

# Saras Biology for School level

Books for both State Board & CBSE

10<sup>th</sup> - Science | 11<sup>th</sup> - Biology | 12<sup>th</sup> - Biology | NEET



Log in [www.saraspublication.com](http://www.saraspublication.com) to check all the titles

# Saras Biology for College level

Books for both UG & PG Courses

Zoology | Botany | Biotechnology | Microbiology  
Biochemistry



Log in [www.saraspublication.com](http://www.saraspublication.com) to check all the titles

Scan QR code  
to order books online



**Saras Publication**

114/35G, A.R.P. Camp Road,  
Periavilai, Nagercoil - 629002  
Kanyakumari District, Tamilnadu.  
Ph : 04652 - 265026, 98421 23441  
E-mail : [info@saraspublication.com](mailto:info@saraspublication.com)

online shopping @ [www.saraspublication.com](http://www.saraspublication.com)

12<sup>th</sup>  
std

Bio-Zoology

N.Arumugam  
P. Senthil Kumar



45 YEARS of Life Science book publishing  
Saras for Science and Biology guide books

SARAS

12<sup>th</sup>  
std

BASED ON  
TAMILNADU STATE BOARD SYLLABUS

# Bio-Zoology

N.Arumugam

P. Senthil Kumar

Only Book having Questions framed  
line by line from the Text Book

SOLVED BOOK BACK QUESTIONS  
SOLVED ADDITIONAL QUESTIONS  
GOVERNMENT EXAM QUESTION PAPERS

FREE

2 SUPPLEMENTS WITH THIS BOOK

FREE SUPPLEMENT - 1

UNIT TEST QUESTION PAPERS - CHAPTER WISE  
ASSESSMENT TEST QUESTION PAPERS - 6  
PTA QUESTION PAPERS - 6

FREE SUPPLEMENT - 2

DEFINITIONS DO YOU KNOW QUESTIONS  
DIFFERENCES DAYS OF IMPORTANCE  
DISCOVERIES ABBREVIATIONS  
LAWS AND THEORIES

Saras

45

Years in Life Science Book Publishing. Since 1974

# Bio-Zoology

12

**Only Book having Objective Questions  
framed line by line from the Text Book**

Solved Book back Questions

Solved Additional Questions

Government Exam Question Papers

## Supplement - 1

Unit Test Question Papers - Chapterwise  
Assessment Test Question Papers - 4  
PTA Question Papers - 6

## Supplement - 2

Definitions Do you know questions  
Differences Days of Importance  
Discoveries Abbreviations  
Laws and Theories

Edited by

**Dr., Capt. N. Arumugam,** M.Sc., M.Phil., Ph.D., FZI, FIAES  
Gold Medalist, Zoological Society of India,  
Fellow, Indian Academy of Environmental Sciences,  
Fellow, Zoological Society of India,  
Principal and Head (Rtd.), Dept. of Zoology, Vivekananda College,  
Agasteeswaram, Kanyakumari Dist - 629 701.

Designed by

**P. Senthil Kumar,** M.Sc., M.Phil., B.Ed.  
PG Asst. in Biology,  
SMSV Higher Secondary School,  
Karaikudi.

## SARAS PUBLICATION

114/35G, A.R.P. Camp Road, Periavilai, Kottar P.O.,  
NAGERCOIL, Kanyakumari Dist. - 629 002. Tamil Nadu  
Website : [www.saraspublication.com](http://www.saraspublication.com)  
E-mail: [info@saraspublication.com](mailto:info@saraspublication.com)  
Telephone: 04652 - 265026, 265099; Cell: 098421 23441.



## 12<sup>th</sup> Bio-Zoology - Line by Line Solved Questions

Copyright Publisher

Published by Saras Publication, Nagercoil.

Printed by Saras Offset Printers, 1337/5, Sattur Road, Sivakasi - 626 189

**Cell:** 09842323441, **E-mail:** print@sarasprinter.in

45 years in Life Science Book publishing. Since 1974

First Edition : 2020

---

All rights reserved.

No part of this book may be reproduced in any form, by photostat, microfilm, xerography or any other means, or incorporated into any information retrieval system, electronic or mechanical, without the written permission of the copyright owner.

**Price : Rs. 390/-**

**Pages : 424 + 60 + 72 (2 Supplement books)**

Published by

**SARAS PUBLICATION**

114/35G, A.R.P. Camp Road, Periavilai,

Kottar P.O., Nagercoil,

Kanyakumari Dist -629 002.

Telephone : 04652 265026, 265099

Cell phone : 09842123441

**Shop online : [www.saraspublication.com](http://www.saraspublication.com)**

**E-mail : [info@saraspublication.com](mailto:info@saraspublication.com)**

### Authors

### Chapters

A. Aravinth M.Sc.,	- 8
S. Boustine M.Sc., M.Phil., Dip. Counselling	- 6,11,12
R. Jeya Saroj Bagya Rose M.Sc., M.Phil., B.Ed., PGDMM	- 9
S. Angel Suby M.Sc., BLS., PGDCA.	- 7, 3
M. Deepa M.Sc., PGDIW & WWT., PGDCR., DMLT.	-1, 2, 4, 5, 10

