GS- 2022- MSc Wildlife Biology and Conservation Entrance Exam
Held on December 12th , 2021

All questions in SECTIONS A (**General)**, B (**Quantitative**) and C (**Wildlife and Conservation Science**) are multiple choice questions. Each question has only ONE correct or best answer. All questions carry ONE mark. There is NO negative marking. There are a total of 75 questions for a maximum of 75 marks.

Section D has an **Essay** type question. The essay carries 25 marks. The word limit for the essay is **750 words.**
However, to qualify for your essay to be graded, you must score a minimum of 50% in each of Sections A, B and C.

You are allowed a maximum of 3 hours for the exam (estimating about 2 hours and 15 minutes for Sections A, B and C and 45 minutes for Section D).

SECTION A

1. Which one of the following sentences has no errors in grammar or choice of words?

a) The tourists saw female leopard having cubs

b) The tourists saw a female leopard having cub

c) The tourists saw a female leopard with cubs

d) The tourists saw female leopard with cubs

2. Read the following paragraph and choose the most logically consistent sentence to fill the blank:

The genitals of monitor lizards are purported to have magical properties that cure a range of illnesses. Monitor lizards therefore feature prominently in confiscations of illegally traded wildlife products. _____. In fact, a young woman who fell sick in the village of Kanihar eventually succumbed to her illness, because her family treated her with a concoction made of monitor lizard genitals instead of seeking medical help. In the interest of both wildlife conservation and human health, superstitious practices should be eradicated, and replaced by evidence-based medical treatments.

a) Likewise, fan corals, musk deer glands, caterpillar fungus, and tiger bones are also found in illegal wildlife trade.

b) A recent study found some evidence for the healing properties of body parts from various wild species.

c) Several mystics and traditional healers all over India, Myanmar, and Thailand prescribe medicines made from plant and animal body parts.

d) Recent biomedical research that investigated the chemical composition of these parts found no evidence in support of their healing properties.

3. Rhea and Jhun were arguing heatedly over the legacies of British colonial rule on wildlife conservation in India, a topic on which their views were widely divergent. As their exchange became more heated, Rhea exclaimed, “Jhun! That is below the belt!”

She most likely meant that:

a) Jhun had hit her below her waist.

b) **Jhun's argument was unfair**

c) Jhun's argument was inconsistent

d) Jhun's argument was uninformed.

4. Choose the most appropriate word from the choices below to complete the sentence:

Instead of having a master narrative on why the human population on Easter Island was extirpated, the book contained many _____ around the same theme.

a) euphemisms

b) **vignettes**

c) metaphors

d) eulogies

5. In May 2020, Baghjan in Assam was in the news for an accident in an industrial plant that resulted in human and wildlife deaths, large-scale evacuations, and environmental damage. In what type of industrial plant did the incident take place?

a) Fertilizer

b) Iron and steel

c) Nuclear power

d) Oil and gas

6. The current (on 13 Nov 2021) Union Minister for Environment, Forest and Climate Change in India is:

a) Arjun Munda

b) Bhupender Yadav

c) Kiren Rijiju

d) Prakash Javdekar

7. Niyamgiri in the state of Odisha is the site of an environmental battle regarding which of the following developmental projects?

a) Hydro-electric Dam

b) Port construction

c) Open-cast mining

d) Resort construction

8. Which political party won the recent (2021) Legislative Assembly elections in the state of West Bengal?

a) Bharatiya Janata Party

b) Communist Party of India (Marxist)

c) Bahujan Samaj Party

d) All India Trinamool Congress

9. Which species of woodpecker was declared extinct by the US government in September 2021?

a) Great Slaty

b) Imperial

c) Ivory-billed

d) Magellanic

10. The SARS-COV2 corona virus disease 'COVID-19' is the largest pandemic of this century. Arrange the countries in descending order of total case counts as of October 2021 (note that the order of countries has remained the same since June 2021).

a) USA, India, Brazil, UK

b) China, India, USA, Brazil

c) Brazil, India, Spain, Russia

d) USA, India, UK, Russia

11. Greta Thunberg, Yousafzai Malala and Boyan Slat all have something in common:

a) They are all known for campaigns to call governments to educate girl children

b) They all have spider species named in their honour

c) They are all well-known ornithologists

d) They have all been nominated for the Nobel awards for environmental conservation

12. At the recently concluded COP 26, in Glasgow, India promised to achieve net zero emissions by _____, missing a key goal of the summit.

a) 2030

b) 2045

c) 2070

d) 2100

13. "If you do not cooperate, you will not be pronounced 'not guilty' in court tomorrow". What is the inference?

a) If you don't cooperate, you will be acquitted

b) If you cooperate, you could be acquitted

c) If you cooperate, you will be found guilty

d) If you cooperate, you are guilty

14. Thousands of female Hipposideros bats rear their pups in Elephanta cave. Although mothers leave the cave at night to forage, on their return, each mother almost always swiftly returns to her pup among the many in the cave. Since it is known that bat calls are the only means by which Hipposideros communicate with one another, and a bat pup cannot distinguish the call of its mother from other adult bats, it can be inferred that each mother bat

can recognize the calls of her pups. Which of the following statements best describes what the above statement is trying to do?

a) Derive a general conclusion about all members of a group from facts known about representative members of that group.

b) Establish the validity of one explanation for a phenomenon by excluding alternative explanations

c) Support the idea that a certain phenomenon can occur by describing a mechanism for the same.

d) Conclude that members of two groups are likely to share a particular ability because of other characteristics they share.

15. Eleven years ago, Sunita was half as old as Ram will be in 4 years. If Ram is 'm' years old now, how old is Sunita now in terms of 'm'?

a) 4m – 11

b) ½(m+4)+11

c) ½(m-11)

d) 4m+11/2

16. Assume that at the Vandalur zoo in Madras, 2/5 of all the animals are mammals, and 2/3 of the mammals are allowed to interact directly with the public. If 24 mammals are allowed to interact directly with the public, how many animals in this zoo are NOT mammals?

