booster dose - 16th to 18th day
- **FOWL CHOLERA** : caused by the bacterium *Pasteurella avicida* ;greenish diarrhoea, pin point foci on liver, pinpoint haemorrhages on the pericardium and bluish discolouration of combs are the common symptoms .
- **INFECTIOUS CORYZA** or **ROUP** :caused by the bacterium *Haemophilus gallinarum* ;affects all age groups ; passes through contaminated water and feed ; nasal and eye discharges with foul smell ; inflamed and swollen eyes .
- **CHRONIC RESPIRATORY DISEASE ( CRD )** : caused by the bacterium *Mycoplasma gallisepticum* ; transmission through eggs , nasal discharge and droppings ; sneezing ,swollen sinuses, respiratory distress , snoring and inflamed eyes are common symptoms
- **ASPERGILLOSIS / BROODER'S PNEUMONIA** :caused by the fungus *Aspergillus fumigatus* ; transmission by inhalation of Fungal spores ; congested lungs with nodules and difficulty in breathing are the common symptoms ; mostly affects brooders ; copper sulphate in drinking water is effective in the control ;
- **AFLATOXICOSIS**: caused by the fungus *Aspergillus fumigatus* ; spreads through contaminated food and water ;reduced immunity and susceptibility to infections are common symptoms .
- **THRUSH / MONILIASIS**: caused by the fungus *Oidium albicans* ( Monilia ) ; lesions in the mouth and gut are common symptoms ; Nystatin is an effective drug.
- **COCCIDIOSIS** : caused by the protozoan *Eimeria tenella* .

76. Which of the following poultry diseases can be transmitted to the young ones through eggs ?

1) C R D                      2) I B D

3) New Castle disease    4) Fowl cholera

- ## UNIT-VIII

- 1) 5-6                      2) 7-10  
3) 11-13                  4) 17-20
89. Which of the food items given here has the least Biological Value ?  
1). Milk                      2). Meat  
3). Egg                      4) Fish
90. Bluish discolouration of combs in poultry birds is indicated in  
1) Aspergillosis              2) Gumboro  
3) Aflatoxicosis              4) Fowl Cholera
91. Postmortem of a poultry bird showed spleenomegaly. The most probable cause of death is  
1) Marek's disease              2) Gumboro  
3) New Castle disease      4) Aflatoxicosis
92. The disease in poultry which reduces immunity and spreads through contaminated food is :  
**(EAMCET-2004)**  
1) Ranikhet disease      2) Aflotoxicosis  
3) Thrush                      4) Marek's
93. Chicks of the first two weeks in the Brooder hover are usually susceptible to one of the following :  
**(EAMCET : 2005)**  
1) Marek's disease      2) Fowl pox  
3) Ranikhet disease      4) Gumboro disease
94. In poultry birds nasal and eye discharges with foul smell, acute respiratory problem and inflamed and swollen eyes are the symptoms of **(EAMCET : 2007)**  
1) Chronic Respiratory disease  
2) Infectious coryza disease  
3) Brooder Pneumonia disease  
4) Marek's disease
95. A group of poultry breeds that evolved in a certain geographical area is  
1) A strain                      2) A variety  
3) A class                      4) A stock
96. An established group of birds having similar general body shape and other characteristics is  
1) A class                      2) A strain  
3) A breed                      4) A race
97. American class birds are mainly  
1) Meat type birds      2) Egg type birds  
3) Dual purpose birds      4) Layers
98. Asiatic class birds are chiefly  
1) Egg type birds              2) Meat type birds  
3) Dual purpose birds      4) Good layers
99. The chief breeds of Asiatic poultry birds are  
1) Wyandotte and Cornish  
2) Sussex and Brahma

- 3) Cochin and Brahma  
4) Australorp and Cochin
100. Meat bird of American class  
1) Cochin                      2) Sussex  
3) Cornish                      4) Rhode Island red
101. Which of the following is a hybrid broiler raised in India ?  
1) Hyline                      2) Hisex  
3) Hubbard                      4) Babcock
102. White leghorn is a  
1) Egg bird of Mediterranean class  
2) Meat bird of Asiatic class  
3) Dual bird of English class  
4) Meat bird of English class
103. Mediterranean class birds are mainly  
1) Meat birds                      2) Egg birds  
3) Dual purpose birds  
4) Highly resistant for diseases
104. Percentage of the nitrogen retained by the body for maintenance and growth  
1) Assimilation efficiency  
2) Biological value  
3) Protein efficiency ratio  
4) Exploitation efficiency
105. Measure used to evaluate the amount of protein utilised in the growth  
1) Biological value  
2) Protein consumption ratio  
3) Protein efficiency ratio  
4) Protein assimilation ratio
- LEVEL-II**
106. Congested lungs with nodules in poultry birds is an indication of  
1) viral disease which also causes enlargement of spleen  
2) bacterial disease which also shows nasal and eye discharges  
3) Fungal disease in which birds experience lowered immunity  
4) Fungal disease which is transmitted by inhalation of spores
107. Read the statements about different breeds/classes of poultry birds and choose the incorrect statement(s)  
i) Minorca is a Mediterranean egg bird  
ii) Cornish is an English breed of meat bird  
iii) New Hampshire is a dual purpose American class bird  
iv) Anconas is an English class of dual purpose bird.

- 1) i & iii                      2) ii & iii  
3) iii only                      4) iv only
108. The following are some common food items.  
Arrange the following in a sequence in the ascending order of PE ratio  
a) Rice    b) Meat    c) Fish    d) Egg  
1) a d b c    2) b c a d    3) a b c d    4) a c d b
109. Read the following statements and choose the right combination of correct statements :  
i) Combs and wattles of productive birds are smooth and thick  
ii) Good Layer birds shed feathers early and slow  
iii) Breast bone is long in productive birds  
1) All                              2) only i & ii  
3) only i & iii                      4) only ii & iii
110. If, lesions in the wall of the gut are the symptoms of a poultry disease  
i) anti bacterial drugs will be most useful  
ii) anti viral drugs will be most effective  
iii) antifungal drugs are the right choice to treat  
Identify the correct statement (s)  
1) i & ii                              2) i & iii  
3) i only                              4) iii only
111. Congestion in lungs and presence of nodules in the lungs of poultry birds  
i) is commonly seen in brooder birds  
ii) is most probably transmitted by inhalation of fungal spores  
iii) is caused by *Aspergillus flavus*  
Identify the correct statement (s)  
1) i & iii                              2) iii only  
3) ii & iii                              4) i & ii
112. Snoring in poultry birds  
i) is an effect of infection by a fungal pathogen such as *Oidium* sps  
ii) is a pathological effect of infection by a species of the smallest of the cellular pathogens  
iii) is a bacterial respiratory disorder associated with swollen sinuses, sneezing, inflamed eyes etc.  
Mark the correct statements  
1) i & ii    2) i & iii    3) ii & iii    4) iii only
- DIRECTION: 38-44 Qs follow the below options**  
**SI: Statement - I ; SII - Statement-II**  
1) Both SI & SII are true and SII is the correct explanation of SI  
2) Both SI & SII are true and SII is not correct explanation of SI  
3) SI is true but SII is false  
4) SII is true but SI is false
113. **SI:** Debeaking is an important management practice in poultry farming

- SII:** Debeaking prevents cannibalism among the birds and reduces wastage of food by birds
114. **SI:** In poultry farming, food given to pullets at the age of 17-20 weeks contain more amount of calcium  
**SII :** From 17-20 weeks pullets start laying eggs.
115. **SI:** Coccidiosis and worm infections are less common in deep litter system  
**SII:** Culling of sick birds is easier in deep litter system
116. **SI:** Vaccination is effective in controlling Gumboro disease  
**SII:** Gumboro disease is caused by IBD virus
117. **SI:** "Finish mash" given to broilers contain less percentage of protein compared to prestarter & Starter mash  
**SII:** Finish mash is given from 5-6 weeks during which growth rate of the bird decreases
118. **SI:** Birds suffering with aflatoxicosis are susceptible to infections.  
**SII :** In aflatoxicosis immunity of birds is reduced.
119. **SI :** Poultry birds suffering with Ranikhet disease show complete or partial paralysis.  
**SII :** In Ranikhet disease nervous system of birds is affected.
120. Match the following and select the correct option
- |                      | <b>List - I</b>            | <b>List - II</b> |
|----------------------|----------------------------|------------------|
|                      | <b>Management Practice</b> | <b>Period</b>    |
| A. First debeaking   | I. One day old             |                  |
| B. First deworming   | II. 8th week               |                  |
| C. First vaccination | III. 10th day              |                  |
| D. Second debeaking  | IV. 5th day                |                  |
|                      | V. 13 th or 14 th week     |                  |
- |    | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> |
|----|----------|----------|----------|----------|
| 1) | III      | II       | IV       | V        |
| 2) | III      | II       | I        | V        |
| 3) | I        | III      | II       | IV       |
| 4) | IV       | II       | I        | III      |
121. Match the following and select the correct option
- |                              | <b>List - I</b>        | <b>List - II</b>               |
|------------------------------|------------------------|--------------------------------|
|                              | <b>Vaccine against</b> | <b>Time period(for layers)</b> |
| A. Marek's                   | I. 30 days old chicks  |                                |
| B. Ranikhet                  | II. One day old chicks |                                |
| C. Fowlpox                   | III. 6 weeks age       |                                |
| D. Booster dose for Ranikhet | IV. 16 days old chicks |                                |
| E. Booster dose for fowl pox | V. Five day old chicks |                                |
|                              | VI. 13th or 14th week  |                                |
- |    | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
|----|----------|----------|----------|----------|----------|
| 1) | II       | V        | IV       | VI       | III      |
| 2) | II       | V        | IV       | I        | VI       |
| 3) | II       | V        | IV       | I        | III      |
| 4) | V        | II       | III      | I        | VI       |

122. Match the following and select the correct option.

**List - I** **List - II**  
**Food** **Biological value**

A. Egg	I 84%
B. Milk	II. 74%
C. Meat	III. 96%
D. Wheat	IV. 58 %
	V. 80 %

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1)	III	I	V	IV
2)	III	I	II	IV
3)	III	V	II	IV
4)	I	III	II	V

- 123 Match the following and select the correct option.

**List - I** **List - II**  
**Food** **Protein Efficiency ratio**

A. Rice	I 1.7
B. Fish	II . 2.0
C. Egg	III 4.5
D. Wheat	IV 3.0

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1)	II	IV	III	I
2)	III	II	IV	I
3)	I	III	IV	II
4)	II	IV	III	I

124. Match the following and select the correct option

**List - I** **List - II**  
**Poultry feed** **% of proteins**

A. Chickmash	I. 16.5
B. Prelayer mash	II. 25
C. Starter mash	III. 20
D. Grower mash	IV. 21
	V. 17.5

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1)	IV	III	II	V
2)	IV	I	II	V
3)	III	I	II	V
4)	IV	I	III	II

125. Read the following statements and choose the combinations of completely correct set of characters with reference to poultry birds.

<b>Pathogen</b>	<b>Disease</b>	<b>Symptom</b>
i) <i>Oidium albicans</i>	Thrush	Susceptibility to infections
ii) <i>Mycoplasma gallisepticum</i>	CRD	Foul smelling nasal discharge
iii) <i>Pasteurella avicida</i>	Fowl cholera	Haemorrhagic spots on pericardium

iv) *Herpes* group virus Marek's disease Splenomegaly

- 1) i & ii 2) ii & iii  
3) iii & iv 4) iii only

126. Read the following statements and choose the combinations with completely correct set of characters with reference to poultry birds :

<b>Organism</b>	<b>Symptom</b>	<b>Disease</b>
i) <i>Paramyxo virus</i>	Paralysis	New Castle disease
ii) <i>Aspergillus fumigatus</i>	Congested lungs	Aflatoxicosis
iii) <i>Haemophilus gallinarum</i>	Acute respiratory problem	Infectious Coryza

iv) *Pasteurella avicida* White diarrhoea Gumboro

- 1) i & iii 2) ii & iii  
3) i & iv 4) ii & iv

127. Read the following statements and choose the combinations with correct set of characters :

<b>Organism</b>	<b>Disease</b>	<b>Symptom</b>
i) <i>Pasteurella avicida</i>	Fowl cholera	Bluish discolouration of comb
ii) <i>Aspergillus fumigatus</i>	Brooder's pneumonia	Foul smelling discharge through nose lesions in gut
iii) <i>IBD virus</i>	Thrush	
iv) <i>Mycoplasma gallisepticum</i>	Chronic respiratory disease	Swollen sinuses

- 1) i & iii only 2) ii & iii only  
3) iv only 4) i & iv only

128. Match the following

<b>Poultry bird</b>	<b>Purpose / class</b>
A Wyandotte	i) Egg Bird of Mediterranean
B Cornish	ii) Meat Bird of American class
C Minorca	iii) Meat Bird of English class
D Rhode Island Red	iv) Dual purpose bird of American class
	v) Egg Bird of Asiatic class

**Correct Combination is :**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1)	iv	iii	i	v
2)	iii	iv	i	i
3)	iii	iv	i	v
4)	iv	iii	i	i

129. Match the following

<b>List - I</b>	<b>List - II</b>
A) <i>Pasteurella avicida</i>	i) Nystatin
B) <i>Aspergillus fumigatus</i>	ii) Copper sulphate
C) <i>Haemophilus gallinarum</i>	iii) Erythromycin
D) <i>Mycoplasma gallisepticum</i>	iv) Penicillin
	v) Streptomycin

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1)	iv	i	iii	v
2)	v	i	iii	iv
3)	iv	i	v	iii
4)	v	i	iv	iii

130. Arrange the following poultry feeds in **descending** order based on the percentage of protein they possess  
 A) Pre layer mash B) Prestarter mash  
 C) Grower mash D) Chick mash  
 E) Finish mash  
 1) ACDBE                      2) BDECA  
 3) ACEDB                      4) EBDCA

