FOREMAN / APPRENTICESHIP SUPERVISOR_2024

*FAST/24*

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ASKED TO DO SO.

**SCREENING TEST**

**TEST BOOKLET**

Time allowed : 2 hours

Full marks : 100

Answer ***all*** the questions.

Questions are of equal value.

TEST BOOKLET SERIES

**A**

Serial No. 2510565 *Roll No.:*

*Signature of the Candidate:*

## *INSTRUCTIONS*

Candidates should read the following instructions carefully before answering the questions:

1. This booklet consists of 12 pages including this front page, containing 50 questions. **Verify the Page Nos. and Test Booklet series on each page and bring at once to the Invigilator's notice any discrepancy.**
2. Answers will have to be given in the OMR Sheet supplied for the purpose.
3. Before you proceed to mark in the OMR Sheet in response to various items in the Test Booklet, you have to fill in some particulars in the OMR Sheet. ***Do not fold the OMR Sheet as this will result in error in your marks.***
4. All questions are of multiple-choice answer-type. You will find ***four*** probable answers **(A)**, **(B)**, **(C)** and **(D)** against each question. Find out which of the four answers appears to be **correct or the best**. Now darken the circle corresponding to the letter of the selected answer in the OMR Sheet with **Black Ball Point Pen**.
5. One and only one circle is to be fully blackened for answer. Any spot in any other circle (multiple circle) or in wrong circle will be considered as wrong answer. If more circle is encoded for a particular answer, it will be treated as a wrong answer. Use of whitener is strictly prohibited.
6. ***There will be negative marking of $\frac{1}{4}$ mark i.e. 0.50 mark for each wrong answer.***
7. ***There are blank pages at the end of this Booklet for Rough Work.***
8. ***The OMR Sheet should be handed over to the Invigilator before leaving the Examination Hall. You are permitted to take away the used Test Booklet after completion of the examination.***

**1.** $\sin\theta\left(\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}\right) = ?$

(A) 1
(B) 2
(C) 3
(D) 4

**2.** The complex number $\left(\frac{1+2i}{1-i}\right)$ lies in

(A) quadrant I
(B) quadrant II
(C) quadrant III
(D) quadrant IV

**3.** In case of rotational motion, we have

(A) Work done = constant torque × angular displacement
(B) Work done = constant torque × linear displacement
(C) Work done = angular force × displacement
(D) Work done = force × angular displacement

**4.** It is found that each square metre of the Sun's surface radiates energy at the rate of $6{\cdot}3 \times 10^7$ $Jm^{-2}s^{-1}$. The Stefan's constant is $5{\cdot}7 \times 10^{-8}$ $Wm^{-2}K^{-4}$. The temperature of the Sun's surface is approximately

(A) 10,000K
(B) 5765K
(C) 2793K
(D) None of the above

**5.** Fill in the blank by choosing the appropriate preposition:

He turned a deaf ear _____ my grievances.

(A) in
(B) for
(C) against
(D) to

**6.** A car, moving at a speed of 50km/hr, is stopped by brakes after 6m. If the same car is moving at a speed of 100km/hr., then the stopping distance would be

(A) 6m
(B) 36m
(C) 24m
(D) 12m

**7.** The passive voice for 'We saw a snake' is

(A) we had seen a snake.
(B) a snake was seen by us.
(C) a snake had been seen by us.
(D) a snake is seen by us.

**8.** According to Hund's Rule, which configuration is correct for the electronic arrangement of oxygen (Z = 8)?

(A) $1s^2 2s^2 2p^4$, with all p-electrons paired
(B) $1s^2 2s^2 2p^4$, with two unpaired electrons in the p-orbital
(C) $1s^2 2s^2 2p^4$, with one unpaired electron in the p-orbital
(D) $1s^2 2s^2 2p^3 2d^1$, with four unpaired electrons in the p and d-orbitals

**9.** The adjective form of 'humility' is _____.

(A) humiliate
(B) humiliation
(C) humble
(D) honourable

**10.** For '$n$' moles of an ideal gas, we have

(A) $C_p - C_v = \frac{n}{R}$

(B) $C_p - C_v = 0$

(C) $C_p - C_v = \frac{R}{n}$

(D) $C_p - C_v = nR$

where the symbols have their usual meaning.

