

# Answers to RBI-DS1/Set-2

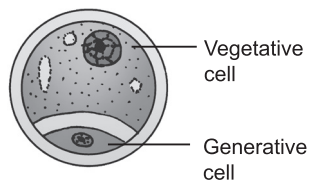
## SECTION-A

1. (c) Nucellus and megaspore mother cell
2. (b) A – (ii), B – (iii), C – (i), D – (iv)
3. (a) 50%
4. (b) Seed ferns
5. (c) It can be used for the detection of cleft-palate in the foetus.
6. (c) They are produced by prokaryotes only.
7. (b)  $\log S = \log C + Z \log A$
8. (d)
9. (b) The pyramid of number in a big tree ecosystem is spindle shaped.
10. (b) the ability of a plant cell to grow into an entire plant.
11. (d) involves digestion of organic matter by the heterotrophic microbes naturally present in the sewage.
12. (c) In 1981, the 'r' value for human population in India was 0.0205.
13. (b) Both A and R are true and R is not the correct explanation of A.
14. (a) Both A and R are true and R is the correct explanation of A.
15. (c) A is true but R is false.
16. (b) Both A and R are true and R is not the correct explanation of A.

## SECTION-B

17. (a) A is vacuole and B is asymmetric spindle.

(b)



18. Aquatic ecosystem - Grazing Food Chain (GFC).

Terrestrial ecosystem - Detritus Food Chain (DFC).

**Difference:** GFC begins with producers whereas DFC begins with dead organic matter or detritus.



- The water in the tender coconut represents the nuclear endosperm, while the white kernel represents the cellular endosperm.
  - (b) Endosperm development precedes that of the zygote as an adaptation to provide assured nutrition to the developing embryo.
24. – X is N-glycosidic linkage; it forms a nucleoside.
- Y is phosphoester linkage; it forms a nucleotide.
  - Z is a phosphodiester linkage; it forms a dinucleotide.
25. (a) *Streptococcus pneumoniae* (bacterium responsible for pneumonia).
- (b) In experiments 2 and 4, the mouse died.

(c)

R strain	S strain
<ul style="list-style-type: none"> <li>– These cells form rough (R) colonies without any mucous (polysaccharide) coat.</li> <li>– They are non-virulent and do not cause pneumonia.</li> </ul>	<ul style="list-style-type: none"> <li>– These cells form smooth (S), shiny colonies with a mucous (polysaccharide) coat.</li> <li>– They are virulent and cause pneumonia.</li> </ul>

26. (a) – *Trichoderma polysporum* is the source organism.
- It is used as an immunosuppressive agent for organ transplant patients to prevent the rejection of the graft.
- (b) – *Streptococcus* is the source organism.
- It is used as a clot buster, to remove the clots from the blood vessels of patients who have suffered myocardial infarction.
- (c) – *Monascus purpureus* is the source organism.
- It is a blood cholesterol-lowering agent.
27. (a) – Some insects and frogs are cryptically-coloured (camouflaged) to avoid detection by their predators.
- The Monarch butterfly is highly distasteful to its predator (bird) because of a special chemical that, it has acquired during its caterpillar stage.
- (b) (i) Parasitism    (ii) Predation    (iii) Mutualism    (iv) Commensalism
28. (a) (i) RNA interference is a method of cellular defense in all eukaryotic organisms.
- (ii) 1. Infection by a virus having RNA genome.
2. Mobile genetic elements, called transposons that replicate via an RNA intermediate.

**OR**

- (b) (i) Rosie is the first transgenic cow.  
(ii) The milk contained human protein,  $\alpha$ -lactalbumin (2.4 g per litre) which is nutritionally important for human babies.

**SECTION-D**

29. (a) (i) Gamete Intra-fallopian transfer (GIFT)  
(ii) Intra-cytoplasmic sperm injection (ICSI)  
(b) **Embryo transfer (ET)**  
(i) The zygote or early embryo with upto eight blastomeres is implanted in the fallopian tube (ZIFT).  
(ii) Embryo with more than eight blastomeres is implanted in the uterus (IUT) for further development.  
(c) (i) – Artificial insemination is carried out in infertility cases where the male partner is unable to inseminate the female partner or the sperm count is very low in the ejaculate.

**OR**

- (c) (ii) Gamete Intra-fallopian transfer (GIFT) and Intra-uterine insemination (IUI).  
30. (a) A – Meiosis  
B – Mitosis  
(b) C is Parthenogenesis  
(c) (i) – Henking was the scientist.  
– He could observe a specific nuclear structure all through spermatogenesis in certain insects.  
– He also observed that 50 percent of the sperms received this structure and the other 50 percent did not receive it; he called it X-body.

**OR**

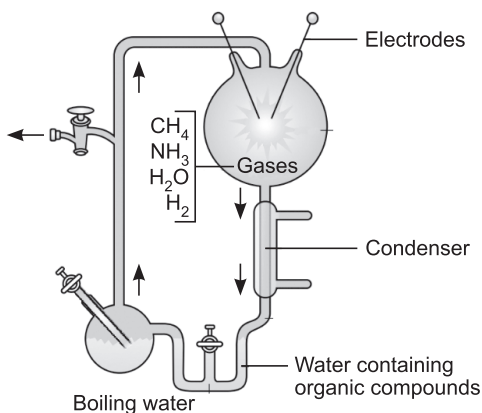
- (c) (ii) – A male honeybee develops parthenogenetically from an unfertilised ovum; so he has no father.  
– When the sperm fertilises the ovum, the fertilised egg develops into a female; hence, he has no son.

