CBSE

Model Answer Sheet 2014

केन्द्रीय माध्यमिक शिक्षा बोर्ड, दिल्ली
सीनियर स्कूल सर्टिफिकेट परीक्षा (कक्षा बारहवीं)
परीक्षार्थी प्रवेश–पत्र के अनुसार भरे

विषय
Subject : BIOLOGY (044)

परीक्षा का दिन एवं तिथि
Day & Date of the Examination : SATURDAY 15TH MARCH, 2014.

उत्तर देने का माध्यम
Medium of answering the paper : ENGLISH

प्रश्न पत्र के ऊपर लिखे कोड को दर्शाए
Write Code No. as written on the top of the Question paper : 57/3

अतिरिक्त उत्तर पुस्तिका (ओं) की संख्या
No. of supplementary answer-book(s) used : NIL

किसी शारीरिक अक्षमता से प्रभावित हो तो संबंधित वर्ग में ✓ का निशान लगाऐं।
If physically challenged, tick the category

B	D	H	S	C

B = दृष्टिहीन, D = मूक एवं बधिर, H = शारीरिक रूप से विकलांग, S = स्पास्टिक, C = डिस्लेक्सिक
B= Blind, D=Deaf & Dumb, H=Physically Handicapped, S=Spastic, C=Dyslexic

क्या लेखन – लिपिक उपलब्ध करवाया गया : हां / नहीं
Whether writer provided : Yes / No : No

*एक खाने में एक अक्षर लिखें। नाम के प्रत्येक भाग के बीच एक खाना रिक्त छोड़ दे।
यदि परीक्षार्थी का नाम 24 अक्षरों से अधिक है, तो केवल नाम के प्रथम 24 अक्षर ही लिखें।
Each letter be written in one box and one box be left blank between each part of the name. In case Candidate's Name exceeds 24 letters, write first 24 letters.

कार्यालय उपयोग के लिए
Space for office use

सीनियर स्कूल सर्टिफिकेट परीक्षा (कक्षा बारहवीं)
SENIOR SCHOOL CERTIFICATE EXAMINATION (CLASS XII)

केन्द्रीय माध्यमिक शिक्षा बोर्ड, दिल्ली
CENTRAL BOARD OF SECONDARY EDUCATION, DELHI

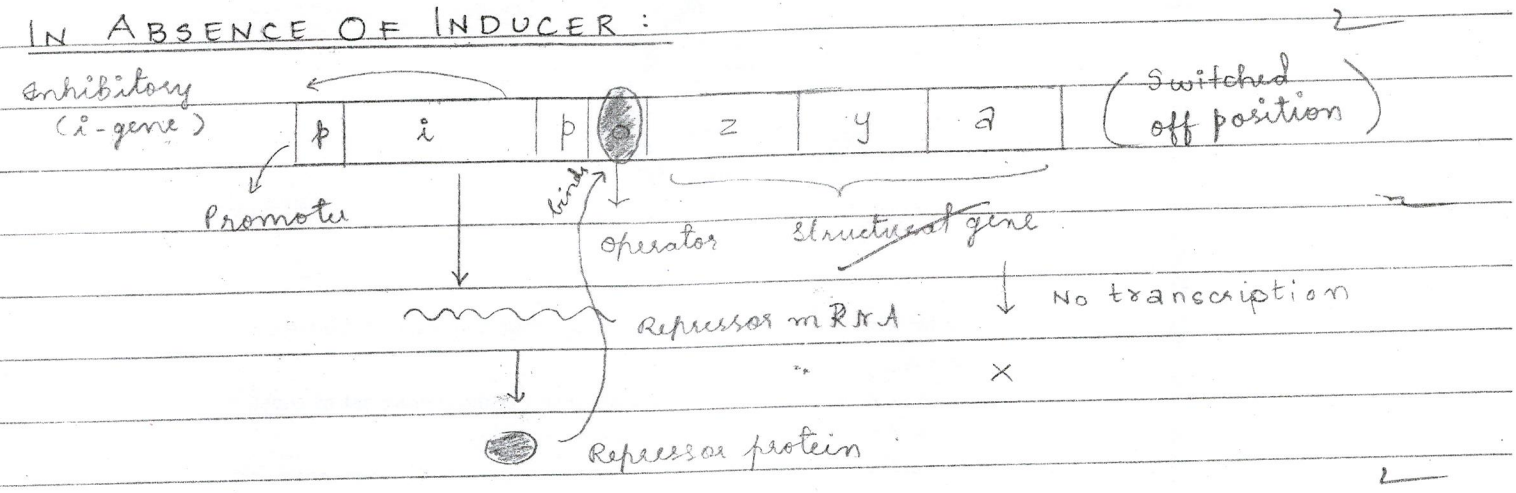
प्रमाणित किया जाता है कि मैंने/हमने इस उत्तर-पुस्तिका का मूल्यांकन प्रश्न पत्र के समुचित सेट के अनुसार और पूर्ण रूप से मूल्यांकन पद्धति के अनुसार किया है।