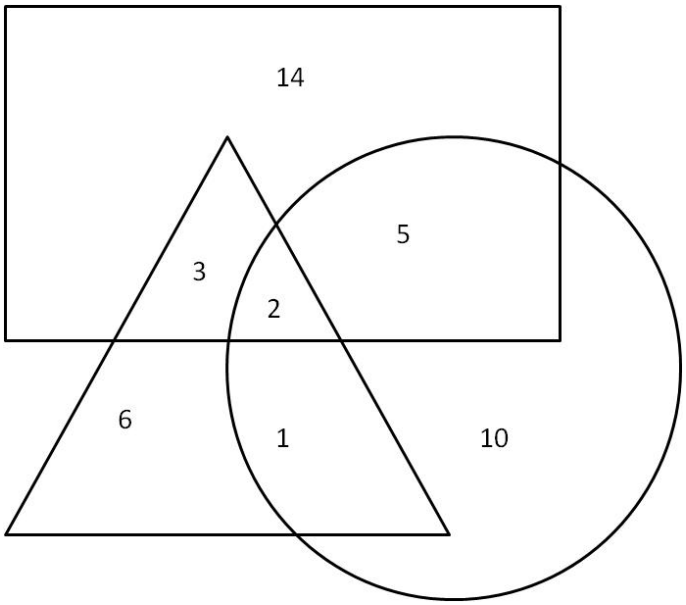
a) 36

b) 48

c) 54

d) 60

17. In a grassland-scrub-dry deciduous forest area, a researcher is studying habitat use by different bird species. The number of birds species found in each habitat are shown below, where the triangle represents grasslands, the rectangle the scrub forests, and the circle the dry deciduous forests. Which of the following statements about the birds in this area is NOT accurate?



a) The number of species unique to grasslands is lower than the number that is shared between scrub and dry deciduous forests

b) Grasslands share fewer bird species with dry deciduous forests than with scrub forests

c) The number of species unique to grasslands is lower than the number of species shared between grasslands and at least one other habitat

d) The number of species found in grasslands but not in dry deciduous forests is less than the number unique to dry deciduous forests

18. In the figure below, find the number of rectangles (Note: Squares are even sided rectangles)

a) 15

b) 16

c) 18

d) 20

19. It takes one research assistant a total of 10 hours to complete 10 pages of data entry. Assuming their computer skills are of the same level, how long will it take for 2 research assistants to complete 20 pages of data entry each?

a) 20 hours

b) 5 hours

c) 40 hours

d) 10 hours

20. On a bench that sits five persons, Parveen is sitting next to Chaya, and Dilshan is sitting next to Kiran. Sharan is not sitting next to Dilshan. Sharan and Chaya are sitting at two ends of the bench. Which two students is Dilshan sitting between?

a) Chaya and Kiran

b) Kiran and Parveen

c) Sharan and Parveen

d) Sharan and Kiran

SECTION B

1. The probability of giving birth to a female pup is 0.6 in a mongoose population. What is the probability that a female gives birth to a litter that has one female and two male pups?

a) 0.096

b) 0.125

c) 0.288

d) 0.66

2. I roll a pair of dice. What is the probability that I get the same number on both dice?

a) 1/8

b) 1/6

c) 1/4

d) 1/2

3. A biologist calculates the mean mass of lizards in a population as 15 g based on a sample size of 15 individuals. Reviewing her data sheet, she realises that she had mistakenly entered the measurement for one individual as 10 g less than the actual mass of that individual. The correct mean mass (in g, rounded to one decimal place) is:

a) 14.7

b) 15.0

c) 15.7

d) 16.0

4. Caracal prey on peafowl in Sariska Tiger Reserve. When a peafowl encounters a caracal, the probability that the caracal attacks the individual is 1/5 and the probability that the peafowl escapes the attack is 4/5. What is the probability that a peafowl which encounters a caracal is NOT killed by the caracal?

a) 0.16

b) 0.2

c) 0.8

d) 0.96

5. There are 10,000 rats on a small island of 1 km^2 area in the Andaman Sea that threaten sea birds that nest on the shores of the island. A researcher is assessing the rodent population of this island. He sets up traps across the island and captures 300 animals. He marks and releases the rats. On the next day, another 300 individuals are captured. Assuming there are no births, death, immigration or emigration between the sampling days, what is the most likely number of marked individuals recaptured on the second day?

a) 75

b) 30

c) 110

d) 9

6. The distance between Bangalore and Mysore is 148 km. An express train left Bangalore towards Mysore at the speed of 80 km/hr. At around the same time, a goods train left Mysore towards Bangalore at the speed of 36 km/hr. At 12 PM, both the trains were at Mandya station. The express train had already been there for 10 minutes, while the goods train had been there for 5 minutes. What is the distance between Mysore and Mandya, and what time did the goods train leave Mysore?

a) 38, 10:10 AM

b) 52, 10:50 AM

c) 48, 10:35 AM

d) 50, 10:40 AM

7. Swathi takes Mila, Isha and Kai to a sweetshop. Mila wants 1/2 as many sweets as Isha, and Kai wants 1.5 times as many sweets as Isha. If Swathi bought a total of 36 sweets, how many did Kai get?

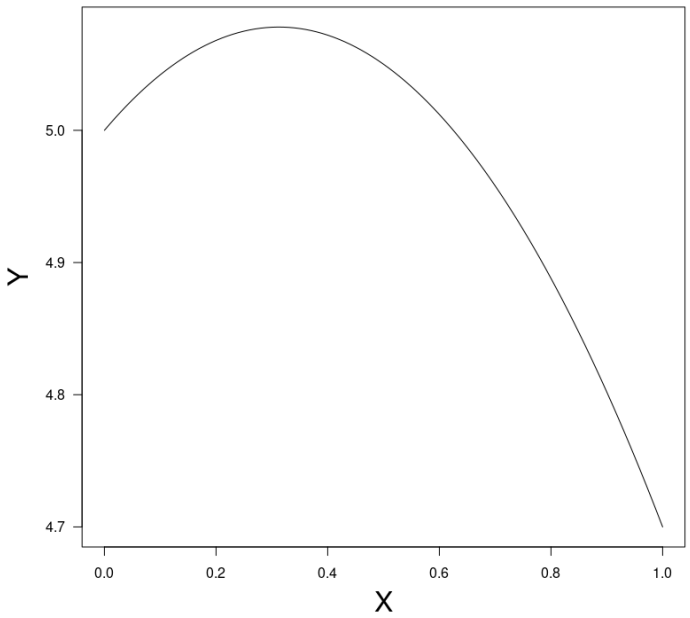
a) 14

b) 16

c) 18

d) 20

8. The function $Y = 5 + 0.5X - 0.8X^2$ is shown in the graph below. Which of the following statements about the first and second derivatives taken at the maximum of this function is TRUE?



a) $\frac{dY}{dX} = 0$ and $\frac{d^2Y}{dX^2} = 0$

b) $\frac{dY}{dX} > 0$ and $\frac{d^2Y}{dX^2} < 0$

c) **$\frac{dY}{dX} = 0$ and $\frac{d^2Y}{dX^2} < 0$**

d) $\frac{dY}{dX} = 0$ and $\frac{d^2Y}{dX^2} > 0$

9. A population shows exponential growth. The population growth rate can be represented by $\frac{dN}{dt} = rN$where r is the instantaneous rate of increase and N is population size. Which of the following statements is correct about per capita growth rate $(\frac{1}{N} \times \frac{dN}{dt})$ of this population?

a) Per capita growth rate decreases with an increase in population size.

b) Per capita growth rate increases with an increase in population size.

c) Per capita growth rate increases with an increase in population size, reaches a maximum, and then decreases with any further increase in population size.

d) Per capita growth rate stays constant with increase in population size.