## BIOTECHNOLOGY

- Controlled use of microorganisms for beneficial purposes is - **Biotechnology**
- Manipulation of gene or an organism which is a part of Biotechnology is referred to as - **Genetic Engineering** or **Recombinant DNA Technology ( r DNA Technology )**
- Creation of new DNA segments not naturally found is called - **r DNA Technology**
- Required segments of DNA can be cut using enzymes commonly called - **Restriction Endonucleases**
- Fragments of DNA can be separated by - **Gel Electrophoresis**
- A restriction fragment containing desired base sequence ( desired gene ) can be identified by - **Southern Blotting Technique**
- Production of many copies of DNA is called - **Cloning**
- The segment of DNA to be cloned is called - **Donor DNA**
- Self replicating genetic material which can carry Donor DNA is called - **Cloning Vector**
- The most commonly used vectors are - **Plasmids of Bacteria**
- Plasmids of bacteria can be obtained by dissolving bacterial cell walls with the help of - **Lysozyme , Ethylene diamine tetra acetic acid ( EDTA) and treating with sodium Lauryl Sarcocinate solution**
- Purification of plasmids is done by - **Gel Electrophoresis** or by *Ultra centrifugation*
- Cleaving of vector DNA at specific sites is done by the help of - **Restriction Endonuclease** ( the same restriction endonuclease used to cut the donor DNA )
- Molecular scissors are - **Restriction endonucleases**
- The joining of cut ends of donor DNA and the vector DNA results in the production of - **r DNA** or **Chimeric DNA** ( which is a type of *hybrid DNA* )
- The enzyme used for joining the two segments of DNA is called - **Ligase**
- DNA ligase acts as - **Molecular glue/ gum**
- Other vectors are **BAC and YAC**
- BAC - Bacterial artificial chromosome**
- YAC - Yeast artificial chromosome**
- BAC and YAC are used for - **Much longer fragment manipulation**
- Chimeric DNA can be introduced into a bacterium directly by using - **Calcium chloride**
- Transfer of chimeric DNA can also be done by Phage mediated genetic transfer called - **Transduction**
- Bacteria containing rDNA are identified by using - **Genetic Markers** or by *Colony Hybridisation Technique*
- The required product is obtained by - **Propagating the genetically engineered bacteria in large quantities in cultures and recovering the product**
- Substances commonly referred to as molecular scissors are the - **Restriction Endonucleases**
- The nucleotide sequence at which the endonucleases cleave the DNA is called - **Restriction Site**
- If both strands break at the centre of symmetry the DNA strands possess - **Blunt ends** or *Flush ends*
- If the cuts are placed around the line of symmetry the DNA strands possess - **Sticky ends** or *Cohesive ends*
- If the sequences read the same on both the strands in 5' to 3' directions , they are called - **Palindromes** or *Palindromic sequences*
- The enzymes that break the DNA from the ends of the polynucleotide molecule ( *hydrolysing phosphodiester bonds of the terminal nucleotides* ) are called - **Exonucleases**
- One of the earliest genetically engineered plasmids is - **pBR 322**
- Viruses mostly used as vectors are - **M13 , Lambda phages**
- Hybrid Vectors which have the combined features of plasmids and bacteriophages are the - **Cosmids**
- Cosmid is formed by - **Cos sequence of the**

### *Lambda phage* and **Plasmid DNA**

- Cos sequence of a cosmid facilitates - **Incorporation of long foreign DNA chains**
- Plasmid sequence of a cosmid is useful in - **Replication**

### **Polymerase Chain Reaction (PCR):**

- Huge number of copies of gene can be made by - **PCR**
- **PCR** is done on - **automated cycler**
- Protocol of PCR
  - Denaturation at 94°C
  - Annealing at 54°C
  - Extension at 72°C
- During denaturation, the double stranded DNA melts by - **Breaking down of hydrogen bonds**
- Primers of reaction mixture moving around is caused by - **Brownian motion**
- Ideal working temperature of DNA polymerase of reaction mixture - **72°C**

### **Application of rDNA technology**

- The 'miniature chemical factories' used in Biotechnology are the - **Microorganisms**

### **I. Alcohols, Acids and Vitamins**

- Degradation of organic substrates anaerobically by microorganisms is called - **Fermentation**
- The mixture of alcohol and petrol used as fuel is called - **Gasohol**
- The microorganism used for producing Ethanol (ethyl alcohol) is - ***Saccharomyces cerevisiae***
- The process used for the production of strong alcohols such as whisky, brandy and rum is - **Distillation**
- 3 % to 5 % acetic acid is the commercial product called - **Vinegar**
- Vinegar is produced from ethanol by the help of the microbe - ***Acetobacter***
- The microbe used for the production of citric acid is - ***Aspergillus niger***
- Lactic acid is produced from *molasses* and dairy *whey* with the help of - ***Lactobacillus bulgaricus***
- The amino acid glutamic acid is produced by the help of - ***Micrococcus glutamicus***
- The microbe useful in the production of Vit. B<sub>2</sub> is - ***Ashbya gossypi***
- The microbe useful in the production of Vit. B<sub>12</sub> is - ***Streptomyces olivaceus***

### **II. Antibiotics**

- The antibiotic activity of penicillin of *Penicillium*

*notatum* was first noticed by - **Alexander Fleming** (while working on the bacterium *Staphylococcus aureus*)

- Industrial production of **Penicillin** from *Penicillium chrysogenum* was first done by - **Flemming, Chain and Florey**
- Streptomycin was discovered by - **Waksman**
- Streptomycin is obtained from - ***Streptomyces griseus***
- Antibiotics destroy microbes by - **Preventing cell wall synthesis, inhibiting nucleic acid and protein synthesis etc.**
- Nystatin and Griseofulvin are chemicals acting against - **Fungi**
- Healthy *flora* of the gut (beneficial intestinal bacteria) are referred to as - **Probiotics**
- Organisms mostly used as *probiotic* organisms are - ***Lactobacilli*, *Bifidobacteria***

### **III. Enzymes**

- *Biological catalysts* are - **Enzymes**
- The enzyme *Streptokinase* is useful in - **Dissolving clots of blood in blood vessels (to prevent attacks and strokes)**
- *Streptokinase* is obtained from - ***Streptococcus pyogenes***
- The enzyme *DNA polymerase* is useful in - **Polymerase Chain Reaction**
- DNA polymerase is biotechnologically produced from - ***Trichoderma reesi***
- The enzyme useful in removing stains from clothes (protein stains) is - **Alkaline Serine Protease**
- *Alkaline Serine Protease* is obtained from - ***Bacillus licheniformes***
- The enzyme useful in the production of *cheese* (coagulation of milk) is - **Rennin**
- Rennin is obtained from - ***Mucor pusillus***
- With reference to enzymes, rDNA technology is now-a-days useful in the production of - **Designer Enzymes** (which are useful in *photography industry, rubber industry, and baking, brewing, paper industries*)

### **IV. Pollution control**

- Bacterial biopesticide is - ***Bacillus thuringiensis***
- *Bacillus thuringiensis* controls the insects that affect - **Cabbage, potato etc.,**
- Oil pollution can be controlled by using - ***Pseudomonas putida***

- For the treatment of sludge, the organisms used are - *Achromobacter*, *Arthrobacter*, *Citromonas*, *Flavobacterium*, *Pseudomonas* (Heterotrophic bacteria)
- *Nitrobacter*, *Nitromonas* (Autotrophic bacteria)
- Organisms which can consume bacteria are *Sphaerotilus natans*, *Zoogloea* (Fungi) and some ciliated protozoans

#### V. Vaccines

- The cultured microbes without virulence - **Attenuated Whole Agent Vaccines**
- Attenuated whole agent vaccines are against - **Yellow fever, measles, rubella, mumps etc.,**
- Previously virulent have been killed with chemicals or heat - **Inactivated Whole Agent Vaccines**
- Inactivated whole agent vaccines are against - **Flu, Cholera, Bubonic plague, Hepatitis A**
- Inactivated exotoxins from microorganisms that contain toxoids are - **Toxoid vaccines**
- Toxoid based vaccines are against - **Tetanus, Diphtheria etc.,**
- A fragment of microorganisms that gives immune response is used in - **Subunit or component vaccines**
- Subunit vaccines are against - *Haemophilus influenzae* type B
- Recombinant vector vaccine and DNA vaccines are developed to provide immunity against **diseases that have complex infection processes**

#### VI. Hormones

- The First human gene product manufactured using rDNA technology is - **Insulin**
- The human growth hormone produced by biotechnology is the - **Somatotropin**
- Somatostatin of the hypothalamus inhibits the secretion of - **hGH (human growth hormone)**
- Somatostatin secreted by the Delta cells of the pancreas inhibits the secretion of - **Insulin**
- Somatostatin produced by Biotechnology is useful in - **the treatment of Pancreatitis**
- Erythropoietin produced by biotechnology is useful in - **production of RBC and treatment of burns**
- Erythropoietin in the human body is secreted by - **Kidney**

#### VII. Interferons

- Viral infected cells in the human body produce substances called - **Interferons**

- Nature of interferons is - **Glycoproteins**
- Function of interferons is - **protection of uninfected cells from viral infection**
- Interferons were first isolated by - **Issac and Linderman**
- *Alpha & Beta interferons* are - **Class I interferons**
- *Alpha Beta interferons* are formed by - **All viral infected cells**
- *Gamma interferons* are - **Class II interferons**
- *Gamma interferons* are formed by - **T cells**
- Interferons enhance the expression of **MHC molecules**
- Interferons activate the **Macrophages and NK cells**
- Biotechnologically interferons are produced by genetically engineered - **Bacteria, Fungi, and Mammalian cells**
- Other medicinal uses of interferons include - **Cancer therapy, Treatment of viral diseases such as Rabies, Dengue, and Hepatitis**

#### VIII Monoclonal Antibodies

- Antibodies produced by a clone of specific lymphocytes are called - **Monoclonal antibodies**
- *Hybridoma Technology* for the production of monoclonal antibodies was invented by - **Kohler and Milstein**
- Hybridoma Technology is based on a hybridisation technique called - **Somatic Hybridisation**
- Hybridoma cell is produced by the fusion of - **B lymphocyte and Myeloma cell**
- The two important functions (of the parental cells) of the *Hybridoma cells* are - **Antibody formation of the B lymphocyte and Uncontrolled division property of the Cancer cell**
- The antibodies produced by a clone of Hybridoma cells are called - **Monoclonal antibodies**
- *Monoclonal antibodies* react with - **Specific antigens**
- Kohler and Milstein obtained B cells for Hybridoma formation from - **Spleen of rat**
- Myeloma cells are obtained from - **Tumours of rat**
- The substance that is useful as *Fusogen* for the formation of Hybridoma is - **Poly Ethylene Glycol (PEG)**
- The medium used for the identification and selection of Hybridoma cells is - **HAT medium**



( Hypoxanthine, Aminopterin ,Thymidine mixture )

- HAT resistant cells are
  - Spleen cells and Hybrid cells
- Cells that die in HAT medium are
  - Myeloma cells
- Spleen cells survive for about
  - One or two days
- Hybridoma cells are cultured for commercial production of -**MABs** (*Monoclonal Antibodies*)
- MABs diagnostically used to detect - **Chlamydia** (a streptococcus bacterium)
- MABs are useful for - **Suppression of Transplant Rejections and for the detection of antigens by Serological tests quickly**
- MABs are also used in **Neutralizing exotoxins, inhibition of platelet clumping in patients who had undergone angioplasty treatment of autoimmune reactions**

**BIOTECHNOLOGY**

**LEVEL-I**

131. HAT resistant cells are
  - 1) Spleen cells                      2) Hybrid cells
  - 3) Myeloma cells
  - 4) Both spleen & Hybridoma cells
132. Vitamin  $B_2$  and  $B_{12}$  are industrially produced by using the microbes
  - 1) *Ashbya gossypii*, *Streptomyces olivaceus*
  - 2) *Aspergillus flavus*, *Saccharomyces* sps
  - 3) *Lactobacillus*, *Micrococcus* sps
  - 4) *Saccharomyces cerevisiae*, *Acetobacter* sps
133. Which of the following organisms are used as probiotics?
  - 1) *Aspergillus* and *Lactobacilli*
  - 2) *Bifidobacteria* and *Ashbya*
  - 3) *Lactobacilli* and *Bifidobacteria*
  - 4) *Micrococcus* and *Aspergillus*
134. Enzyme used in fabric softening and brightening is
  - 1) Protease                      2) Cellulase
  - 3) Polymerase                      4) Amylase
135. Enzymes used in dissolving the blocks of coronary blood vessels to prevent heart attacks are
  - 1) Polymerases                      2) Proteases
  - 3) Rennins                      4) Streptokinases
136.  $\alpha$  - interferons &  $\beta$  -interferons are produced by
  - 1) Viral infected cells                      2) Macrophages
  - 3) Viruses                      4) T-cells
137. Commercially produced enzyme that removes protein stains is
  - 1) Streptokinase                      2) DNA Polymerase
  - 3) Cellulase                      4) Alkaline serine protease

