Strictly Confidential: (For Internal and Restricted use only)
Senior School Certificate Examination-2020
Marking Scheme – BIOLOGY (SUBJECT CODE - 044)
(PAPER CODE – 57/5/1,2,3)

General Instructions: -

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.**Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best efforts in this process.**
2. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them.**
3. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
4. Evaluators will mark(√) wherever answer is correct. For wrong answer 'X"be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
5. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
6. If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
7. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
8. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
9. A full scale of marks 0-70 has to be used. Please do not hesitate to award full marks if the answer deserves it.
10. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).
11. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-
    - Leaving answer or part thereof unassessed in an answer book.
    - Giving more marks for an answer than assigned to it.
    - Wrong totaling of marks awarded on a reply.

- Wrong transfer of marks from the inside pages of the answer book to the title page.
- Wrong question wise totaling on the title page.
- Wrong totaling of marks of the two columns on the title page.
- Wrong grand total.
- Marks in words and figures not tallying.
- Wrong transfer of marks from the answer book to online award list.
- Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
- Half or a part of answer marked correct and the rest as wrong, but no marks awarded.

12. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.

13. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.

14. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.

15. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.

16. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges

SECTION – A

1. Which one of the following part of the plant when put into the soil is likely to produce new offspring ?

(a) Part of an internode

(b) A stem cutting with a node

(c) Part of a primary root

(d) A flower

Ans. (b) / a stem cutting with a node

[1 Mark]

2. In a bacterium when RNA-polymerase binds to the promoter on a transcription unit during transcription, it

(a) terminates the process

(b) helps remove introns

(c) initiates the process

(d) inactivates the exons

Ans. (c) / initiates the process

[1 Mark]

3. The hypothesis that "Life originated from non-living organic pre-existing molecules was proposed by

(a) Oparin and Haldane

(b) Louis Pasteur

(c) S.L. Miller

(d) Hugo de Vries

Ans. (a) / Oparin and Haldane

[1 Mark]

4. Mating of a superior male of a breed of a cattle to a superior female of another breed is called

(a) in breeding

(b) out crossing

(c) out breeding

(d) cross breeding

Ans. (d) / cross breeding

[1 Mark]

OR

Large-holes in 'Swiss-Cheese' are due to

(a) Propionibacterium sharmanii

(b) Saccharomyces cerevisae

(c) Penicillium chrysogenum

(d) Acetobacter aceti

Ans. (a) / *Propionibacterium sharmanii*

[1 Mark]

5. Increased concentration of DDT in fish-eating birds is due to

(a) eutrophication

(b) bio-magnification

(c) cultural eutrophication

(d) accelerated eutrophication

Ans. (b) / bio-magnification

[1 Mark]

OR

Species-Area relationship is represented on a log scale as

(a) hyperbola

(b) rectangular hyperbola

(c) linear

(d) inverted

Ans. (c) / linear

[1 Mark]

SECTION –B

(Q Nos. 6-12 are of two marks each)

6. State two advantages of an apomictic seed to a farmer.

Ans. There is no segregation of characters in apomictic seeds ,
the farmers can keep on using the hybrid seeds to raise new crops year after year / desired varieties can be cultivated year after year ,
hybrid characters can be preserved ,
the farmers do not have to buy hybrid seeds every year
Any two = 1 × 2

[2 Marks]

7. Explain when is a genetic code said to be

(a) Degenerate

(b) Universal

Ans. (a) Some amino acids are coded by more than one codon / explained with any correct example = 1

(b) A particular codon codes for the same amino acid in all organisms / as an example from bacteria to human UUU would code for phenylalanine (Phe) / any other correct example = 1

[2 Marks]

8. Differentiate between opioids and cannabinoids on the basis of their

(a) specific receptor site in human body.

(b) mode of action in human body.

	Opioids	**Cannabinoids**
a.	central nervous system / gastrointestinal tract	Brain = 1
b.	depressant /slows down body functions / sedative / pain killer	effects on cardiovascular system of the body functions /analgesic / increased muscle strength / increased performance in sports persons / hallucinogen = 1

[1 + 1 = 2 Marks]

9 (a) Name the two techniques employed to meet the increasing demand of fish in the world.

(b) Name any two fresh water fishes.