10. If $\log_b x = y$, then which of the following is true?

a) $y^b = x$

b) $x^y = b$

c) $b^y = x$

d) $y^x = b$

11. If the mean height of trees in a savanna woodland is 10m and the variance around the mean is 4, then the coefficient of variation (= [standard deviation/ mean] * 100) is:

a) 40%

b) **20%**

c) 80%

d) 10%

12. A researcher sets out from her field camp, which is inside a wildlife sanctuary, to her home town. There are three different routes that lead from her field camp to the only entrance into the wildlife sanctuary. From the entrance, there are four different routes to a highway, from which there are two different routes to her home town. How many different ways are there from her field camp to her home town?

a) 9

b) 14

c) 24

d) 32

13. Conducting multiple t- tests on the same data set will:

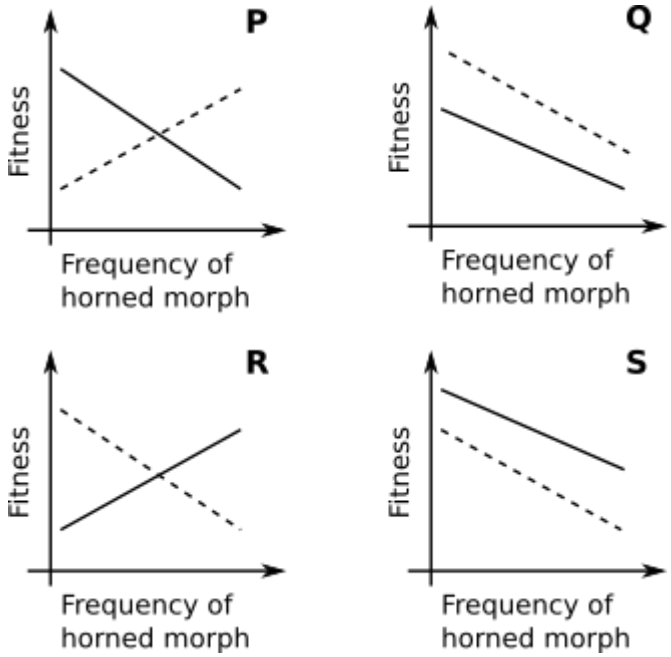
a) **increase the probability of falsely rejecting a true null hypothesis**

b) decrease the probability of falsely rejecting a true null hypothesis

c) increase the probability of failing to reject a true null hypothesis

d) decrease the probability of failing to reject a true null hypothesis

14. Males in a beetle population either have long horns or are hornless. These two male morphs are genetically determined. A study found that the two morphs are maintained in the population through negative frequency dependence. That is, the fitness of any morph is highest when it is rare and decreases as it becomes more common. Which of the following figures represents this pattern? In the figures, the dashed line is the fitness of the horned morph and the solid line is the fitness of the hornless morph. (The X axis represents the frequency of the horned morph in the population, calculated as abundance of the horned morph divided by the sum of the abundances of both morphs)



a) P

b) Q

c) R

d) S

15. The Southern shrewbill is an endemic species that lives on a single island in the Indian Ocean. The birds nest only once a year. Researchers have estimated that the adult population of this bird is about 600. The sex ratio among adults is 2 females to 1 male, but the sex ratio among juveniles is 1female :1 male. Assuming that males and females in this species form a strict pair bond for the nesting season and that both males and females are required for nesting, what is the maximum number of shrewbill nests that we can expect in a given year?

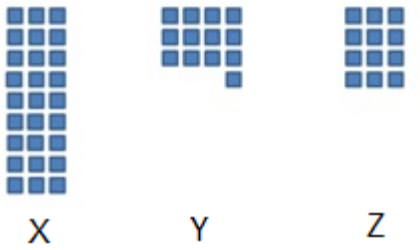
a) 200

b) 300

c) 400

d) 600

16. Which of the following figures contains a prime number of squares and why?



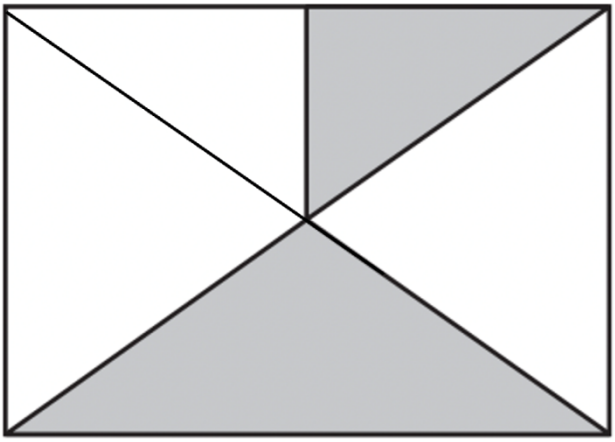
a) X, because its height is much greater than its width

b) Y, because the single square in the bottom row makes the total an odd number

c) Y, because composite (non-prime) numbers of squares can be arranged as rectangles or squares

d) X, because it is the product of two odd numbers

17. What fraction of the figure below is shaded?



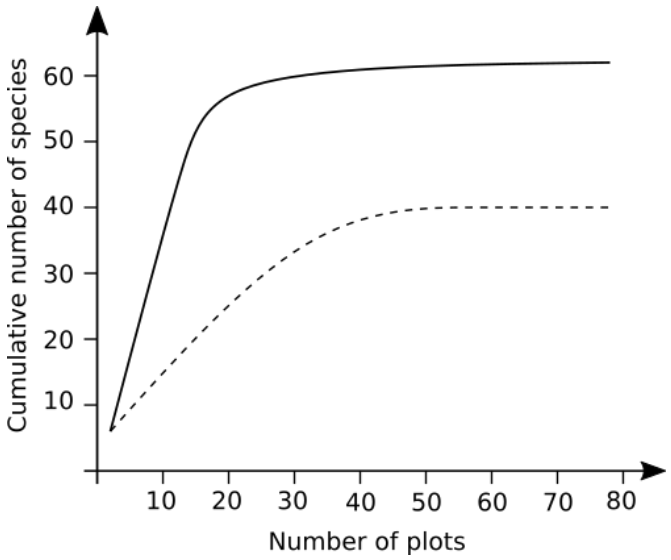
a) 1/3

b) 3/8

c) 3/4

d) 5/16

18. The figure below shows species accumulation curves for plant communities in a short grass meadow (P, dashed line) and a tall grass meadow (Q, solid line) in southern peninsular India, measured in 1992. A researcher wishes to design a study to estimate plant species richness in these two habitats in 2022. She has only 4 months to sample both forests. She therefore uses the information shown below and decides to lay twice the number of plots in short grass than in tall grass meadows. Which option below is the most likely explanation for this sampling decision?



