PUPLIC EXAMINATION MARCH 2020

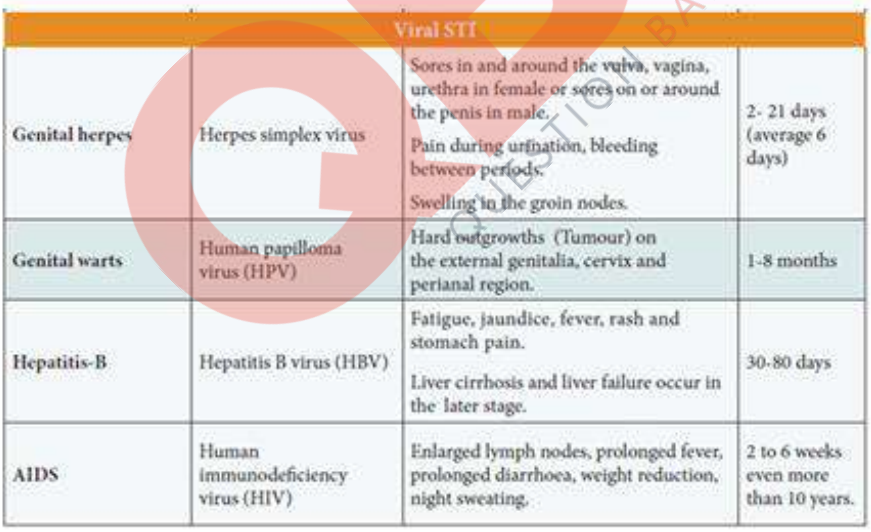
STD: XII **09.03.2020**

SUBJECT: ZOOLOGY **TYPE - A ANSWER KEY** **MARKS : 70**

PART - I

	CHOOSE THE CORRECT ANSWER	
Q.No	**CONTENT**	**Marks**
1	b) copper	**15X1=15**
2	a) Foetoscope	
3	c) Ideonella sakaiensis	
4	d) Plasma Cells	
5	c) Amenorrhoea - Absence of menstruation	
6	b) Jacob, Monod	
7	d) Both (A) and (R) are true and (R) is the correct explanation for (A)	
8	c) Chromosome 19	
9	a) SCID	
10	c) (i) – True, (ii) – True, (iii) – False, (iv) - True	
11	d) Zoological Park	
12	d) Gall fly	
13	b) Individuals mate selectively.	
14	c) The blackbuck, The Indian Spiny – tailed lizard, The white – footed fox	
15	a) $I^A I^O$ and $I^B I^O$	
	PART - II **Answer any 6 of the following questions. Questions No.24 is compulsory.**	**6x2=12**
16	❖ The mammary glands secrete a yellowish fluid called **colostrum** during the initial few days after parturition. ❖ It has less lactose than milk and almost no fat, but it contains more proteins, vitamin A and minerals. Colostrum is also rich in **IgA** antibodies.	**1** **1**

17	❖ **Placenta** is a temporary endocrine organ formed during pregnancy and it connects the foetus to the uterine wall through the umbilical cord. ❖ During pregnancy, the placenta acts as a temporary endocrine gland and produces large quantities of **human Chorionic Gonadotropin (hCG), human Chorionic Somatomammotropin (hCS) or human Placental Lactogen (hPL), oestrogens and progesterone** which are essential for a normal pregnancy. ❖ A hormone called **relaxin** is also secreted during the later phase of pregnancy which helps in relaxation of the pelvic ligaments at the time of parturition. ❖ It should be noted that hCG, hPL and relaxin are produced only during pregnancy. Thus placenta is a endocrine tissue.	**Any two points**
18	❖ Huntington's chorea is inherited as an autosomal dominant lethal gene in man. ❖ It is characterized by involuntary jerking of the body and progressive degeneration of the nervous system, accompanied by gradual mental and physical deterioration. The patients with this disease usually die between the age of 35 and 40.	**1** **1**
19	<table><tr><th>Divergent evolution</th><th>Convergent evolution</th></tr><tr><td>Structures which are similar in origin but perform different functions are called homologous structures that brings about **divergent evolution**</td><td>Organisms having different structural patterns but similar function are termed as analogous structures.</td></tr><tr><td>E.g.Thorn of *Bougainvillea* and the tendrils of *Curcurbita* are homologous structures but their functions are different.</td><td>E.g.the wings of birds and insects are different structurally but perform the same function of flight that brings about **convergent evolution**</td></tr></table>	**1** **1**
20	**Cytological isolation** – Fertilizationdoes not take place due to thedifferences in the chromosome numbersbetween the two species, the bull frog*Rana catesbiana* and gopher frog *Ranaareolata*.	**2**
21	❖ Lysozyme acts as antibacterial agent and cleaves the bacterial cell wall. Interferons induce antiviral state in the uninfected cells. ❖ Complementary substances produced from leucocytes lyse the pathogenic microbes or facilitate phagocytosis.	**1** **1**
22	❖ Protecting soil quality using organic materials and encouraging biological activity. ❖ Indirect provision of crop nutrients using soil microorganisms. ❖ Nitrogen fixation in soils using legumes. ❖ Weed and pest control based on methods like crop rotation, biological diversity, natural predators, organic manures and suitable chemical, thermal and biological interventions.	**Any two points**
23	Red list has eight categories of species i) Extinct ii) Extinct in wild iii) Critically Endangered iv) Endangered v) Vulnerable vi) Lower risk vii) Data deficiency viii) Not evaluated.	**2**