Ans. (a) Aquaculture , Pisciculture = ½ × 2

(b) Catla / *Catla catla* , Rohu / *Labeo rohita* , Common Carp , *Clarias* / Magur , *Anabas* / Climbing Perch , Calbasu , Mrigal / *Cirrhina mrigala* , Singhara / *Mystus* , Singhi / *Hetropneustes*

(*Any two*) = ½ × 2

[2 Marks]

OR

Describe the contributions of Alexander Fleming, Ernest Chain and Howard Florey in the field of microbiology.

Ans. (Alexander Fleming) - discoverd antibiotic Penicillin , = 1

(Ernest Chain & Howard Florey) - its full potential as an effective antibiotic was established by them = 1

[1 + 1 = 2 Marks]

10. All cloning vectors do have a 'selectable marker'. Describe its role in recombinant DNA-technology.

Ans. It helps in identifying and eliminating non-transformants (non-recombinants) , and selectively permitting the growth of transformants (recombinants) = 1 × 2

[2 Marks]

11 Mention how have plants developed mechanical and chemical defence against herbivores to protect themselves with the help of one example of each.

Ans. Mechanical - By developing (modified)Thorns (which are means of defence) eg. Acacia / Cactus / any other appropriate example = 1

Chemical - by producing and storing poisonous chemicals / like cardiac glycosides / nicotine / caffeine / quinine / strychnine / opium / Calotropis has cardiac glycosides / any other appropriate example - provides defence against grazers / browsers = 1

[2 Marks]

12. Name and explain the processes earthworm and bacteria carry on detritus.

Ans. (Earthworm) - breaks down detritus into smaller particles , fragmentation = ½ × 2

(Bacteria) - (Enzymes of it) break down detritus into simple inorganic substances , catabolism / mineralization = ½ × 2

[2 Marks]

SECTION - C

13. Explain three different modes of pollination that can occur in a chasmogamous flower.

Ans. (Autogamy / Self pollination) - Pollination is achieved within the same flower / transfer of pollen grains from the anther to the stigma of the same flower = 1 //

(Geitonogamy) - Transfer of pollen grains from the anther to the stigma of another flower of the same plant = 1 //

(Xenogamy / Cross pollination) - Transfer of pollen grains from anther to the stigma of flowers of a different plant = 1 //

(Anemophily) - Transfer of pollen grains from anther to stigma of same / another flower through wind = 1 //

(Zoophily) - Transfer of pollen grains from anther to stigma of same / another flower through animals= 1 //

(Chiropterophily) - Transfer of pollen grains from anther to stigma of same / another flower through bats = 1 //

(Hydrophily) - Transfer of pollen grains from anther to stigma of same / another flower through water = 1 //

(Entomophily) - Transfer of pollen grains from anther to stigma of same / another flower through insects = 1 //

(Ornithophily) - Transfer of pollen grains from anther to stigma of same / another flower through birds = 1 //

(Malacophily) - Transfer of pollen grains from anther to stigma of same / another flower through snails = 1

(any three) = 1 × 3

[1 × 3 = 3 Marks]

OR

Explain the formation of placenta after implantation in a human female.

Ans. Trophoblast (of blastocyst) forms finger like projections / chorionic villi , which are surrounded by the uterine tissue and maternal blood , The chorionic villi and uterine tissue become interdigitated to form placenta = 1 × 3

[3 Marks]

14. State Mendel's law of dominance. How did he deduce the law ? Explain with the help of a suitable example.

Ans. Factors (characters are controlled by discrete units called factors) which occur in pairs , in a dissimilar pair of factors / heterozygous one member of a pair dominates (dominant) the other (recessive) = ½ × 2

In a cross between tall (TT) plant and dwarf (tt) plant , tall trait appears in F1 , tallness and dwarfness appear in F2 , in the ratio 3 : 1 = ½ × 4

// In lieu of the above explanation any other typical monohybrid cross till F2 generation can be considered.

[1 + 2 = 3 Marks]

15. What are 'SNPs' ? Where are they located in a human cell ? State any two ways the discovery of SNPs can be of importance to humans.

Ans. SNPs - Single Nucleotide Polymorphism / locations where single base DNA differences occur in humans = 1

Location - human genome / human chromosome = 1

Importance - Finding chromosomal location for disease - associated sequences , and tracing human history = ½ × 2

[3 Marks]

16. (a) State what does the study of Fossils indicate.