138. Toxoid vaccines are used against
  - 1) Rubella                      2) Mumps
  - 3) Cholera                      4) Diphtheria
139. Which of the following are hybrid vectors used in r-DNA technology ?
  - 1) bacteriophages                      2) plasmids
  - 3) phasmids                      4) cosmids
140. The enzyme that forms linear chains of nucleotides from a medium containing nucleotides is obtained from the microbe called
  - 1) *Thermus aquaticus*                      2) *Trichoderma reesi*
  - 3) *Streptococcus pyogenes*
  - 4) *Staphylococcus aureus*
141. Citric acid is industrially produced using the microbe
  - 1) *Ashbya gossypii*
  - 2) *Staphylococcus aureus*
  - 3) *Streptomyces griseus*
  - 4) *Aspergillus niger*
142. The first human gene product(s) using rDNA technology is
  - 1) hGH                      2) Erythropoietin
  - 3) Insulin                      4) Monoclonal antibodies
143. The discovery of one of the following is instrumental in the advancement of Recombinant DNA Technology: **( EAMCET:2004 )**
  - 1) Genetic code                      2) t-RNA
  - 3) Endonucleases                      4) Antibiotics
144. The enzyme employed for amplification of DNA during PCR is commercially obtained from : **( EAMCET:2006 )**
  - 1) *Streptococcus pyogenes*
  - 2) *Bacillus licheniformis*
  - 3) *Trichoderma reesi*
  - 4) *Thermus aquaticus*
145. In rDNA technology restriction fragments of DNA can be separated by
  - 1) Gel electrophoresis method
  - 2) Southern blotting technique
  - 3) Colony hybridization technique
  - 4) Western blotting technique
146. In rDNA technology a restriction fragment containing desired base sequence (desired gene) can be identified by
  - 1) Gel electrophoresis method
  - 2) Southern blotting technique
  - 3) Western blotting technique
  - 4) Colony hybridization technique
147. DNA to be cloned is called
  - 1) Vector DNA                      2) Chimeric DNA
  - 3) Donor DNA                      4) rDNA

148. Commonly used vectors in rDNA technology  
 1) Plasmids of bacteria  
 2) Plasmids of bacteria  
 3) Cosmids  
 4) Bacteriophages
149. Plasmid vectors are purified by  
 1) Gel electrophoresis method or southern blotting technique  
 2) Ultra centrifugation method or gel electrophoresis method  
 3) Ultra centrifugation method or southern blotting technique  
 4) Colony hybridization method of western blotting method
150. The hybrid DNA formed in the rDNA technology is called.  
 1) Mosaic DNA  
 2) Chimeric DNA  
 3) Chimaera  
 4) ds DNA
151. In rDNA technology the chimeric DNA can be introduced directly into suitable recipient bacterial cells by using  
 1) Calcium carbonate  
 2) Magnesium chloride  
 3) Calcium chloride  
 4) Sodium chloride
152. Phage mediated introduction of hybrid DNA into bacterial cells is called  
 1) Transformation  
 2) Transduction  
 3) Transcription  
 4) Transfection
153. If the cuts of DNA molecule are symmetrically placed around the line of symmetry, it generates DNA strands with  
 1) Flush ends  
 2) Cohesive ends  
 3) Blunt ends  
 4) Both flush and blunt ends
154. The sticky ends bind to the complementary nitrogen bases of the other DNA fragments by  
 1) Phosphodiester bonds  
 2) Hydrogen bonds  
 3) Disulphide bonds  
 4) Peptide bonds
155. These enzymes cleave nucleotides from the ends of polynucleotide molecule  
 1) Nucleases  
 2) Exonucleases  
 3) Endonucleases  
 4) Ligases
156. Cloning vehicles carry  
 1) Pathogens  
 2) Microorganisms  
 3) DNA molecules  
 4) RNA molecules
157. The character /s of a good vector  
 1) It must be able to replicate  
 2) It should be possible to introduce vector DNA into the cell  
 3) It must be possible to grow and identify them easily  
 4) All the above
158. Which of the following are **not** used as vectors?  
 1) Plasmids  
 2) Bacteriophages  
 3) Cosmids  
 4) Plasmids
159. Phage head is formed by  
 1) Carbohydrates  
 2) Fats  
 3) Proteins  
 4) Glycolipids
160. In bacteriophage nucleic acid molecule is present in  
 1) The phage tail  
 2) The phage neck  
 3) The phage head  
 4) The entire phage
161. In cosmids cos sequence facilitates  
 1) Easy replication  
 2) Easy insertion of foreign DNA  
 3) Incorporation of relatively longer foreign DNA  
 4) Easy identification of bacterial cells
162. Ethanol is a common solvent used in producing  
 1) Gasolene  
 2) Gasohol  
 3) Gas  
 4) Petrol
163. Gasohol is a mixture of  
 1) Gas and alcohol  
 2) Gas and petrol  
 3) petrol and alcohol  
 4) Gasolene and gas
164. Ethanol is produced industrially by using  
 1) the bacterium *Lactobacillus bulgaricus*  
 2) the yeast *Saccharomyces cerevisiae*  
 3) the fungus *Aspergillus niger*  
 4) the bacterium *Streptomyces olivaceous*
165. Raw materials from which ethanol is produced industrially  
 1) Cornstarch and molasses  
 2) Sugar beets and potatoes  
 3) Grapes  
 4) All these
166. In the production of commercial vinegar yeast *Saccharomyces cerevisiae* is used for  
 1) The fermentation of ethanol  
 2) Oxidation of ethanol  
 3) The fermentation of cornstarch, molasses etc.  
 4) The oxidation of cornstarch, molasses etc.
167. In the production of commercial vinegar Acetobacter is used for  
 1) The fermentation of cornstarch, molasses etc.  
 2) The fermentation of ethanol  
 3) The oxidation of cornstarch molasses etc.  
 4) The oxidation of ethanol
168. This fungus is used to produce citric acid from cornstarch  
 1) *Aspergillus niger*  
 2) *Aspergillus fumigates*  
 3) *Aspergillus flavus*  
 4) *Penicillium notatum*
169. The vitamin that is produced industrially by using *Ashbya gossypii*  
 1) Vitamin B<sub>2</sub> (Riboflavin)  
 2) Vitamin B<sub>12</sub> (Cyanocobalamin)  
 3) Vitamin B<sub>6</sub> (Pyridoxine)  
 4) Vitamin B<sub>1</sub> (Thiamine)

170. Industrial production of penicillin was developed by  
 1) Alexander Fleming, Chain, Florey  
 2) E. Chain, Florey, Waksman  
 3) Alexander Fleming, Louis Pasteur  
 4) Lindermann, Milsten, Waksman
171. Anti fungal antibiotics among the following  
 1) Gentamycin and kanamycin  
 2) Pencillin and cephalosporin  
 3) Chloramphenicol and colistrin  
 4) Nystatin and griseofulvin
172. The organism used in the control of oil pollution  
 1) *Trichomonas* 2) *Monas*  
 3) *Pseudomonas* 4) *Chilomonas*
173. The hormone inducing the production of RBC is secreted by  
 1) Hypothalamus 2) Liver  
 3) Delta cells of pancreas 4) Kidneys
174. Properties of hybridoma cell  
 1) Antibody secretion and controlled division  
 2) Antibody secretion and uncontrolled division  
 3) Formation of memory cells and uncontrolled division  
 4) Formation of plasma cells and uncontrolled division

### LEVEL-II

175. The following are the steps in the production of new recombinant DNA.  
 a) Production of restriction fragments  
 b) Separation of fragments by Gel electrophoresis  
 c) Cleavage of the vector DNA  
 d) Joining of donor DNA to the vector DNA  
 Arrange them in the correct sequence  
 1. a - b - c - d 2. c - d - b - a  
 3. b - a - c - d 4. c - a - b - d
176. Study the following and choose the **correct** answer
- | Microbe                         | Product                  | Use                 |
|---------------------------------|--------------------------|---------------------|
| I) <i>Thermus aquaticus</i>     | DNA polymerase           | PCR                 |
| II) <i>Mucor pusillus</i>       | Alkaline serine protease | Coagulation of milk |
| III) <i>Trichoderma reesi</i>   | Cellulase                | Fabric softening    |
| IV) <i>Streptomyces griseus</i> | Streptomycin             | Antibiotic          |
- 1) I and IV 2) II and III  
 3) I, II and III 4) I, III and IV
177. Read the statements about rDNA technology and choose the **incorrect** statement(s) :  
 i) Restriction endonucleases are referred to as molecular scissors

- ii)  $M_{13}$  bacteriophage is useful as cloning vehicle in rDNA technology  
 iii) Plasmids are self replicating polymers of ribose nucleotides which are used as vectors in genetic engineering  
 iv) Cos sequence of cosmids are more suitable for ligation of long DNA fragments  
 1) iv only 2) iii only 3) ii & iv 4) i & iv
178. Read the following statements and choose the right combination with reference to r-DNA technology  
 i) Both donor DNA and vector DNA are cleaved at specific sites with the help of the same restriction endonuclease  
 ii) Hybrid DNA is also called chimeric DNA.  
 iii) Ligases are called molecular scissors.  
 1) All 2) only i & ii  
 3) only i & iii 4) only ii & iii
179. Identify the correct answer :  
**Assertion (A)** : Palindrome nucleotide sequences can be obtained by using endonucleases only.  
**Reason (R)** : Endonucleases cut DNA strands at random.  
 1) A & R are correct and R does not explain A  
 2) A & R are incorrect  
 3) A is correct and R is incorrect  
 4) A is incorrect and R is correct

180. Match the following :

#### List - I

- A) *Acetobacter*  
 B) *Aspergillus niger*  
 C) *Saccharomyces cerevisiae*  
 D) *Streptomyces olivaceus*

#### List - II

- i) Citric acid  
 ii) Cobalamin  
 iii) Ethanol  
 iv) Riboflavin  
 v) Vinegar

	A	B	C	D
1)	iv	i	iii	i
2)	v	i	iii	i
3)	v	i	i	iii
4)	iv	v	i	i

181. Match the following :

#### List I

- A) Rennin  
 B) Streptokinase  
 C) Alkaline serine protease  
 D) Cellulase

#### List II

- i) Dissolves blocks in blood vessels  
 ii) *Bacillus licheniformes*  
 iii) *Trichoderma reesi*  
 iv) *Mucor pusillus*  
 v) *Thermus aquaticus*

	A	B	C	D
1)	iv	i	i	iii
2)	iv	i	i	v
3)	iv	i	i	iii
4)	v	iv	i	iii

182. **List I** **List II**  
 A) Hybridoma technology i) Platelets of blood  
 B) Beta interferons ii) Alexander Fleming  
 C) Megakaryocytes iii) Kohler and Milstein  
 D) Streptomycin iv) Waksman  
 v) Viral infected cells

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1)	iii	iv	v	i
2)	iii	v	i	iv
3)	iii	v	iv	i
4)	v	iii	i	iv

183. Match the following :

<b>List I</b>	<b>List II</b>
A) Cos sequence	i) MABs
B) Serological tests	ii) Treatment of burns
C) Beta interferon	iii) Viral infected cells
D) Erythropoietin	iv) Leucocytes
	v) Phage lambda

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1) iv	i	iii	i
2) v	i	i	iii
3) v	i	iii	i
4) v	iii	i	i

184. Match the following and select the correct option.

<b>List - I</b>	<b>List - II</b>
A. Gel electrophoresis	I. Introduction of Chimeric DNA into bacterial cells.
B. Colony hybridisation	II. Restriction fragments of DNA are produced
C. Southern blotting	III. Identification of restriction fragments with desired DNA
D. Phage mediated transduction	IV. Bacteria containing rDNA are identified
	V. Restriction fragment containing desired gene is identified
	VI. Restriction fragments of DNA are separated

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1) III	IV	V	I
2) V	IV	III	I
3) V	IV	II	VI
4) VI	V	III	IV

185. Match the following and select the correct option.

<b>List - I</b>	<b>List - II</b>
A. Ligases	I. Cleave the ds DNA at specific places
B. Exonucleases	II. Join two nucleotide fragments
C. Designer enzymes	III. Produced for specific activities using rDNA technology
D. Restriction endonucleases	IV. Cleave nucleotides from the ends of polynucleotide molecule

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1) II	IV	III	I
2) II	III	IV	I
3) I	IV	III	II
4) II	I	III	IV

186. Match the following and select the correct option.

<b>List - I</b>	<b>List - II</b>
A. Plasmids	I. Hybrid vectors
B. Palindromes	II. Self replicating circular DNA in addition to chromosome in bacteria
C. Bacteriophages	III. The sequences that read same on both strands of DNA
D. Cosmids	IV. Small particles capable of growing only in bacteria

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1) II	I	III	IV
2) I	II	IV	III
3) II	III	IV	I
4) IV	III	II	I

187. Match the following and select the correct option

<b>Microbial products</b>	<b>Use</b>
A. Immunising agents	I. Vitamins
B. Primary metabolic products	II. Antibiotics
C. Large molecules	III. Enzymes
D. Secondary metabolic products	IV. Vaccines

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1) IV	II	III	I
2) I	III	II	IV
3) IV	I	III	II
4) II	I	IV	III

188. Match the following and select the correct option regarding Microbial products.

**List - I**

- A. Monoclonal antibodies  
B. Interferons  
C. Probiotics  
D. Vaccines

**List - II**

- I. Treatment of autoimmune diseases  
II. Cancer therapy and treatment of viral infections  
III. Induce artificial active immunity in the body of the host  
IV. Friendly germs with positive influence on health  
V. Used in serological tests to detect antigens and pathogens in quick and accurate manner

	A	B	C	D
1)	I	V	II	IV
2)	V	III	II	I
3)	I	II	IV	III
4)	I	V	IV	III

189. Match the following and select the correct option regarding Microbial products.

**List - I**

- A. Fleming, Chain and Florey  
B. Waksman  
C. Issac and Lindermann  
D. Kohler and Milstein

**List - II**

- I. Discovered streptomycin  
II. Developed industrial production of penicillin  
III. Produced insulin  
IV. Developed hybridoma technology  
V. First isolated interferons

	A	B	C	D
1)	III	I	V	IV
2)	II	I	V	IV
3)	II	III	IV	V
4)	IV	II	III	I

1) A & R are correct and R does not explain

A 2) A & R are incorrect

3) A is correct and R is incorrect

4) A is incorrect and R is correct

190. **Assertion (A) :** In rDNA technology to isolate plasmids from bacteria, bacterial cells are treated with lysozyme and EDTA

**Reason (R) :** Lysozyme and EDTA dissolve bacterial cell wall.

191. **Assertion (A) :** The recognition sequence of endonuclease is symmetrical

**Reason (R) :** The sequence in 5' to 3' directions on one strand is same as the sequence in 3' to 5' direction on the complementary strand.