Certified that I/we have evaluated this answer book according to the correct set of question paper and strictly as per the marking scheme.

SECTION D

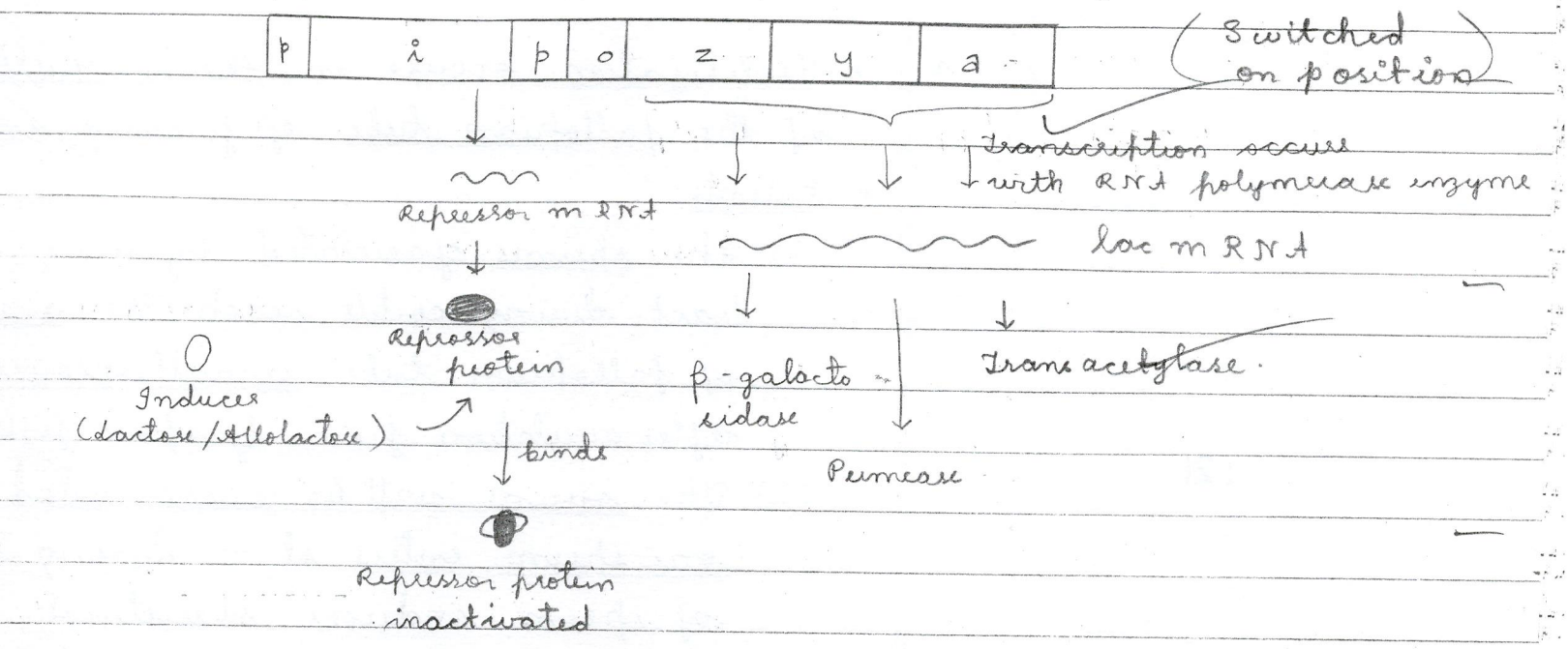
30. THE LAC OPERON: (E. COLI):