## Contents

NO	CHAPTER	PAGE NO
1	Reproduction in Organisms	1 - 19
2	Human Reproduction	20 - 55
3	Reproductive Health	56 - 82
4	Principles of Inheritance and Variation	83 - 115
5	Molecular Genetics	116 - 161
6	Evolution	162 - 198
7	Human Health and Diseases	199 - 242
8	Microbes in Human Welfare	243 - 267
9	Applications of Biotechnology	268 - 306
10	Organisms and Population	307 - 341
11	Biodiversity and its Conservation	342 - 376
12	Environmental Issues	377 - 406
Biology Public Exam Question Paper - March 2020		407 - 411
Zoology Public Exam Question Paper - March 2020		412 - 415

### Supplement - 1

Unit Test Question Papers - Chapterwise  
 Assessment Test Question Papers -4  
 PTA Question Papers - 6

### Supplement - 2

Definitions	Do you know questions
Differences	Days of Importance
Discoveries	Abbreviations
Laws and Theories	

## Our Titles for 12<sup>th</sup> Biology

- 12<sup>th</sup> Bio-Botany + 2 Supplement Books  
Line by Line Solved Questions
- 12<sup>th</sup> Bio-Zoology + 2 Supplement Books  
Line by Line Solved Questions
- 12<sup>th</sup> Bio-Botany  
Book Back Solved Questions
- 12<sup>th</sup> Bio-Zoology  
Book Back Solved Questions
- 12<sup>th</sup> Botany for Pure Science  
Line by Line Solved Questions
- 12<sup>th</sup> Zoology for Pure Science  
Line by Line Solved Questions
- 12<sup>th</sup> Bio Botany  
1 Mark solved Questions - 1050
- 12<sup>th</sup> Bio Zoology  
1 Mark solved Questions - 1050
- 12<sup>th</sup> Model Solved Question Papers 12
- 12<sup>th</sup> உயிரி-தாவரவியல் + 2 Supplement Books  
வரி வரி வினா விடைகள்
- 12<sup>th</sup> உயிரி-விலங்கியல் + 2 Supplement Books  
வரி வரி வினா விடைகள்
- 12<sup>th</sup> உயிரி-தாவரவியல்  
புத்தக வினா விடைகள்
- 12<sup>th</sup> உயிரி-விலங்கியல்  
புத்தக வினா விடைகள்
- 12<sup>th</sup> உயிரி-தாவரவியல்  
1 மதிப்பெண் வினா விடைகள்
- 12<sup>th</sup> உயிரி-விலங்கியல்  
1 மதிப்பெண் வினா விடைகள்
- 12<sup>th</sup> உயிரியல் விடையளிக்கப்பட்ட  
மாதிரி வினாத்தாள்கள் 12
- 12<sup>th</sup> CBSE Biology

# 6 Evolution

## Book Back Solved Questions - 1 Mark

### I. Choose the Correct Answer

- 1) The first life on earth originated  
 a) *in air*                      b) *on land*  
 c) *in water*                    d) *on mountain*
- 
- 2) Who published the book “Origin of species by Natural Selection” in 1859?  
 a) *Charles Darwin*  
 b) *Lamarck*  
 c) *Weismann*  
 d) *Hugo de Vries*
- 
- 3) Which of the following was the contribution of Hugo de Vries?  
 a) *Theory of mutation*  
 b) *Theory of natural Selection*  
 c) *Theory of inheritance of acquired characters*  
 d) *Germplasm theory*
- 
- 4) The wings of birds and butterflies is an example of  
 a) *Adaptive radiation*  
 b) *Convergent evolution*  
 c) *Divergent evolution*  
 d) *Variation*
- 
- 5) The phenomenon of “ Industrial Melanism” demonstrates  
 a) *Natural selection*  
 b) *Induced mutation*  
 c) *Reproductive isolation*  
 d) *Geographical isolation*
- 
- 6) Darwin’s finches are an excellent example of  
 a) *Connecting links*  
 b) *Seasonal migration*  
 c) *Adaptive radiation*  
 d) *Parasitism*
- 
- 7) Who proposed the Germplasm theory?  
 a) *Darwin*                      b) *August Weismann*  
 c) *Lamarck*                    d) *Alfred Wallace*
- 
- 8) The age of fossils can be determined by  
 a) *Electron microscope*  
 b) *Weighing the fossils*  
 c) *Carbon dating*  
 d) *Analysis of bones*
- 
- 9) Fossils are generally found in  
 a) *Igneous rocks*  
 b) *Metamorphic rocks*  
 c) *Volcanic rocks*  
 d) *Sedimentary rocks*
- 
- 10) Evolutionary history of an organism is called  
 a) *Ancestry*                    b) *Ontogeny*  
 c) *Phylogeny*                d) *Paleontology*
- 
- 11) The golden age of reptiles was  
 a) *Mesozoic era*              b) *Cenozoic era*  
 c) *Paleozoic era*              d) *Proterozoic era*

I. 1.(c) 2. (a) 3. (a) 4. (b) 5. (a) 6. (c) 7. (b) 8. (c) 9. (d) 10. (c) 11. (a)

12) Which period was called “Age of fishes”?

- a) Permian                      b) Triassic  
c) Devonian                     d) Ordovician

13) Modern man belongs to which period?