192. **Assertion (A) :** Cosmids are the hybrid vectors.

**Reason (R) :** Cosmids are constructed using the cos sequences of the phage lambda and plasmid DNA of bacteria.

193. **Assertion (A) :** As per microbiology microorganisms are considered as 'miniature chemical factories'.

**Reason (R) :** Microorganisms have the capacity to convert a raw material into useful and valuable end product.

194. **Assertion (A) :** Vitamins are the primary metabolic products of microbes.

**Reason (R) :** Vitamins are the products that are not used by microorganisms.

195. **Assertion (A) :** Antibiotics are the secondary metabolic products of microorganisms.

**Reason (R) :** Antibiotics are the metabolic products that are used as immunising agents.

196. **Assertion (A) :** Vaccines are used in the prevention of diseases.

**Reason (R) :** Vaccines induce artificial passive immunity in the body of host.

197. **Assertion (A) :** Streptokinase is used to prevent attacks or strokes.

**Reason (R) :** Streptokinase dissolves the blocks of coronary and cerebral blood vessels

198. **Assertion (A) :** Enzymes produced using rDNA technology are called designer enzymes.

**Reason (R) :** By using rDNA technology enzymes for specific activities are produced.

199. **Assertion (A) :** Somatostatin is used in the treatment of pancreatitis.

**Reason (R) :** Somatostatin inhibits the excess secretion of insulin and glucagon in pancreatitis.

200. **Assertion (A) :** Interferons are used in the cancer therapy and in the treatment of viral infections.

- Reason (R) :** Interferons enhance the increased expression of MHC molecules and promote the antiviral activity of macrophages and NK cells
201. **Assertion (A):** In the production of hybridomas, B- lymphocytes and myeloma cells are mixed in the presence of polyethylene glycol  
**Reason (R) :** Polyethylene glycol is a fusogen, which promotes fusion of B cells and myeloma cells.
202. Which of the following is **not correct**  
 1) Cellulase produced from *Trichoderma reesi* is used in fabric brightening  
 2) Streptokinase produced from *Streptococcus pyogenes* is used in dissolving blood clots  
 3) DNA polymerase produced from *Thermus aquaticus* is used in polymerase chain reaction  
 4) Rennin produced from *Bacillus* is used to remove complex stains on clothes

203. Read the following statements and choose the combinations with correct set of characters :

<b>Organism/Product Discoverer/Inventor</b>	<b>Source of discovery/Use</b>
i) Penicillin Alexander Fleming	<i>Penicillium chrysogenum</i>
ii) Streptomycin Waksman	<i>Streptomyces griseus</i>
iii) Interferons Issac & Linderman	Cancer therapy
iv) MABs Production Kohler & Milstein	Suppression of transplant organ rejection
1) All 2) iii & iv only	3) i, ii & iv only 4) ii, iii & iv only

204. Read the following statements and choose the choice with incorrect combination(s) :

<b>Organism / tissue</b>	<b>Cells/Product / function</b>	<b>Character II /Distribution/Function</b>
i) Probiotics	Lactobacilli	Friendly intestinal flora
ii) <i>Streptomyces olivaceus</i>	Streptomycin	Antibiotic which controls microbial growth
iii) <i>Acetobacter</i>	Heterotrophic bacteria	Treatment of sewage
iv) <i>Pseudomonas putida</i>	Bacterium	Oil eating
1) i & iii only 2) ii only	3) iii & iv only	4) i, iii & iv only

205. Read the following statements and choose the incorrect combination(s) :

<b>Organism</b>	<b>Character/Product</b>	<b>Character II /Effect/Function</b>
i) <i>Zoogloea</i>	a prokaryotic organism	treats sewage
ii) <i>Bacillus thuringiensis</i>	Bacterium	Biopesticide
iii) <i>Thermus aquaticus</i>	microbe that produces a commercial enzyme	useful in polymerase chain reaction
iv) <i>Mucor pusillus</i>	Producer of rennin	fabric brightener
1) i & iii only 2) iii only	3) iv only	4) iii & iv only

## CELL CYCLE

- A typical 'cell cycle' includes  
- **Interphase and Cell division phase**
- Cyclins and kinases are studied clearly in - ***Saccharomyces cerevisiae***
- A typical cell cycle lasts for about  
- **20 to 24 hrs.**
- The *longest phase* in cell cycle is  
- **Interphase**
- The first phase of the interphase is - **G<sub>1</sub> phase**
- The synthesised products of G<sub>1</sub> phase include - **Ribosomes , membrane bound organelles and enzymes necessary for DNA replication**
- The event of S phase is - **Replication of DNA( doubling of total content of DNA)**
- The phase preceding the M phase is  
- **G<sub>2</sub> phase**
- G<sub>2</sub> phase is characterised by - **Increased nuclear volume , formation of proteins required for spindle formation etc.**
- Division phase is **M-phase**
- Cell spends most of the time in  
- **G<sub>1</sub> of the Interphase**
- Time required for these phases remains almost constant - **S and G<sub>2</sub> phases**
- An example for continuous cell cycles in man - **Dermal cells in the skin**
- Cells that withdraw from G<sub>1</sub> phase and enter G<sub>0</sub> phase - **Nerve cells , Muscle cells , RBC**
- Cells that re-enter cell cycle after G<sub>0</sub> phase  
- **Lymphocytes**

### Cell cycle Regulation

- The chief cell cycle regulator *proteins* are - **Cyclins and Kinases ( Regulatory subunits )**
- Types of *Cyclins* are  
- **G<sub>1</sub> cyclin (cyclin D) , S cyclin (cyclin E and A), and M cyclin (cyclin B)**
- The cell cycle regulators whose levels rise and fall with phases of cell cycle are the - **Cyclins**
- The cell cycle regulators whose levels remain stable are the - **Kinases**
- Nature of kinases is  
- **Phosphorylating Enzymes**
- *Kinases* cannot act on their own unless they are associated with - **Cyclins** ( hence called cyclin dependent kinases - **Cdks**)
- The function of kinases is - **Adding phosphate groups to proteins that control the process of cell cycle**

- Types of Cyclin - Cdk complexes -  
**G<sub>1</sub> - Cdk (Cdk4 or Cdk6), S- Cdk (Cdk2), M- Cdk (Cdk1) complexes**
- The Cyclin- Cdk complex that activates the Factors required for DNA replication in the S phase is - **G<sub>1</sub> Cdk - Cyclin Complex**
- The *inhibitor* of S- Cdk cyclin complex is degraded by - **G<sub>1</sub> Cdk - Cyclin complex**
- Proteins necessary for the replication of DNA in the S phase are phosphorylated by  
- **S Cdk- Cyclin complex**
- M Cdk - Cyclin complex is synthesised during  
- **S phase and G<sub>2</sub> phase**
- M Cdk - Cyclin complex is activated only after  
- **Replication of DNA**
- As DNA replication continues **cyclin E is destroyed**
- By this the level of mitotic cyclins begin to **rise**
- *Activated* M Cdk - Cyclin complex induces -  
**i. Condensation of chromosomes**  
**ii. Breaking of nuclear membrane**  
**iii. Spindle formation**
- Changes in Anaphase are promoted by - **Anaphase Promoting Complex(APC) or cyclosome**
- APC triggers the destruction of **Cohesins** and **allow the sister chromatids to separate**
- APC also stimulates **mitotic cyclins** by **activating a protein called ubiquitin**
- *APC* is activated by  
- **M Cdk - Cyclin complex**
- Decondensation of chromosomes , and reorganisation of nuclear membrane are favoured by - **Decrease in M Cdk - Cyclin complex**

### Check points

- G1 Check point in a cell cycle is provided by - **G<sub>1</sub> Cdk- Cyclin complex**
- G1 Check point allows the transition from  
- **G<sub>1</sub> to S phase**
- G2 Check point allows the transition from  
- **G<sub>2</sub> to M phase**
- G2 Check point is provided by  
- **M Cdk- Cyclin complex**
- Final Check point occurs during the  
- **Cell Division**
- Final Check point regulates - **Formation of spindle fibres and their attachment to the centromeres**

### Genes Regulating the Cycle

- The *gene* associated with formation of Cyclins is  
- **cdc 2 ( cell division cycle gene )**

- Adult stem cells are **undifferentiated cells found throughout the body**
- Somatic stem cells divide to replenish the dying cells and regenerate damaged tissues
- The gene associated with cell cycle regulation in mammals is - **P53 gene**
- Production of *cyclin kinase inhibitor* (CKI) is induced by the protein - **P53 protein**
- The function of **CKI** is - **Inactivation of Cdk - Cyclin complex**
- CKI arrests the cell at the - **G1 check point** (*allowing the cell to repair the damaged DNA*)
- The scientists who won Nobel Prize for the discovery of *cdc gene mutants* and cell cycle regulation events  
- **Nurse, Hartwell and Hunt**
- Possible uses of cell cycle regulation research -  
**Cancer treatment, skin repair with out grafting**

## CELL CYCLE LEVEL-I

206. Which of the following is an inactive phosphorylating enzyme of the cell cycle regulators ?  
1) G<sub>1</sub> cyclin                      2) M cyclin  
3) S cyclin                        4) CDK
207. Chromosomal condensation during the initial stages of cell division is induced by  
1) S-CDK cyclin complex  
2) M-CDK cyclin complex  
3) G<sub>1</sub>-CDK cyclin complex  
4) APC
208. Which of the following cells do not enter G<sub>0</sub> phase  
1. Dermal cells                  2. Nerve cells  
3. Muscle cells                  4. RBC
209. DNA replication occurs during  
1. G<sub>0</sub> phase                      2. G<sub>1</sub> phase  
3. G<sub>2</sub> phase                      4. S phase
210. Which of the following is seen during G<sub>2</sub> phase  
1. DNA replication  
2. Disappearance of nuclear membrane  
3. Formation of membrane bound organelles  
4. Proteins required for the formation of spindle fibers
211. APC is activated by  
1. G<sub>1</sub> - CdK complex    2. G<sub>2</sub> - CdK complex  
3. S - CdK complex    4. M - CdK complex
212. M-cdk cyclin complex is synthesized during  
1. S and G<sub>0</sub> phases    2. S and G<sub>1</sub> phases  
3. S and G<sub>2</sub> phases    4. G<sub>2</sub> phase only

213. Which of the following cells with draw from G<sub>1</sub> phase and permanently enter G<sub>0</sub> phase ?  
1) B lymphocytes              2) T lymphocytes  
3) Erythrocytes                4) All the above
214. The anaphase promoting complex is activated by : (*EAMCET:2006*)  
1) M cdk cyclin                2) G<sub>1</sub> cdk cyclin  
3) S cdk cyclin                4) Transcription factor
215. S-CDK complex inhibitor is degraded by  
1) G<sub>1</sub>-CDK cyclin complex  
2) M-CDK cyclin complex  
3) G<sub>1</sub> cyclin                      4) S cyclin
216. Consider the following statements about cell cycle and find out the incorrect one  
1) Doubling of DNA content occurs during S phase  
2) Nuclear volume increases during G<sub>1</sub> phase  
3) Protein required for spindle formation are produced during G<sub>2</sub> phase  
4) The inhibitor of S- Cdk complex is degraded by G<sub>1</sub> Cdk cyclin complex
217. These cells reenter the cell cycle from G<sub>0</sub> phase  
1) Lymphocytes  
2) Dermal cells of skin  
3) Nerve cells  
4) Muscle cells and RBC
218. Kinases of cell cycle are  
1) Hydrolysing enzymes  
2) Phosphorylating enzymes  
3) Acetylating enzymes  
4) Oxidative enzymes
219. Inhibitor of S-Cdk - cyclin complex is degraded by  
1) S- Cyclin                      2) G<sub>0</sub> - Cyclin  
3) G<sub>1</sub> - Cyclin complex    4) G<sub>0</sub>-Cdk-cyclin complex
220. Cell division is completed due to  
1) Decrease in M Cdk - cyclin complex  
2) Decrease in G<sub>1</sub> Cdk - cyclin complex  
3) Decrease in Anaphase promoting complex  
4) Decrease in S Cdk-cyclin complex
221. Final check point in cell cycle is during  
1) G<sub>1</sub> phase                      2) G<sub>2</sub> phase  
3) M phase                      4) S phase
222. Critical check point in the cell cycle is  
1) G<sub>1</sub> check point              2) G<sub>2</sub> check point  
3) M check point              4) S check point
223. This check point allows the transition of G<sub>1</sub> phase into S phase  
1) M check point              2) Final check point  
3) G<sub>2</sub> check point              4) G<sub>1</sub> check point



224. In cell cycle a second transition occurs at  
 1)  $G_1$  check point      2)  $G_2$  check point  
 3) M check point      4) Final check point
225. The concentration and activity of this complex act as  $G_2$  check point  
 1)  $G_1$  Cdk - cyclin complex  
 2) M Cdk - cyclin complex  
 3)  $G_2$  Cdk - cyclin complex  
 4) S Cdk - cyclin complex
226. The product of cdc 2 gene is  
 1) Cyclin      2) Kinase  
 3) CKI      4) Cdk- cyclin complex
227. The product of  $P^{53}$  gene functions as  
 1) A transcriptional inhibitor  
 2) A transcriptional enzyme  
 3) A transcriptional activator  
 4) Cyclin Kinase activator
228. This regulates the expression of other genes that control the cell cycle  
 1) cdk 2 gene      2) cdc 2 gene product  
 3) CKI      4)  $P^{53}$  gene