24	**Prevention** ❖ Regulate or control of pollutant(s) discharge at the point of generation. ❖ Wastewater can be pretreated by scientific methods before discharge to municipal treatment sources. ❖ Setting up of Sewage Treatment Plants (STP) and Effluent Treatment Plants (ETP). ❖ Regulate or restrict the use of synthetic fertilisers and pesticides. ❖ Public awareness and people's involvement is essential.	**1** **1**
	PART - III **Answer any 6 of the following questions. Questions No.33 is compulsory.**	**6x3=18**
25	❖ Regeneration is regrowth in the injured region. Regeneration was first studied in *Hydra* by Abraham Trembley in 1740. Regeneration is of two types, **morphallaxis** and **epimorphosis**. ❖ In morphallaxis the whole body grows from a small fragment e.g. *Hydra* and *Planaria*. When *Hydra* is accidentally cut into several pieces, each piece can regenerate the lost parts and develop into a whole new individual. The parts usually retain their original polarity, with oral ends, by developing tentacles and aboral ends, by producing basal discs. ❖ **Epimorphosis** is the replacement of lost body parts. It is of two types, namely **reparative** and **restorative** regeneration. In reparative regeneration, only certain damaged tissue can be regenerated, whereas in restorative regeneration severed body parts can develop. e.g. star fish, tail of wall lizard.	**1** **1** **1**
26	 **Viral STI** Genital herpes — Herpes simplex virus — Sores in and around the vulva, vagina, urethra in female or sores on or around the penis in male. Pain during urination, bleeding between periods. Swelling in the groin nodes. — 2- 21 days (average 6 days) Genital warts — Human papilloma virus (HPV) — Hard outgrowths (Tumour) on the external genitalia, cervix and perianal region. — 1-8 months Hepatitis-B — Hepatitis B virus (HBV) — Fatigue, jaundice, fever, rash and stomach pain. Liver cirrhosis and liver failure occur in the later stage. — 30-80 days AIDS — Human immunodeficiency virus (HIV) — Enlarged lymph nodes, prolonged fever, prolonged diarrhoea, weight reduction, night sweating. — 2 to 6 weeks even more than 10 years.	**Any three(3X1=3)**
27	The main goals of Human Genome Project are as follows ❖ Identify all the genes (approximately 30000) in human DNA. Determine the sequence of the three billion chemical base pairs that makeup the human DNA. ❖ To store this information in databases. Improve tools for data analysis. ❖ Transfer related technologies to other sectors, such as industries. Address the ethical, legal and social issues (ELSI) that may arise from the project.	**1** **1** **1**

28

S.No		Bacillary Dysentry	Amoebic Dysentry
1	Causative agent	Shigella species (Bacteria)	Entamoeba histolytica (Protozoan)
2.	Site of Infection	Intestine	Intestine (colon) and secretes histolytic enzymes causing ulceration.
3.	Mode of Transmission	Foecal oral route, food and water contaminated with faces	Foecal oral route (food and water contaminated with faeces)
4.	Symptoms	(i) Abdominal pain, dehydration. (ii) Blood and Mucus in stoos. (iii) Frequency of stools is less and not frequent as in amoebiasis.	Bleeding abdominal pain and stools with excess mucus. Foul smelling stools symptoms can range from diarrhea to dysentery.

