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**NATIONAL
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11
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IMPORTANT INFORMATION

- You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET**.
- 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 coordinator teacher.
- 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.

SECTION-A : GENERAL I. Q.

- A can beat B by 60 m in a 1760 m race. B can beat C by 20 m in a 1760 m race. If A and C run 1760 m, then by how much will A win over C?
(1) 79.4 m (2) 85 m
(3) 77.1 m (4) None of these
- Direction :
In a certain code language,
(A) 'pit dar na' means 'you are good'
(B) 'dar tok pa' means 'good and bad';
(C) 'tim na tok' means 'they are bad'.
In that language, which word stands for 'they'?
(1) na (2) tok
(3) tim (4) None of these
- If $a : b = 2 : 3$, $b : c = 5 : 7$, Then $a : b : c$ is
(1) $a + b + c$ (2) $-(a + b + c)$
(3) $0, (a + b + c)$ (4) None of these
- 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) Thursday (4) None of these
- Six persons are sitting in a circle facing the centre of the circle. Parikh is between Babita and Narinder. Asha is between Chitra and Pankaj. Chitra is to the immediate left of Babita. Who is to the immediate right of Babita?
(1) Parikh (2) Pankaj
(3) Narinder (4) None of these
- Study the following figure carefully and answer the question given below

What area in the figure represents the urban and hard working people?
(1) $1 + 2 + 3 + 4$ (2) $1 + 4 + 9 + 11$
(3) $1 + 4 + 8 + 9$ (4) None of these
- There is a set of 9 coins, all looking alike. However, one among them is a false coin having slightly less weight than the rest. One has to find out the false coin by weighing them in a balance without the provision of weights. The minimum number of weighings needed is
(1) 4 (2) 3
(3) 2 (4) None of these
- How many parallelograms are there in the figure below?

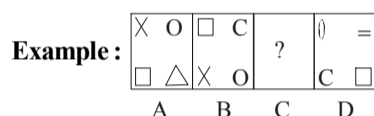


- (1) 14 (2) 15
(3) 18 (4) None of these

9. How many times do the hands of a clock point towards each other in a day?

- (1) 24 (2) 20
(3) 22 (4) None of these

10. In this type of question, you are given a set of four figures (Labelled A, B, C and D) following a certain sequence and hence forming a series. However, the figure at C is missing. The candidate is required to choose this figure from the alternatives 1, 2 and 3. Choose the correct figure in sequence.



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

SECTION-B : PHYSICS & CHEMISTRY

11. Chlorophyll, a green colouring matter contains 2.68% Mg. The number of atoms of Mg present in 1 g chlorophyll are:

- (1) 6.72×10^{20} (2) 6.72×10^{21}
(3) 6.72×10^{22} (4) None of these

12. After a shower of rain, a rainbow is seen

- (1) towards the Sun
(2) opposite the Sun
(3) even in the absence of the Sun
(4) None of these

13. To expel half the mass of air from a large flask at 27°C , it must be heated to:

- (1) 54°C (2) 327°C
(3) 277°C (4) None of these

14. CsBr has b.c.c. type structure with edge length 4.3 pm. The shortest inter-ionic distance in between Cs^+ and Br^- is:

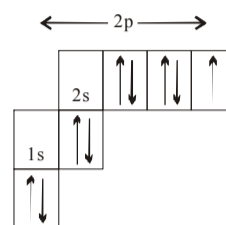
- (1) 3.72 pm (2) 1.86 pm
(3) 7.44 pm (4) None of these

15. Rutherford's experiment, which established the nuclear model of the atom, used a beam of:

- (1) β -particles which impinged on a metal foil and got absorbed
(2) γ -rays, which impinged on a metal foil and ejected electrons

- (3) Helium nuclei, which impinged on a metal foil and got scattered
(4) None of these