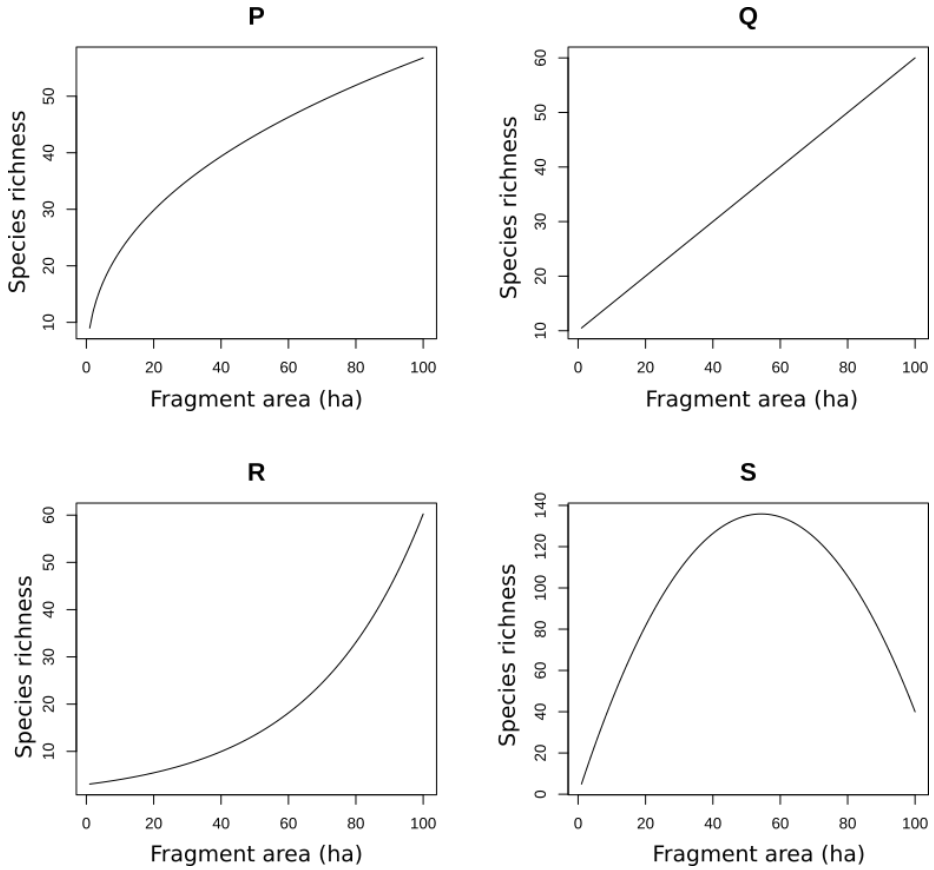
a) P is expected to have more species than Q based on meadow type, and therefore requires more sampling.

b) The number of species at the asymptote of P is higher than that of Q and therefore P requires more sampling.

c) P reaches its asymptote more slowly than does Q and therefore P requires more sampling.

d) The meadow type, of which P is a representative, is of higher endemicity, than the meadow type that Q belongs to; therefore, P requires more sampling.

19. A researcher examines variation in species richness of butterflies among rainforest fragments in a large landscape. He finds the following relationship between species richness (S) and fragment area (A): $S = 9A^{0.4}$. Which graph below best represents this relationship?



a) P

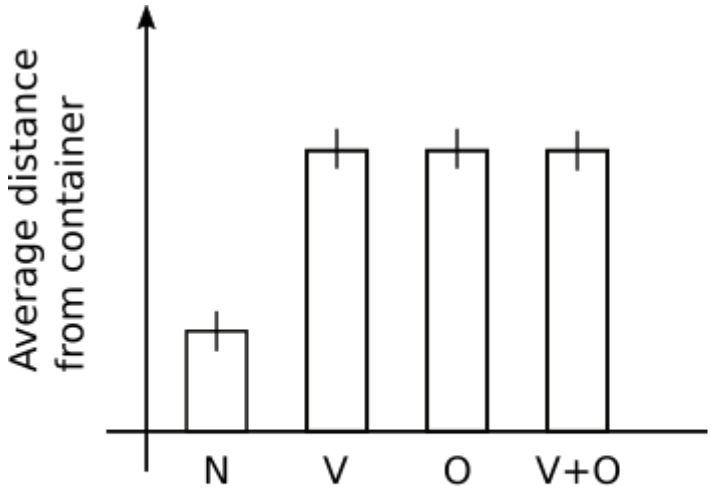
b) Q

c) R

d) S

20. I wished to test whether mosquito larvae used either visual or olfactory cues or both to sense dragonfly nymph predators. I set up an experiment with four treatments:
i. Visual cues only (V): Artificial pool with a sealed transparent container containing a live dragonfly nymph
ii. Olfactory cues only (O): Artificial pool with a porous opaque container containing a live dragonfly nymph
iii. Visual and Olfactory cues (V+O): Artificial pool with a porous transparent container containing a live dragonfly nymph
iv. No Visual or Olfactory cues (N): Artificial pool with a sealed opaque container containing a live dragonfly nymph

Mosquito larvae were randomly assigned to any one of the four treatments and their behaviour was observed for 10 minutes. The average distance of the larva from the container was estimated as a measure of their predator avoidance behaviour (the greater the distance, the greater the predator avoidance behaviour). Based on the results shown below, which ONE of the following statements can be inferred?