- a) Quaternary                  b) Cretaceous  
c) Silurian                      d) Cambrian

14) The Neanderthal man had the brain capacity of

- a) 650-800cc                  b) 1200cc  
c) 900cc                         d) 1400cc

15. According to Darwin the organic evolution is due to

- a) *Intraspecific competition*  
b) *Interspecific competition*  
c) *Competition within closely related species*  
d) *Reduced feeding efficiency in one species due to the presence of interfering species.*

16. A population will not exist in Hardy-Weinberg equilibrium if

- a) *Individuals mate selectively*  
b) *There is no mutation*  
c) *There is no migration*  
d) *The population is large*

### Book Back Solved Questions - 2 Marks

1. List out the major gases that seems to be found in the primitive earth

1. Ammonia                  3. Hydrogen  
2. Methane                  4. Water vapour

2. Differentiate between the eating habit and brain size of *Australopithecus* and *Ramapithecus*

<i>Australopithecus</i>	<i>Ramapithecus</i>
<b>Eating habit</b>	
Omnivorous	Herbivorous
<b>Brain size</b>	
1. Brain capacity of 350 to 450cc.	1. Brain capacity of 300 to 400cc.
2. High cranial capacity.	2. Low cranial capacity.

3. Rearrange the descent in human evolution. *Australopithecus* → *Homo erectus* → *Homo sapiens* → *Ramapithecus* → *Homo habilis*

*Homo sapiens*



*Homo erectus*



*Homo habilis*



*Australopithecus*



*Ramapithecus*

4. Mention any three similarities found common in Neanderthal and *Homo sapiens* (Modern man)

- Both belong to the genus ***Homo***.
- Used ***animal hides*** to protect their body.
- They knew ***use of fire***.
- They ***buried*** their ***dead***.
- Brain capacity was between ***1400-1600cc***.

12. (c) 13. (a) 14. (d) 15. (a) 16. (a)

## Book Back Solved Questions - 3 Marks

1. Mention the main objections to Darwinism.

1. Darwin failed to explain the *mechanism of variation*.

2. He explained survival of the fittest but not *arrival of the fittest*.

3. He focussed on small *fluctuating variations* that are *not inheritable*.

4. *Somatic* and *germinal variations* were not distinguished.

5. No proper explanation was given for occurrence of the following:

\* Vestigial organs

\* Large tusks in extinct *mammoths*

\* *Oversized antlers* in extinct Irish deer, etc.

2. How does Neanderthal man differ from modern man in appearance?

No	Neanderthal man	Homo sapiens
1.	<i>Semierect</i> posture	<i>Erect</i> posture
2.	<i>Flat</i> cranium	Skull had <i>short base</i> and <i>high brain</i> case.
3.	<i>Sloping</i> forehead.	Forehead is <i>flat</i> .
4.	Thin large orbits.	Square orbits.
5.	<i>Heavy brow</i> ridges.	<i>Light brow</i> ridges.
6.	<i>Protruding</i> jaws.	<i>Short</i> jaws
7.	<i>No chin</i>	<i>Protruding</i> chin.

3. How does Mutation theory of De Vries differ from Lamarck and Darwin's view in the origin of new species ?

	De Vries	Lamarck	Darwin's
1.	De Vriesm	Lamarckism	Darwinism
2.	<i>Sudden change</i> in genetic material	<i>Gradual accumulation</i> of variations.	<i>Gradual accumulation</i> of variations.
3.	Mutation	Use and disuse of organs, Acquired characters	Natural selection - Survival of the fittest
4.	Speciation in a single step.	Speciation in several steps.	Speciation in several steps.
5.	No intermediates	Intermediate forms	Intermediate forms

**4. Who disproved Lamarck's theory of acquired characters? How?**

August Weismann

**Explanation**

1. August Weismann proposed "**germplasm theory**".
2. He conducted **experiments on mice**.
3. He cut the tails of mice and bred for **20 generations**.
4. All mice were born with tail.
5. He proved that **change in the somatoplasm** will not be transferred to the next generation.
6. But, change in the **germplasm** was **inherited**.

**5. How did Darwin explain fitness of organisms?**

1. All living organisms **increase** their population in large numbers due to overproduction or **prodigality of production**.
2. This leads to **struggle for existence, struggle for food, space and mate**.
3. In the struggle, organism with **useful variation** are selected by **natural selection**.
4. These are the **fittest organisms to survive**.
5. These fittest ones leave more **progenies**.
6. Such organisms become **better adapted** to the changed environment.

**Book Back Solved Questions - 5 Marks**

**1. Explain the three major categories in which fossilization occur**

**Fossilization** is the process by which plant and animal remains are preserved in sedimentary rocks.

The three categories are:

1. Actual remains
2. Petrification
3. Natural moulds and casts

**1. Actual Remains**

1. The following hard body parts of dead animals are preserved by Earth's crust.

1. Bones
2. Teeth
3. Shells

2. This is the **most common method** of fossilization.

3. The following factors from earth's crust preserve actual remains.

1. Salt
2. Frozen ice
3. Volcanic ash

4. When animals die, their **hard body parts** are covered with **sediments**.

5. These parts are protected from **further deterioration** and are preserved **as such**.

6. Marine organisms are preserved by the **salt** of the oceans.

7. The frozen ice of **Serbian Coast** has preserved **Woolly Mammoth** which has lived there 22000 years ago.

8. **Volcanic ash** has preserved intact **human** beings and **animals** in the ancient city Pompeii, Italy.

**2. Petrification**

**Petrification** is the process in which the original body is lost by disintegration and being replaced by molecule for molecule by minerals.