(b) Rearrange the following group of plants according to their evolution from Palaeozoic to Cenozoic periods :

Rhynia; Arborescent Lycopods; Conifers; Dicotytedon.

Ans. (a) They are an evidence of evolution / they indicate common ancestory / they represent extinct organisms / which existed in different geological period / life forms varied over time and certain life forms were restricted to certain geological time spans / new forms of life have arisen at different times in the history of earth (any two) = 1 + 1

(b) Rhynia → Arborescent Lycopods → Conifers → Dicotyledon
(½ for Arborescent Lycopods, ½ for Dicotyledon)

// if a student writes given sequence is correct = 1

[3 Marks]

17. (a) Explain the mode of action of Cu^{++} releasing IUDs as a good contraceptive. How is hormone releasing IUD different from it ?

(b) Why is 'Saheli' a preferred contraceptive by women (any two reasons) ?

Ans. (a) Cu^{++} releasing IUDs - Suppress sperm motility / suppress the fertilizing capacity of sperms = 1

Hormone releasing IUDs - Make the uterus unsuitable for implantation / the cervix hostile to the sperms = 1

(b) It is a 'once a week' pill / oral contraceptive / with very few side effects / high contraceptive value/ non-steroidal / easy to use / not expensive (any two) = ½ × 2

[3 Marks]

18. (a) Explain why bee-hives are set up on the farms for some of our crop-species. Name any two such crop species.

(b) List any three important steps to be kept in mind for successful bee keeping.

Ans. (a) Increases pollination efficiency / improves the crop yield / increases honey yield = ½

Sunflower / *Brassica* / Apple / Pear/ any other appropriate examples (any two) = ½ × 2

(b) Knowledge of the nature and habits of bees / Selection of suitable location for keeping the beehives / Catching and hiving of swarms (group of bees) / Management of beehives during different seasons / Handling and collection of honey and of beeswax (Any three) = ½ × 3

[3 Marks]

19. Why GMOs are so called ? List the different ways in which GMO plants have benefitted and have become useful to humans.

Ans. Plants / bacteria / fungi / animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO) = 1

(i) Made crops more tolerant to abiotic stresses (cold / drought / salt / heat) /

(ii) Reduced reliance on chemical pesticides (pest-resistant crops) /

(iii) Helped to reduce post harvest losses /

(iv) Increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil) /

(v) Enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice /

(vi) To create tailor-made plants to supply alternate resources to industries (in the form of starch / fuels / pharmaceuticals)

Any other correct beneficial uses of genetically modified bacteria / fungi / animals to be evaluated

(any four) = ½× 4

[1 + 2 = 3 Marks]

20. Differentiate between "Pioneer-species"; "Climax-community" and "Seres".

Ans. Pioneer species - The species that invade a bare area = 1

Climax community - a community that is in near equilibrium with the environment / remains stable as long as the environment remains unchanged = 1

Sere - The entire sequence of communities that successively change in a given area = 1

[3 Marks]

OR

Explain any three ways other than zoological parks, botanical gardens and wildlife safaries, by which threatened species of plants and animals are being conserved 'ex situ'.

Ans.
- Gametes of threatened species can be preserved in viable / fertile condition for long periods using cryopreservation techniques /
- eggs can be fertilized in vitro /
- plants can be propagated using tissue culture methods /
- Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks /
- Storing semen / sperms in sperm bank /
- pollen grains can be stored in pollen banks

(any three) = 1 × 3

[3 Marks]

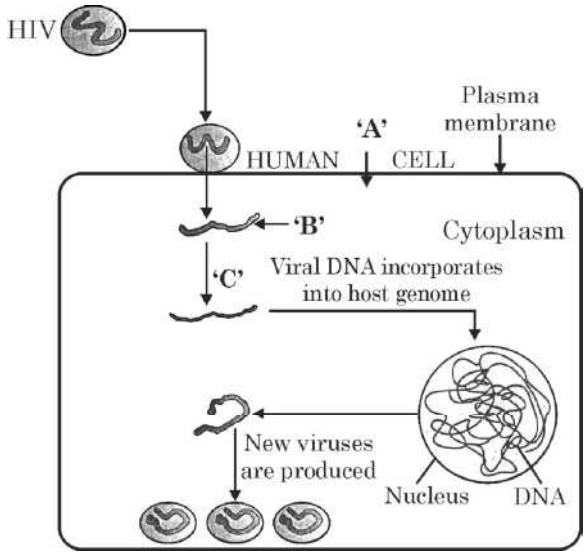
21. Explain 'Integrated organic' farming as successfully practiced by Ramesh C. Dagar, a farmer in Sonepat (Haryana).