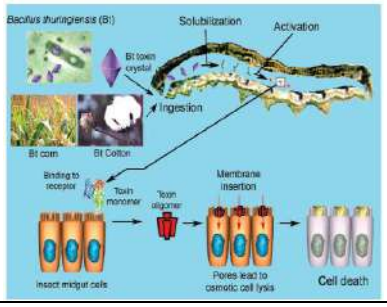
3

29

- **COMMENSALISM (+, 0):** This defines the interaction in which two or more species are mutually associated in activities centering on food and one species at least, derives benefit from the association while the other associates are neither benefited nor harmed. **1**
- The concept of commensalism has been broadened in recent years, to apply to coactions other than those centering on food such as cover, support, production, and locomotion. **1**
- Examples: Barnacles attached to Whales travel thousands of miles collecting and filtering food from the moving water. The whales are not affected by the barnacles. **1**

30

- *Bacillus thuringiensis* is a soil dwelling bacterium which is commonly used as a biopesticide and contains a toxin called ***cry* toxin** . Scientists have introduced this toxin producing genes into plants and have raised genetically engineered insect resistant plants. e.g. Bt-cotton. **1**
- When the insects ingest the toxin crystals their alkaline digestive tract denatures the insoluble crystals making them soluble. The *cry* toxin then gets inserted into the gut cell membrance and paralyzes the digestive tract. The insect then stops eating and starves to death. **1**



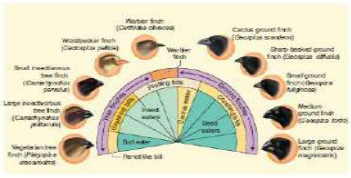
1

31

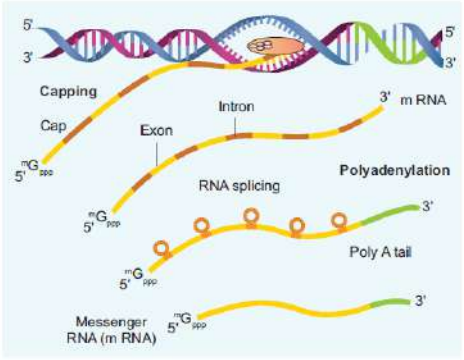
- Creating new or more vigorous pests and pathogens. Worsening the effects of existing pests through hybridization with related transgenic organisms.
- Harming non-target species such as soil organisms, non-pest insects, birds and other animals.
- Disrupting biotic communities including agro ecosystems.

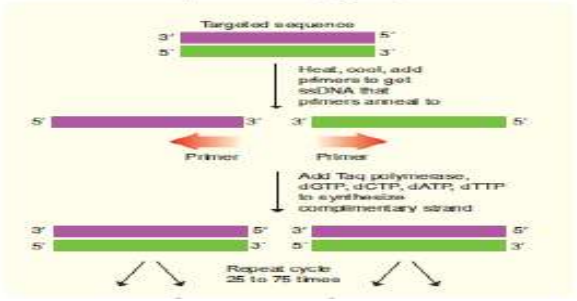
Any 3 (3X1=3)