(i) IN ABSENCE OF INDUCER:



* In the absence of inducer, the repressor protein synthesized by the inhibitory (i-gene) from a repressor mRNA binds to the operator region of the lac operon.
* Hence, the RNA polymerase enzyme fails to perform the transcription of the structural gene.
* This is the 'negative' regulation of transcription by the inhibitory repressor protein (in the process of lactose hydrolysis to glucose and galactose in E. Coli)

(ii) IN PRESENCE OF INDUCER:



* If a inducer (here lactose or allolactose) is present, it will bind to the repressor protein created thus inactivating the protein and it won't be able to bind to operator region.

* Hence, the RNA polymerase can perform transcription of the structural gene creating the lac mRNA and enzymes β-galactosidase, permease and transacetylase from the

(catalyses lactose hydrolysis) (increases permeability of cell to β-galactosidase)

'z', 'y', 'a' genes of the structural gene respectively.

29. a. * Fertilization occurs in the ampullary - isthmic junction of the fallopian tube of females in humans.

* Events:

(i) The sperms ejaculated by male into female reproductive tract during coitus reach the ampullary - isthmic junction of fallopian tube simultaneously as the ovum released after ovulation from Graafian follicle.

(ii) The ovum will be surrounded by sperms but only one sperm enters it — during this step, the entry of sperm induces structural changes in the zona pellucida layer on contact that makes it impermeable to further entry of sperms.

(iii) The sperm enters the cytoplasm of ovum by dissolution of membranes including plasma membrane of ovum with the hydrolytic enzymes from acrosome and in the process, loses all parts except the haploid elongated nucleus.

(iv) The secondary oocyte completes the IInd meiotic division (unequal) leading to formation of a small second polar body (degenerates) and the haploid ootid which fuses with haploid sperm nucleus to form diploid zygote.

b. * ICSI - Intra Cytoplasmic Sperm Injection
* In this method, the egg/ovum and sperm (gametes) are collected from the female and male partners and the
* sperm is directly injected into the ovum under laboratory conditions.
* The so formed zygote is then to allowed to develop further within the mother's body after transferring it by ZIFT (Zygote Intra Fallopian Transfer).

28. SEWAGE TREATMENT (In STP's - Sewage Treatment Plants)

(i) PRIMARY TREATMENT:

* Physical matter like debries and soil, sand, silt etc. removed by: (i) Sequential filtration

(ii) Sedimentation

* The substances that settle down forms primary sludge and the effluent is primary effluent.

(ii) SECONDARY TREATMENT:

* Biological treatment in which primary effluent is passed to large aeration tanks and is constantly agitated and supplied with air / O_2.
* This causes creation of flocs or association of useful aerobic bacteria and fungal filaments into a meshlike structure.
* In this process, the microbes use up organic matter in the polluted water and hence reduce the BOD - Biochemical Oxygen Demand (amount of oxygen required to oxidise all the organic matter in 1 litre polluted water by microbes)
* Once the BOD is sufficiently reduced, it is allowed to pass to a settling tank where flocs are allowed to settle down - activated

sludge.

* A little sludge is pumped back to the aeration tank to serve as inoculum but most is passed to the anaerobic sludge digester where its degraded by useful anaerobic bacteria (Eg: methanogens) releasing a mixture of gases like CH_4, CO_2, H_2, H_2S etc (biogas).
* The water coming out after this treatment is hence purified and can be discharged into water bodies.

This treatment is essential to:

(i) Avoid pollution of the natural water bodies by excessive accumulation of harmful chemicals, organic matter and nutrients which may lead to eutrophication.

