DO NOT START ATTEMPTING THE TEST PAPER UNTIL YOU ARE ASKED TO DO SO

CLASS 11th

iOS'13
International Olympiad of Science
Organized by Society of Science Education, New Delhi, India

SILVER ZONE FOUNDATION

TEST PAPER TYPE
DD
LEVEL 1

QUESTION PAPER

Duration : 60 Minutes **Maximum Marks : 100**

Enrollment No.	
Student Name	
School Name	

Read the following instructions carefully before you begin to answer the questions in the OMR Answer Sheets provided along with this question paper. Ask the Examination In-charge/Invigilator how to mark the OMR Answer Sheets, in case you have any doubts.

INSTRUCTION TO CANDIDATES TO BE EXPLAINED BY THE INVIGILATORS

1. This Booklet contains 40 questions. All questions carry an equal marks of 2.5 each.
2. All questions are compulsory.
3. The paper is divided into 4 sections. Section A and B is compulsory for all the candidates. However section C and D is to be answered by the candidates as per their choice of subject, i.e. either Mathematics or Biology.
4. This Booklet contains 6 pages. Please check, if any page is misprintied, missing or repeated.
5. Collect your OMR Answer Sheets from the Invigilator/Examination In-Charge to answer the questions given in this Booklet.
6. You must fill all the necessary information's which are required in the space provided in this booklet and OMR Answer Sheet.
7. Correct Answers must be marked by **"Darkening"** the corresponding circles on the OMR Answer Sheet, against the relevant question number with **Pencil** or **Blue/Black, Ball point Pen** only. Answers which are not darkened in circle will not be awarded with any mark.
8. Space for rough work is provided in this booklet. No rough work is to be done in the OMR Answer Sheet.
9. Mobile Phones and other Wireless equipments are banned in the examination halls/rooms.
10. OMR Answer Sheets must be handed over to the Examination In-charge/Invigilator before you leave the examination room/hall and recheck that you have filled all the required informations.
11. The results will be published in our web-site WWW.SILVERZONE.ORG in the month of Jan 2014. You can check it with your 12 digit Roll Number provided in the Enrollment Ticket.

TEACHERS ARE REQUESTED TO CHECK IF THE REQUIRED INFORMATIONS ARE PROPERLY FILLED BY THE CANDIDATES IN THE QUESTION PAPER & OMR ANSWER SHEETS, AND ALSO ENSURE THAT OMR ANSWER SHEETS ARE PROPERLY MARKED. PLEASE SEND US BACK THE OMR ANSWER SHEETS ONLY.

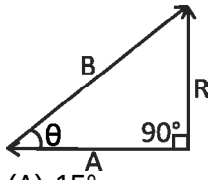
Note: Return this question paper along with answer sheet

SECTION - A : PHYSICS

1. Which one of the following is the dimension of potential difference?

(A) $ML^2T^{-3}A^{-1}$ (B) $MLT^{-2}A^{-1}$
(C) $ML^2T^{-2}A$ (D) $MLT^{-2}A$
(E) None of these

2. In vector diagram, shown in the given figure, R is the resultant of vectors A and B. If $R = \frac{B}{\sqrt{2}}$, find the of value of angle θ.



(A) 15° (B) 45°
(C) 60° (D) 75°
(E) None of these

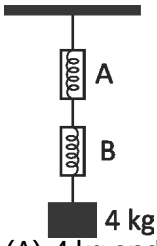
3. Given $A = \hat{i} + \hat{j}$ and $B = \hat{i} + \hat{k}$. What is the value of the scalar product of A and B?

(A) 1 (B) $\sqrt{2}$
(C) $\sqrt{3}$ (D) 2
(E) None of these

4. A body moves along a circular track of radius 20 cm. It starts from one end of a diameter, moves along the circular track and reaches the other end of the diameter in 5 seconds. What is the angular speed of the body?

(A) $\frac{\pi}{2}$ rad s^{-1} (B) $\frac{\pi}{3}$ rad s^{-1}
(C) $\frac{\pi}{4}$ rad s^{-1} (D) $\frac{\pi}{5}$ rad s^{-1}
(E) None of these

5. A block of mass 4 kg is suspended through two light spring balances A and B as shown in the figure. Then balances A and B will respectively read



(A) 4 kg and zero kg (B) zero kg and 4 kg
(C) 4 kg and 4 kg (D) 2 kg and 2 kg
(E) None of these

6. An engine pulls a car of mass 1500 kg on a level road at a constant speed of 5 ms^{-1}. If the frictional force is 1500 N, what power does the engine generate?