The principal minerals are

1. Iron pyrites
2. Silica
3. Calcium carbonate
4. Calcium bicarbonate
5. Magnesium bicarbonate

**3. Natural Moulds and Casts**

1. The **indelible impressions** are left by the animals on the **soft muds**.

2. The impressions are hardened into stones called **moulds**.

3. Casts are fossilized moulds filled up with **hard minerals**.

4. Eg. **Coprolites** are pellets of **fossilized faecal matter** of organisms.

5. Coprolites help to find out the **dietary habits** of prehistoric animals.

2. Differentiate between divergent evolution and convergent evolution with one example for each.

Divergent Evolution	Convergent Evolution
<ol style="list-style-type: none"> <li>1. Structures which are similar in structure and origin but perform different functions bring divergent evolution.</li> <li>2. <b>Homologous</b> structure.</li> <li>3. Similar in <b>anatomy</b>.</li> <li>4. Dissimilar in <b>function</b>.</li> <li>5. Originated from the <b>same ancestor</b>.</li> <li>6. Example in animals Forelimbs of Bird            Cat            Bat Horse        Whale        Man</li> <li>7. In plants: Thorn and tendril. Thorn of <i>Bougainvillea</i> is used for defence from grazing animals. Tendrils of <i>Cucurbita</i> and <i>Pisum sativum</i> are used as support for climbing.</li> </ol>	<p>Structures having different structural patterns but similar function cause convergent evolution.</p> <p><b>Analogous</b> structure <b>Dissimilar</b> in anatomy. Similar in function. Originated from <b>different</b> ancestors. Examples in animals *Wings of birds and insects. *Eyes of octopus and mammals. *Flippers of Penguins and Dolphins. In plants: Sweet potato and potato. * Root modification in <b>sweet potato</b> * Stem modification in <b>potato</b> Both are used for storage of food.</p>

3. How does Hardy-Weinberg's expression ( $p^2+2pq+q^2=1$ ) explain that genetic equilibrium is maintained in a population? List any four factors that can disturb the genetic equilibrium.

**Explanation**

**Hardy-Weinberg** stated that "the allele frequencies in a population are stable and are constant from generation

to generation in the absence of gene flow, genetic drift, mutation, recombination and natural selection.

1. Consider a **large** population of **beetles**.

2. They appear in **two** colors

☞ Dark grey (black)

☞ Light grey

3. Color is determined by **gene 'A'**.

4. AA, Aa - Dark grey

aa - Light grey

5. Let us say

Frequency of A = p = 0.3

Frequency of a = q = 0.7

6. p + q = 1

7. The genotype frequency can be calculated by Hardy-Weinberg equation

$$(p+q)^2 = p^2+2pq+q^2$$

$$p^2 = \text{Frequency of AA}$$

$$2PQ = \text{Frequency of Aa}$$

$$q^2 = \text{Frequency of aa}$$

$$P = 0.3, \quad q = 0.7$$

$$p^2 = (0.3)^2 = 0.09 = 9\% \text{ AA}$$

$$2pq = 2(0.3)(0.7) = 0.42 = 42\% \text{ Aa}$$

$$q^2 = (0.7)^2 = 0.49 = 49\% \text{ aa}$$

This clearly shows that Beetle population remains in **equilibrium under Hardy-Weinberg law**.

**Factors that Disturb the Equilibrium**

1. Gene flow
2. Genetic drift
3. Mutation
4. Recombination
5. Natural selection

**4. Explain how mutation, natural selection and genetic drift affect Hardy-Weinberg equilibrium.**

### 1. Mutation

1. Mutation is the **sudden change** in the **gene**.

2. Mutation **generates new alleles**.

3. Genes are sometimes **deleted**.

4. Genes are sometimes **duplicated**.

5. So, **gene frequency** changes.

### 2. Natural Selection

1. In a large population, the **fit alleles** are **allowed to survive**. They tend to produce more and **more alleles by reproduction**.

2. The **unfit alleles** are not allowed to survive. So, they cannot produce alleles and are **eliminated**.

3. So, gene frequency changes.

### Genetic Drift

1. **Genetic drift** is a change in **gene frequency by chance** (sampling error) in a **small population**.

2. Small population arises due to

1. **Natural disasters**

2. **Bottle neck effect**

3. **Founder's effect**

3. Due to genetic drift, **alleles** are lost by **chance**.

4. Even **beneficial alleles** are lost.

**5. Taking the example of peppered moth, explain the action of natural selection. What do you call that phenomenon?**

### Action of Natural Selection

Charles Darwin proposed that the **fittest organisms** can only survive and

produce *more progeny* than the unfit ones by the evolutionary process of **natural selection**.

1. Natural selection can be well explained with peppered moth, *Biston betularia* as an example.

2. There are two colours

- Black
- White

3. In the **preindustrialization period**, in England, the walls of buildings were **white**. Hence, white moths could easily escape from the **predators**.

4. In the **post industrialization period**, the walls and barks of trees got blackened due to **smoke** from chimneys.

5. The **black** moths merged with the background and escaped from the predator.

6. The white moths were easily identified and were eaten by birds.

7. Black moth has developed the **survival capability** through natural selection.

8. **Adaptation** to the changed situation was essential for evolution which was supported by Natural selection.

9. Black moth population had increased whereas white moth decreased.

### Phenomenon

This phenomenon is termed as **industrial melanism**.