(ii) Prevent the spread of infectious water borne disease caused due to the deadly pathogens in polluted water.

SECTION C.

27. a. * The constant internal environment (homoeostasis) is beneficial to organisms as it ensures the proper occurrence of all the metabolic reactions and biological functions of the body, despite the changing external environment.

* Hence, the organism can survive in unfavourable conditions and changing climates without it affecting their internal processes.

b. Organisms can overcome stressful external conditions by:

(i) Migrate:
If the stressful period lasts for a short time, the organisms can migrate or move to a region with favourable conditions and then return when the period is over. (Eg: Siberian cranes: cold North to warm Rajasthan areas).

(ii) Suspend:
Organisms can also temporarily halt their functions

for the unfavourable period like dormancy (seeds), diapause or a stage of suspended development (zooplankton), hibernation / winter sleep (polar bears), aestivation / summer sleep (snails).

26. OUTBREEDING DEVICES (encourage cross pollination in plants).

(i) Different positions and different heights of the male (stamens) and female (pistil) reproductive structures to prevent self pollination in bisexual flowers (autogamy) - inability to meet.

(ii) Production of unisexual (male and female) flowers and on different plants (Dioecy) would prevent both autogamy and geitonogamy.

(iii) Asynchrony in the times of maturation of androecium and gynoecium (protandry / protogyny) to prevent meeting of pollen and egg and prevent autogamy.

10

25. a. (i) CuT ✓

(ii) Cu7 ✓

b. * Copper releasing IUD's increase phagocytosis of sperms (in uterus) and prevents within the uterus. ✓

* It also hampers the fertilizing capacity and motility of sperms and viability. ✓

24. a. * Adaptive radiation: It is the process in which a species starts from a point and literally radiates out to different habitats within the same geographical region causing adaptation and evolution. ✓

* Eg: Darwin's finches

These small birds were found on the Galapagos island and it was observed that within the same area there were many species of it with different beak sizes, as they evolved from the original seed eating to insect ivorous species in the different habitats.

b. * Evolution of placental mammals and Australian marsupials (Placental mammals evolved to represent Australian marsupials, all within the Australian continent).

* Convergent evolution

* It is named so ↑ because it doesn't necessarily indicate common ancestry of the species but rather shows similar adaptations due to similar habitats and functions.

23. a (i) Partially open mouth with furrowed tongue.

(ii) Broad palm with characteristic palm crease.

b. Both

c. Klinefelter's

d. Male

e. (i) Rudimentary ovaries and sterility
(ii) short stature and lack of secondary sexual female characters.

f. Female.

22. a * such visits must be organised to ensure the proper standards of life for such people who are often shunned by society.
* They must be made to know of the methods by which they can prevent the deadly infectious diseases which often break out in slums due to lack of hygiene and also the importance of proper nutrition.

b. Steps:
(i) Maintanence of a clean and tidy home and surrounding areas.
(ii) Proper waste and sewage disposal methods must be introduced.

(iii) Importance of regular personal hygiene and awareness of the diseases which can hence be avoided.

(iv) Advocating methods for water treatment and purification - provision of uncontaminated food and water

21. a. * Alexander von Humboldt

* Observation: The species richness discovered was directly proportional to the area explored but only upto a certain limit.

b. (i) The general case - when a limited area is explored and species richness noted.

(ii) the case when large areas like entire continents are taken and the relation between area and species richness studied.

z → Regression coefficient (slope of line).