16. Which element is represented by the following electronic configuration?

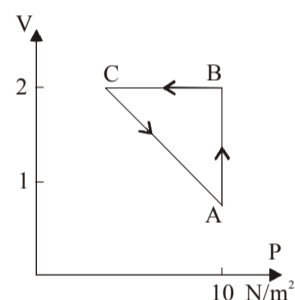


- (1) Nitrogen (2) Oxygen
(3) Fluorine (4) None of these

17. In dry ice there are:

- (1) Ionic bond (2) Covalent bond
(3) Hydrogen bond (4) None of these

18. An ideal gas is taken through the cycle $A \rightarrow B \rightarrow C \rightarrow A$ as shown in figure. If net heat supplied to the gas in the cycle is 5J, the work done by the gas in the process $C \rightarrow A$ is:

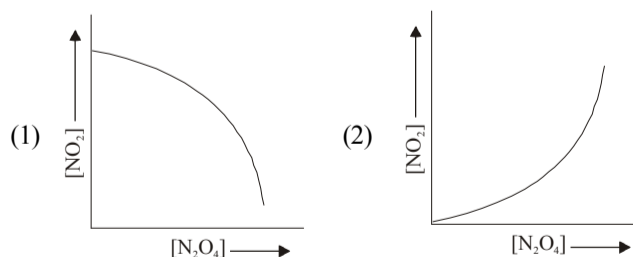


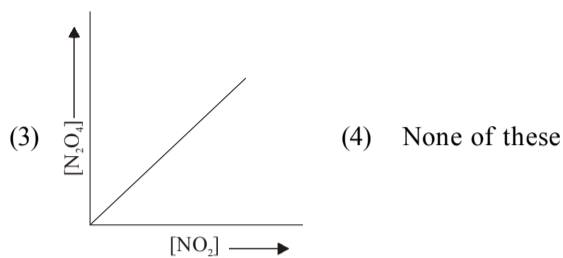
- (1) -5 J (2) -10 J
(3) -15 J (4) None of these

19. A mixture of ethyl alcohol and propyl alcohol has a vapour pressure of 290 mm at 300 K. The vapour pressure of propyl alcohol is 200 mm. If the mole fraction of ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be :

- (1) 350 (2) 300
(3) 700 (4) None of these

20. If the equilibrium constant for the reaction; $\text{N}_2\text{O}_4 \rightleftharpoons 2\text{NO}_2$ is $K = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]}$ then which of the graphs are correct at constant temperature:

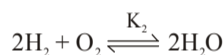
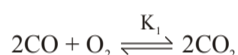
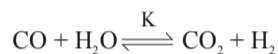




21. The resistance experienced by a body lying in a stream of fluid depends on velocity of flow, density of the fluid, length of the body and viscosity of the fluid. If the resistance (F) varies directly as the square of velocity, then it is related to the coefficient of viscosity as:

- (1) $F \propto \frac{1}{v}$ (2) $F \propto v$
 (3) $F \propto v^2$ (4) None of these

22. Given the following equilibria in gas phase:



The equilibrium constants are related as:

- (1) $K = K_1 K_2$ (2) $K = (K_1 K_2)^2$
 (3) $K = (K_1/K_2)^{1/2}$ (4) None of these

23. Which of the following represents the correct set of four quantum numbers of a $4d$ electrons?

- (1) $4, 3, 2, +\frac{1}{2}$ (2) $4, 2, \pm 1, -\frac{1}{2}$
 (3) $4, 3, -2, +\frac{1}{2}$ (4) None of these

24. The chemical bond that must be present in azo dyes is

- (1) $>\text{C}=\text{C}<$ (2) $-\text{N}=\text{N}-$
 (3) $>\text{C}=\text{N}-$ (4) None of these

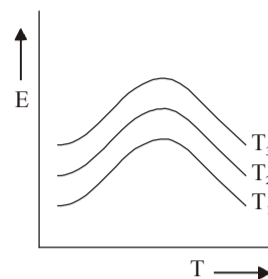
25. A thin wire of length L and uniform linear mass density ρ is bent into a circular loop with centre at O as shown. The moment of inertia of the loop about the axis XX' is

- (1) $\frac{\rho L^3}{8\pi^2}$ (2) $\frac{\rho L^3}{16\pi^2}$
 (3) $\frac{3\rho L^3}{8\pi^2}$ (4) None of these

