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EHF NATIONAL INTERACTIVE SCIENCE OLYMPIAD

N I S O

12 Class **A1 Paper Code**

L E V E L - 1

1. You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET (OMR). STUDENTS OF CLASS 1 & 2 HAVE TO UNDERLINE** THE CORRECT ANSWER IN THE QUESTION PAPER ITSELF. THEY ARE NOT REQUIRED TO USE THE RESPONSE SHEET (OMR). THEY HAVE TO FILL THEIR NAME, ROLL NUMBER, CLASS, SCHOOL NAME IN THE SPACE PROVIDED IN THE QUESTION PAPER.
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 EXCEPT FOR CLASSES 1 AND 2.

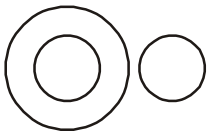
SECTION-A : GENERAL I.Q.

1. BTO, DSQ, FRS, HQU, _____.
(1) IPX (2) JPW
(3) CPW (4) JRW

2. What is the probability of a leap year having 53 Saturdays or 53 Sundays?
(1) 2/7 (2) 4/7
(3) 3/7 (4) None of these

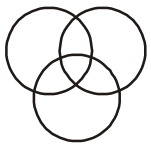
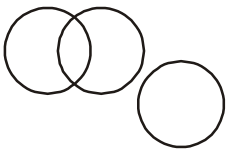
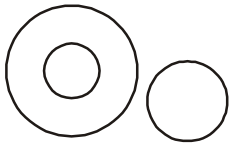
3. Raju was on tour and he travelled first 160 km at 64 km/hr and the next 160 km at 80 km/hr. The average speed for the first 320 km of the tour was
(1) 35.5 km/hr (2) 36 km/hr
(3) 71.1km/hr (4) None of these

4. Which one of the following sets is best represented in the adjoining diagram?



(1) Country, States, Districts
(2) Animals, Males, Females and Hermaphrodite
(3) States, District, Union Territory
(4) None of these

5. Select from the given diagrams, the one that illustrates the relationship among the given three classes:
Judge, Thief, Criminal

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

6. Sanjeev walks 10 metres towards the South. Turning to the left, he walks 20 metres and then moves to his right. After moving a distance of 20 metres, he turns to the right and walks 20metres. Finally, he turns to the right and moves a distance of 10 metres. How far and in which direction is he from the starting point?

(1) 10 metres North (2) 20 metres South
(3) 20 metres North (4) None of these

7. If P × Q means 'P is the brother of Q', P ÷ Q means 'P is the son of Q' and P – Q means 'P is the sister of Q'. Then which of the following relations will show that Q is the maternal uncle of P?

(1) P ÷ R – Q (2) Q × R – P
(3) Q ÷ R – P (4) P × R – Q

8. If the first day of the year (other than the leap year) was Friday, then which was the last day of that year?

(1) Monday (2) Friday
(3) Saturday (4) None of these

9. If 18th February 1997 fell on Tuesday, then what would have been the day on 18th February 1999?

(1) Monday (2) Tuesday
(3) Thursday (4) None of these

10. Which number comes in the place of question mark in the given table?

72	24	6
96	16	12
108	?	18

(1) 12 (2) 16
(3) 18 (4) None of these

SECTION-B : PHYSICS & CHEMISTRY

11. A particle of mass m is located in a one dimensional potential field where potential energy is given by: $V(x) = A(1 - \cos px)$, where A and p are constants. The period of small oscillations of the particle is

(1) $2\sqrt{\frac{m}{(Ap)}}$ (2) $2\sqrt{\frac{m}{(Ap^2)}}$

(3) $2\sqrt{\frac{m}{A}}$ (4) none of these

12. A planoconvex lens has a maximum thickness of 6 cm. When placed on a horizontal table with the curved surface in contact with the table surface, the apparent depth of the bottom most point of the lens is found to be 4 cm. If the lens is inverted such that the plane face of the lens is in contact with the surface of the table, the apparent depth of the center of the plane face is found to be $\frac{17}{4}$ cm. Then radius of curvature of the lens is _____