### LEVEL-II

229. The following are the statements about cell cycle and its regulation :  
 I) Meristematic cells in plants divide rapidly  
 II) Dermal cells in the skin of human beings divided slowly  
 III) Neurons, myocytes and erythrocytes withdraw from  $G_1$  phase and enter into non dividing state.  
 The correct combination is  
 1) All are correct  
 2) Only II and III are correct  
 3) Only I and III are correct  
 4) Only I and II are correct
230. The following are the phases in the cell cycle  
 A)  $G_1$  phase      B) M-phase  
 C) S-Phase      D)  $G_2$  phase  
 Arrange them in correct sequence starting from one division phase to the beginning of another division phase  
 1.  $B \rightarrow C \rightarrow A \rightarrow D$     2.  $B \rightarrow A \rightarrow C \rightarrow D$     3.  $A \rightarrow B \rightarrow D \rightarrow C$     4.  $A \rightarrow C \rightarrow D \rightarrow B$
231. Arrange the following events in cell cycle/cell cycle regulation in the correct order starting from  $G_1$  phase, neglecting events not mentioned here. a) Production of M-CDK cyclin complex b) Formation of  $G_1$  - CDK cyclin complex c) Replication of DNA d) Inducing production of mitotic spindle e) Degradation of M cyclin

- f) Formation of S-CDK complex  
 1) b f c a d e      2) b d a e c f  
 3) f b c a d e      4) f c b a e d
232. Study the following  
 I) The factors required for DNA replication in S-phase are activated  
 II) Activation of APC  
 III) Degradation of S-Cdk cyclin complex activator  
 IV) Stimulation of degradation of the cyclin B during mitosis  
 which of the above are **incorrect** pertaining to ' $G_1$  Cdk-cyclin complex'  
 1) I, III and IV      2) II, III and IV  
 3) II and IV      4) I only
233. Which of the following statement is **correct** pertaining to activated 'M-Cdk cyclin complex'  
 1) It is synthesized during 'S' phase and  $G_1$  phase  
 2) It induces the reorganization of nuclear membrane  
 3) It induces decondensation of chromosomes  
 4) It induces the formation of mitotic spindles
- 1) Both A and R are correct and R is correct explanation of A  
 2) Both A and R are correct and R is not correct explanation of A  
 3) A is correct but R is wrong  
 4) A is wrong but R is correct
234. **Assertion (A):** In the S phase of cell cycle the total content of DNA doubles up.  
**Reason (R):** In S phase DNA replication occurs.
235. **Assertion (A):**  $G_2$  phase of cell cycle is characterised by increased volume of cell  
**Reason (R):** Proteins required for spindle formation are produced during  $G_2$  phase.
236. **Assertion (A):** Kinases of cell cycle regulation are called cyclin dependent kinases.  
**Reason (R):** Kinases of cell cycle regulation are catalytic but cannot act independently until they are associated with cyclins.
237. **Assertion (A):** In mammals  $p^{53}$  gene is also associated with cell cycle regulation.  
**Reason (R):** The product of  $p^{53}$  gene functions as a transcriptional activator and regulates the expression of other genes that control cell cycle.
238. Study the following  
 I.  $G_1$  phase begins after mitosis  
 II. In S phase DNA replication occurs.

III. In G<sub>2</sub> phase proteins required for spindle formation are produced.

IV. Cells spend most of the time in M phase.

Identify the correct statements.

1) I, II and IV    2) I, II and III

3) II, III and IV    4) All

239. Study the following

I. Time for this phase varies in different cells.

II. Substrates and enzymes required for DNA replication are synthesized during this phase.

III. Nuclear volume increases.

IV. DNA replication occurs.

V. Total content of DNA doubles up.

Which of the above are applicable to S phase of cell cycle ?

1) II, IV and V    2) I, II and III

3) IV and V    4) IV, V and III

240. Match the following and select the correct option regarding cell cycle regulation.

List - I

List - II

A. Cyclins

I. M check point

B. Kinases

II. Pulling of chromosomes to the poles

C. APC

III. Function as transcriptional activator

D. P<sup>53</sup> protein

IV. Regulatory sub units

V. Phosphorylating enzymes

A	B	C	D
1) I	V	III	II
2) IV	V	II	III
3) IV	I	V	III
4) V	IV	I	II

## CANCER BIOLOGY

- Erratic, uncontrolled cell division resulting in the formation of a mass of cells called tumour is referred to as - **Cancer**
- Cancerous tissue is - **autonomous, aggressive and atypical of the parent cells**
- Study of tumours is called - **Oncology**
- The abnormal mass of cells in tumour - **Neoplasm**
- Cancerous tumours are called - **Malignant tumours**
- Non - cancerous tumours are called - **Benign tumours**
- Cells can detach and migrate to other parts of the body in the case of - **cancerous tumours**
- Migration of cancer cells to other parts of the body is called - **Metastasis**
- A *localised* tumour with a *fibrous capsule* is - **Benign tumour**

- The tumours that do not show metastasis are the - **Benign tumours**
- Cells do not migrate from a benign tumour as it has a - **Fibrous capsule**
- Characters of malignant tumours or cancer**
  - Indefinite growth
  - evading apoptosis without contact inhibition
  - unlimited growth due to more telomerase (Telomerase causes the replication of TTAGGG)
  - increased cell division
  - altered ability to differentiate
  - spherical shape (due to less microfilaments)
  - abnormal antigens on the cell
  - unusual number of chromosomes
  - ability to invade the neighbouring tissues
  - entire or partly missing cadherin (cadherin helps in the attachment of the cells)
  - detachment of cancerous cells (metastasis)
- Stages of cancer**
- Three stages of cancer - **Initiation, promotion and progression**
- First mutation - Initiation of cancer
- Second mutation - Promotion of cancer
- Third mutation - Progression of cancer
- Fourth mutation - Affects of cancer
- Types of Cancers**
- Cancers which are inherited are called - **Familial cancers**
- Cancers which are not inherited are called - **Sporadic cancers**
- Malignant tumours of epithelial tissues are called - **Carcinomas**
- Carcinomas account for - **85 % of cancers**
- Carcinomas affect - **Linings of glands, digestive, respiratory, urinogenital systems etc. breast, nervous tissue etc.**
- Cancer of adenoids is - **Adenocarcinoma**
- Cancer of nerve tissue (brain tumour) is - **Glioblastoma**
- Malignancies of connective tissues or organs that originate in the Mesoderm are called - **Sarcomas**
- Sarcoma of bone - **Osteosarcoma**
- Sarcoma of cartilage - **Chondrosarcoma**
- Sarcoma of blood vessels - **Angiosarcoma**
- Cancers of muscles are called - **Sarcomas**
- Sarcomas constitute - **2 % of the tumours diagnosed (least common type)**
- Malignant tumours of stem cells of haemopoietic tissue - **Leukemia**

- Leukemia is a - **Liquid tumour**
- Leukemia affects particularly - **White blood cells growing in the bone marrow**
- Examples for Leukemia  
- **Chronic myelocytic leukemia ,Acute 'T' cell leukemia**
- Leukemias constitute  
- **4 % of the reported cancers**
- Malignant tumours of the secondary lymphoid organs such as *spleen* and *lymph nodes* are called  
- **Lymphomas**
- Lymphomas account for - **4 % of the reported cancers**

#### Causative Agents of Cancers

- Genes which have the potential to cause cancers are called - **Oncogenes / Tumour Inducing Genes**
- Oncogenes of certain viruses are called  
- **Viral Oncogenes**
- Avian Sarcoma Virus was discovered by -  
**Paton Rous**
- Viral oncogenes are normally carried by -  
**Retroviruses**
- Genes which have the potential to cause cancers in human beings are called  
- **Cellular oncogenes / Proto-oncogenes**
- Proto- oncogenes are - **Inactive oncogenes**
- Proto- oncogenes are converted into Active Oncogenes by  
- **Mutation**
- Genes that suppress the activity of oncogenes are called  
- **Tumour Suppressor Genes**
- Example for a tumour suppressor gene  
- **Gene P53**
- The protein which suppresses tumour formation , coded by gene P53 is - **P53 protein**
- P53 protein suppresses the expression of -  
**Oncogenes**
- When tumour suppressor gene undergoes mutation- **it fails to deactivate oncogenes which results in cancer**
- Cancer may also be caused by  
- **Chromosomal changes**
- Cancers may also be caused due to non-functioning of  
- **DNA repair genes ( which lead to DNA repair syndrome )**
- Other reasons for the cause of cancers include - carcinogenics such as **Radiation, X rays , U-V rays, Tobacco , Alcohol ,Cosmetics, chemicals such as Hexachlorophene ,Dioxins , Benzopyrene ,Arsenic , Coal-tar etc.**

## CANCER BIOLOGY

### LEVEL-I

- Which of the following is a liquid tumour ?  
1) Glioblastoma  
2) Acute 'T' cell leukemia  
3) Adeno carcinoma  
4) Chondrosarcoma
- Comparatively the least common type of malignancies are the  
1) lymphomas                      2) leukemias  
3) sarcomas                        4) carcinomas
- Proto oncogenes are  
1) Active tumour inducing genes  
2) V. Onco genes  
3) C oncogenes  
4) Tumour suppressor genes
- Which of the following is not a direct causative agent of cancer ?  
1) V-ONC (genes)      2) C-ONC (genes)  
3) some chromosomal aberrations  
4) mutated tumour suppressor gene
- Which of the following is/are malignancies of connective tissues ?  
1) carcinomas                      2) melanomas  
3) glioblastomas                    4) sarcomas
- Glioblastoma is a cancer of the  
1) connective tissues      2) glomerulus  
3) blood                        4) brain
- The most common type of cancers in human beings are  
1) Lymphomas                      2) Leukemias  
3) Carcinomas                      4) Sarcomas
- Malignant tumours of spleen is referred to as  
1) sarcoma                          2) lymphoma  
3) carcinoma                        4) leukemia
- An example of liquid tumor is :(*EAMCET:2005*)  
1) Glioblastoma                      2) Adeno carcinoma  
3) Chondrosarcoma                    4) Myelocytic leukemia
- Hepatocellular cancer caused in serum hepatitis is a kind of condition  
1) Lymphoma                        2) Leukemia  
3) Sarcoma                            4) Carcinoma
- Cancers originating from the cells of various glands , breast and nervous tissues  
1) Leukemia                          2) Carcinomas  
3) Lymphomas                        4) Sarcomas
- Chondrosarcoma is the cancer of  
1) Cartilage                        2) Bone  
3) Connective tissue proper  
4) Fluid connective tissue
- Squamous cell cancer is a kind of  
1) Melanoma                        2) Lymphoma  
3) Carcinoma                        4) Sarcoma

254. These genes normally induce transformation of the cell  
 1) Tumour suppressor genes  
 2) Oncogenes  
 3) cdc and P<sup>53</sup> genes  
 4) All 1, 2 & 3
255. Cellular oncogenes (C-onc) of human being are also called  
 1) Active oncogenes    2) Viral oncogenes  
 3) Proto oncogenes    4) All 1,2&3
256. Malignant tumours in the lining of urinogenital system and breasts are called  
 1) Sarcoma                      2) Carcinoma  
 3) Lymphoma                      4) Kaposi's sarcoma
- LEVEL-II**
257. Read the following statements and choose the right statement(s) :  
 i) Cellular oncogenes are proto oncogenes  
 ii) Proto oncogenes in human beings are inactive genes.  
 iii) Rous discovered a retrovirus which causes carcinoma in birds  
 1) All                                      2) only i & ii  
 3) only i                                      4) only i & iii
258. Following are the statements regarding malignant tumour and choose the correct combination  
 I. Malignant tumours of epithelial cells may be formed in lungs  
 II. Burkett lymphoma is a malignant tumours of lymph nodes  
 III. Adeno carcinoma is a malignant tumour of a connective tissue  
 1) I & II                                      2) II & III  
 3) I & III                                      4) All are correct
259. Read the statements about cancers and choose the incorrect statement(s) :  
 i) Metastasis occurs in the case of malignancies only  
 ii) Cancer of the blood vessels is a type of carcinoma  
 iii) Benign tumours have a fibrous outer capsule  
 iv) Certain chromosomal aberrations can cause cancers.  
 1) i & iii only                                      2) ii only  
 3) iii only                                      4) iii & iv only
260. Read the following statements and choose the correct combinations with correct set of characters :  

Type of cancer	Origin - Diagnosed %
I. Carcinomas	epithelial cells - 85%
II. Sarcomas	connective tissues - 4%

- III. Leukemias                      secondary lymphoid - 2% organs  
 IV. Lymphomas                      spleen & lymph nodes- 4%  
 1) i & iii    2) i & iv    3) i & ii    4) iii & iv
261. Match the following :  

<b>List - I</b> A. Angiosarcoma B. Kaposi sarcoma C. Glioblastoma D. Squamous cell carcinoma	<b>List - II</b> i. skin ii. brain iii. blood vessels iv. AIDS associated malignancy v. liver
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<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
1) iii	iv	i	ii
3) iii	ii	iv	i

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
2) iii	iv	ii	i
4) iii	iv	v	ii
262. Identify the **mismatched** pair  
 1) Glioblastoma - brain  
 2) Angiosarcoma - blood vessels  
 3) Lymphoma-spleen  
 4) Adenosarcoma -bone
- Read the following options**  
 1) Both A & R are true and R is the correct explanation of A  
 2) Both A & R are true and R is not correct explanation of A  
 3) A is true but R is false  
 4) R is true but A is false
263. **Assertion (A):** Benign tumours cannot exhibit metastasis.  
**Reason (R) :** Benign tumours are with a fibrous capsule and more cadherin proteins.
264. **Assertion (A):** Cancer cells are spherical in shape.  
**Reason (R) :** In cancer cells less number of microfibrils are present.
265. **Assertion (A):** Lymphomas are cancers of secondary lymphoid organs.  
**Reason (R) :** Lymphomas affect blood cells particularly the WBC growing in the bone marrow.
266. **Assertion (A):** p<sup>53</sup> gene is a tumour suppressor gene  
**Reason (R) :** p<sup>53</sup> protein produced by p<sup>53</sup> gene suppress the expression of oncogenes.
267. **Assertion (A):** Cancer cells exhibit unlimited growth potential  
**Reason (R):** In cancer cells less abundance of telomerase causes unlimited growth potential
268. **Assertion (A):** Cancer cells loose contact with other cells and exhibit metastasis  
**Reason (R):** In cancer cells, cadherin protein molecules either completely (or) partly missing (*EAMCET:2007*)

269. **Assertion (A):** The phenomenon where tumour cells detach and migrate to other parts of the body where they give rise to secondary tumours is called Metastasis.