26. An oil drop of radius 1 cm is sprayed into 1000 small equal drops of same radius. If the surface tension of oil drop is 0.05 N/m, then the work done is:

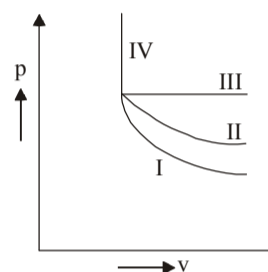
- (1) $18\pi \times 10^{-7}$ J (2) $180\pi \times 10^{-7}$ J
 (3) $1800\pi \times 10^{-7}$ J (4) None of these

27. Energy emitted by a black body and wavelength relations at temperature T_1 K, T_2 K and T_3 K are shown by curves. The relation between the temperature is



- (1) $T_3 > T_2 > T_1$ (2) $T_1 > T_2 > T_3$
 (3) $T_1 = T_2 = T_3$ (4) None of these

28. Fig. shows indicator diagrams I, II, III and IV for four thermodynamic processes to which a gas sample may be subjected. The adiabatic and isothermal curves respectively are:



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

29. Vibration of a string of length 60 cm fixed at both ends are represented by $y = 4 \sin \left[\frac{\pi x}{20} \right] (\cos 96\pi t)$. The nodes are located at cm excluding the ends of the string.

- (1) $0, 20, 60$ cm (2) $0, 60, 20$ cm
 (3) $0, 20, 40$ cm (4) None of these

30. Two point charges $(+q, +q)$ situated at a distance r have force F . If one charge is at rest while other moves round the former in a circle of radius r , then the work done is

- (1) $F \times r$ (2) $F \times 2\pi r$
 (3) Zero (4) None of these

SECTION-C : MATHEMATICS

31. The inverse of a matrix $\begin{Bmatrix} ab & 0 \\ 0 & 1 \end{Bmatrix}$ is

- (1) $\begin{Bmatrix} a & 0 \\ 0 & a \end{Bmatrix}$ (2) $\begin{Bmatrix} b & 0 \\ a & b \end{Bmatrix}$
 (3) $\begin{Bmatrix} 1/a & 0 \\ a & 1/b \end{Bmatrix}$ (4) None of these

32. If $A \cup B = A \cup C$ and $A \cap B = A \cap C$, then

- (1) $B = C$ only when $A \subseteq B$
 (2) $B = C$ only when $A \subseteq C$
 (3) $B = C$
 (4) None of these

33. The argument of $\frac{1-i\sqrt{3}}{1+i\sqrt{3}}$ is equal to
- (1) $\frac{\pi}{3}$ (2) $\frac{2\pi}{3}$
 (3) $\frac{4\pi}{3}$ (4) None of these
34. The number of ways in which four letters can be selected from the word DEGREE is
- (1) 7 (2) 6
 (3) $\frac{6!}{3!}$ (4) None of these
35. The derivative of $f(x) = |x|$ at $x = 0$ is
- (1) 1 (2) 0
 (3) -1 (4) does not exist.
36. The area of the loop between the curve $y = a \sin x$ and x -axis is
- (1) a (2) $2a$
 (3) $3a$ (4) None of these
37. If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$, then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is equal to
- (1) 3 (2) 2
 (3) 0 (4) None of these
38. If $\tan 2\theta \cdot \tan\theta = 1$, then θ is equal to
- (1) $n\pi + \frac{\pi}{6}$ (2) $n\pi \pm \frac{\pi}{6}$
 (3) $2n\pi \pm \frac{\pi}{6}$ (4) None of these
39. The angles of a triangle are in A.P. and the least angle is 30° . The greatest angle in radians is
- (1) $\frac{\pi}{3}$ (2) $\frac{2\pi}{3}$
 (3) $\frac{\pi}{2}$ (4) None of these
40. The cube roots of unity
- (1) are collinear
 (2) lie on a circle of radius $\sqrt{3}$
 (3) Form an equilateral triangle
 (4) None of these