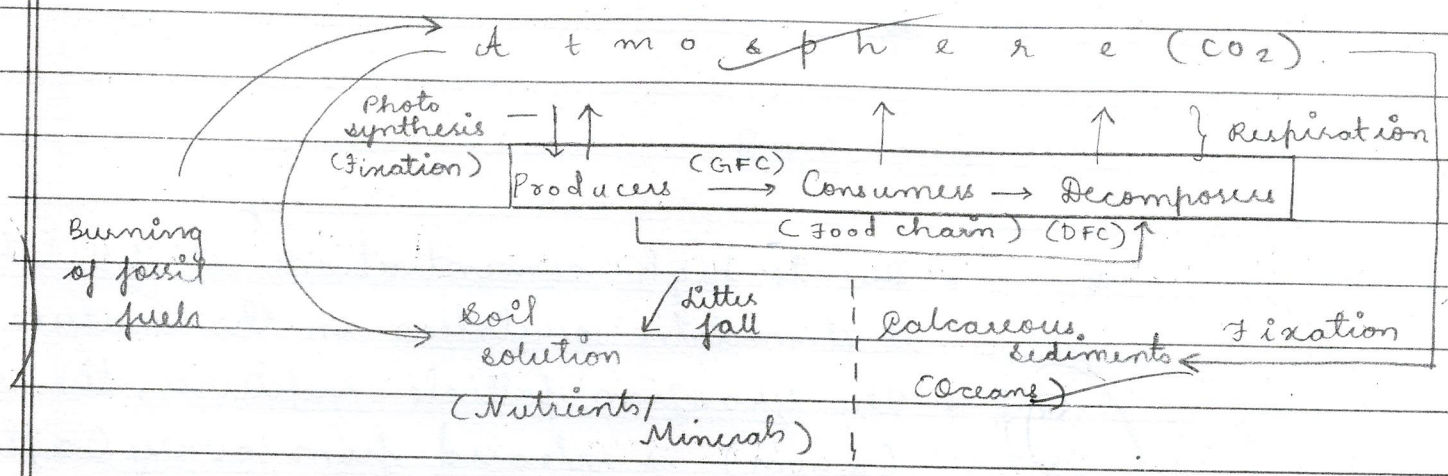
c. The slope is steeper when the value of regression coefficient, z, is higher, that is, increased species diversity

in a given area and when large geographical areas or continents are considered.

20. * Gel Electrophoresis
* In the process, the DNA fragments formed after digestion by restriction endonuclease, being negatively charged, are allowed to move towards the anode in a medium under an external electric field.
* The medium commonly used is agarose gel, obtained from seaweeds. and is a polymer.
* Due to the sieving effect of the medium, the larger DNA fragments remain behind and the smaller ones move further towards the anode hence, gets separated according to size - 'resolved'.
* The separated DNA fragments are visualized by staining with ethidium bromide and exposure to ultraviolet light (DNA visible in organge colour).

19. * Function of reservoir: To make up for the imbalance caused (deficit) due to loss of balance in the efflux and influx of minerals.

* CARBON CYCLE:



* The Carbon cycle is a gaseous cycle with its source and sink as the atmosphere and the oceans.
* The carbon is present in atmosphere as Carbon dioxide which is released by:
  (i) Respiration by plants, animals and other living beings.
  (ii) Burning of fossil fuels

* The fixation of Carbon dioxide is carried out by plants (photosynthesis) so deforestation hampers cycle.
* Carbon is also present in nature as calcareous sedi ments, on oceans (usually) and land (nutrients).

SECTION B

18. * Due to high concentrations of LH (Luteinizing hormone), it stimulates ovulation in the mature Graffian follicle.
* The Graafian follicle ruptures, the secondary oocyte (ovum) is released from ovary (after which the remnants of follicle becomes corpus luteum)

17. a. The appearance of pink flowers are not 'blending' because here, the alleles do not blend but they do segregate independently. The genotype is the same (Rr) as usual and the genotypic ratio also doesn't vary. The only difference is that the 'R' allele is not completely domi

nant over 'r' recessive allele so in the phenotypic expression, we see a change, that is, pink flowers intermediate of red and white.

b. Incomplete Dominance

16. Stability of Double Helical Structure of DNA:

(i) Complementarity of the two strands of DNA due to complementary nitrogenous bases ~~pairs~~ which form strong hydrogen bonds ~~which~~ with each other — Adenine forms 2 hydrogen bonds with thymine and cytosine 3 with guanine.