Ans. He includes bee-keeping / dairy management / water harvesting / composting / and agriculture in a chain of processes which support each other (any three) = 1½
Cattle excreta (dung) are used as manure / Crop waste is used to create compost / which can be used as a natural fertiliser / generate natural gas for satisfying the energy needs of the farm (any three) = 1½

[1½ + 1½ = 3 Marks]

SECTION - D

22. Study the diagram showing the entry of HIV into the human body and the processes that are followed :



(a) Name the human cell 'A' HIV enters into.

(b) Mention the genetic material 'B' HIV releases into the cell.

(c) Identify enzyme 'C'.

Ans. (a) Macrophage

(b) RNA / viral RNA

(c) Reverse transcriptase

[1 × 3 = 3 Marks]

23. Following a road accident four injured persons were brought to a nearby clinic. The doctor immediately injected them with tetanus antitoxin.

(a) What is tetanus antitoxin ?

(b) Why were the injured immediately injected with this antitoxin ?

(c) Name the kind of immunity this injection provided.

Ans. a) A preparation containing (pre-formed / readymade) antibodies to the toxin = 1

b) To provide quick immune response / to neutralize or nullify the effect of the tetanus bacteria / pathogen = 1

c) Passive immunity = 1

[3 Marks]

24. "The population of a metro city experiences fluctuations in its population density over a period of time."

(a) When does the population in a metro city tend to increase ?

(b) When does the population in metro city tend to decline ?

(c) If 'N' is the population density at the time 't', write the population density at the time 't + 1'.

Ans. (a) Number of births / Natality / Number of immigrants / (B+I) is more than the number of deaths / mortality / number of emigrants / (D+E) //

Pre-reproductive population far exceeds reproductive population = 1

(b) If number of deaths / mortality / number or emigrants / (D + E) is more than (B+I) //

Pre-reproductive population is less than reproductive population = 1

(c) $N_{t+1} = N_t + [(B+I) - (D+E)]$

(B = Natality , I = Immigration , D = Mortality , E = Emigration) = 1

[3 Marks]

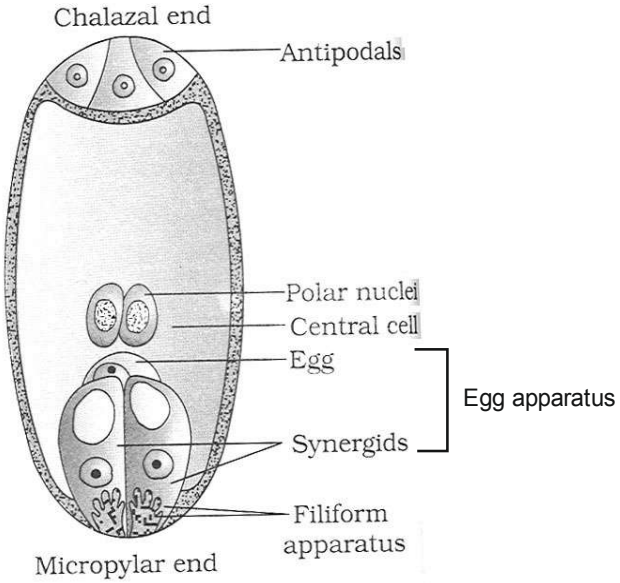
SECTION - E

25. (a) Describe the process of megasporogenesis, in an angiosperm.

(b) Draw a diagram of a mature embryo sac of angiosperm, label its any six parts.