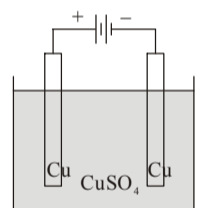
SECTION-C : BIOLOGY

31. Quinine, which is used in the treatment of malaria is extracted from
- (1) Stem of Hevea (2) Bark of Cinnamon
 (3) Bark of Cinchona (4) None of these
32. The most important use of embryo culture is in
- (1) overcoming hybridization barriers
 (2) induction of somaclonal variations
 (3) production of secondary metabolites
 (4) None of these
33. DNA finger printing technique was discovered by
- (1) Wilmut (2) Elthoven
 (3) A. Jeffreys (4) None of these

34. The human genome project involved sequence of
- (1) 3 million base pairs (2) 30,000 base pairs
 (3) 2000 base pairs (4) None of these
35. If 100 DNA molecules are labelled with ^{15}N isotope and they are replicated for two generations in medium containing ^{14}N isotope. Then you can expect
- (1) 100 hybrid and 100 light DNA
 (2) None of the given choices
 (3) 200 heavy and 200 light DNA
 (4) 200 hybrid and 200 light DNA
36. Which animal/s is/are endemic to the western ghats?
- (1) Monitor lizard (2) Both (1) & (3)
 (3) Swamp Deer (4) None of these
37. Indian bustard is on the verge of extinction due to
- (1) hunting (2) climatic changes
 (3) deforestation (4) None of these
38. Once infected, the person will be infected for life. This is true in case of
- (1) cancer (2) AIDS
 (3) hepatitis (4) None of these
39. The diagnosis of HIV can be done by
- (1) ELISA (2) PCR
 (3) all of these (4) Dot blot
40. Instrument used to determine the haemoglobin count is called
- (1) haemocytometer (2) spirometer
 (3) haemometer (4) None of these

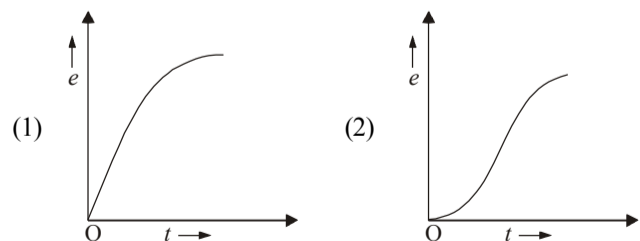
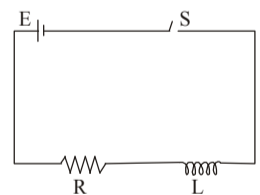
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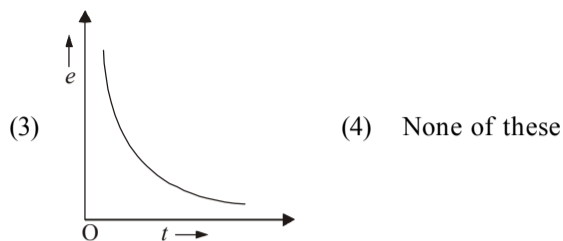
41. The diagram shows an electrolysis cell which contains 1 L of an aqueous 1 M copper (II) sulphate solution. If 0.4 moles of electrons pass through the cell, the concentration of copper ions after passage of the charge will be

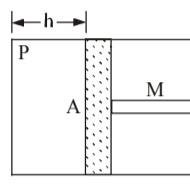


- (1) 0.4 M (2) 0.8 M
 (3) 1.0 M (4) None of these

42. The diagram shows a cell E , connected to a pure resistor R and pure self induction L of negligible resistance. If at time $t = 0$, the switch S is closed, the self induced emf 'e' across the self inductor varies with time as in

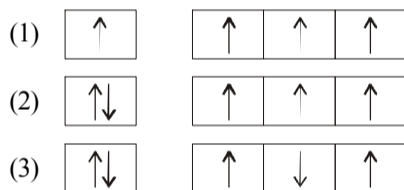




43. A cylindrical piston of mass M slide smoothly inside a long cylinder closed at one end, enclosing a certain mass of gas. The cylinder is kept with its axis horizontal. If the piston is disturbed from its equilibrium position, it oscillates simple harmonically. Find its period
- 