(1) 34 cm (2) 128 cm
(3) 75 cm (4) None of these

13. Which device controls heating and cooling to maintain a desired temperature?

(1) Cryostat (2) Thermostat
(3) Thermister (4) None of these

14. Name the barometer which does not contain a liquid:

(1) Aneroid barometer (2) Fortin's barometer
(3) Mercury barometer (4) Barostat

15. A projection lantern used for transparencies or for opaque objects is called :

(1) Episcope (2) Epidiascope
(3) Slide projector (4) None of these

16. A thermometer for measuring very low temperature is called:

(1) Pyrometer (2) Bolometer
(3) Cryometer (4) None of these

17. An instrument for measuring focal length of a lens is called:

(1) Focometer (2) Spherometer
(3) Heliometer (4) None of these

18. Name the device for detecting and measuring small amount of thermal energy :

(1) Pyrometer (2) Pyranometer
(3) Bolometer (4) None of these

19. A radio active substance contains 10,000 nuclei and its half life period is 20 days. The number of nuclei present at the end of 10 days is

(1) 7,500 (2) 8,000
(3) 7,070 (4) None of these

20. Which of the following is most suitable for measuring very high temperatures?

(1) Thermocouple
(2) Pyrometer
(3) Thermoelectric thermometer
(4) Platinum resistance thermometer

21. The work function (f) of some metals is listed below. The number of metals which will show photoelectric effect when light of 300nm wave-length falls on the metal is

Metal	Li	Na	K	Mg	Cu	Ag	Fe	Pt	W
f(ev)	2.4	2.3	2.2	3.7	4.8	4.3	4.1	6.3	4.75

(1) 4 (2) 6
(3) 8 (4) None of these

22. Consider the ground state of Cr atom (z = 24) The number of electrons with the azimuthal quantum number, l = 1 and 2 are respectively:

(1) 12 and 4 (2) 12 and 5
(3) 16 and 4 (4) None of these

23. Pick the odd one out.
(1) Sodium borohydride reacts very slowly with cold water.
(2) Sodium borohydride reacts very violently with cold water to produce H_2.
(3) Solubility of sodium borohydride in water at 25ºC is 10.05 g/ml.
(4) None of these

24. Hydrogen will not reduce.
(1) Heated cupric oxide
(2) Heated ferric oxide
(3) Heated aluminium oxide
(4) None of these

25. D_2O is preferred to H_2O, as a moderator, in nuclear reactors because
(1) D_2O slows down fast neutrons better
(2) D_2O has high specific heat
(3) D_2O is cheaper
(4) None of these

26. SO_2 acts as a temporary bleaching agent but Cl_2 acts as a permanent bleaching agent, Why?
(1) Cl_2 bleaches due to reduction but SO_2 due to oxidation
(2) Cl_2 bleaches due to reduction but SO_2 due to reduction
(3) Both (1) & (2)
(4) None of these

27. When CO_2 is bubbled through a solution of Barium Peroxide in water.
(1) O_2 is released
(2) Carbonic acid is formed
(3) H_2O_2 is formed
(4) None of these

28. Identify the correct statement, regarding the molecule XeO_4:
(1) XeO_4 Molecule is tetrahedral.
(2) XeO_4 Molecule is square planar
(3) There are four pp–dp bonds
(4) None of these

29. In which of the following ionization processes the bond energy increases and the magnetic changes from paramagnetic to diamagnetic?
(1) $NO \rightarrow NO^+$ (2) $CH_2 \rightarrow CH_2^+$
(3) $O_2 \rightarrow O_2^+$ (4) None of these

30. The percentage of P- Character in the orbitals forming P-P bonds in P_4 is
(1) 75% (2) 50%
(3) 33% (4) None of these

SECTION-C : BIOLOGY

31. In which kingdom would you classify the oxygen and nitrogen-fixing organisms, if the five-kingdom system of classification is used?
(1) Monera (2) Fungi
(3) Plantae (4) None of these

32. The phylogenetic system of classification was put forth by
(1) Theophrastus
(2) Adolf Engler and Karl Prantl
(3) Carolus Linnaeus
(4) None of these