**Reason (R) :** In cancer cells cadherin protein molecules are partly or entirely missing .

270. **Assertion (A) :** Cancers are most common in fast dividing tissues like epithelium.

**Reason (R) :** 85% of the cancers diagnosed are tumours of epithelial cells.

271. Study the following regarding tumours.

- I. These are with a fibrous capsule.
- II. These tumours exhibit metastasis
- III. Harmless and can be removed by simple surgery.
- IV. The cells do not migrate to other parts of the body .

Which of the above are applicable to benign tumours ?

- 1) All
- 2) I, II and III
- 3) I, III and IV
- 4) II , III and IV

272. Study the following statements regarding malignant tumours.

- I. The cells are spherical shape due to more microfibrils.
- II. These are most common in slowly dividing tissues.
- III. The cells are with unusual number of chromosomes.
- IV. These are non capsulated.
- V. The cell surfaces are with abnormal antigens.

Which of the above are correct ?

- 1) II , III and IV
- 2) III , IV and V
- 3) I , II and III
- 4) I , II and V

273. Match the following and select the correct option.

**List - I**

A. Carcinoma

B. Sarcoma

C. Leukemia

D. Lymphoma

**List - II**

I. Malignant tumour of stem cells of haemopoietic tissues

II. Liquid tumours affecting WBC growing in bone marrow

III. Malignant tumours of secondary lymphoid organs

IV. Malignant tumour of connective tissue

V. Malignant tumours of epithelial cells.

- |    | A  | B  | C   | D   |
|----|----|----|-----|-----|
| 1) | V  | IV | II  | I   |
| 2) | IV | V  | I   | III |
| 3) | V  | IV | I   | III |
| 4) | V  | I  | III | II  |

274. Match the following

**List - I**

- A. Adenocarcinoma
- B. Glioblastoma
- C. Squamous cell carcinoma
- D. Renal cell

**List - II**

- I. Cancer of breast
- II. Cancer of glandular tissue
- III. Cancer of kidney
- IV. Brain tumours
- V. Skin cancer carcinoma

- |    | A  | B   | C  | D   |
|----|----|-----|----|-----|
| 1) | I  | II  | V  | II  |
| 2) | II | I   | IV | III |
| 3) | II | IV  | V  | III |
| 4) | II | III | I  | V   |

275. Study the following (EAMCET:2008)

- A. The cell of malignant tumors divide erratically
- B. They are malignant tumors of epithelial cells.
- C. They are malignant tumors of organs that originate from mesoderm
- D. These tumors are found in organs such as spleen and lymph nodes.

Which of the above are true for angio-sarcoma ?

- 1) A and B
- 2) B and D
- 3) A and C
- 4) B and C

## STEM CELLS

- Certain embryonic cells which can divide and give rise to different other cells are called  
- **Stem Cells**
- Zygote which can give rise to the whole organism is a  
- **Totipotent Cell**
- Totipotent Cell gives rise to  
- **Pleuri-potent Cells**
- Pleuri-potent Cells differentiate into -  
**Multipotent cells**
- Multipotent cells differentiate into  
- **Unipotent Cells**
- Each unipotent cell gives rise to  
- **single modified cell**
- Embryonic stem cells (ES cell lines) are the **cultures of cells of the inner cell mass blastocyst**
- ES cells are **pleuri-potent cells**
- ES cells give rise to **all the primary germ layers**
- ES cells can form more than **200 cell types**
- Haemopoietic cells are - **Pleuri** and **Multipotent cells (self renewing cells)**
- When stem cells divide - **Some of the daughter cells remain as Stem cells**

- *Haemopoietic stem cells* give rise to - Two types of **Secondary stem cells / Common Progenitor Cells**
- The *Common Progenitor Cells* produced from HSC's are - **Myeloid Stem Cell** and **Lymphoid Stem Cell** (*which are non-renewing cells*)
- Each Common progenitor cell gives rise to - **Committed progenitor cells** (*they are also non-renewing cells*)
- The *Committed progenitor cells* that arise from Myeloid stem cell are - **I. Erythroid progenitor II. Megakaryocyte III. Basophil progenitor IV. Eosinophil progenitor V. Granulocyte - Monocyte progenitor**
- Cells that *directly arise* from *Myeloid stem cell* are - **Dendritic Cells**
- Lymphoid secondary stem cell (*Common progenitor cell*) gives rise to - **'T' cell progenitor and 'B' cell progenitor**
- Lymphoid Secondary Stem cell *directly* gives rise to - **Natural Killer Cells and Dendritic Cells**
- Erythroid Progenitor gives rise to Erythrocyte through intermediate stages called - **Proerythroblast, Erythroblast and Reticulocytes**
- *Platelets* arise from - **Megakaryocyte**
- *Basophil* arises from - **Basophil progenitor**
- *Eosinophil* arises from - **Eosinophil progenitor**
- *Neutrophil* and *Monocyte* arise from - **Granulocyte - monocyte progenitor**
- *NK cell* (LGL) arises from - **Lymphoid Secondary Stem Cell (Lymphoid Common Progenitor)**
- 'T' cell progenitor differentiates into '*T' immunocompetent lymphocyte*' in the - **Thymus**
- Immunocompetent T cytotoxic cell becomes *functional Cytotoxic T lymphocyte* in the - **Secondary Lymphoid organs**
- 'B' cell progenitor differentiates into *Immunocompetent B cell* in the - **Bone Marrow**
- Immunocompetent B cell transforms into *Functional B cell* in the - **Secondary Lymphoid Organs**
- Functional B cells on exposure to antigens produce - **Plasma cells and Memory cells**
- Plasma cells secrete - **Antibodies**
- The long lived Memory cells - **Show quick immune response on subsequent exposure to the same type of antigen**
- The Stem Cells of *skeletal muscle tissue* are called - **Satellite Cells**

- Satellite Cells replace - **damaged striated muscle cells**
- The Stem Cells of *smooth muscles* are called - **Pericytes**
- The person who isolated Human Embryonic Stem Cells (ES Cells) - **Thomson**
- Stem Cells are useful in treating cell based diseases such as - **Parkinson's Disease**
- The best known stem cell therapy is - **Bone marrow treatment**
- Bone marrow transplant is used to treat - **Leukemia**
- Multipotent stem cells rich blood is seen in - **Umbilical cord**

## **STEM CELLS**

### **LEVEL-I**

276. Which of the following is a committed progenitor cell that gives rise to polymorpho nuclear neutrophils (PMN)
  - 1) lymphoid stem cell
  - 2) myeloid stem cell
  - 3) monoblast
  - 4) granulocyte - monocyte progenitor
277. The progenitors that are formed in bone marrow and differentiated else where are : (EAMCET:2005)
  - 1) Pre-NK cell
  - 2) Pre-Erythroblast
  - 3) Pre-T cell
  - 4) Myeloblast
278. Satellite cells are the stem cells present in the
  - 1) epithelium of skin
  - 2) epithelium of gastrointestinal tract
  - 3) skeletal muscle tissue
  - 4) smooth muscle tissue
279. Satellite cells replace the damaged
  - 1) Striated muscle cells of voluntary muscles
  - 2) Striated muscle cells of cardiac muscles
  - 3) Smooth muscle cells of visceral muscles
  - 4) Smooth muscle cells of involuntary muscles.
280. Human embryonic stem cells (ES cells) are first isolated by
  - 1) Tim Hunt
  - 2) Thomson
  - 3) Paul Nurse
  - 4) Leeland Hartwell
281. Stem cells in the epithelium of skin and gastrointestinal tract replenish the lost cells of apical layers, so these are
  - 1) Totipotent cells
  - 2) Multipotent cells
  - 3) Unipotent cells
  - 4) Pleuripotent cells
282. Satellite cells and pericytes are
  - 1) Unipotent cells
  - 2) Multipotent cells
  - 3) Pleuripotent cells
  - 4) Totipotent cells
283. Granulocyte - monocyte progenitor forms the
  - 1) monocyte and all granulocytes
  - 2) neutrophil and monocyte

- 3) basophil and monocyte  
4) eosinophil and monocyte
284. The cell that can give rise to the whole organism is  
1) Multipotent cell      2) Totipotent cell  
3) Unipotent cell      4) Pleuripotent cell
285. Embryonic inner cell mass of blastocyst contains  
1) Pleuripotent cells      2) Totipotent cell  
3) Unipotent cell      4) Multipotent cell
286. Stem cells of muscles of duodenum in a mammal are  
1) Pericytes      2) Statellite cells  
3) Formative cells      4) sarcocytes
287. Haemopoietic stem cells produce  
1) Committed progenitors  
2) Dendritic cells  
3) Common progenitors  
4) Erythroid progenitors
288. The secondary stem cells produced by HSCs are  
1) Erythroid progenitor and Megakaryocyte  
2) Basophil progenitor and eosinophil progenitor  
3) T-cell progenitor and B - cell progenitor  
4) Myeloid progenitor and lymphoid progenitor
289. Common progenitors among the following are  
1) Natural killer cells and dendritic cells  
2) Myeloid stem cells and lymphoid stem cells  
3) Eosinophil progenitors and basophil progenitors  
4) B-cell progenitors and T-cell progenitors
290. The committed progenitors produced from myeloid stem cell  
1) Erythroid progenitor and megakaryocyte  
2) Basophil progenitor and eosinophil progenitor  
3) Granulocyte - monocyte progenitor  
4) All 1, 2 & 3
291. Lymphoid progenitor directly gives rise to  
1) Natural killer cell and dendritic cell  
2) Natural killer cell and megakaryocyte  
3) Megakaryocyte and dendritic cell  
4) T<sub>H</sub> cell and B-cell
292. Dendritic cell is produced from  
1) Myeloid progenitor and B - cell progenitor  
2) Lymphoid progenitor and myeloid progenitor  
3) Megakaryocyte and T-cell progenitor  
4) Granulocyte - monocyte progenitor and macrophage.
293. One of the following cells is not present in the erythroid lineage  
1) Reticulocyte      2) Pro erythroblast  
3) Erythroblast      4) Reticular cell
294. Macrophage is produced from  
1) Megakaryocyte      2) Natural killer cell  
3) Monocyte      4) Dendritic cell

295. T-cell progenitor differentiates into T-lymphocyte in  
1) Thymus      2) Thyroid  
3) Spleen      4) Bursa of Fabricius
296. Study the following about stem cells  
A. Haemopoietic stem cells are pluripotent and multipotent  
B. Common progenitors are self renewing cells  
C. Each common progenitor gives to certain committed progenitors  
1) A and B are true      2) A and C are true  
3) B and C are true      4) A, B and C are true

## **LEVEL-II**

**Directions for : Q.No: 22&23**

**Read the following options**

- 1) Both A & R are true and R is the correct explanation of A  
2) Both A & R are true and R is not correct explanation of A  
3) A is true but R is false  
4) R is true but A is false
297. **Assertion (A):** Zygote is a totipotent cell.  
**Reason (R) :** Zygote can give rise to the whole organism.
298. **Assertion (A):** Human embryonic stem cells are used in treating cell based diseases like Parkinson disease.  
**Reason (R) :** Human embryonic stem cells replace deceased or damaged cells in the brain.
299. Study the following  
A) Erythroid progenitor  
B) Erythrocyte  
C) Myeloid progenitor  
D) Reticulocyte  
E) Erythroblast  
F) Proerythroblast  
G) Haemopoietic stem cells  
Arrange these in correct sequence.  
1) C - G - A - F - D - E - B  
2) G - C - A - F - E - D - B  
3) G - C - D - F - E - B  
4) G - C - F - A - D - E - B
300. Study the following ( )  
A) Platelets  
B) Myeloid progenitor  
C) Megakaryocyte  
D) Haemopoietic stem cell  
Arrange these in correct sequence.  
1) D - B - A - C      2) A - C - B - D  
3) D - C - B - A      4) D - B - C - A
301. Study the following  
A) Haemopoietic stem cell  
B) Monocyte  
C) Myeloid progenitor





- Magnet creates – **The strong magnetic field and aligns the protons of hydrogen atoms**
- Protons are exposed to the beam of radio waves. This – **Spins the various protons of the body**
- Receiver protons of MRI receive the – **Faint signals of protons**
- The receiver information is processed and an image is formed by – **Computer**
- MRI can detect – **The tiny changes of structures in the body**
- Contrast agent used in MRI scanning is – **Gadolinium**
- Contrast agents – **Increase the accuracy of images**
- Extremely accurate method in diagnostic imaging is – **MRI scanning**

## MONITORING OF BODY'S VITAL

### FUNCTIONS:

- **ECG OR EKG (Electrocardiography):**
- Non-invasive test that is used to detect the heart conditions by measuring electrical activity of heart – **ECG/EKG**
- The record is called – **Electrocardiogram**
- The instrument used to record the changes is – **Electrocardiograph**
- **In an electrocardiogram –**
  - P-wave indicates – **atrial depolarization**
  - QRS complex indicates – **ventricular depolarization**
  - T-wave represents – **repolarization of ventricles**
  - The relationship between P-waves and QRS complexes is – **1 : 1**
  - The interval from beginning of QRS complex to the apex of the T-wave – **Absolute refractory period**
  - The last half of T-wave is – **Relative refractory period**
  - PR interval is measured from the – **beginning of the P-wave to the beginning of the QRS complex**
  - The duration of PR interval is – **0.12-0.20 seconds**
  - S-T segment connects the – **QRS complex and T-wave**
  - The duration of S-T segment is – **0.08-0.12 seconds**

- The Q-T interval is measured from the – **beginning of the QRS complex to end of the T-wave**
- Duration of Q-T interval is – **0.40 seconds**
- In the heartbeat, both the atria and ventricles relax for about – **0.2 seconds**
- A prolonged PR interval indicates – **Coronary artery disease**