- (1) $T = 2\pi\sqrt{\frac{Mh}{PA}}$ (2) $T = 2\pi\sqrt{\frac{MA}{Ph}}$
 (3) $T = 2\pi\sqrt{\frac{M}{PAh}}$ (4) None of these

44. In which of the following orbital diagram Aufbau principle is violated:

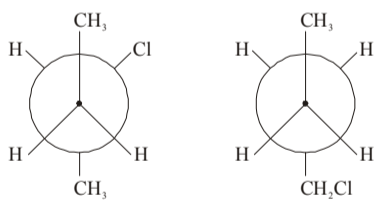


(4) None of these

45. For maximum horizontal range, the angle of projection of a projectile should be

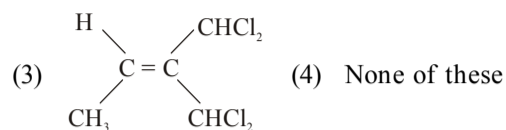
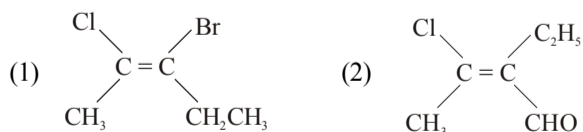
- (1) 30° (2) 45°
 (3) 60° (4) None of these

46. The pair of structures given below represent

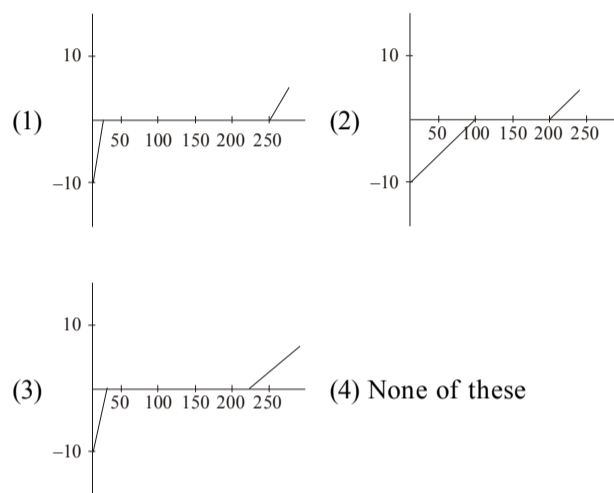


- (1) Enantiomers
 (2) Structural isomers
 (3) Diastereomers
 (4) None of these

47. Select the E-isomer among the following :

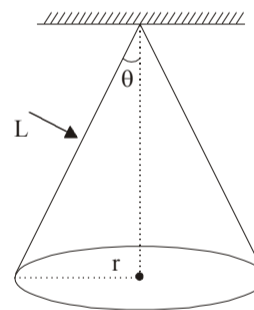


48. An iron container of mass 200 g contains 400 g ice at -10°C . Heat is supplied to the system at 150 cal/s. Given specific heat capacity of ice = $0.5 \text{ cal/g}^\circ\text{C}$, of iron is $0.2 \text{ cal/g}^\circ\text{C}$ and latent heat of fusion of ice is 80 cal/g . Which of the following graphs represents the variation of temperature with time during 4 minute?



Solve the problem and choose the correct answer.

A particle of mass 'm' is suspended from a ceiling through a string of length 'L'. The particle moves in a horizontal circle of radius r, in such a way that the system is a conical pendulum.



49. Find the speed of the particle.

- (1) \sqrt{rg} (2) $\sqrt{rg\cos\theta}$
 (3) $\sqrt{rg\sin\theta}$ (4) None of these

50. Find the tension in the string.

- (1) $\frac{mgL}{\sqrt{(L^2 - r^2)}}$ (2) $\frac{mgL}{\sqrt{L^2 - 2r^2}}$
 (3) $\frac{mgL}{\sqrt{(L^2 - r^2)}}$ (4) None of these

😊 END OF THE EXAM 😊

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