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Level - 1 : All Level-1 successful* participants will get certificate, aptitude report and online subscription, and school toppers will be eligible for school hero medals.

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1. You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET (OMR)**.
2. The question paper is made as per syllabus guidelines & pattern given in the information Booklet. The Question Paper for Classes 1 to 6 contains 25 Questions each to be answered in 40 minutes. The Question paper for classes 7 to 12 contains 50 Questions each to be answered in 60 minutes. All questions are compulsory. Further instructions are given in the instruction letter to the teacher.
3. Use the response sheet to mark your responses by darkening the required circle. The response sheet has to be returned to the foundation, duly filled in. **THE STUDENT CAN RETAIN THE QUESTION PAPER.**

**NATIONAL
BIOTECHNOLOGY
OLYMPIAD**

N B T O

**11
Class**

**A1
Paper
Code**

L E V E L - 1

GENERAL KNOWLEDGE

1. Medicine of quinine is provided by

- (1) Eucalyptus plants
- (2) Aconite plant
- (3) Cinchona plant
- (4) None of these

2. Which of the following statements is/are correct:

(I) Ozone Depletion causes reduction in stratospheric and upper tropospheric temperatures.

(II) Increase in Green House Gases causes reduction in stratospheric and upper tropospheric temperatures.

- (1) (I) only
- (2) (II) only

(3) Both (I) and (II)

(4) None of these

3. Which of the following statements is/are correct with regard to Vitamin D:

(I) Vitamin D is produced in the skin by ultraviolet light.

(II) Higher levels of Vitamin D are associated with higher morbidity.

(III) Body has no mechanism to prevent sunlight from producing too much Vitamin D.

- (1) I and III
- (2) I and II
- (3) II and III
- (4) None of these

SECTION B: PHYSICS AND CHEMISTRY

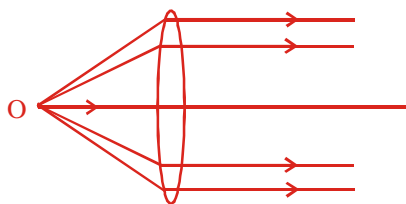
4. Recently Chinese scientists have developed Carbon Aerogel. Which of the following is/are correct about it:
- (I) It is the second lightest material after Graphite aerogel.
(II) It has excellent elasticity.
(III) It is expected to play an important role in pollution control.
(IV) It is expected to become ideal for sound absorption.
- (1) II, III and IV (2) II and IV
(3) I and III (4) None of these
5. Growing agricultural crops between rows of planted trees is known as
- (1) Social forestry (2) Jhum
(3) Taungya System (4) none of these
6. The greenhouse gases, otherwise called radioactively active gases includes
- (1) Carbon dioxide (2) CH₄
(3) Both (1) and (2) (4) None of these
7. According to the United Nations Intergovernmental Panel on climate change, the global average temperature has increased by 0.3-0.6°C and the water level has increased by 10-25 cm in the last 100 years.
- (1) True (2) False
(3) Can't say (4) None of these
8. What is the name of India's first nuclear reactor?
- (1) Apsara (2) Kamini
(3) Dhruva (4) None of these
9. In Mumbai terror attacks on 26 Nov. 2008, what was the code name of security forces commando action against terrorists ?
- (1) Operation Vijay
(2) Operation Shakti
(3) Operation Black Tornado
(4) None of these
10. The main pollutant in waste water discharged from a petroleum refinery is oil (both in free and emulsified form). Free oil is removed by
- (1) trickling filters
(2) biological oxygen pond
(3) gravity separator having oil skimming devices
(4) none of these

11. The equation of state of some gases can be expressed as van der Waals equation i.e.

$$(P + a/v^2)(V - b) = RT$$

Where P is the pressure, V is the volume, T is the absolute temperature and a, b, R are constants. The dimensions of 'a' are:

- (1) [M¹L¹T⁻¹] (2) [M¹L⁻⁵T¹]
(3) [M¹L⁵T⁻²] (4) None of these
12. A tuning fork vibrating with a sonometer having 20 cm wire produces 5 beats per second. The beat frequency does not change when the length of the wire is changed to 21 cm. The frequency of tuning fork is
- (1) 200Hz (2) 210Hz
(3) 205Hz (4) None of these
13. Two bulbs of wattage 40W and 100W rated at 220V are connected in series across a 440V. What will happen?
- (1) 40W bulb will fuse
(2) 100W bulb will fuse
(3) Both bulbs will fuse
(4) None of these
14. Two charged spheres, separated by a distance d, exert a force F on each other. If they are immersed in a liquid of dielectric constant 2, then what is the force (if all the conditions are same)?
- (1) F/2
(2) F
(3) 2F
(4) None of these
15. IUPAC name of the following compound is
- $$\text{CH}_3\text{CH}_2\text{NHCHO}$$
- (1) N-formyl ethane amine
(2) N-ethyl formyl amine
(3) N-ethyl methanamide
(4) None of these
16. An object O is placed in front of a lens as shown in the figure. What adjustment should be made to produce a parallel beam of light?