33. Which series ends with the cohort umbellales in Bentham and Hooker's system of classification?
(1) Calyciflorae (2) Thalamiflorae
(3) Disciflorae (4) None of these

34. Which one of the taxonomic aids can give comprehensive account of complete compiled imformation of any one genus or family at a particular time?
(1) Flora (2) Herbarium
(3) Monograph (4) None of these

35. A perennial shrub has compound leaves and solitary zygomorphic and epigynous flowers. Each flower reveals dichlamydeous condition with many stamens and multiple fruit with exalbuminous seeds. What is the ratio of advanced and primitive characters in it?
(1) 1:2 (2) 2:3
(3) 1:1 (4) None of these

36. Classification of organisms based on evolutionary as well as genetic relationships is called
(1) Numerical taxonomy (2) Cladistics
(3) Phenetics (4) None of these

37. Phenetic classification of organisms is based on.
(1) Sexual characteristics
(2) Observable characteristics of existing organisms
(3) Dendrogram based on DNA characteristics
(4) None of these

38. In Angiosperm, characters of flowers are used in classification because
(1) Flowers are attractive
(2) Flowers are large
(3) Characters of flowers are linked to their conservation
(4) None of these

39. Biosystematics aims at
(1) Identification and arrangement of organisms on the basis of cytological characteristics.
(2) The classification of organisms based on the evolutionary history and establishing their phylogeny totally on various parameters from all fields of studies.
(3) Delimiting various taxa of organism and establishing their relationship.
(4) None of these

40. Practical purpose of taxonomy or classification is:
(1) To know the evolutionary history
(2) Facilitate the identification of unknown species
(3) Identification of medicinal plants
(4) None of these

SECTION-C : MATHEMATICS

31. Consider the system of linear equations
$a_1x + b_1y + c_1z + d_1 = 0$, $a_2x + b_2y + c_2z + d_2 = 0$
and $a_3x + b_3y + c_3z + d_3 = 0$.

Let us denote by $\Delta(a, b, c)$ the determinant $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$,

if $\Delta(a, b, c) \neq 0$, then the value of x in the unique solution of the above equations is :

(1) $\frac{-\Delta(d, b, c)}{\Delta(a, b, c)}$ (2) $\frac{\Delta(b, c, d)}{\Delta(a, b, c)}$

(3) $\frac{\Delta(a, c, d)}{\Delta(a, b, c)}$ (4) $-\frac{\Delta(a, b, d)}{\Delta(a, b, c)}$

32. If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will always be true?
(1) $A = B$
(2) $AB = BA$
(3) either A or B is a zero matrix
(4) either A or B is an identity matrix

33. Events A, B, C are mutually exclusive events such that $P(A) = \frac{3x+1}{3}$, $P(B) = \frac{1-x}{4}$ and $P(C) = \frac{1-2x}{2}$. Then set of possible values of x are in the interval

(1) $\left[\frac{1}{3}, \frac{1}{2}\right]$ (2) $\left[\frac{1}{3}, \frac{13}{3}\right]$

(3) $\left[\frac{1}{3}, \frac{2}{3}\right]$ (4) none of these

34. A dice is thrown. Let A be the event that the number obtained is greater than 3. Let B be the event that the number obtained is less than 5. Then $P(A \cup B)$ is

(1) $\frac{3}{5}$ (2) $\frac{2}{5}$

(3) 1 (4) 0

35. The function $f(x) = \log\left(x + \sqrt{x^2 + 1}\right)$ is

(1) neither an even nor an odd function
(2) a periodic function
(3) an odd function
(4) an even function

36. If $y = y(x)$ and $\frac{2 + \sin x}{y + 1}\left(\frac{dy}{dx}\right) = -\cos x$, $y(0) = 1$, then $y\left(\frac{\pi}{2}\right)$ equals

(1) 2/3 (2) 1/3
(3) –1/3 (4) 1

37. For the primitive integral equation $ydx + y^2\,dy = x\,dy$; $x \in R$, $y > 0$, $y = y(x)$, $y(1) = 1$, then $y(-3)$ is
(1) 0 (2) 3
(3) 1 (4) 2