Ans. (a) The MMC in the nucellus undergoes meiotic division , results in the production of four megaspores , one of the megaspores is functional , while the other three degenerate = ½ × 4

(b)



(any 6 correct labels) =½ × 6

OR

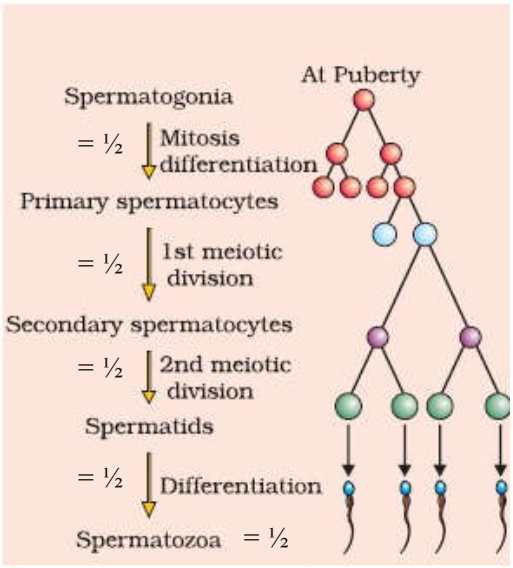
(a) Where and how in the testes process of spermatogenesis occur in humans.

(b) Draw diagram of human sperm and label four parts.

Ans. (a) Seminiferous Tubules = ½

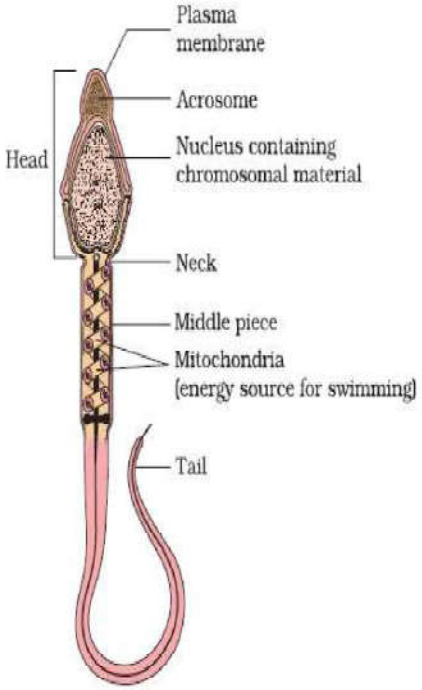
The spermatogonia multiply by mitotic division to form primary spermatocytes , which undergo meiosis leading to formation of two equal (haploid) cells called secondary spermatocytes , The secondary spermatocytes undergo the second meiotic division to produce four (equal haploid) spermatids , The spermatids are transformed into spermatozoa (sperms) by the process called , spermiogenesis = ½ × 5

//



= ½ × 5

(b)



Any four correct labels = ½ × 4

[3 + 2 = 5 Marks]

26. (a) Why did T.H. Morgon select Drosophila melanogaster for his experiments ?

(b) How did he disprove Mendelian dihybrid F_2 phenotypic ratio of 9 : 3 : 3 : 1 ? Explain giving reasons.

Ans. a) They could be grown on simple synthetic medium in the laboratory / they complete their life cycle in about two weeks / a single mating could produce a large number of progeny flies / there was a clear differentiation of the sexes - the male and female flies are easily distinguishable / it has many types of hereditary variations that can be seen with low power microscopes. (any 3) = 1 × 3

b) Morgan observed that genes of the traits closely linked on the same chromosome show much less recombinant percentage , whereas genes of the traits loosely linked on the same chromosome showed higher recombinant percentage. (This proved deviation from 9 : 3 : 3 : 1) = 1 + 1

[3 + 2 = 5 Marks]

OR

(a) List any four major goals of Human Genome project.

(b) Write any four ways the knowledge from HGP is of significance for humans.

(c) Expand BAC and mention its importance.

Ans. a) Some of the important goals of HGP were as follows:

(i) Identify all the approximately 20,000-25,000 genes in human DNA ,

(ii) Determine the sequences of the 3 billion chemical base pairs that make up human DNA,

(iii) Store this information in databases ,

(iv) Improve tools for data analysis ,

(v) Transfer related technologies to other sectors such as industries ,

(vi) Address the ethical legal and social issues (ELSI) that may arise from the project

(any 4) = ½ × 4

b) Solving challenges in health care/ agriculture /energy production/ environmental remediation / diagnosed disorder / treat disorders / prevents disorders (any four) = ½ × 4

c) BAC - bacterial artificial chromosomes = ½

Used as vector for cloning of DNA fragments = ½

[2 + 2 + 1 = 5 Marks]

27. (a) Name the insect that attacks cotton crops and causes lot of damage to the crop. How has Bt cotton plants overcome this problem and saved the crop ? Explain.