**6. Darwin's finches and Australian marsupials are suitable examples of Adaptive Radiation - Justify the statement.**

### Adaptive Radiation

*The evolutionary process of producing new species from a single ancestor which adapted to newly invaded habitats.*

### Darwin's Finches

1. Arrived on the **Galapagos** about 2 million years ago.

2. Evolved into **14 recognized** species having

1. Different body size
2. Different beak shape
3. Different feeding behaviour

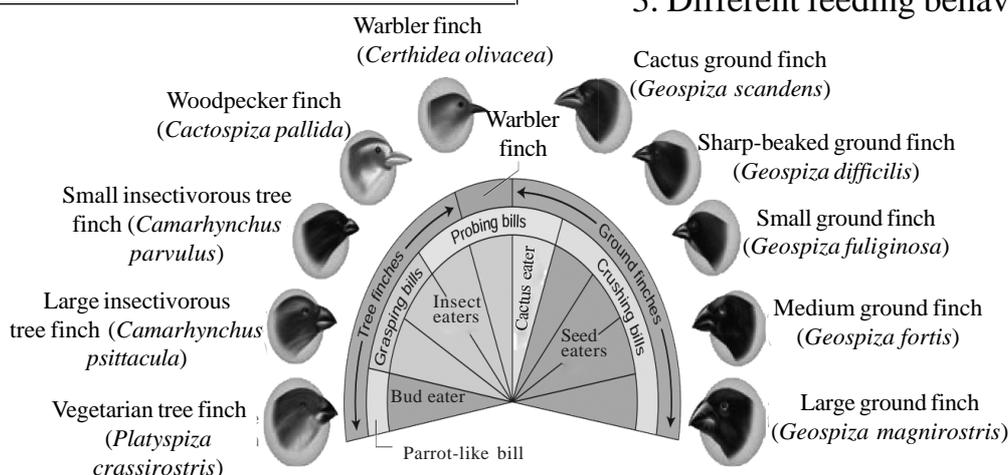


Fig. Darwin's finches.

3. Changes in *size* and *form* of *beak* enabled them to different sources of food such as

- *Insects*      • *Nectar from cactus*
- *Seeds*        • *Blood from Iguanas*

4. Mild mutation of *ALXI* gene caused change in beak shape of Darwin finches.

### Australian Marsupials

1. Marsupials and placental mammals of North America are adapted to particular *food resource*, *locomotory skill* and *climate*.

2. They were separated from their common ancestor over 100 million years.

3. They produced varieties of species.

4. They do resemble each other in

- Size
- Locomotory mode
- Feeding
- Foraging
- Mode of reproduction

5. This shows clearly their *distinctive evolutionary relationship*.

6. Marsupials evolved into more than 200 species in *Australia*.

7. Fewer than 200 species of placental mammals were evolved in *North America*

8. There was lot of similarities in the way they have evolved showing *adaptive radiation*.

7. List the types of selection. Explain.

1. *Stabilizing selection*
2. *Directional selection*
3. *Disruptive selection*

### 1. Stabilizing Selection

1. *In a stable environment, the organisms with average phenotypes survive; The organisms with extreme phenotypes from both the ends are eliminated.*

2. This is also known as *centripetal selection*.

3. It operates in a *stable environment*.

4. *Phenotype stability* is maintained.

5. This *stabilizes the selection*.

6. Hence, there is *no speciation*.

Eg. In a *storm* some *sparrows* died and a few survived.

Measurements of sparrows which survived a storm, clustered around *mean*, in the middle of the graph.

Measurements of dead sparrows clustered around the ends of the graph. They have *extreme variation*.

*The peak of the graph gets higher and narrower.*

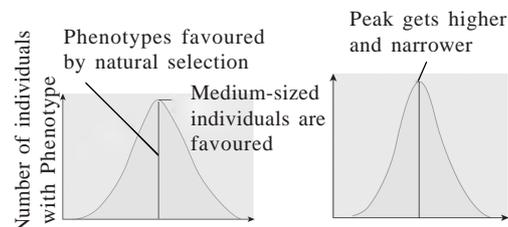


Fig. Stabilizing selection.

### 2. Directional Selection

1. Directional selection removes individuals from *one end towards the other end* of phenotype distribution.

2. This happens in an *environment* where there is a *gradual change*.

Eg. \* There is a size difference between male and female sparrows.

\* Both look alike externally, but differ in *body weight*.

\* Females show directional selection in relation to body weight.

\* *The peak of the graph shifts in one direction.*

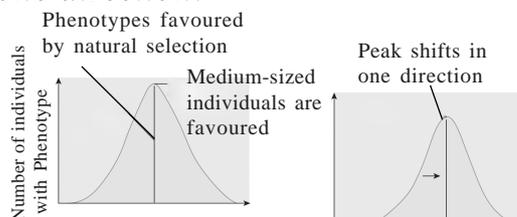


Fig. Directional selection.

### 3. Disruptive Selection

1. *The organisms of phenotype of both extremes are selected whereas the average phenotype organisms are eliminated.*

2. It is also termed as **Centrifugal selection or Adaptive radiation.**

4. This occurs when homogenous environment changes to **heterogenous environment.**

5. This results in **splitting** the population into **sub populations** or **species.**

6. This is a **rare** form of selection.

7. This leads to the formation of **two** or **more species.**

8. **Two peaks** are formed in the graph.

Eg. Darwin's finches in Galapagos Island developing different sized beaks in relation to seed size.

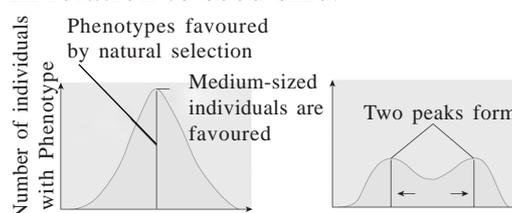


Fig. Disruptive selection.