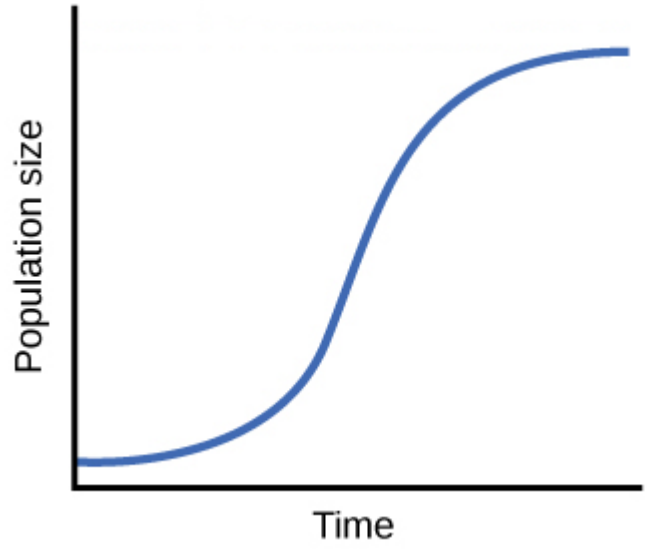
a) Visual cues are sufficient for mosquito larvae to sense the predator

b) Olfactory cues are necessary for mosquito larvae to sense the predator

c) The response to both cues is the sum of the responses to individual cues

d) Visual cues are necessary for mosquito larvae to sense the predator

21. If a population grows in size over time in a manner shown in this graph (depicts logistic growth), how will the rate of growth (the slope of the line, or dN/dt) change over time?



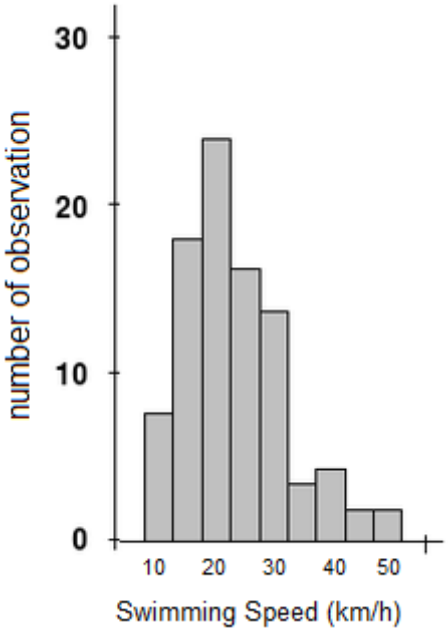
a) Linear increasing line

b) Flat line

c) **Unimodal curve**

d) Accelerating curve

22. A researcher examining swimming speed of great white sharks found that the frequency distribution of speed was right skewed (as shown in the figure below). The researcher later determined that the measurements for some individuals with speeds greater than 40 km/h were a result of faulty equipment, and reanalyzed the data after removing these aberrant values. The researcher compared how mean, median and mode changed in the reanalysis. Which of the following statements is accurate about the absolute changes in mean, median and mode?



a) change in median > change in mean > change in mode

b) change in mean > change in median > change in mode

c) change in mode > change in median > change in mean

d) change in mode > change in mean > change in median

23. Sparrows have to decide between two types of food, F1 and F2. F1 is larger and its profitability (measured as the energy gained divided by handling time) is greater than that of F2. Optimal foraging theory posits that when sparrows encounter F1, they should always choose to feed on it. However, when they encounter F2, they should reject it and continue their search unless the time that it takes to find F1 is too long. That is, the $\frac{\text{energygained}}{\text{handlingtime}}$ of F2 should be greater than the $\frac{\text{energygained}}{\text{handlingtime+searchtime}}$ of F1.

Given the information in the table below, which option represents the smallest value that the search time of F1 can take and still make it profitable for the sparrow to eat F2?

Food type	Energy (indexed by dry wt. in mg)	Handling time (in seconds)
F1	35	8
F2	5	2

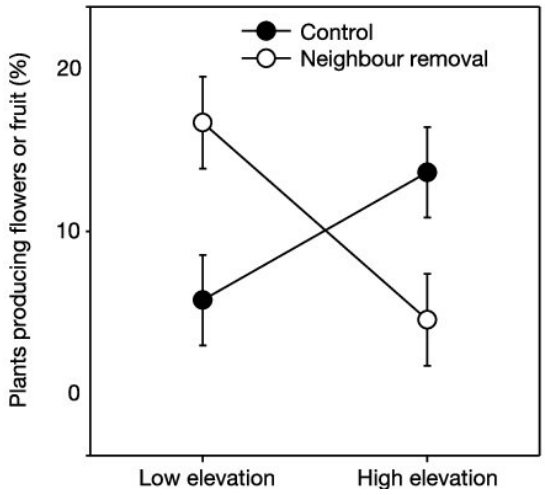
a) 2 seconds

b) 5 seconds

c) 7 seconds

d) 9 seconds

24. A study by Callaway et al. (Nature, 2002, 417:844-848) examined how interactions between plants changed across elevation. Shown below are results from this study where they quantified reproduction (flowering or fruiting) in plants that were growing in the presence of neighbours (Control), and plants that had their neighbours removed (Neighbour removal). The experiment was conducted at low and high elevations. Based on these results, which of the following statements is TRUE?



a) Competition dominates interactions with neighbours at low and high elevation

b) Facilitation dominates interactions with neighbours at low and high elevation

c) Facilitation dominates interactions with neighbours at low but not high elevation

d) Facilitation dominates interactions with neighbours at high but not low elevation

25. The effect of an abundantly flowering invasive plant on the pollination success of a native plant is debated. One set of researchers proposes that the invasive plant negatively affects the pollination success of an individual native plant irrespective of the density of the invasive plant (Idea 1). A second set of researchers proposes that the effect of the invasive on the native plant is density dependent. When the invasive plant is at low density in the neighbourhood, they have a negative effect on pollination success of the native plant. In contrast, when they are at a high density, they have a positive effect: they increase the pollination success of individual native plants much more than would a similar density of native conspecifics (Idea 2). A third set of researchers argue that since the invasive plant rarely occurs at low densities, it is only relevant to consider high density effects of the invasive plant. They propose that the pollination success of an individual native plant is the same whether it experiences a high density of the invasive plant or a high density of native conspecifics (Idea 3).