## SECTION-E

31. (a) (i)

Convergent evolution	Divergent evolution
<ul style="list-style-type: none"> <li>- When different structures in different species evolve to perform the same function due to the similar habitat that has resulted in selection of similar adaptive features, it is called convergent evolution.</li> <li>- Analogous structures are the result of convergent evolution.</li> </ul>	<ul style="list-style-type: none"> <li>- When the same structure in different species develops along different directions due to adaptations to different needs, it is called divergent evolution.</li> <li>- Homologous structures are the result of divergent evolution.</li> </ul>

(ii)



- He used a temperature of 800°C in the gas chamber.
- Amino acids were the products formed.

**OR**

- (b) (i) 1. - Before continental drift, there were mammals resembling horse, hippopotamus, rabbit, bear, etc. in South America.
- Due to continental drift, when South America joined North America, these mammals were overridden by the North American animals.
2. - Due to continental drift, Australia became separated from the main land.
- The pouched mammals of Australia started surviving better due to lack of competition from any other mammal.

(ii) *Ramapithecus* → *Australopithecus* → *Homo habilis*

***Ramapithecus***

- They were hairy and walked like gorillas and chimpanzees.

***Australopithecus***

- They hunted with stone weapons.
- They ate mainly fruits.

***Homo habilis***

- They had a brain capacity of 650-800 cc.
- They probably did not eat meat.

32. (a) (i) – Plasmids are an important tool as
1. they are used as vectors to introduce a desired segment of DNA into host cell for cloning.
  2. they also help in selecting the recombinants from non-recombinants.
- Plasmids are obtained from bacteria like
    1. *Salmonella typhimurium*
    2. *Agrobacterium tumefaciens*
- (ii) ‘Ori’
- It is the sequence of DNA, where replication of DNA is initiated.
  - When an alien/recombinant DNA is ligated to ‘ori’ of the vector, it can be made to multiply equal to the copy number of the vector.
- ‘Selectable marker’**
- The selectable marker helps in identifying and eliminating the non-transformants and selectively permitting the growth of the transformants.
- (iii) – Restriction endonuclease are used to cut the DNA at specific sites, i.e., a little away from the centre of the palindromic sequence,
- By using the specific restriction endonuclease, the desired gene of the interest can be isolated from the source organism.
  - Similarly the same restriction endonuclease can be used to cut the host/vector DNA to ligate the gene of interest
  - Unless the vector and the host DNA are cleaved, rDNA cannot be produced.

**OR**

- (b) (i) Operational guidelines for Bioreactors
1. The bioreactor must have a curved base to facilitate the mixing of the reactor contents.
  2. The stirrer facilitates the even mixing and oxygen availability throughout the bioreactor.
  3. Cells can be multiplied in continuous culture system, wherein the used medium is drained from one side while fresh medium is added from the other.
  4. The bioreactor must have a temperature control, foam control, pH control and oxygen delivery system.
- (ii) It is the log or exponential phase, when the cells are in their physiologically the most active state.
- (iii) – No, the product has to be subjected through a series of processes, mainly separation and purification, called downstream processing.
- The product has to be formulated with suitable preservatives.
  - In case of drugs, such formulations have to under go clinical trials.
  - Strict quality control testing for each product is also required.
33. (a) (i) – Colostrum provides passive acquired immunity.
- Passive immunisation is necessary, when a person is infected with a deadly microbe and quick immune response is necessary.  
*e.g.* for tetanus, snake bite. (any one)
- (ii) 1. The cancer causing viruses, called oncogenic viruses, have genes called viral oncogenes. When these genes have entered our body cells and activated the cellular oncogenes under certain conditions, it could lead to oncogenic transformation of cells, *i.e.* cancer is caused.
2. – When the cells of a (benign) tumour acquire the property of metastasis, they separate, reach distant sites through body fluids and get lodged there and start new tumour there, it is called malignant.
    - These cells damage the surrounding normal tissues.
    - They compete with the normal cells and starve them of vital nutrients.

**OR**

- (b) (i) – The nicotine (of tobacco) stimulates adrenal glands to secrete adrenaline and nor-adrenaline; both these hormones raise the blood pressure.
- Smoking increases the carbon monoxide level of blood, which competes with oxygen for transport.
  - As the concentration of haembound oxygen decreases, there is oxygen deficiency in the body.
- (ii) – Ascariasis is caused by the helminth, *Ascaris lumbricoides*
- The intestine becomes blocked and damaged.

**Symptoms**

1. Intestinal bleeding
2. Muscular pain
3. Anaemia
4. Blockage of intestinal passage. (any three)

**Transmission**

- The eggs of the parasite from the faeces of infected person contaminate soil, water and plants.
- Infection is mainly through contaminated water, fruits and vegetables.