Ex: Arteriosclerosis and rheumatic fever

- PR interval shortens at **high heart rate**  
**Ex: Exercise/Fever**
- PR interval increases at **lower heart rate** Ex: **Sleep**
- First degree heart block is **Arteriosclerosis**
- Duration, amplitude and morphology of QRS complex helps in diagnosing – **Cardiac arrhythmia, conduction abnormalities, ventricular hypertrophy, myocardial infarction**
- S-T segment is elevated above the base line in – **acute myocardial infarction**
- S-T segment is depressed in – **coronary ischemia**
- T-wave is inverted in **coronary ischemia**
- T-wave is tall in **Hyperkalemia**
- T-wave is flat in **hypokalemia and coronary ischemia**
- Q-T interval lengthens in **myocardial damage and coronary ischemia**

### EEG (Electroencephalography):

- The electrical signals of brain are recorded in – **EEG**
- The record is called – **Electroencephalogram**
- EEG diagnoses – **Epilepsy**
- Number of electrodes attached to scalp in recording – **about 20**
- Evaluation of other body functions during sleep by EEG is – **Polysomnography**

### TRANSPLANTATION:

- Organ transplants are categorized as **life saving**
- Tissue transplants are categorized as **life enhancing**

### Types of transplantation:

- Self tissue transfer – **Autograft**
- Transfer between genetically identical – **Isograft**
- Isograft is mainly performed between – **Monozygotic twins**
- Isografts are closer to autografts in terms of **recipient immune response**
- Transfer from non-identical members of the same species – **Allograft**

- Transfer from one species to another species – **Xenograft (xenopplantation)**
- Extremely dangerous among the transfers is – **Xenograft**
- An organ of diseased donor may be transplanted to two recipients - **Split transplantation**
- Complete set of organs may be transplanted - **Domino transplantation**

#### **Graft rejections and suppressions:**

- In allograft, the skin becomes revascularized within – **3-7 days**
  - The vascularization decreases by – **7-10 days**
  - The grafted tissue undergoes necrosis on – **10<sup>th</sup> day**
  - The tissue is completely rejected by – **12-14 days**
  - The cells which play a key role in allograft rejection are – **T-cells**
  - Immunological memory is developed in **rejection reactions**
  - Immunological memory rejects the second allograft within – **5-6 days**
  - Antigenically similar tissues are **histocompatible**
  - Antigenically similar tissues do not **allow rejection reactions**
  - MHC of humans – **HLA (Human leucocyte antigen) system**
  - MHC loci on chromosomes are **closely linked**
- #### **ELISA (Enzyme Linked Immunosorbent Assay)**
- Requisition of ELISA – **Antibody, antigen, an enzyme, a substrate**
  - The commonly measure protein to indicate the pregnancy is **Human gonadotropin (HCG)**
  - ELISA is a relatively **accurate test**
  - In ELISA, **monoclonal antibodies are used**
  - Types of ELISA – **Sandwich test or Competitive test**
  - The substrate coupled with antibodies is used in – **Sandwich test**
  - The enzyme coupled with antigens is used in – **Competitive test**
  - The concentration of coloured product in ELISA is measured by – **Spectrophotometer**
  - The intensity of colour is proportional to **concentration of antigen**
  - ELISA is also adapted to measure **concentration of antibodies**

**Ex:** Identification of **Human anti HIV antibodies in the blood sample of HIV positive patient**

## **BIOMEDICAL TECHNOLOGY**

### **LEVEL-I**

- X-rays were discovered by
  - 1) Robert Gallo
  - 2) Rontgen
  - 3) Robert Hook
  - 4) Dobzhansky
- Most carcinogenic diagnostic imaging is
  - 1) X-rays
  - 2) MRI scan
  - 3) CT scan
  - 4) 1 & 3
- In which of the following diagnostic imaging, the protons of the body spun?
  - 1) X-rays
  - 2) MRI scan
  - 3) CT scan
  - 4) 1 & 3
- Extremely accurate method of diagnostic imaging is
  - 1) X-rays
  - 2) MRI scan
  - 3) CT scan
  - 4) 1 & 3
- The interval from beginning of QRS complex to the apex of the T-wave in ECG is
  - 1) Relative refractory period
  - 2) Absolute refractory period
  - 3) Incubation period
  - 4) Latent period
- In the heartbeat, both the atria and ventricles relax for about
  - 1) 0.2 seconds
  - 2) 0.4 seconds
  - 3) 0.12 seconds
  - 4) 0.08 seconds
- T-wave tall in
  - 1) Hyperkalemia
  - 2) Hypokalemia
  - 3) Hyperglycemia
  - 4) Hypoglycemia
- Polysomnography is an evaluation during
  - 1) active state of human being
  - 2) sleeping state of human being
  - 3) diseased state of human being
  - 4) all the above
- Xenograft means transfer of organ
  - 1) between the monozygotic twins
  - 2) between the individuals of same species
  - 3) between the individuals of one species to another species
  - 4) between the members of same family.
- Antigenically similar tissues
  - 1) allow rejection reactions
  - 2) do not allow rejection reactions
  - 3) some times allow rejection reactions
  - 4) all the above
- ELISA in which the substrate coupled with antibodies is used is
  - 1) sandwich test
  - 2) competitive test
  - 3) Western blot test
  - 4) Southern blot test
- Biomedical Engineering deals more with
  - 1) Biochemistry
  - 2) Biophysics
  - 3) Biotechnology
  - 4) Biometry

318. Which of the following statement are true ?  
 1) X - rays are used in diagnostic radiography and crystallography  
 2) X - rays are a form of nonionising radiations  
 3) X - rays are a type of electromagnetic radiation with a wave length of 10 to 0.01 nanometer  
 1) All are true                      2) 1,2 one true  
 3) 1,3 are true                      4) 2,3 are true
319. 'Ileus' means  
 1) free fluids                      2) Free air  
 3) blocked intestine              4) blocked bile duct
320. In 'ascites' there is  
 1) free fluid                      2) free cells  
 3) free air                      4) free blood
321. Digital subtraction angiography in used is tracing  
 1) Tumours in brain    2) Blocks in blood vessels  
 3) Valve defect in heart    4) Kidney stones
322. Angiography works on the principle of  
 1) X-rays                      2) Gammarays  
 3) ultrasound                      4) Magnetic resonance
323. If on an X - ray film the image appears black it indicates presence of  
 1) air                      2) fluids  
 3) blood                      4) stones
324. One of the lowest radiation exposure is seen in the x - ray of  
 1) Head                      2) chest  
 3) legs                      4) Abdomen
325. Which of the following is a 'risk factor' in the use of x - rays for diagnosis  
 1) After x - ray examination, there is no radiation left in the body  
 2) X - ray imaging is fast  
 3) X - rays are ionising radiations  
 4) X rays have no side effects
326. Evaluation of the density of bone for assessing osteoporosis can be done using  
 1) X - ray radiography    2) MRI  
 3) C T scan                      4) ultrasoand
327. Magnetism and radiowaves are the basis of  
 1) Radiography              2) CT scan  
 3) CAT scan                      4) MRI
328. The imaging device used to study aneurysm is  
 1) MRI                      2) CT scan  
 3) Ultrasound                      4) ECG
329. In the ECG, the 'P' wave indicates  
 1) Atrial depolarisation  
 2) Atrial repolarisation  
 3) Ventricular depolarisation  
 4) Ventricular repolarisation
330. Which of the following is referred to as relative refractory period ?  
 1) 1st half of Q RS wave  
 2) last half of Q RS wave  
 3) 1st half of T-wave  
 4) last half of T-wave
331. A normal Q - T interval is for about  
 1) .20 sec                      2) .40 sec  
 3) .80sec                      4) .60 sec
332. From the beginning of the T-wave to the beginning of QRS complex is called  
 1) S - T interval              2) P - Q segment  
 3) P - R interval              4) S - T segment
333. Repolarisation of the ventricles is represented in the ECG as  
 1) P Wave                      2) QRS wave  
 3) T wave                      4) S - T segment
334. A prolonged PR interval is an indication of  
 1) Rheumatic fever              2) Arrhythmia  
 3) Myocardial infarction    4) Hypokalemia
335. Which of the following have 0.08 to 0.12 sec duration in the ECG ?  
 1) P wave                      2) S - T segment  
 3) QRS complex              4) Q - T interval
336. 1st degree heart block is seen as  
 1) arteriosclerosis              2) Conduction abnormality  
 3) Ventricular hypertrophy  
 4) Coronary ischemia
337. In acute myocardial infarction there is  
 1) Elevated S - T segment  
 2) Inverted T - Wave  
 3) Tall T - Wave              4) Prolonged PR interval
338. A test that can help diagnose epilepsy is  
 1) ECG                      2) EEG  
 3) EKG                      4) MRI
339. A recording that evaluates the other body functions like, respiration, pulse during sleep is  
 1) Angiography              2) Cardiography  
 3) Polysomnography              4) Radiography
340. In recording a EEG number of electrodes attached to the scalp is approximately  
 1) 10                      2) 15  
 3) 20                      4) 32
341. Which of the following organs transplantation can be an example of autograft ?  
 1) Heart                      2) Kidney  
 3) Cornea                      4) Skin
342. Most dangerous of all types of transplants is  
 1) Isograft                      2) Allograft  
 3) Xenograft                      4) Autograft
343. Example of split transplantation  
 1) Heart                      2) lung  
 3) liver                      4) kidney

344. If a complete set of organs may be transplanted it is called
- 1) Split transplantation
  - 2) Dominotransplantation
  - 3) Xeno Transplantation
  - 4) Iso transplantation
345. A grafted tissue undergoes necrosis on
- 1) 7th day
  - 2) 9 th day
  - 3) 10 th day
  - 4) 14 th day
346. In the allograft, skin becomes revascularised between
- 1) 1-3 days
  - 2) 3 - 7 days
  - 3) 4 - 8 days
  - 4) 5-9 days
347. The cells which play an important role is allograft rejection
- 1) Macrophages
  - 2) B-cells
  - 3) T-cells
  - 4) Plasma cells
348. A second allograft is rejected by the memory in about
- 1) 1-3 days
  - 2) 3-5 days
  - 3) 5-6 days
  - 4) 6- 8 days
349. 'ELISA' means
- 1) Enzyme linked immunity sorbent assay
  - 2) Enzyme lysed immuno sorbent assay
  - 3) Enzyme linked immuno solvent arrangement
  - 4) Enzyme linked immunoglobulin substrate assay
350. The commonly measured protein which indicates pregnancy is
- 1) Relaxin
  - 2) Human chorionic gonadotropin
  - 3) Progesterone
  - 4) Follicle stimulating hormone
351. In ELISA test the amount of product is measured by measuring a change in
- 1) Temperature
  - 2) Colour
  - 3) pH
  - 4) Turbidity

### LEVEL-II

352. Match the following

List-I	List-II
A. Autograft	I. Between two different species
B. Isograft	II. Within the same species
C. Allograft	III. In between monozygotic twins
D. Xenograft	IV. Within the same individual

A	B	C	D
1) I	II	III	IV
2) IV	III	II	I
3) II	III	IV	I
4) II	IV	III	I

353. Match the following

List-I	List-II
A. Epilepsy	I. ELISA
B. Heartbeat	II. EEG
C. Tissue transfer	III. Transplantation
D. HIV antibodies	IV. ECG

  

A	B	C	D
1) I	II	III	IV
2) IV	III	II	I
3) II	III	IV	I
4) II	IV	III	I

354. Read the following and choose the correct combinations

- I. Antigenically similar tissues are histocompatible
  - II. Antigenically similar tissues do not allow rejection reactions
  - III. MHC loci on chromosome are closely linked
- 1) I and II only
  - 2) II and III only
  - 3) I and III only
  - 4) I, II, III

355. Read the following and choose the correct combinations

- A. The recorded image in CT scan is tomogram
  - B. In X-rays, the dense bones absorb less radiation
  - C. Extremely accurate method in diagnostic imaging is MRI scanning
- 1) A and B only
  - 2) A and C only
  - 3) B and C only
  - 4) A, B and C

356. Assertion (A): **Isografts are closer to autografts in terms of recipient immune response**

Reason (R): **Isograft is mainly performed between monozygotic twins**

- 1) Both A and R are correct and R is correct explanation to A
- 2) Both A and R are correct but R is not correct explanation to A
- 3) Only A is true but R is false
- 4) A is false but R is true

357. Assertion (A): **Gadolinium is used in MRI scanning**

Reason (R): **Gadolinium is a contrast agent to increase the accuracy of images**

- 1) Both A and R are correct and R is correct explanation to A
- 2) Both A and R are correct but R is not correct explanation to A
- 3) Only A is true but R is false
- 4) A is false but R is true

358. Read the following and choose the correct combinations pertaining to ECG

Stage	Position	Probable disorder
I. T-wave	Tall	Hyperkalemia
II. Q-T interval	Lengthens	Epilepsy
III. T-wave	Inverted	Coronary ischemia
IV. Q-T interval	Lengthens	Hyperglycemia

- 1) I and II                      2) I and III  
3) II and IV                    4) II and III

359. Coronary ischemia is indicated when there is

- 1) Lengthening of Q-T interval and Inverted T - Wave  
2) Elevation of S - T segment, shortening of P - R interval  
3) Shortening of Q - T interval, elevation of S - T segment  
4) Depressed S - T segment, shortening of Q - T interval

360. Study the following and choose the correct statements

- 1) Organs like heart, lung, kidney, liver, pancreas and intestine can be transplanted  
2) Tissues like cornea, skin graft, islets of Langerhans can be transplanted  
3) Blood transfusion is a type of tissue transfusion

- 1) All are correct                      2) 1, 2 are correct  
3) 2, 3 are correct                    4) 1, 3 are correct

361. Study the following and choose the **correct** statements

- 1) Various antibodies that determine histocompatibility in man are called HLA system  
2) MHC loci are closely linked, hence are usually inherited as a complete set  
3) Various antigens that determine histocompatibility are MHC

- 1) 1, 2 are correct                      2) 2, 3 are correct  
3) 1, 3 are correct                    4) All are correct

362. Study the following and choose the **correct** statement

- 1) ELISA may be a sandwich or competitive test  
2) In sandwich ELISA the substrate coupled antibodies are used  
3) In competitive ELISA enzyme coupled antibodies are used  
1) All are correct  
2) 1, 2 are correct  
3) 2, 3 are correct  
4) 1, 3 are correct

363. Match the following and choose the correct option

**Column-A**

- A) Fungal metabolites  
B) Organ transplant  
C) Tissue transplant  
D) ELISA

**Column-B**

- a) Life saving  
b) Spectrophotometer  
c) Polygraph  
d) Immune suppressant  
e) Life enhancing

	A	B	C	D
1)	d	e	a	c
2)	d	a	e	b
3)	d	a	e	c
4)	a	d	e	c

364. Study the following biomedical technologies

- i) Computerised axial tomography  
ii) Haemodialysis  
iii) Magnetic resonance imaging  
iv) Electrocardiography  
v) Sonography

Which of the above technologies are related to the "diagnostic imaging"

- 1) All except ii and iv  
2) All except iv and v  
3) All except i and iii  
4) Only i and iii

365. Match the following

A) T-wave	i) indicates atrial depolarization
B) QRS complex	ii) represents repolarization of ventricles
C) P-wave	iii) referred to as absolute refractory period
D) Last half of T-wave	iv) referred to as relative refractory period
	v) denotes ventricular depolarization

- 1) A-iv, B-i, C-ii, D-iii    2) A-i, B-iv, C-v, D-iii  
3) A-ii, B-v, C-i, D-iv    4) A-ii, B-iv, C-i, D-v

## **APPLIED BIOLOGY** **LEVEL-III**

366. Identify the correct answer :

**Assertion (A):** Sub unit vaccines are not dangerous as there is no chance of their causing disease by the accidental occurrence of "live" viruses in them.