Which one of the following experiments is most suitable to test Idea 3?

a) Compare the pollination success of a focal native plant grown under (i) low native plant density and (ii) high native plant density
b) Compare the pollination success of a focal native plant grown under (i) low invasive plant density and (ii) high invasive plant density
c) Compare the pollination success of a focal native plant grown under (i) low native plant density and (ii) low invasive plant density
d) Compare the pollination success of a focal native plant grown under (i) high native plant density and (ii) high invasive plant density

SECTION C

1. St. John's Wort (Hypericum fasciculatum) is a terrestrial plant often found growing around ponds in northern Florida. It has been observed that individuals of this species growing around ponds containing fishes have greater reproductive success than those growing around ponds without fish. Tiffany Knight and her colleagues conducted a study to understand this curious pattern, i.e. fish in the water influencing the fitness of a plant growing on land. Their study revealed that the fish were connected, in a food chain, to the bee pollinators of St. John's Wort, through the larval and adult stages of a key species. Based on the information provided, this key species is most likely to be a:

a) butterfly

b) dragonfly

c) praying mantis

d) ant lion

2. Which of the following processes can increase the genetic diversity of a population?

a) Directional selection

b) Emigration

c) Genetic drift

d) Immigration

3. The evolution of an amniotic egg allowed certain animal taxa to colonise drier terrestrial habitats. Which of the following taxa have an amniotic egg?

a) Amphibians, reptiles and birds

b) Lancelets, tunicates and reptiles

c) Reptiles, birds and mammals

d) Tunicates, fishes and amphibians

4. In sex-role reversed species, like jacanas, which one of the following patterns is expected?

a) males are the competing sex and females are the choosy sex

b) females are the competing sex and males are the choosy sex

c) males and females mate at random

d) females are the competing sex and males are the choosy sex in the beginning of the breeding season and then the roles reverse

5. The Ken-Betwa river linking project threatens to submerge a large part of which Tiger Reserve?

a) Bandhavghar Tiger Reserve

b) Panna Tiger Reserve

c) Ranthambore Tiger Reserve

d) Satpura Tiger Reserve

6. The Cretaceous–Tertiary extinction (popularly known as the 'KT' extinction) was a key event in evolutionary history. The period witnessed a sudden mass extinction of 3/4th of all plants and animals on earth. Approximately how long ago (in millions of years) did the KT extinction take place?

a) 65

b) 3

c) 150

d) 156

7. In 2016, renowned biologist and writer E. O. Wilson authored a famous book, calling for setting aside a certain proportion of the earth for the purpose of conservation. According to Prof. Wilson, what percentage of the earth should be designated for nature to thrive?

a) 17%

b) 50%

c) 30%

d) 10%

8. Many wild animals hold cultural and religious significance in India. Which of the following species is most prominently associated with the Bishnoi community of Rajasthan?

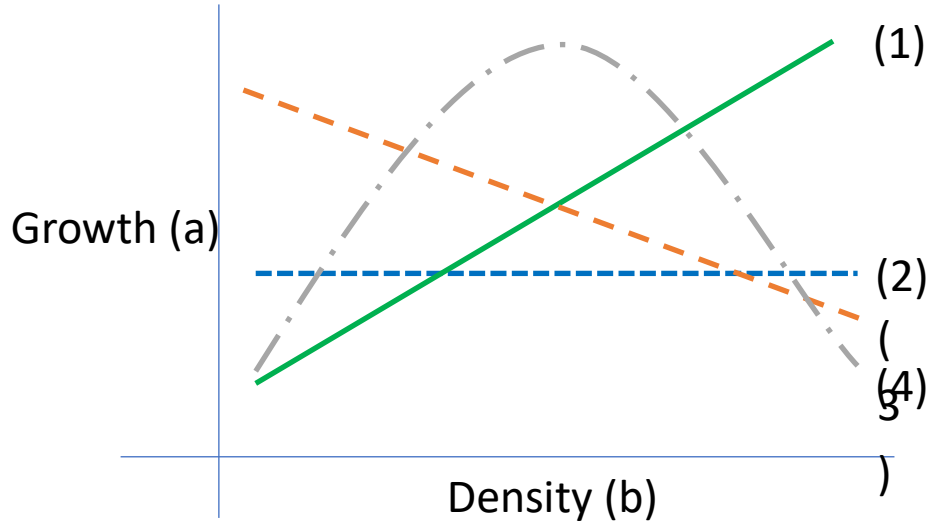
a) Tiger

b) Sambar deer

c) Striped hyena

d) Blackbuck

9. A commonly known concept in the study of populations is density-dependence, which is the idea that some demographic rates vary as a function of population density. Study the graph below. Which combination of lines, from among the options below, correctly represents density-dependence?



a) 1 & 4 but not 3

b) 3 & 4 but not 2

c) 1 & 3 but not 4

d) 2 & 4, but not 1

10. During a recent survey in Madagascar, scientists discovered a species that may well be a contender for the world's smallest reptile. With a body size around 20 mm, and aptly given the species specific name of nana, this creature is a:

a) chameleon

b) skink

c) gecko

d) snake

11. Mass nesting of Olive Ridley turtles known as the arribada happens at:

a) Hutbay, Little Andamans

b) Gahirmata, Odisha

c) Marina beach, Chennai

d) Kovalam, Kerala

12. Mammals and living birds share all of the following characteristics except:

a) endothermy

b) descent from a common amniotic ancestor

c) a dorsal, hollow nerve cord

d) an archosaur common ancestor

13. Arrange the following species in order of increasing number of teeth:
human, cat, pangolin, dog

a) cat < pangolin < dog < human

b) pangolin < cat < human < dog

c) pangolin < dog < cat < human

d) pangolin < human < cat < dog

14. Based on the taxonomic order to which they belong, which of the following is the correct grouping of Binturong, Brown mongoose, Field mouse and pika? (Note that species in a bracket belong to the same order)

a) (Binturong), (Brown mongoose), (Field mouse), (pika)

b) (Binturong, Brown mongoose), (Field mouse), (pika)

c) (Binturong, Brown mongoose), (Field mouse, pika)

d) (Binturong), (Brown mongoose), (Field mouse, pika)

15. Match the following books to their authors:

F) F.W Champion	1) The Unquiet Woods
G) Ramachandra Guha	2) The Song of the Dodo
H) David Quammen	3) With Camera in Tiger-Land
I) Elizabeth Kolbert	4) The Sixth Extinction: An Unnatural History

a) F-2, G-3, H-1, I-4

b) F-4, G-2, H-3, I-1

c) F-3, G-1, H-2, I-4

d) F-4, G-3, H-1, I-2

16. Niko Tinbergen, a Nobel laureate, observed that ground-nesting gulls meticulously remove broken eggshells and other debris from their nests, whereas cliff-nesting gulls do not. He made the following observations about distance of eggs from eggshells and percentage survival of the chicks in ground-nesting gulls:

Distance between eggs and eggshells (cm)	Percentage survival of the chicks
5	35
15	58
100	68
200	79
No eggshells	78

In contrast, he found no relationship between the presence of eggshells and chick survival in cliff-nesting gulls. Which of the following best explains the eggshell removal behaviour of ground-nesting gulls?

a) Damaged eggs might potentially be a source of disease that infects the newly-hatched chicks.

b) The jagged edges of broken shells might endanger newly-hatched chicks.

c) The stark white of the exposed interior and broken shells might nullify camouflage provided by the mottled brown plumage of chicks.

d) By clearing the surrounding, the birds can lay more eggs; as a result, the survival chances of the chicks increase.