38. If $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular vectors of equal magnitude, then the angle θ which $\vec{a} + \vec{b} + \vec{c}$ makes with any one of the three vectors is given by

(1) $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$ (2) $\cos^{-1}\left(\frac{1}{3}\right)$

(3) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (4) none of these

39. If $\vec{a}\ \vec{b}\ \vec{c} = 0$, $|\vec{a}|\ 3, |\vec{b}|\ 5, |\vec{c}|\ 7$

then the angle between $\vec{a}$ and $\vec{b}$ is :

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$

(3) $\frac{2\pi}{3}$ (4) $\frac{\pi}{6}$

40. The circle whose equations are
$x^2 + y^2 + c^2 = 2ax$ and $x^2 + y^2 + c^2 - 2by = 0$ will touch one another externally, if :

(1) $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$

(2) $\frac{1}{c^2} + \frac{1}{a^2} = \frac{1}{b^2}$

(3) $\frac{1}{b^2} + \frac{1}{c^2} = \frac{1}{a^2}$

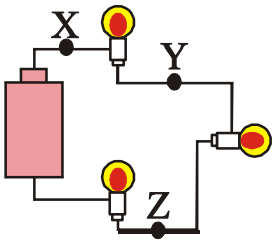
(4) none of these

INTERACTIVE SECTION

41. Which one of the following is a second order reaction?
(1) $CH_3COOCH_3 + NaOH \rightarrow CH_3COONa + H_2O$
(2) $H_2 + Cl_2 \xrightarrow{\text{SUNLIGHT}} 2HCl$
(3) $NH_4NO_3 \rightarrow N_2 + 3H_2O$
(4) None of these

42. For the electrochemical cell:
$M \mid M^+ \| X^- \mid X$, $E\ [M^+ \mid M] = 0.44\,V$ and $E^o\ [X \mid X^-] = 0.33\,V$.
From the data one can deduce that
(1) $M + X \rightarrow M^+ + X^-$ is the spontaneous reaction
(2) $M^+ + X^- \rightarrow M + X$ is the spontaneous reaction
(3) Ecell = 0.77 V
(4) None of these

43.



Three identical light bulbs are connected to a battery as shown above. Some adjustments could be made to the circuit that would increase the current being measured at X as given below. Find out the correct option that would increase the current?

a. Increase the resistance of one of the bulbs.

b. Increase the resistance of two of the bulbs.

c. Decrease the resistance of two of the bulbs.

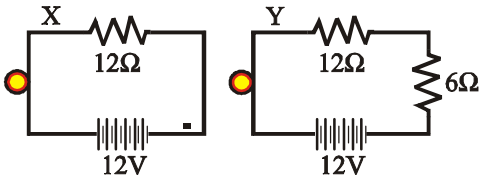
d. Increase the voltage of the battery.

e. Decrease the voltage of the battery.

f. Remove one of the bulbs.

(1) c, d and f (2) b and e
(3) a and c (4) None of these

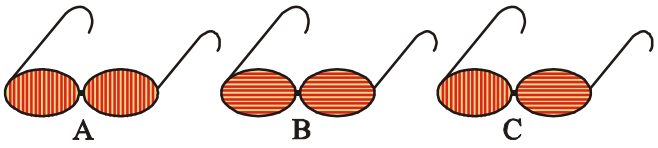
44.



A 12V battery, a 12ohm resistor and a light bulb are connected as shown in the circuit X above. A 6ohm resistor is added to the 12ohm resistor and bulb to create a circuit Y as shown. The bulb will appear

(1) Dimmer in circuit X
(2) Dimmer in circuit Y
(3) With the same brightness in both circuits
(4) None of these

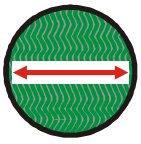
45. Consider the three pairs of sunglasses below. Identify the pair of glasses that is capable of eliminating the glare resulting from sunlight reflecting off the calm waters of a lake?