### Additional Solved Questions - 1 Mark

1. Urey and Miller used the following gaseous mixture in their experiment

- $CH_3 + NH_3 + H_2 + H_2O$
- $CH_4 + NH_3 + H_2 + H_2O_2$
- $CH_4 + NH_3 + H_2 + H_2O$
- $CH_4 + NH_4 + H_2 + H_2O$

2. Urey and Miller's experiment is a proof for

- Abiogenesis
- Biogenesis
- Special creation
- Big Bang

3. Identify the organic compounds synthesized from inorganic compounds by Urey and Miller.

a. Glycine, Alanine, Beta alanine, Aspartic acid

b. Glycine, Ammonia, Beta alanine, Aspartic acid

c. Glycine, Alanine, Ammonia, Aspartic acid

d. Glycine, Alanine, Beta alanine Ammonia

4. Which one is not related to mutation

- Discontinuous variation
- Not transmitted to other generations
- Fully fledged
- No intermediate forms

I. 1. (c) 2. (a) 3. (a) 4. (b)

5. Sudden and large variations were responsible for the origin of new species.  
*a. De vries      b. Lamarck*  
*c. Darwin      d. Haeckel*
6. Which sequence is in our fore limb.  
*a. Humerus, radius, carpals ulna, metacarpals, phalanges*  
*b. Humerus,, ulna, radius carpals metacarpals, phalanges*  
*c. Humerus, radius, ulna, carpals metacarpals, phalanges*  
*d. Humerus, radius, ulna, metacarpals, carpals phalanges*
7. Which is not an analogous organ  
*a. Eyes of octopus and mammals*  
*b. Flippers of penguins and dolphins*  
*c. Wings of insects and birds*  
*d. Stem modification of sweet potato and root modification of potato*
8. The diet of the prehistoric animal can be identified by  
*a. Carts      b. Coprolites*  
*c. Moulds      d. Volcanic ash*
9. The emergence of homo sapiens as a distinct species from apes proves that  
*a. Natural selection is in force*  
*b. Struggle for existence*  
*c. Ontogeny recapitulates phylogeny*  
*d. Survival of the fittest*
10. Which natural selection leads to adaptive radiation  
*a. Centripetal selection*  
*b. Centrifugal selection*
11. Sampling error is due to  
*a. Immigration      b. Mutation*  
*c. Gene flow      d. Genetic drift*
12. Marsupials have undergone adaptive radiation in  
*a. Africa      b. Australia*  
*c. Galapagos island      d. Asia*
13. Which term is used to describe heritable changes in one or more characteristics of a population of species from one generation to the other ?  
*a) Selection      b) Gene flow*  
*c) Evolution      d) Mutation*
14. What is the estimated age of solar system and earth by radiometric dating?  
*a) 5 to 6.5 billion*  
*b) 7 to 7.5 billion*  
*c) 6 to 7.5 billion*  
*d) 4.5 to 4.6 billion*
15. Which theory explains the origin of universe?  
*a) Biogenesis      b) Abiogenesis*  
*c) Special creation*  
*d) Big Bang*
16. Name the “First pre-cells” transformed into “living cells”?  
*a) Biotic soup*  
*b) Coacervates*  
*c) Protobionts      d) Protista*
17. The sea with a large population of organic monomers and polymers is called
5. (a)    6. (c)    7. (d)    8. (b)    9. (c)    10. (b)    11. (d)    12. (b)    13.(c)  
 14. (d)    15. (d)    16. (b)

- a) *Hot dilute soup*    c) *First cell*  
b) *Hot soup*            d) *Pre cell*

**18.** Which marine group was predominant during the Paleozoic period?

- a) *Reptiles*            b) *Vertebrates*  
c) *Invertebrates*    d) *Pisces*

**19.** Name the study of prehistoric life through fossils.

- a) *Cytology*        b) *Embryology*  
c) *Ecology*         d) *Paleontology*

**20.** Chemical evolution was proposed by

- a) *Lamarck*  
b) *Oparin and Haldane*  
c) *Charles Darwin*  
d) *August Weismann*

**21.** Which era is known as the “golden age of reptiles”?

- a) *Paleozoic*        b) *Cenozoic*  
c) *Precambium*    d) *Mesozoic*

**22.** Hardened faecal matter in tiny pellets of fossil are known as

- a) *Coacervates*    b) *Coprolites*  
c) *Casts*  
d) *Colloidal aggregates*

**23.** Name the theory that says “life arose from pre-existing life”.

- a) *Abiogenesis*    b) *Biogenesis*  
c) *Special creation*  
d) *Chemical evolution*

**24.** The theory of recapitulation or biogenetic law was proposed by

- a) *Heinrich*        b) *Wallace*

- c) *Ernst Von Haeckel*  
d) *Osborn*

**25.** What is the term used for organisms having different structural patterns but similar function?

- a) *Analogous*    b) *Homologous*  
c) *Vestigial*      d) *Atavistic*

**26.** What is the significant finding in the comparative study of the embryo of different animals?

- a) *Structural familiarity*  
b) *Structural variety*  
c) *Structural clarity*  
d) *Structural similarity*

**27.** The process of change occurring in the sequence composition of molecules such as DNA, RNA and protein across generation is known as

- a) *Molecular evolution*  
b) *Biological evolution*  
c) *Chromosomal evolution*  
d) *Genetical evolution*