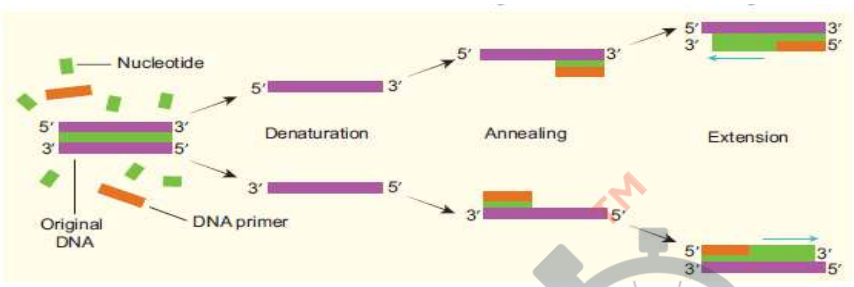
	• Irreparable loss or changes in species diversity or genetic diversity within species. • Creating risks for human health.	
32	❖ The naturally occurring green house gases in the air, mainly carbon dioxide, methane and water vapour trap radiation from the sun and act like a thermal blanket around our planet earth. ❖ Without the greenhouse gases, the earth would have an average temperature of -18^{o}C and be covered in ice. ❖ The green house effect keeps the earth warm enough to sustain life.	**1** **1** **1**
33	❖ The hormone **thymosin** is not secreted ❖ T cellsdo not become mature and **immunocompetent**.	**1½** **1½**
	PART - IV **Answer all the questions**	**5x5=25**
34	a) ❖ It is a hormone roduced by posterior lobe of pituitary glands. As pregnancy progresses, increase in oxytocin concentration promotes, uterine contractions which facilitale downward movement of the foetus. The powerful concentration of the uterine muscles leads to the expulsion of the baby through birth canal resulting in child birth or parturition. ❖ Oxytocin causes the "**Let-Down" reflex**-the actual ejection of milk from the alveoli of the mammary glands. During lactation, oxytocin also stimulates the recently emptied uterus to contract, helping it to return to pre - pregnancy size. ❖ Relaxin is a hormone secreted by the placenta and also found in the corpus luteum. It promotes parturition by relaxing the pelvic joints and by dilatation of the cervix with continued powerful contractions.	**2** **2** **1**
	(OR)	
	b. ❖ Inability to conceive or produce children even after unprotected sexual cohabitation is called infertility. That is, the inability of a man to produce sufficient numbers or quality of sperm to impregnate a woman or inability of a woman to become pregnant or maintain a pregnancy. ❖ The causes for infertility are tumours formed in the pituitary or reproductive organs, inherited mutations of genes responsible for the biosynthesis of sex hormones, malformation of the cervix or fallopian tubes and inadequate nutrition before adulthood. Long-term stress damages many aspects of health especially the menstrual cycle. Ingestion of toxins (heavy metal cadmium), heavy use of alcohol, tobacco and marijuana, injuries to the gonads and aging also cause infertility. **Other causes of infertility** ❖ Pelvic inflammatory disease (PID), uterine fibroids and endometriosis are the most common causes of infertility in women. ❖ Low body fat or anorexia in women. i.e. a psychiatric eating disorder characterised by the fear of gaining weight. ❖ Undescended testes and swollen veins (varicocoele) in scrotum. ❖ Tight clothing in men may raise the temperature in the scrotum and affect sperm production. ❖ Under developed ovaries or testes. ❖ Female may develop antibodies against her partner's sperm. ❖ Males may develop an autoimmune response to their own sperm.	**1** **2** **2**

35	**a)** Mitotic or meiotic non-disjunction of sexchromosomes causes allosomal abnormalities. Several sex chromosomal abnormalities have been detected. Eg. Klinefelter's syndrome and Turner's syndrome. **(i) Klinefelter's Syndrome (XXY Males)** This genetic disorder is due to the presenceof an additional copy of the X chromosome resulting in a karyotype of 47,XXY. Persons with this syndrome have 47 chromosomes (44AA+XXY). They are usually sterile males, tall, obese, with long limbs, high pitched voice, under developed genitalia and have feeble breast (gynaecomastia) development. **(ii) Turner's Syndrome (XO Females)** This genetic disorder is due to the lossof a X chromosome resulting in a karyotype of 45,X. Persons with this syndrome have 45 chromosomes (44 autosomes and one X chromosome) (44AA+XO) and are sterile females. Low stature, webbed neck, under developed breast, rudimentary gonads lack of menstrual cycle during puberty, are the main symptoms of this syndrome.	**1** **2** **2**
	(OR)	
	b) **Adaptive Radiation** The evolutionary process which produces new species diverged from a single ancestral form becomes adapted to newly invaded habitats is called adaptive radiation.Adaptive radiations are best exemplified in closely related groups that have evolved in relatively short time. Darwin's finches and Australian marsupials are best examples for adaptive radiation. **Darwin's finches** ❖ Their common ancestor arrived on the Galapagos about 2 million years ago. ❖ During that time, Darwin's finches have evolved into 14 recognized species differing in body size, beak shape and feeding behavior. Changes in the size and form of the beak have enabled different species to utilize different food resources such as insects, seeds, nectar from cactus flowers and blood from iguanas, all driven by Natural selection. **Fig.** represents some of the finches observed by Darwin. ❖ Genetic variation by mild mutation in the ALX1 gene in the DNA of Darwin finches is associated with variation in the beak shape.  Darwin's finches **Australian Marsupials** ❖ Marsupials in Australia and placental mammals in North America are two subclasses of mammals they have adapted in similar way to a particular food resource, locomotory skill or climate. ❖ They were separated from the common ancestor more than 100 million year ago and each lineage continued to evolve independently. ❖ Despite temporal and geographical separation, marsupials in Australia and	**1** **1** **1** **2**