- (1) move object along the axis nearer to the lens
- (2) tilt the lens forward
- (3) move object along axis further from lens
- (4) none of these

17. The theory which explains that gases consist of molecules, which are in rapid motion is known as:

- (1) Kinetic molecular theory
- (2) Bohr's theory
- (3) Dalton's atomic theory
- (4) None of these

18. Quick lime (CaO – Calcium Oxide) reaction with water is regarded as exothermic. A student mixes these two products in a test tube and touches its side surface. Which of the following statement correctly describes the student's observation?

- (1) The test tube becomes cold due to release of heat energy.
- (2) The test tube becomes hot due to release of heat energy.
- (3) The test tube becomes hot due to absorption of heat energy.
- (4) None of these

19. If the concentration of glucose ($C_6H_{12}O_6$) in blood is 0.9 gL^{-1} , what will be the molarity of glucose in blood?

- (1) 5 M
- (2) 50 M
- (3) 0.005 M
- (4) None of these

20. A person is suffering from fever with a high temperature of 104°F . What will be his body temperature in $^\circ\text{C}$?

- (1) 41°C
- (2) 38°C
- (3) 40°C
- (4) None of these

SECTION C: BIOLOGY

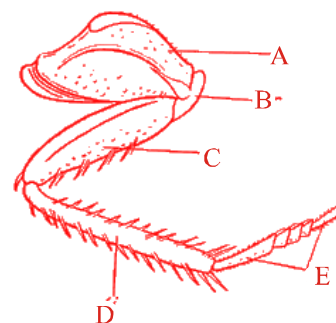
21. Children suffering from the infection of *Ascaris* exhibit stunted growth because

- (1) a substance produced by *Ascaris* combines with trypsin of host causing interference with the utilization of proteins
- (2) they don't eat well
- (3) all the proteins of the host are used up by *Ascaris*
- (4) none of these

22. The enzyme present in the intestinal juice of earthworm but absent in the pancreatic juice of higher vertebrates is

- (1) cellulose
- (2) lipase
- (3) amylase
- (4) none of these

23. In the following diagram of a leg of Cockroach parts have been indicated by alphabets. Choose the answer in which these alphabets have been correctly matched with the parts which they indicate-



- (1) A = Coxa, B = trochanter, C = femur, D = tibia, E = tarsus
- (2) A = Coxa, B = tibia, C = tarsus, D = femur, E = trochanter
- (3) A = Coxa, B = femur, C = trochanter, D = tarsus, E = tibia
- (4) None of these

24. A new flower species has a unique photosynthetic pigment. The leaves of this plant appear to be reddish yellow. What wavelengths of visible light are not being absorbed by this pigment?

- (1) Green and yellow
- (2) Red and yellow
- (3) Blue and violet
- (4) None of these

25. The old saying “one rotten apple spoils the whole barrel” comes from chemical signaling in plant.

- (1) via an increased uptake of carbon dioxide during respiration in target cells.
- (2) via a local regulator for apple development.
- (3) via release of ethylene gas, a plant hormone for ripening.
- (4) none of these

26. In blood group typing in human, if an allele contributed by one parent is I^A and an allele contributed by the other parent is i , the resulting blood group of the offspring will be

- (1) A
- (2) B
- (3) AB
- (4) None of these

27.



The process of removing stamens from the flower during hybridization is called

- (1) Caping
- (2) Emasculation
- (3) Selfing
- (4) None of these

28. Select the correct statement from the following regarding cell membrane

- (1) Lipids are arranged in a bilayer with polar heads towards the inner part.
- (2) Fluid mosaic model of cell membrane was proposed by Singer and Nicolson.
- (3) Na^+ and K^+ ions move across cell membrane by passive transport.
- (4) None of these

29. A common approach for studying functions of a cell is to isolate a particular cell organelle from other cell _____ and try to make it perform its normal functions in a _____.

- (1) apparatus, test tube
- (2) structure, test tube
- (3) components, test tube
- (4) none of these

30. The diagram shows a plant shoot and the same shoot six hours later.



plant shoot

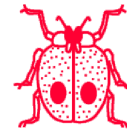


same shoot six hours later

Which change in environmental conditions could cause this change in the appearance of the shoot?