**28.** Root modification in sweet potato and stem modification in potato are considered as the best example for

- a) *Homologous organ*  
b) *Analogous organs*  
c) *Organs of use*  
d) *Organs of disuse*

**29.** A slight change that occurs over-time in conserved molecules DNA, RNA, protein is often called as

- a) *Biological clock*

17. (a)    18. (c)    19. (d)    20. (b)    21. (d)    22. (b)    23. (b)    24. (c)  
25. (a)    26. (d)    27. (a)    28. (b)    29. (d)

- b) Geological clock  
c) Genetical clock  
d) Molecular clock

**30.** Who postulated the first theory of evolution in his famous book “Philosophie Zoologique”?

- a) Charles Darwin    b) Lamarck  
c) Hugo de Vries    d) Mendel

**31.** Who explained the theory of evolution in his book “The origin of species by natural selection”?

- a) Charles Darwin  
b) Ernst Von Haeckel  
c) Urey-Miller  
d) Oparin and Haldane

**32.** According to Darwin what is the core principle that resulted in the survival of the fittest?

- a) Variation    b) Natural selection  
c) Struggle for existence  
d) Adaptation

**33.** Industrial Melanism in Pepper Moth *Biston betularia* is a classic example of

- a) Recapitulation  
b) Natural selection  
c) Artificial selection  
d) Micro evolution

**34.** Mild mutation in the ALX1 gene leads to phenotypic change in

- a) Sparrows    b) Darwin finches  
c) Moth    d) Peacock

**35.** How do you refer to the changes occurring in allele frequency in a population?

- a) Artificial selection  
b) Macro evolution  
c) Micro evolution  
d) Centrifugal selection

**36.** Where Hominid evolution occurred?

- a) Asia and Africa  
b) Africa and Europe  
c) Europe and Asia  
d) Europe and America

**37.** Cro-Magnon is considered to the ancestor of

- a) Modern Africans  
b) Modern Asians  
c) Modern Americans  
d) Modern Europeans

**38.** The study of history of all life forms on Earth that originated on earth millions of years ago is known as

- a) Evolutionary Biology  
b) Paleobiology  
c) Microbiology  
d) Modern biology

**39.** When did modern man *Homo sapiens* arise in Africa?

- a) 50000 years ago  
b) 25000 years ago  
c) 75000 years ago  
d) 30000 years ago

**40.** Which is not a molecular clock?

- a) Protein    b) DNA  
c) Lipid    d) RNA

**41.** Which has a four chambered heart?

- a) Reptile    b) Crocodile  
c) Frog    d) Fish

30. (b) 31. (a) 32. (b) 33. (b) 34. (b) 35. (c) 36. (a) 37. (d) 38. (a) 39. (b)  
40. (c) 41. (b)

42. Where Woolly mammoth was preserved?

- a) Frozen coast of Siberia
- b) Frozen coast of Greenland
- c) Frozen coast of Alaska
- d) Frozen coast of Iceland

43. Where do we find animals and human beings preserved by volcanic eruption?

- a) Pompeii      b) Venice
- c) Milan        d) Rome

44. Why "Archeopteryx" fossil is an example for connecting link.

- a) Reptilian characters
- b) Bird's character
- c) Both Reptilian and bird's character
- d) Amphibian character

45. Vestigial organs appearing suddenly are called as

- a) Atavistic organs
- b) Rudimentary organs
- c) Organ of use
- d) Organ of disuse

46. Select Hardy-Weinberg equation

- a)  $2(p+q)^2 = p^2 + 4pq + q^2$
- b)  $(p+q)^2 = p^2 + 2pq + q^2$
- c)  $(p+q)^2 = p + 2pq + q^2$
- d)  $p^2 + q^2 = 2p + pq + q^2$

47. Which is the correct sequence?

- a) Protobionts → Protovirus → Coacervates → Monera → Protista
- b) Protobionts → Coacervates → Protovirus → Monera → Protista
- c) Protobionts → Coacervates → Protovirus → Protista → Monera
- d) Protobionts → Coacervates → Protista → Monera → Protovirus

48. Identify the incorrect pair

- a) Forelimbs of cat and horse
- b) Wings of insect and bird
- c) Tendrils of Cucurbita and stem modification
- d) Root modification in sweet potato and stem modification in potato

49. Identify the correct sequence

- a) Egg → Zygote → Gastrula → Cleavage → Blastula
- b) Egg → Zygote → Blastula → Cleavage → Gastrula
- c) Egg → Zygote → Cleavage → Blastula → Gastrula
- d) Egg → Zygote → Cleavage → Gastrula → Blastula

### Match the Following

		Ans
I.	1. Homo sapiens - Golden age of reptiles	<b>Modern man</b>
	2. Gene equilibrium - Study of fossils	<b>Hardy-Weinberg law</b>
	3. Paleontology - Modern man	<b>Study of fossils</b>
	4. Mesozoic era - Hardy-Weinberg law	<b>Golden age of Reptiles</b>