	placental mammals in North America have produced varieties of species living in similar habitats with similar ways of life. ❖ Their overall resemblance in shape, locomotory mode, feeding and foraging are superimposed upon different modes of reproduction. ❖ This feature reflects their distinctive evolutionary relationships. ❖ The marsupials have undergone adaptive radiation to occupy the diverse habitats in Australia, just as the placental mammals have radiated across North America.	
36	**a)** • The genetic codon is a **triplet code** and 61 codons code for amino acids and 3 codons do not code for any amino acid and function as **stop codon (**Termination**).** • The genetic code is universal. It means that all known living systems use nucleic acids and the same three base codons (triplet codon) direct the synthesis of protein from amino acids. For example, the mRNA (UUU) codon codes for phenylalanine in all cells of all organisms. Some exceptions are reported in prokaryotic, mitochondrial and chloroplast genomes. However similarities are more common than differences. • A non-overlapping codon means that the same letter is not used for two different codons. For instance, the nucleotide sequence GUU GUC represents only two codons. • It is comma less, which means that the message would be read directly from one end to the other i.e., no punctuation are needed between two codes. • A degenerate code means that more than one triplet codon could code for a specific amino acid. For example, codons GUU, GUC, GUA and GUG code for valine. • Non-ambiguous code means that one codon will code for one amino acid. • The code is always read in a fixed direction i.e. from 5'→3' direction called polarity. • AUG has dual functions. It acts as a initiator codon and also codes for the amino acid methionine. • UAA, UAG (tyrosine) and UGA (tryptophan) codons are designated as termination (stop) codons and also are known as "non-sense" codons.	**Any5** **(5X1=5)**
	b) ❖ In Eukaryotes, there are at least three RNA polymerases in the nucleus (in addition to RNA polymerase found in the organelles). There is a clear division of labour. The RNA polymerase I transcribes rRNAs (28S, 18S and 5.8S), whereas the RNA polymerase III is responsible for transcription of tRNA, 5srRNA and snRNA. The RNA polymerase II transcribes precursor of mRNA, the hnRNA (heterogenous nuclear RNA). ❖ In eukaryotes, the monocistronic structural genes have interrupted coding sequences known as **exons** (expressed sequences) and non- coding sequences called **introns** (intervening sequences). The introns are removed by a process called **splicing**. ❖ hnRNA undergoes additional processing called as **capping** and **tailing**. In capping an unusual nucleotide, methyl guanosine triphosphate is added at the 5' end, whereas adenylate residues (200-300) (Poly A) are added at the 3' end in tailing . ❖ Thereafter, this processed hnRNA, now called mRNA is transported out of the nucleus for translation.	**1** **1** **1** **1**

	 Process of transcription in eukaryotes	1
	(OR)	
37	**a)** ❖ The polymerase chain reaction (PCR) is an *invitro* amplification technique used for synthesising multiple identical copies (billions) of DNA of interest.Denaturation, renaturation or primer annealing and synthesis or primer extension, are the three steps involved in PCR**.** ❖ The double stranded DNA of interest is denatured to separate into two individual strands by high temperature . This is called **denaturation**. Each strand is allowed to hybridize with a primer (renaturation or primer annealing). The primer template is used to synthesize DNA by using Taq – DNA polymerase. During denaturation the reaction mixture is heated to 950 C for a short time to denature the target DNA into single strands that will act as a template for DNA synthesis. ❖ Annealing is done by rapid cooling of the mixture, allowing the primers to bind to the sequences on each of the two strands flanking the target DNA. ❖ During primer extension or synthesis the temperature of the mixture is increased to 75^{o}C for a sufficient period of time to allow Taq DNA polymerase to extend each primer by copying the single stranded template. At the end of incubation both single template strands will be made partially double stranded. The new strand of each double stranded DNA extends to a variable distance downstream. These steps are repeated again and again to generate multiple forms of the desired DNA. This process is also called DNA amplification	**1** **1** **1** **1**





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(OR)

b)

Helminthes are mostly endoparasitic in the gut and blood of human beings and cause diseases called **helminthiasis.** The two most prevalent helminthic diseases are Ascariasis and Filariasis.

1

½

Ascaris is a monogenic parasite and exhibits sexual dimorphism. **Ascariasis** is a disease caused by the intestinal endoparasite *Ascaris lumbricoides* commonly called the **round worms.** It is transmitted through ingestion of embryonated eggs through contaminated food and water. Children playing in contaminated soils are also prone to have a chance of transfer of eggs from hand to mouth. The symptoms of the disease are abdominal pain, vomiting, headache, anaemia, irritability and diarrhoea. A heavy infection can cause nutritional defi ciency and severe abdominal pain and causes stunted growth in children. It may also cause enteritis, hepatitis and bronchitis.