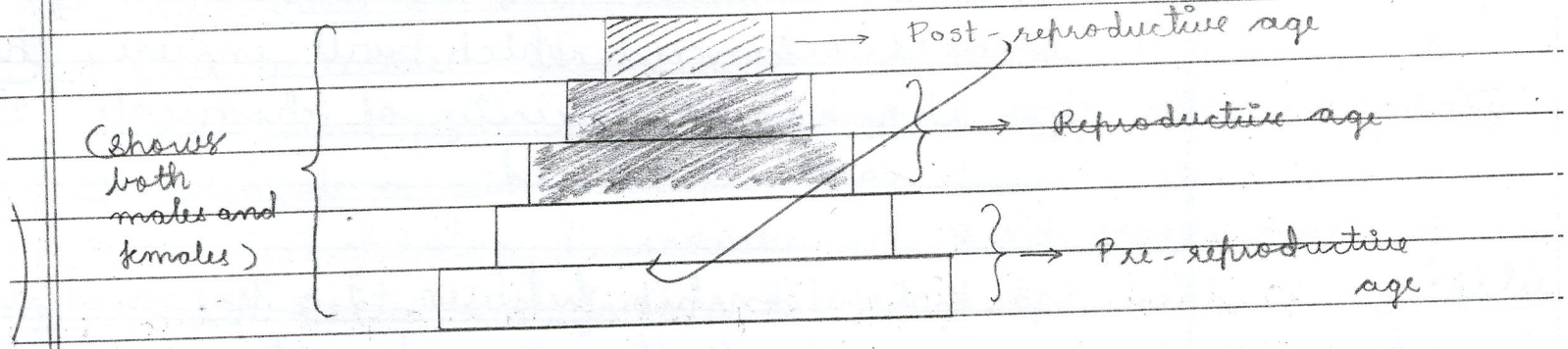
(ii) The base pairs are stacked ~~with~~ their planes one over the other in the double helical structure which provides extra stability.

Also, DNA is less reactive due to absence of reactive $-OH$ group at 2' carbon, evolution of a process of repair which prevents their degradation and presence of thymine instead of uracil as nitrogenous base.

food for its young ones and they will come out once the seeds start further development.

The phenomenon seen here is Mutualism (two organisms existing symbiontically or in mutual cooperation and benefits to each other). and Coevolution (the evolution of fig tree and wasp in accordance with the changes in each other) and also Coextinction (hence).

12. AGE PYRAMID OF EXPANDING POPULATION:



11. * The viruses 'Baculoviruses' belonging to genus Nucleo polyhedrovirus are effective attackers of insect pests and certain arthropods.

* They are suitable for use in an ecologically sensitive area as they are species-specific (1), narrow-spectrum (2), limited biocontrol agents (3) that attack only (4) the pests and do not affect any other organisms.

10. Symptoms of Ascariasis:
(i) Internal bleeding
(ii) Fever
(iii) Anemia
(iv) Blockage of the intestinal (small) passage.
A healthy person acquires it through contaminated food and water (eggs of the round worm Ascaris may be present).

9. Drosophila melanogaster.
Morgan preferred to work with fruit flies due to:
(i) Short life cycle of about two weeks hence many generations can be studied easily.
(ii) Can be cultured in a simple synthetic medium in the laboratory.

(iii) A single mating between male and female produces a large number of offsprings with easily studiable characteristics (hereditary).

SECTION A.

8. The 'C' peptide is a polypeptide chain that connects the 'A' and 'B' polypeptide chains in the pro insulin and is not present (after processing) in the mature human insulin.

7. Bacterial cells - Lysozyme
Fungal cells - Chitinase

6. Gause's Competitive Exclusion Principle.
Two species which compete for similar resources cannot coexist indefinitely by the sharing of resources, that is, there will be the inevitable elimination of the less efficient species.

4. Mycorrhizae (symbiotic association).

4. Parthenium (Carrot grass)

3. Spirulina (single cell protein)

2. Anaphase - I (Meiosis I)

1. Because it (foreign DNA) will not become part of the genomic DNA or chromosome without being attached to a certain region of chromosome, called the ori/origin of replication, which allows the replication of the chromosome. Otherwise, the foreign DNA will be rejected.