(A) 5.0 kW (B) 7.5 kW
(C) 10 kW (D) 12.5 kW
(E) None of these

7. A raindrop of radius r falls from a certain height h above the ground. The work done by the gravitational force is proportional to:

(A) r (B) r^2
(C) r^3 (D) r^4
(E) None of these

8. A ring of radius r has its mass non-uniformly distributed over its circumference with centre at the origin. If x is the distance of the centre of mass of the ring from its centre, then

(A) $x = r$ (B) $x < r$
(C) $x > r$ (D) $0 \le x \le r$
(E) None of these

9. A mass m is suspended at the end of a massless wire of length L and cross-sectional area A. If Y is the Young's modulus of the material of the wire, the frequency of oscillations along the vertical line is given by:

(A) $v = \frac{1}{2\pi}\sqrt{\frac{mL}{YA}}$ (B) $v = \frac{1}{2\pi}\sqrt{\frac{YL}{mA}}$
(C) $v = \frac{1}{2\pi}\sqrt{\frac{AL}{Ym}}$ (D) $v = \frac{1}{2\pi}\sqrt{\frac{YA}{mL}}$
(E) None of these

10. A uniform metal wire of density ρ, cross-sectional area A and length L is stretched with a tension T. The speed of transverse wave in the wire is given by:

(A) $\sqrt{\frac{TL}{\rho A}}$ (B) $\sqrt{\frac{T\rho}{AL}}$

(C) $\sqrt{\frac{T}{A\rho}}$ (D) $\sqrt{\frac{T\rho}{A}}$

(E) None of these

11. The percentage change in the time period of a simple pendulum if its length is increased by 2% is:

(A) 4% (B) 2%

(C) 1% (D) $\sqrt{2}$%

(E) None of these

12. Find the ratio C_p/C_v of a gas, If the gas has *f* degree of freedom.

(A) $\frac{3+f}{2}$ (B) $1+\frac{2f}{2}$

(C) $\frac{1}{2}+f$ (D) $1+\frac{2}{f}$

(E) None of these

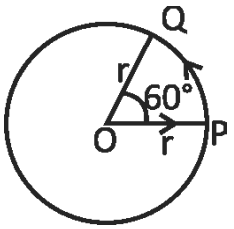
13. When a plane harmonic wave of wavelength λ travels in a medium the particle speed will always be less than the wave speed if the amplitude of the wave is:

(A) Less than $\frac{\lambda}{2\pi}$ (B) Less than λ

(C) Greater than $\frac{\lambda}{\pi}$ (D) Greater than λ

(E) None of these

14. A cyclist starts from centre O of a circular track of radius r = 1 km, reaches edge P of the track and then cycles along the circumference and stops at point Q as shown in figure. The displacement of the cyclist is:



(A) $r\left(1+\frac{\pi}{6}\right)$ (B) r

(C) $r\left(1+\frac{\pi}{3}\right)$ (D) $\frac{\pi r}{3}$

(E) None of these

15. A train standing at a certain distance from a railway platform is blowing a whistle of frequency 500 Hz. If the speed of sound is 340 ms^{-1}, the frequency and wavelength of the sound of the whistle heard by a man running towards the engine with a speed of 10 ms^{-1} respectively are:

(A) 500 Hz, 0.7 m (B) 500 Hz, 0.68 m

(C) 486 Hz, 0.7 m (D) 515 Hz, 0.68 m

(E) None of these

SECTION - B : CHEMISTRY

16. The root mean square speeds of gaseous molecules changes with change in the:

(A) Pressure of the gas

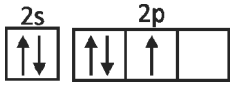
(B) Temperature of the gas

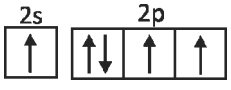
(C) Volume of the gas

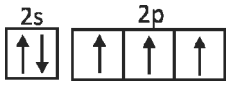
(D) Density of the gas

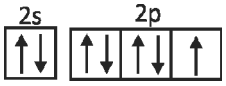
(E) None of these

17. In which one of the following orbital diagrams aufbau principle is violated?

(A) 