17. Which of the following are the reasons why rRNA is particularly useful in studies of the deep-time evolutionary histories of living organisms?

(i) rRNA is evolutionarily ancient and no living organism lacks it.

(ii) rRNA is easier to extract, purify and analyse than tRNA and mRNA.

(iii) rRNA plays the same role in translation in all organisms.

(iv) rRNA has evolved slowly so that sequence similarities between groups of organisms are easily found.

Choose the correct option.

a. i and ii

b. i, ii and iii

c. ii and iv

d. i, iii and iv

18. The current geological epoch that we live in is widely known as the Anthropocene, and captures the idea that humans now dominate the earth and earth systems. Based on various historical indicators of human activities and their footprints on the earth system, the global scientific community:

a) agrees that this epoch began with the advent of agriculture, about 10000 years ago

b) agrees that this epoch began with the Industrial Revolution, about 170 years ago

c) agrees that this epoch began with the Great Acceleration, marked by sharp rises in various growth indices of human societies, about 70 years ago

d) cannot agree on when this epoch began

19. Match the vectors with the disease that they spread:

i. Aedes aegypti	P. Dengue
ii. Anopheles gambiae	Q. Kyasanur Forest Disease
iii. Canis familiaris	R. Malaria
iv. Haemaphysalis spinigera	S. Rabies

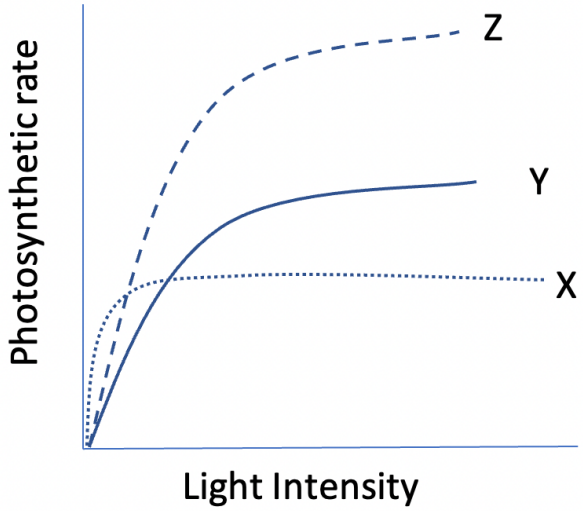
a) i. P; ii. Q; iii. S; iv. R

b) **i. P; ii. R; iii. S; iv. Q**

c) i. Q; ii. P; iii. R; iv. S

d) i. Q; ii. R; iii. S; iv. P

20. The graph below shows the photosynthetic rates of three co-existing tree species, X,Y and Z across a gradient of light intensity. Assuming that higher photosynthetic rates translate to better competitive abilities, which of the following statements is true?



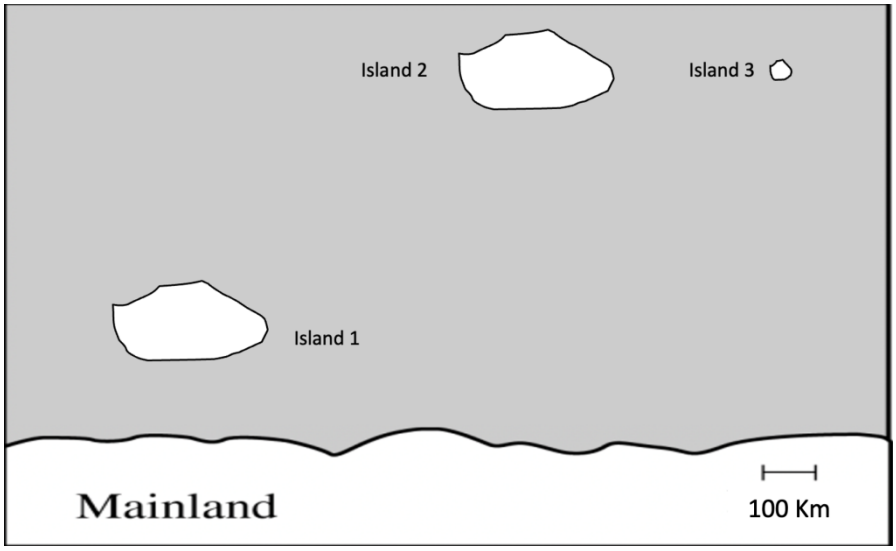
a) Species X is outcompeted by Y and Z in low light environments

b) Species Y is outcompeted by X in high light environments

c) Species Z is a superior competitor in all light environments

d) Species Y is out-competed in all light environments

21. The Macarthur-Wilson equilibrium model of island biogeography predicts that the number of species found on islands depends on their distance from source populations and island area. The figure below depicts three islands of the same age, but differing in size and distance from a mainland.



According to the Macarthur-Wilson model, the relative number of bird species on the main land and the three islands is predicted to be (assume that species only arrive on islands from the mainland):

a) Mainland > Island 1 > Island 2 > Island 3

b) Mainland > Island 1 > Island 2 = Island 3

c) Mainland > Island 1 = Island 2 > Island 3

d) Mainland = Island 1 > Island 2 > Island 3

22. Below is a list of 10 species and 8 protected areas

Species: Himalayan thar, Snow leopard, Himalayan brown bear, Lesser florican, Western tragopan, Cheer pheasant, Hangul, Kashmir musk deer, Asiatic black bear, Himalayan goral

Protected areas: Silent Valley National Park, Eagle-nest Wildlife Sanctuary, Kibber Wildlife Sanctuary, Dachigam National Park, Dudhwa Tiger Reserve, Great Himalayan National Park, Corbett Tiger Reserve, Namdapha Tiger Reserve.

If you were asked to choose the least number of protected areas to conserve all the species listed above, which combination of protected areas would you select?