		Ans
<b>II.</b>	1. Lamarck - Age of Earth 2. Archeopteryx - DNA 3. Geological time scale - Connecting link 4. Molecular clocks - Philosophie Zoologique	<b>Philosophie Zoologique</b> <b>Connecting link</b> <b>Age of Earth</b> <b>DNA</b>
<b>III.</b>	1. Adaptive radiation - Human Appendix 2. Vestigial organ - Natural selection 3. Charles Darwin - Germany 4. Neanderthal man - Darwin Finches	<b>Darwin finches</b> <b>Human Appendix</b> <b>Natural Selection</b> <b>Germany</b>
<b>IV.</b>	1. Devonian - Cave paintings 2. Cro-Magnon - Vegetarian 3. <i>Homo habilis</i> - Fossil invertebrate 4. Cambrian - Age of fishes	<b>Age of fishes</b> <b>Cave paintings</b> <b>Vegetarian</b> <b>Fossil invertebrates</b>
<b>V.</b>	1. Quaternary - Rise of Dinosaurs 2. Jurassic - Appearance of first land plants 3. Ordovician - Earliest Amphibians 4. Carboniferous - Age of human beings	<b>Age of human being</b> <b>Rise of Dinosaurs</b> <b>Appearance of first land plants</b> <b>Earliest Amphibians</b>
<b>VI.</b>	1. Homo erectus - Mutation theory 2. Genetic drift - Adaptive radiation 3. Marsupials - Bottle neck effect 4. De Vries - First human like being	<b>First human like being</b> <b>Bottle neck effect</b> <b>Adaptive radiation</b> <b>Mutation theory</b>

**Additional Solved Questions - 2 Marks**

1. What is the religious theory regarding the origin of life? Explain.

**Religious Theory**  
Special creation theory

**Explanation**

1. *Theory of special creation* states that life was created by a supernatural power, "God".

2. According to **Hinduism**, Lord **Brahma** created the Earth.

3. Christianity, Islam and most religions believe that God created the universe, the plants and the animals.

2. Which theory states that life arose from pre-existing life. Explain.

### Theory

Theory of Biogenesis

### Explanation

According to the **theory of biogenesis**, life arose from **pre-existing life**.

1. The term 'biogenesis' refers to the **biochemical process** of production of living organisms.

2. This term was coined by **Henry Bastian**.

3. What is paleontology? Mention its importance.

### Paleontology

Paleontology is the study of prehistoric life through fossils.

### Importance

1. Fossils are described as the true **witnesses** of evolution or documents of various **geological strata** of evolution.

2. Coprolites help in identifying the **nature of diet** of pre-historic animals.

4. "Human egg has no Yolk. However human embryo develops an yolk sac"  
-Justify

1. Yolk sac is a **vestigial** organ in man.  
2. The **ancestor** of man, the reptile, has yolk and yolk sac.

3. It is **non functional** in man.

4. It is an example for **ontogeny** recapitulates phylogeny.

5. What is the modern view of Biogenetic law?

**Animals do not recapitulate the adult stage of any ancestors.**

**The embryo recapitulates the embryonic history and not the adult history of the ancestor.**

6. What are the changes that cause chromosomal mutation?

1. Deletion
2. Addition
3. Duplication
4. Inversion
5. Translocation

7. What are the changes altered due to chromosomal mutation?

Chromosomal mutation leads to changes in the following:

- Structure of the chromosome
- Phenotype of the organism
- Variations

8. Write short notes on contributions of Lamarck

1. Jean Baptiste de Lamarck, was the **first one** to **postulate the theory of evolution**.

2. His theory is known as

"Lamarckian" or

The law of **use** and **disuse** or

The theory of inheritance of acquired characters.

3. He wrote a book "**Philosophie Zoologique**" in the year 1809.

**9. Define gene pool**

The **total genome** of a population is called gene pool.

It is an important factor that affects Hardy-Weinberg equilibrium.

**10. Write short notes on *Homo habilis***

Human fossil between *Australopithecus* and *Homo erectus*

1. They lived **about 2 mya**.
2. Their brain capacity was between **650 – 800cc**.
3. They were **vegetarian**.
4. They had **“Bipedal locomotion”**
5. They used tools that were made of **chipped stones**.

**11. What is relative dating and absolute dating.****Relative Dating**

Method to determine **the age of fossil** by comparing a fossil **to similar rocks** and **fossils of known ages**.

**Absolute Dating**

1. Method used to determine the **precise age of fossil** by **radiometric dating**
2. It measures the **decay of isotopes**.

**12. Write notes on Protista.**

- Eukaryotic organisms.
- Cells contain **nucleus** with **nuclear membrane**.
- Nuclear membrane separated **nucleoprotein** from cell substance.

**13. Write notes on Neo-Darwinism.**

1. The interpretation of Darwinian evolution through **Natural selection**.

2. It is a **modified** theory of Darwinism.

3. New **facts** and **discoveries** about evolution has led to modification of **Darwinism**.

4. It emphasized the change in the **frequency of genes** in a population.

5. Change in the **frequency** of genes is due to

1. **Mutation**
2. **Isolation**
3. **Natural selection**
4. **Variation**

6. This theory is supported by Wallace, Heinrich, Haeckel, Weismann and Mendel.

**14. Explain connecting link.**

1. The **organisms** which possess the characters of **two different groups** (transitional stage) are called connecting links.

2. Examples:

- *Peripatus* is the connecting link between **Annelida** and **Arthropoda**.
- *Archeopteryx* is the connecting link between **Reptiles** and **Aves**.

**15. Describe the mechanism of evolution?**

*Evolution is due to changes in allele frequencies in a population. It is called **microevolution**.*

It is brought about by the four **fundamental forces** of evolution, such as:

1. **Natural selection**
2. **Genetic drift**
3. **Mutation**
4. **Gene flow**