(b) Write the role of gene Cry IAb.

Ans. (a) (cotton) bollworms = 1
B. thuringiensis forms protein crystals (during a particular phase of their growth) ,

these crystals contain a toxic insecticidal protein, the Bt toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilise the crystal , the activated toxin binds to the surface of midgut epithelial cells and create pores, that cause cell swelling and lysis and eventually cause death of the insect = ½ × 6

b) crylAb controls corn borer =1 //

* Since the capital 'C' denotes protein (Cryprotein) and not the gene (cry gene) , hence every student should be awarded 1 mark whether question is attempted or not attempted.

OR

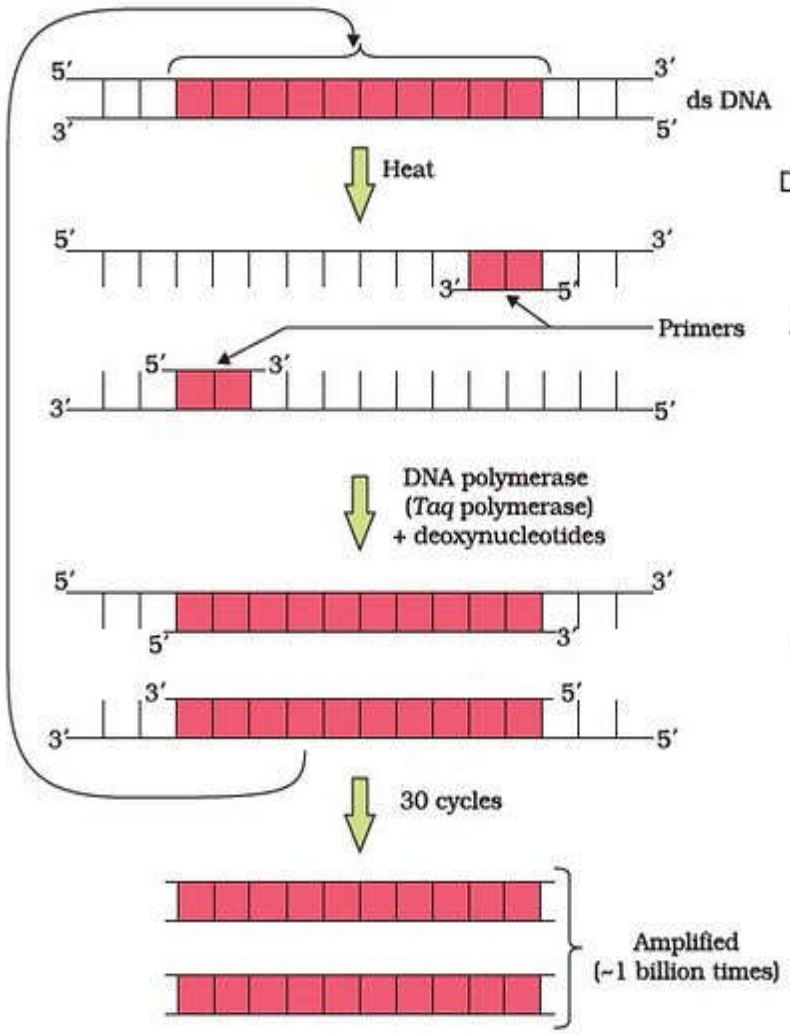
(a) Explain the different steps carried out in Polymerase Chain Reaction, and the specific roles of the enzymes used.

(b) Mention application of PCR in the field of

(i) Biotechnology

(ii) Diagnostics

Ans. (a)



//

Explanation of different steps of PCR in lieu of the diagram can be evaluated.

Enzyme DNA polymerase / Taq polymerase , the enzyme extends the primers using nucleotide provided in the reaction = ½ + ½

(b) (i) Multiple copy of gene of interest can be made in vitro / gene amplification = ½

(ii) Early detection of disease at a time when the symptoms are not yet visible // or the toxin is in low concentration / used to detect mutations in genes in suspected cancer patients / a powerful technique to identify many other genetic disorders = ½

[4 + 1 = 5 Marks]