- (1) a decrease in available water
- (2) a decrease in light intensity
- (3) a decrease in wind speed
- (4) none of these

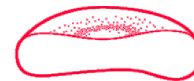
31. The diagram shows the external features of an animal.



To which group does the animal belong?

- (1) annelids
- (2) molluscs
- (3) arthropods
- (4) none of these

32. The diagram shows a specialised cell cut in half.



What does this diagram indicate about the structure of this cell?

- (1) The cell does not have a membrane.
- (2) The cell is long and thin.
- (3) The cell is concave on each side.
- (4) None of these

33. Which diagram shows the appearance of a plant cell after it is placed in distilled water?



(1)



(2)



(3)

(4) none of these

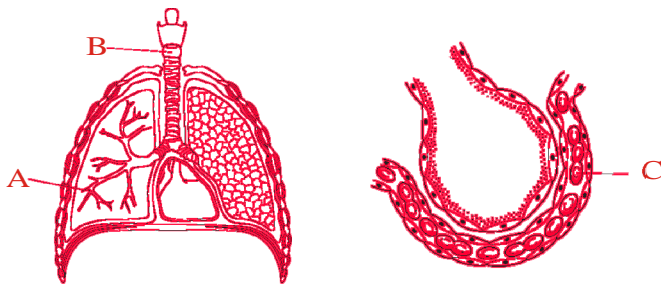
34. The lungs are folded into many small air sacs and blood vessels, which divide to form many small capillaries that increase the transfer of substances through their walls. The structures in the digestive system similar in function to these air sacs and capillaries are the

- (1) gastric glands
- (2) colon and rectum
- (3) villi
- (4) none of these

35. Your body needs grams of carbohydrates each day but only milligrams of vitamins, Why?

- (1) Carbohydrates are used up, but vitamins are reusable
- (2) The body needs carbohydrates to function, but not vitamins
- (3) Vitamins contain much more energy per gram
- (4) None of these

36. The diagram shows the breathing system and a section of an alveolus surrounded by a capillary.



Which label shows a cell?

- (1) A
- (2) B
- (3) C
- (4) None of these

37. The edible portion of coconut is



- (1) Endosperm
- (2) Mesocarp
- (3) Seed coat
- (4) None of these

38. Wind pollinated plants differ from insect pollinated plants in having

- (1) small petals and sticky pollen
- (2) coloured petal and large pollens
- (3) no petals and light pollen
- (4) none of these

39. Which one of the following pairs is wrongly matched?

- (1) Bryophyllum-Leaf buds
- (2) Agave-Bulbils
- (3) Water hyacinth-Runner
- (4) None of these

40. Monocotyledonous plants show which of the following feature:

- (1) flowers are trimerous
- (2) always perennial growth
- (3) tap root system
- (4) none of these

SECTION C: MATHEMATICS

21. A bag contains 10 white and 3 black balls. Balls are drawn one by one without replacement till all the black balls are drawn. The probability that the procedure of drawing balls will come to an end at the seventh draw is

- (1) $\frac{15}{286}$
- (2) $\frac{105}{286}$
- (3) $\frac{35}{286}$
- (4) None of these

22. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a differentiable function satisfying $f(y)f(x-y) = f(x)$ $x, y \in \mathbb{R}$ and $f'(0) = p, f'(5) = q, f'(-5)$ is

- (1) $\frac{p^2}{q}$
- (2) $\frac{p}{q}$
- (3) $\frac{q}{p}$
- (4) None of these

23. The number of solutions of the equation

$$\sin^{-1} \frac{1-x^2}{2x} = \frac{\pi}{2} (\sec(x-1)) \text{ is/are.}$$

- (1) 1
- (2) 2
- (3) 3
- (4) None of these

24. Two finite sets have m and n elements. The number of subsets of the first set is 112 more than that of the second set. The values of m and n are, respectively,

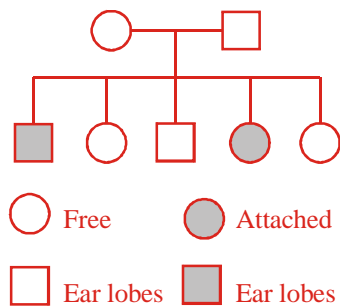
- (1) 4, 7
- (2) 7, 4
- (3) 4, 4
- (4) none of these