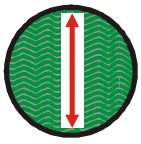
(1) A (2) B
(3) C (4) None of these.

46. Which among the following shows the correct relationship between long chain molecule orientation & the orientation of the polarization axis?

(1)

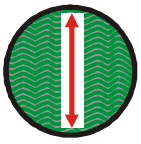


When molecules in the filter are aligned vertically, the polarization axis is horizontal.

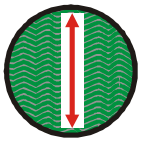


When molecules in the filter are aligned horizontally, the polarization axis is vertical.

(2)

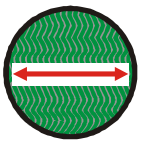


When molecules in the filter are aligned vertically, the polarization axis is vertical.

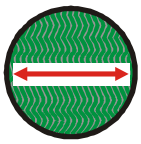


When molecules in the filter are aligned horizontally, the polarization axis is vertical.

(3)



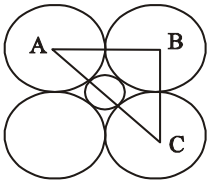
When molecules in the filter are aligned vertically, the polarization axis is horizontal.



When molecules in the filter are aligned horizontally, the polarization axis is horizontal.

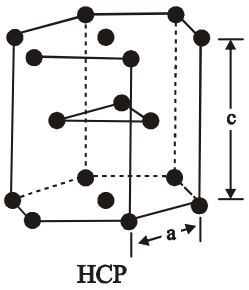
(4) None of these

47.



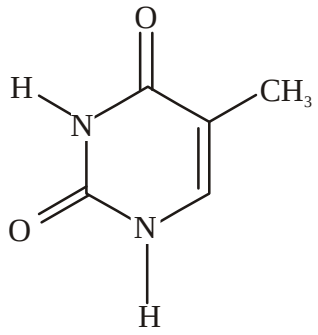
(1) AC = 2(R+r) (2) AC = (r+R)
(3) AC = 2R (4) None of these

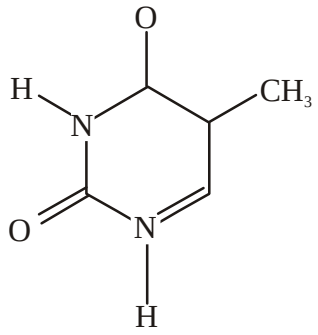
48. The packing efficiency of the two-dimensional square unit cell shown below is

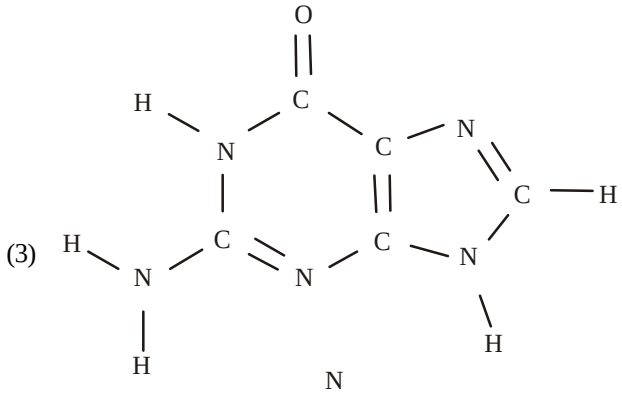


(1) 74% (2) 68.02%
(3) 78.54% (4) None of these

49. Which of the following represents the structure of THYMINE ?

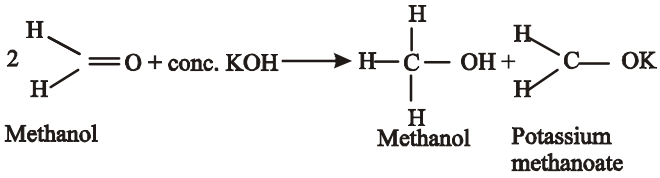
(1) 

(2) 

(3) 

(4) None of these

50. The given diagram represents which reaction?



(1) Aldol-Condensation Reaction
(2) Wurtz-Fittig Reaction
(3) Cannizzaro reaction
(4) None of these

END OF THE EXAM