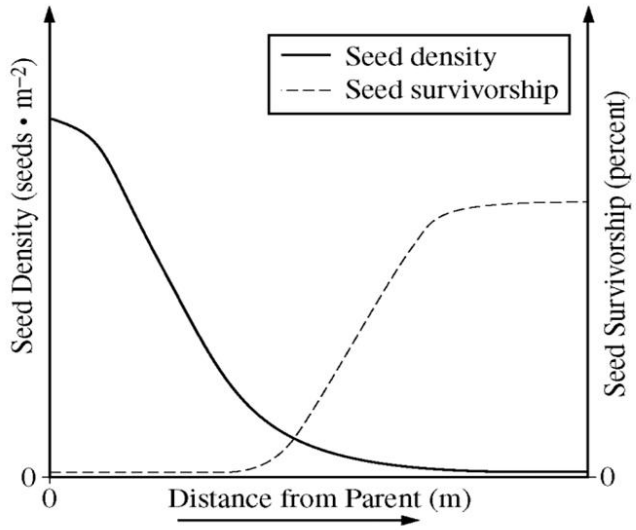
a) Corbett Tiger Reserve, Dudhwa Tiger Reserve, Namdapha Tiger Reserve

b) Corbett Tiger Reserve, Dachigam National Park, Kibber Wildlife Sanctuary

c) Dachigam National Park, Great Himalayan National Park, Dudhwa Tiger Reserve

d) Dachigam National Park, Dudhwa Tiger Reserve, Eagle-nest Wildlife Sanctuary

23. The figure below depicts seed density and percent seed survivorship as a function of distance from parent tree.



Based on the above figure, recruitment of new individuals into the population should be:

a) Highest directly under the parent tree

b) Highest at an intermediate distance from the parent tree

c) Highest far from the parent tree

d) Independent of the distance from the parent tree.

24. The Bering land bridge allowed for faunal interchange between which regions

a) North America and South America

b) Asia and North America

c) Madagascar and Africa

d) South America and Australasia

25. An orchid living on a tree is an example of which of the following types of interactions?

a) **Commensalism**

b) Mutualism

c) Parasitism

d) Predation

26. Which one of the following may make it difficult to observe genotypes in Hardy-Weinberg equilibrium in natural populations?

a) **Assortative mating between males and females**

b) Lack of selection in natural populations

c) Lack of mutations in natural populations

d) Very large size of natural populations

27. The Convention on the Conservation of Migratory Species of wild animals (CMS or Bonn Convention) aims to conserve terrestrial, aquatic and avian migratory species throughout their range. Which of the following species would be covered by this convention?

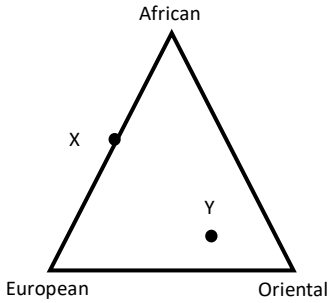
a) **Siberian crane, Bar-headed goose, Sperm whale, Olive Ridley turtle**

b) Sarus crane, Great Indian hornbill, Humpback whale and Indian Flap-shell turtle

c) Median egret, Pink-headed duck, Gangetic dolphin and Cane turtle

d) Cattle egret, Wreathed hornbill, Irrawaddy dolphin and Soft-shell turtle

28. The following figure shows genetic ancestry proportions for two individuals X and Y. Which of the following is FALSE?



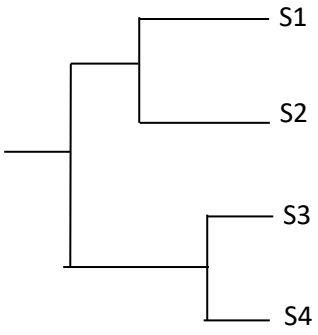
a) X has no oriental ancestry

b) Y has ancestry from all lineages

c) Both X and Y have mixed ancestry

d) X has a lower proportion of oriental ancestry than African ancestry

29. Consider two caves X and Y. There are four species of blind fish found in these caves: S1, S2, S3 and S4. S1 and S2 are only found in Cave X and S3 and S4 are only found in Cave Y. The species are related to each other as shown in the following phylogeny.



With respect to the above species, which of the following is FALSE?

a) Species richness is equal in X and Y

b) Endemism is equal in X and Y

c) Phylogenetic diversity is equal in X and Y

d) Alpha diversity is equal in X and Y

30. Which of the following accurately describes expected patterns of migration of organisms as a consequence of global warming?

a) **from lower to higher elevations for terrestrial organisms; from shallower to deeper depths for marine organisms; from lower to higher latitudes for marine & terrestrial organisms**

b) from lower to higher elevations for terrestrial organisms; from shallower to deeper depths for marine organisms; from southern to northern latitudes for marine & terrestrial organisms from lower to higher elevations for terrestrial organisms

c) from deeper to shallower depths for marine organisms; from lower to higher latitudes for marine & terrestrial organisms

d) from higher to lower elevations for terrestrial organisms; from shallower to deeper depths for marine organisms; from lower to higher latitudes for marine & terrestrial organisms

SECTION D

Choose ONE of the following topics and write an essay on the same (maximum of 750 words):

TOPIC ONE

India aspires to be a leader both in science and conservation. Among the disciplines where India has sought to build its scientific capabilities is particle physics. Therefore, India started the Neutrino project, which required the construction of a particle accelerator in a very specific kind of topography and geology. After a wide search, the best site for such an accelerator was found to be at the edge of a tiger reserve. The particle accelerator construction involved blasting of rocks, drilling of a large tunnel, a continuous removal and transport of vast amounts of debris, besides the presence and movement of people, equipment and material for several years. The physicists felt that in the interest of science, such environmental costs were reasonable and justified. Conservationists, on the other hand, felt that such a project should not be permitted on the edge of a tiger reserve, even if it disadvantaged our science somewhat. If you were the minister jointly holding the portfolios of environment and science, what decision would you make on this project, and how would you argue and reason your stance.

OR

TOPIC TWO

The Wild Life (Protection) Act passed in 1972 practically outlawed all hunting of wild animals in India. Passed at a time when hunting was not regulated, and when most large mammals were thought to be in decline, this strictness of this law was hailed widely. It has even been credited for the reported recovery of many mammal species. Today, across many parts of India, cultivators are complaining more and more stridently about crop depredation by wild pigs that pose a huge challenge to their farm-based livelihoods. As a result, some farming groups, elected representatives and state governments have started to ask that legal protections against hunting be removed for a species like the wild pig. Conservationists, on the other hand, contend that within protected areas, a species like the wild pig is an important prey species that sustains endangered large carnivores like the tiger, and any relaxation on its hunting can adversely affect species like the tiger. So far, no scientific assessments are available from either side to support their claim. Do

you believe that there is a case for—or against—the permitting of hunting of wild pigs. Carefully reason why you believe that your stance is correct, and why the alternative is not.