25. If X and Y are two sets and X' denotes the complement of X, then $X \cap (X \cup Y)'$ is equal to
 (1) X (2) Y
 (3) ϕ (4) None of these
26. The number of solutions of the equation $\sin(e^x) = 5^x + 5^{-x}$ is-
 (1) 0 (2) 1
 (3) 2 (4) None of these
27. The number of integral values of k for which the equation $7 \cos x + 5 \sin x = 2k + 1$ has solution is
 (1) 4 (2) 8
 (3) 10 (4) None of these
28. The greatest positive integer, which divides $(n + 1)(n + 2)(n + 3) \dots (n + r) \quad n \in W$, is
 (1) r (2) r!
 (3) $(r + 1)!$ (4) None of these
29. The nth term of the series $3 + 7 + 13 + 21 + \dots$ is =
 (1) $4n - 1$ (2) $n + 2$
 (3) $n^2 + n + 1$ (4) None of these
30. Find the square roots of $-15 - 8i$.
 (1) $\pm(1 - 4i)$ (2) $\pm(1 + 4i)$
 (3) $\pm(4 - 1i)$ (4) None of these
31. Six points in a plane are joined in all possible ways by indefinite straight lines. No two of them are coincident or parallel and no three pass through the same point (with the exception of the original six points). The number of distinct points of intersection is equal to
 (1) 105 (2) 45
 (3) 51 (4) None of these
32. The value of ${}^{50}C_4 + {}^{56}C_3 + \dots + {}^{56}C_{r-1}$ is
 (1) ${}^{55}C_4$ (2) ${}^{55}C_3$
 (3) ${}^{56}C_4$ (4) None of these
33. Two concentric circles are of radii 13 cm and 5 cm. The length of the chord of larger circle which touches the smaller circle is
 (1) 12 cm (2) 20 cm
 (3) 24 cm (4) None of these
34. From a point Q, the length of the tangent to a circle is 12 cm and the distance of Q from the centre is 13 cm. The radius of the circle is
 (1) 7 cm (2) 6.5 cm
 (3) 5 cm (4) None of these
35. If α and β are the zeroes of quadratic polynomial $ax^2 + bx + c = 0$, then find the value of $\frac{1}{a} + \frac{1}{b} + \frac{1}{a} + \frac{1}{b}$.
 (1) $\frac{b}{ac}$ (2) $\frac{ac}{b}$
 (3) $\frac{a}{bc}$ (4) None of these
36. An aeroplane takes 1 hour less for a journey of 1200 km if its speed increased by 100 km/hr from its usual speed. Find its usual speed.
 (1) 280 km/hr (2) 290 km/hr
 (3) 300 km/hr (4) None of these
37. If $\tan \theta = \frac{a}{x}$, then the value of $\frac{x}{\sqrt{a^2 + x^2}} =$
 (1) $\cos \theta$
 (2) $\sin \theta$
 (3) $\operatorname{cosec} \theta$
 (4) None of these
38. If the angle of the depression of an object from a 75 m high tower is 30° , then the distance of the object from the base of tower is :
 (1) $25\sqrt{3}$ m (2) $50\sqrt{3}$ m
 (3) $75\sqrt{3}$ m (4) None of these
39. An experiment whose outcomes has to be among a set of events that are completely known but whose exact outcomes is unknown is a
 (1) sample space
 (2) elementary event
 (3) random experiment
 (4) none of these
40. The sum of the first three terms of a G.P. is 16 and the sum of the next three terms is 128, Find the sum of n terms of the G.P.

- (1) $\frac{16}{7}(2^n - 1)$ (2) $\frac{7}{16}(2^n - 1)$
 (3) $\frac{16}{7}(2^n + 1)$ (4) None of these

INTERACTIVE SECTION

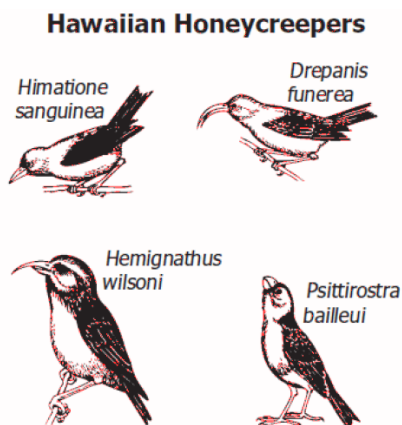
41. Given below is a pedigree chart of a family with five children. It shows the inheritance of attached ear lobes as opposed to the free ones. The squares represent the male individuals and circles represent the female individuals.



Which one of the following conclusions drawn is correct?

- (1) The parents are homozygous recessive
- (2) The trait is Y-linked
- (3) The parents are heterozygous
- (4) None of these

42.