(B) 

(C) 

(D) 

(E) None of these

18. Which one of the following oxides gives hydrogen peroxide on treatment with a dilute acid?

(A) Na_2O_2

(B) PbO_2

(C) MnO_2

(D) TiO_2

(E) None of these

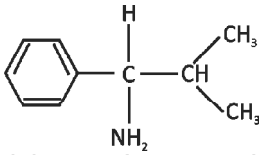
19. Which one of the following characteristics about phosphorus is correct?

(A) Both white and red phosphorus are inactive
(B) Both white and red phosphorus are reactive
(C) White phosphorus is reactive whereas red phosphorus is inactive
(D) White phosphorus is much less reactive than red phosphorus
(E) None of these

20. Which one of the following has maximum number of atoms?

(A) 24 g of C ($M = 12\ g\ mol^{-1}$)
(B) 23 g of Na ($M = 23\ g\ mol^{-1}$)
(C) 48 g of S ($M = 32\ g\ mol^{-1}$)
(D) 108 g of Ag ($M = 108\ g\ mol^{-1}$)
(E) None of these

21. What is the IUPAC name of the given compound?



(A) 1- amino-2-methyl-1-phenylpropane
(B) 1- amino-1-phenyl-2-methylpropane
(C) 2- methyl-1-amino-1-pheylpropane
(D) 1- isopropyl-1-phenylmethyl-2-amine
(E) None of these

22. The value of the Boltzmann constant is:

(A) $6.023 \times 10^{23}\ mol^{-1}$
(B) $1.36 \times 10^{-23}\ J\ K^{-1}\ mol\ molecule^{-1}$
(C) $1.36 \times 10^{-23}\ J\ K^{-1}\ mol^{-1}$
(D) $1.36 \times 10^{-23}\ J\ K^{-1}$
(E) None of these

23. An element X belongs to Group 14 and 2nd period of the periodic table. Its atomic number will be:

(A) 6 (B) 14
(C) 8 (D) 16
(E) None of these

24. In the compound $CH_2 = CH - CH_2-CH_2-C \equiv CH$, the $^{2}C - ^{3}C$ bond is of the type

(A) sp- sp^2 (B) sp^3- sp^3
(C) sp- sp^3 (D) sp^2- sp^3
(E) None of these

25. Electromagnetic radiation with maximum wavelength is:

(A) Ultraviolet (B) Radiowave
(C) X-ray (D) Infrared
(E) None of these

26. The atomic numbers of elements of the lanthanide series lie in the range of

(A) 58 to 71 (B) 57 to 70
(C) 59 to 72 (D) 56 to 69
(E) None of these

27. Which of the following combinations would lead to a covalent bond?

(A) Electronegative element + electropositive element
(B) Electronegative element + electronegative element
(C) Electropositive element + electropositive element
(D) Inert gas + electropositive element
(E) None of these

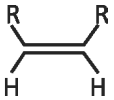
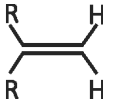
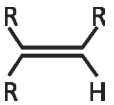
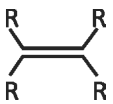
28. Calculate the density of hydrogen chloride gas at 30 °C and 5 atm pressure.

(A) 6.34 g L^{-1} (B) 9.34 g L^{-1}
(C) 7.34 g L^{-1} (D) 8.34 g L^{-1}
(E) None of these

29. For a monatomic gas, the value of the ratio of $C_{p,m}$ and $C_{v,m}$ is:

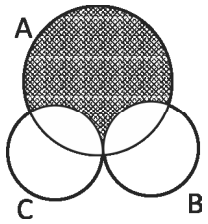
(A) $\frac{5}{3}$ (B) $\frac{7}{5}$
(C) $\frac{9}{7}$ (D) $\frac{9}{11}$
(E) None of these