$1^{1/2}$

½

Filariasis is caused by *Wuchereria bancroft i*, commonly called **fi larial worm.** It is found in the **lymph vessels** and **lymph nodes** of man . *Wuchereria bancroft i* is sexually dimorphic, viviparous and digenic. The life cycle is completed in two hosts, man and the female *Culex* mosquito. Th e female fi larial worm gives rise to **juveniles** called **microfi lariae larvae**. In the lymph glands, the juveniles develop into adults. The accumulation of the worms block the lymphatic system resulting in infl ammation of the lymph nodes. In some cases, the obstruction of lymph vessels causes elephantiasis or fi lariasis of the **limbs**, **scrotum** and **mammary glands**

1 1/2

38 **a)**

❖ Exotic species (non-native; alien) are organisms often introduced unintentionally or deliberately for commercial purpose, as biological control agents and other uses. They often become invasive and drive away the local species and is considered as the second major cause for extinction of species. Exotic species have proved harmful to both aquatic and terrestrial ecosystems.

1

❖ Tilapia fish (Jilabi kendai) (*Oreochromis mosambicus*) introduced from east coast of South Africa in 1952 for its high productivity into Kerala's inland waters, became invasive, due to which the native species such as *Puntius dubius* and *Labeo kontius* face local extinction. Amazon sailfin catfish is responsible for destroying the fish population in the wetlands of Kolkata. The introduction of the Nile Perch, a predatory fish into Lake Victoria in East Africa led to the extinction of an ecologically unique assemblage of more than 200 nature species of cichlid fish in the lake.

2

❖ African apple snail (*Achatina fulica*) is the most invasive among all alien fauna in India. This mollusc was first reported in the Andaman and Nicobar Islands. It is now found across the country and threatens the habitat of several native species. Moreover it is becoming a vicious pest in vegetable farms. Exotic earthworms compete for food with native varieties and deplete their population in soil.

1

1

❖ Papaya Mealy Bug (*Paracoccus marginatus*) is native of Mexico and Central America, is believed to have destroyed huge crops of papaya in Assam, West Bengal and TamilNadu.

(OR)

b)

❖ Every living organism responds to its environment. There are various ways by which organisms respond to abiotic conditions. Some organisms can maintain constant physiological and morphological conditions or undertake steps to overcome the environmental condition, which in itself is a response

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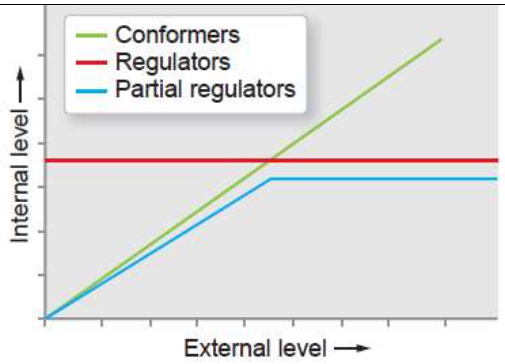

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The types of responses observed are

Regulate: Some organisms are able to maintain homeostasis by physiological means which ensures constant body temperature, ionic / osmotic balance. Birds, mammals and a few lower vertebrate and invertebrate species are capable of such regulation. **1**

Conform: Most animals cannot maintain a constant internal environment. Their body temperature changes with the ambient temperature. In aquatic animals like fishes, the osmotic concentration of the body fluids changes with that of the ambient water osmotic concentration. Such animals are called **Conformers**. In case of extreme condition, the inhabitants relocate themselves as in migration. **1**

Migrate: Organisms tend to move away temporarily from a stressful habitat to a new, hospitable area and return when the stressful period is over. Birds migrate from Siberia to Vedanthangal in Tamilnadu to escape from the severe winter periods.

Suspend: In certain conditions, if the organisms is unable to migrate, it may avoid the stress by becoming inactive. This is seen commonly in bears going into **hibernation** during winter. Some snails and fish go into **aestivation** to avoid summer related problems like heat and desiccation. Some lower animals suspend a certain phase of their life cycle, which is referred to as **diapause**. **1** **1**

PART	Book Back Questions	Interior questions	Total No. of Questions	Total Mark
I	7	8	15	15
II	5	4	9	18
III	5	4	9	27
IV	5	5	10	50
Total	22	21	43	110