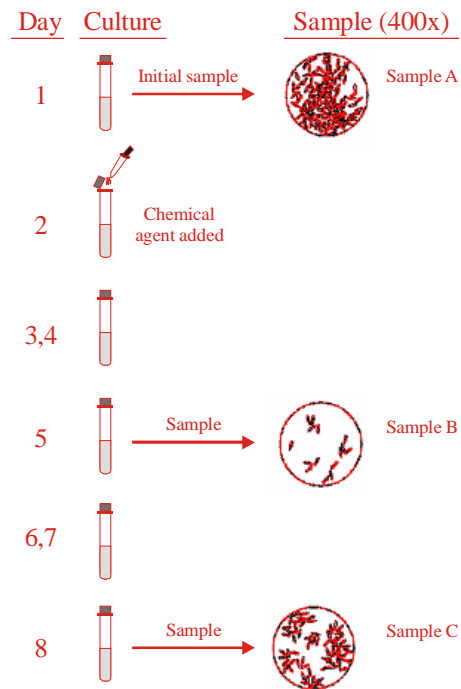


The different species of Hawaiian honeycreepers shown all descended from a single species of North American bird. They now have different beaks, eat different foods, sing different songs, and live in different environments on the islands. Which factor probably contributed *most* to the development of

these different species?

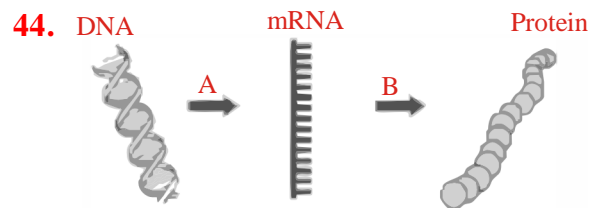
- (1) Predation
- (2) Egg size
- (3) Geographic isolation
- (4) None of these

43. **Bacterial Culture Experiment**



These three samples from the same live culture were all viewed at the same magnification. Which conclusion is best supported by the observation of these three samples?

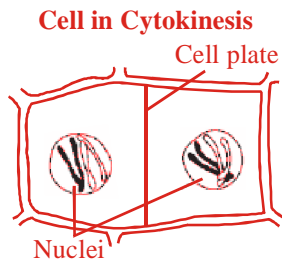
- (1) The sampling techniques used did not produce accurate data.
- (2) The culture became contaminated by airborne bacteria during the initial sampling.
- (3) The culture included some bacteria that were resistant to the chemical agent.
- (4) None of these



In eukaryotic cells, the process indicated by arrow A occurs in the—

- (1) Cytoplasm
- (2) Ribosome
- (3) Nucleus
- (4) None of these

45.



A student looking through a light microscope saw this cell in cytokinesis. This cell is *most* likely from-

- (1) an animal
- (2) a bacterium
- (3) a plant
- (4) none of these

46.

Experimental Setup

150 W bulb switched on for 8 hours per day	150 W bulb switched on for 8 hours per day	150 W bulb switched on for 8 hours per day	150 W bulb switched on for 8 hours per day
Bean plant 500 mL soil with a pH of 5	Bean plant 500 mL soil with a pH of 6	Bean plant 500 mL soil with a pH of 7	Bean plant 500 mL soil with a pH of 8

The diagram shows a setup for a plant investigation. Which variable is *most* likely being tested?

- (1) Hours of light exposure
- (2) Soil volume
- (3) Soil pH
- (4) None of these

47. Reproduction and Development of Three Animals

Organism	Sea Anemone	Frog	Monkey
Type of Reproduction	Asexual or sexual	Sexual	Sexual
Early Stage			
Adult			

The information in the table supports which conclusion?

- (1) Sea anemones are more complex than frogs or monkeys.
- (2) Sea anemones and monkeys are adapted to similar environments.
- (3) Frogs are more closely related to monkeys than to sea anemones.
- (4) None of these

48. The chances of developing cancer, diabetes, or sickle-cell anemia are higher if a family member also has the disorder because they are-

- (1) genetically based
- (2) related to diet
- (3) highly infectious
- (4) none of these

49.

Organism	Direction of Movement		
	Toward Light	Away from Light	Neither
Euglena	X		
Paramecium			X
Fungus			X
Coleus plant	X		
Earthworm		X	

These data were collected by observing responses of different organisms to light. Which conclusion is supported by these data?

- (1) Decomposers are attracted to light.
- (2) Protists are not attracted to light.
- (3) Organisms that use photosynthesis are attracted to light.
- (4) None of these

50. Amino acids link together by peptide bonds to form proteins. In which cellular organelle would this process occur?

- (1) Mitochondrion
- (2) Lysosome
- (3) Ribosome
- (4) None of these



END OF THE EXAM