**Reason (R):** Sub unit vaccines are recombinant vaccines and they contain only the protein antigens that can initiate immune response in the host without multiplying (as they do not contain genetic material)

- 1) A & R are correct and R does not explain A
  - 2) A & R are incorrect
  - 3) A is correct and R is incorrect
  - 4) A & R are correct and R explains A
367. Identify the correct answer :  
**Assertion (A):** Production of "tailored enzymes" for specific needs is possible inside a cell using biotechnology  
**Reason (R):** As the sequence of aminoacids and the sequence of nucleotodies which can code for the aminoacids are colinear introduction of a synthetic nucleotide sequence into a cell induce formation of a specific polypeptide
- 1) A & R are correct and R does not explain A
  - 4) A & R are correct and R explains A
  - 2) A & R are incorrect
  - 3) A is correct and R is incorrect
  - 4) A & R are correct and R explains A
368. The following are the statements about **Hybridoma Technology** and **choose the right combination**
- i. Hybridoma technology necessarily involves tumour cells as such cells are technically speaking 'immortal' which are useful for continuous production of a product required.
  - ii. Hypoxanthine, aminopterin and thymidine mixture is a medium that can curb hybridoma cells.
  - iii. B - cells are used in hybridoma technology as they can produce specific clones of cells to produce specific immunoglobulins.
- 1) all are true
  - 2) i & ii only
  - 3) i & iii only
  - 4) ii & iii only
369. Identify the **correct** answer :  
**Assertion (A):** Interferons prevent spread of viral diseases from affected cells to neighbouring cells.  
**Reason (R):** Interferons are a kind of antibiotics which interfere with the metabolism of viruses and prevent their multiplication.
- 1) A & R are correct and R does not explain A
  - 2) A & R are incorrect
  - 3) A is correct and R is incorrect
  - 4) A & R are correct and R explains A
370. The following steps are involved in the **production of monoclonal antibodies**. Arrange them in the correct sequence as would occur in a laboratory procedure of producing monoclonal antibodies
- a) Production of MABs
  - b) Obtaining B cells from the spleen and myeloma cells from tumour of a rat
  - c) Elimination of non hybridized myeloma cells by exposure to HAT medium.
  - d) Subjecting PEG treated mixture of B cells and

- myeloma cells to HAT medium.
- e) Subjecting mixture of B cells and myeloma cells to certain fusogens
  - f) Removal of non fused B cells from the culture by allowing them to die naturally.
- 1) b e d f c a
  - 2) b c e d f a
  - 3) b e d c f a
  - 4) e b d f c a
371. Read the statements about stems cells and choose the **incorrect** statement(s) :
- i) Embryonic stem cells are pluripotent and multipotent cells
  - ii) Myeloid stem cell is a common progenitor
  - iii) B cells arise from myeloid stem cell
  - iv) Erythroid progenitor, is a committed progenitor
- 1) ii & iv
  - 2) i only
  - 3) iv only
  - 4) iii only
372. Arrange the following in their **increasing order of biological values** and **decreasing order of protein efficiency ratios** respectively
- a) Fish
  - b) Meat
  - c) Egg
  - d) Milk
- 1) adbc / cdab
  - 2) cdab / dbac
  - 3) bdac / cdab
  - 4) dabc / cbda
373. **Assertion(A) :-** Decondensation of chromosomes occurs at the end of cell division marked by depletion in M cyclin  
**Reason (r) :-** M-Cdk complex decreases at the end of cell division
- 1) A and R are correct and R is the correct explanation to A
  - 2) A and R are correct R is not the correct explanation to A
  - 3) A is true and 'R' is false
  - 4) A and R are both are false
374. Type of common progenitor that forms the plasma cells is
- 1) Myeloid Progenitor
  - 2) Pre NK cell
  - 3) Lymphoid Progenitor
  - 4) Myeloblast cell
375. Read the statements about **cell cycle regulation** and choose the **incorrect** statement(s) :
- i) Degradation of M cyclin in a cell cycle initiates a new cell cycle
  - ii) APC is activated by M-CDK complex
  - iii) Transcription factors required for the replication of DNA are activated by S-CDK complex
  - iv) Break down of nuclear membrane as a part of karyokinesis is promoted by S-CDK cyclin complex.
- 1) i & iii
  - 2) iv only
  - 3) ii only
  - 4) i & ii
376. The following are the statements about cell cycle regulators and choose the **right combination** :
- i.) Proteins that control various processes in cell cycle are phosphorylated by an activated form of enzyme called cyclin- CDK complex.

- ii) The inhibitor of S-CDK cyclin complex is degraded by M-cyclin CDK complex.  
 iii) Decondensation of chromosomes after anaphase is promoted by degradation of M cyclin and so inactivation of M-CDK complex.  
 1) All are true                      2) i & ii only  
 3) iii only                            4) ii & iii only

377. Identify the **correct pair**

- 1) Component vaccine - Haemophilus influenza type B  
 2) Conjugate vaccine - Human papilloma virus  
 3) Inactivated Whole Agent Vaccine- Bubonic plague  
 4) Attenuated Whole Agent Vaccine - HAV

378. Match the following : (*EAMCET - 2005*)

List-I	List-II
A) Milstein	1. Interferon
B) Erythropoietin	2. r-DNA
C) Type-II	3. Hybridoma
D) Fusogen	4. Palindrome
E) Lindermann	5. Poly Ethylene Glycol

- 1) A-3 B-2 C-4 D-5 E-1  
 2) A-3 B-2 C-5 D-4 E-1  
 3) A-3 B-2 C-4 D-1 E-5  
 4) A-2 B-3 C-4 D-5 E-1

379. Match the following : (*EAMCET - 2006*)

Set-I	Set-II
a) Scylla tranquibarica	1) Silver carp
b) Oidium albicans	2) Agar
c) Gracellaria	3) Green crab
d) Ancona	4) Thrush
e) Hypophthalmichthys molitrix	5) Mediterranean bird

- 1) a - 3, b - 4, c - 2, d - 1, e - 5  
 2) a - 4, b - 3, c - 2, d - 5, e - 1  
 3) a - 3, b - 5, c - 2, d - 4, e - 1  
 4) a - 3, b - 4, c - 2, d - 5, e - 1

380. Study the following

- I)  $G_1$  Cdk - cyclin complex activates the factors required for DNA replication in S phase.  
 II)  $G_1$  cdk - cyclin complex inhibits the S-cdk cyclin complex inhibits the S-cdk cyclin complex  
 III) S cdk cyclin complex phosphorylates the proteins necessary for DNA replication in S phase.  
 IV) M-cdk cyclin complex is synthesized in M phase.  
 Identify the **correct** statements.  
 1) I and II                      2) I and III  
 3) II and IV                    4) I, III and IV

381. Study the following

- I. The concentration and activity of  $G_1$  cdk cyclin complex acts as  $G_1$  checkpoint.  
 II. The concentration and activity of  $G_2$  cdk cyclin complex acts as  $G_2$  checkpoint  
 III. Final check point is also called M checkpoint  
 IV. The concentration and activity of Mcdk cyclin complex acts as M checkpoint  
 Which of the above are **correct** ?  
 1) I and IV                      2) II and III  
 3) II and IV                    4) I and II

382. Study the following

- I. In mammals the product of  $P^{53}$  gene functions as a transcriptional activator  
 II.  $P^{53}$  protein regulates the expression of other genes that control the cycle.  
 III. Some times  $P^{53}$  protein induces the production of cyclin kinase inhibitor, which inactivates cdk - cyclin complex.  
 IV.  $P^{53}$  protein suppresses the tumour formation.  
 Identify the **correct** statements .  
 1) Only I and III                      2) Only III and IV  
 3) Only I, II and IV                    4) All

383. Match the following and select the **correct** option

List-I	List-II
A. IVRI	I. Developed hybrid strains in layers
B. NECC	II. Developed hybrid strains in broilers
C. NABARD	III. Monitors the marketing of poultry products in India
D. CPBF	IV. Produces poultry medicines
	V. Provides financial assistance for poultry farming

A	B	C	D
1) IV	III	V	II
2) II	V	III	I
3) IV	III	V	I
4) II	III	V	IV

384. Match the following and select the **correct** option.

List-I	List-II
A. ELISA	I. Restriction fragments of DNA are separated
B. Southern blotting	II. Plasmids are purified
C. Western blotting	III. Restriction fragment containing desired gene can be identified
D. Gel electrophoresis	IV. Screening test of AIDS

V. Confirmation test of AIDS

VI. Bacteria containing rDNA are identified

A	B	C	D
1) IV	III	V	II
2) V	IV	III	I
3) IV	VI	V	I
4) IV	V	VI	II

385. Match the following and select the correct option.

**List - I**

- A. Peyton Rous  
B. Paul Nurse, Tim Hunt and Leyland Hartwell  
C. Thomson  
D. Alexander Fleming

**List - II**

- I. Demonstrated that sarcoma is a type of tumour  
II. First isolated human embryonic stem cells  
III. Discovered *cdc* gene mutants and cell cycle regulation events  
IV. Observed the antibiotic activity of penicillin  
V. Discovered streptomycin

A	B	C	D
1) I	III	II	IV
2) I	III	II	V
3) II	I	III	IV
4) I	II	IV	V

386. It has been found to be economical to grow the three major carps - Catla, Labeo and Cirrhina together because  
1) One forms the food for the other  
2) They compete with each other in their growth and reproduction  
3) The excreta of one forms the food for the other  
4) Competition for food amongst them is remote
387. Restriction enzyme 'Eco RI' nicks at one of the following sites on DNA  
1) 5'G ↓ AATTC3'  
2) 5'GG ↑ CC3'  
3) 5'A ↓ AGCTT3'  
4) 5'AA ↑ TT 3'
388. Monoclonal antibodies are  
1) single parent type that attack many antigens  
2) single parent type and attack specific antigens  
3) various parent types and attack many antigens  
4) various parent type and attack single antigen
389. People recovering from long illness are often advised to include the alga *Spirulina* in their diet because it  
1) makes the food easy to digest  
2) is rich in proteins  
3) has antibiotic properties  
4) restores the intestinal micro flora

390. Which of the following is the sequence of cultivation of fish?

- 1) Fry - fingerlings - spawn - Adult
- 2) Spawn - fry - fingerlings - adult
- 3) Adult - spawn - fingerlings - fry
- 4) Fingerlings - fry - spawn - adult

391. The hybridoma cells are

- 1) cells of oncogenes and brain
- 2) activated B lymphocytes fused with myeloma cells
- 3) hybrid cells of oncogenes fused with myeloma cells
- 4) hybrid cells of T cells and myeloma cells

392. Restriction endonuclease cuts DNA at specific sites and cellular DNA is not damaged as

- 1) rest enzyme susceptible sites are coated with protein
- 2) rest enzyme susceptible sites are catalyzed by specific enzymes
- 3) they cleave DNA only at very limited and specific sites
- 4) they cleave DNA at random

393. A cell - coded protein that is formed in response to infection with most animal viruses is called

- 1) interferon
- 2) antigen
- 3) histone
- 4) antibody

394. **Assertion :** In rDNA technology desired genes are often transferred into bacteria prokaryotes) or yeast (eukaryotes)

**Reason :** Both bacteria and yeast multiply very fast to form huge populations which express the desired gene.

- 1) Both A & R are true and R is the correct explanation of A
- 2) Both A & R are true and R is not correct explanation of A
- 3) A is true but R is false
- 4) R is true but A is false

395. **Assertion :** Interferons are a type of antibodies produced by body cells infected by bacteria.

**Reason :** Interferons stimulate inflammation at the site of injury.

- 1) Both A & R are true and R is the correct explanation of A
- 2) Both A & R are true and R is not correct explanation of A
- 3) A is true but R is false
- 4) Both A and R are false



## KEY

### AQUACULTURE

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### POULTRY

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### BIOTECHNOLOGY

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### CELL CYCLE

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### CANCER BIOLOGY

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### STEM CELLS

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### BIOMEDICAL TECHNOLOGY

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### LEVEL-III

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