30. Which one of the following will react fastest with H_2 under catalytic hydrogenation condition?

(A) 
(B) 
(C) 
(D) 
(E) None of these

SECTION - C : MATHEMATICS

31. The shaded region in the given figure is:



(A) $A \cap (BUC)$ (B) $A-(B \cup C)$

(C) $A \cap (B-C)$ (D) $A \cup (B \cap C)$

(E) None of these

32. If x, 2x + 2, 3x + 3, are in G.P., then the fourth term is:

(A) 27 (B) -13.5

(C) 13.5 (D) -27

(E) None of these

33. $\sqrt{-2}\,\sqrt{-3}$ **=**

(A) $\sqrt{6}$ (B) -6

(C) $-\sqrt{6}$ (D) $i\sqrt{6}$

(E) None of these

34. The value of $\sin^2 75° - \sin^2 15°$ is:

(A) 0 (B) 1

(C) $\frac{1}{2}$ (D) $\frac{\sqrt{3}}{2}$

(E) None of these

35. If α, β are roots of the equation $4x^2 + 3x + 7 = 0$, then $\frac{1}{\alpha}+\frac{1}{\beta}$ is equal to:

(A) $\frac{7}{3}$ (B) $\frac{-7}{3}$

(C) $\frac{-3}{7}$ (D) $\frac{3}{7}$

(E) None of these

36. ${}^{n}c_{r} \div {}^{n}c_{r-1}$ **=**

(A) $\frac{n-r+1}{r}$ (B) $\frac{n-r}{r}$

(C) $\frac{n+r-1}{r}$ (D) $\frac{n-r-1}{r}$

(E) None of these

37. The value of $(1 + i)(1 + i^2)(1 + i^3)(1 + i^4)$ is:

(A) 2 (B) 0

(C) 1 (D) i

(E) None of these

38. 4 buses runs between Bhopal and Gwalior. If a man goes from Gwalior to Bhopal by a bus and comes back to Gwalior by another bus, then the total possible ways are:

(A) 16 (B) 12

(C) 8 (D) 4

(E) None of these

39. The probability that a man will be alive in 20 years is $\frac{3}{5}$ and the probability that his wife will be alive in 20 years is $\frac{2}{3}$. Then the probability that at least one will be alive in 20 years, is

(A) $\frac{7}{15}$ (B) $\frac{4}{15}$

(C) $\frac{8}{15}$ (D) $\frac{13}{15}$

(E) None of these

40. Focus and directrix of the parabola $x^2 = -8ay$ are

(A) $(0, -2a)$ and $y = 2a$

(B) $(0, 2a)$ and $y = -2a$

(C) $(2a, 0)$ and $x = -2a$

(D) $(-2a, 0)$ and $x = 2a$

(E) None of these

SECTION - D : BIOLOGY

31. In which one of the following, the cells are not organized into tissues?
(A) Cnidarians (B) Sponges
(C) Flatworms (D) Roundworms
(E) None of these

32. The main difference between Gram-positive and Gram-negative bacteria remains in the composition of:
(A) Cilia (B) Cell wall
(C) Nucleolus (D) Cytoplasm
(E) None of these

33. The network of tube-like structures running through the cytoplasm is called:
(A) Golgi complex
(B) Mitochondria
(C) Endoplasmic reticulum
(D) Ribosome
(E) None of these

34. Sieve tubes and companion cells occurs in:
(A) Xylem (B) Cambium
(C) Meristem (D) Phloem
(E) None of these

35. Which one of the following cells are dead?
(A) Parenchyma (B) Collenchyma
(C) Sclerenchyma (D) All of these
(E) None of these

36. Sponges belongs to which one of the following phyla?
(A) Porifera (B) Cnidaria
(C) Arthropoda (D) Annelida
(E) None of these

37. The largest gland associated with the human alimentary canal is:
(A) Stomach (B) Liver
(C) Pancreas (D) Small intestine
(E) None of these

38. Which one of the following acids is the end product of fermentation?
(A) Hydrochloric acid (B) Lactic acid
(C) Pyruvic acid (D) Citric acid
(E) None of these

39. What is blood pressure?
(A) The pressure of blood on the heart muscles
(B) The pressure of flow of blood exerted on the walls of arteries and veins
(C) The pressure of blood on the walls of veins only
(D) The pressure of blood on the walls of arteries only
(E) None of these

40. The junction between two neurons is called:
(A) Synapse (B) Dendrite
(C) Joint (D) Axon
(E) None of these

Space for Rough Work