**11.** A soap bubble of surface tension 0·025 N/m gets enlarged slowly from a radius of 0·01 m to a radius of 0·10 m. The work done in the operation is approximately

(A) $2{\cdot}6 \times 10^{-6}$ J
(B) $2{\cdot}6 \times 10^{-3}$ J
(C) 3·9 J
(D) $6{\cdot}2 \times 10^{-3}$ J

**12.** In the hydration of Portland cement, which compound forms the gel-like structure responsible for the strength of concrete?

(A) Calcium Silicate Hydrate (C-S-H)
(B) Calcium Hydroxide ($Ca(OH)_2$)
(C) Calcium Aluminate Hydrate
(D) Gypsum

**13.** In which of the following ways does the structure of diamond and graphite differ significantly?

(A) Diamond has delocalized electrons, while graphite does not.
(B) Diamond forms a 3D covalent network, while graphite forms layers of 2D covalent bonds.
(C) Diamond is composed of only carbon atoms, while graphite contains both carbon and hydrogen atoms.
(D) Diamond is a conductor, while graphite is an insulator.

**14.** The diagonals of a parallelogram are represented by the vectors $\vec{d}_1 = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{d}_2 = \hat{i} - 3\hat{j} + 4\hat{k}$. The area of the parallelogram is

(A) $7\sqrt{3}$ sq. units
(B) $5\sqrt{3}$ sq. units
(C) $3\sqrt{5}$ sq. units
(D) $6\sqrt{3}$ sq. units

**15.** Which one of the following set has an entry into the list of fundamental quantities?

(A) Length, Time, Mass
(B) Mass, Time, Acceleration
(C) Length, Time, Velocity
(D) Length, Mass, Acceleration

**16.** During the smelting of copper, the matte formed consists of

(A) Copper Oxide and Silica
(B) Copper Sulphide and Iron Sulphide
(C) Copper Carbonate and Carbon Dioxide
(D) Copper Silicate and Iron Silicate

**17.** If in the expansion of $(a - 2b)^n$, the sum of the 4th & 5th term is 0, then the value of $\frac{a}{b}$ is

(A) $\frac{n-4}{5}$
(B) $\frac{2(n-4)}{5}$
(C) $\frac{5}{n-4}$
(D) $\frac{5}{2(n-4)}$

**18.** The meaning of 'riding on a wave' is

(A) to meet someone accidentally.
(B) to enjoy the advantages of something.
(C) the act of stealing.
(D) doing something regularly.

**19.** The reported speech for the sentence: Mina said, "I am waiting for my turn now" is

(A) Mina said that she was waiting for her turn then.
(B) Mina said that she will be waiting for her turn then.
(C) Mina told that she is waiting for her turn now.
(D) Mina told that she is waiting for her turn then.

**20.** One end of a copper wire is joined to the end of a steel wire of same radius so that both can be subjected to the same longitudinal force. Young's modulus of steel is twice that of copper. When the length of copper wire increases by 1% under the action of a longitudinal force, the length of the steel wire, under the same force, increases by

(A) 2%
(B) 1%
(C) 0·5%
(D) None of the above

**21.** He is _____ honourable man. Fill in the blank with the appropriate article.

(A) the
(B) an
(C) a
(D) Both 'a' and 'an'

**22.** The least count of a measuring instrument tells

(A) the least or smallest amount of a physical quantity it can measure accurately.
(B) the maximum value of a physical quantity that the instrument can measure accurately.
(C) the standard deviation of measurement.
(D) the proportional error of measurement.

**23.** What is the role of cryolite in the extraction of aluminium?

(A) Acts as a reducing agent
(B) Increases conductivity and lowers the melting point
(C) Removes impurities
(D) Serves as a source of oxygen

**24.** Two bodies of masses $m$ and $4m$ have equal kinetic energy. The ratio of their respective momentum is

(A) 1 : 4
(B) 1 : 2
(C) 1 : 1
(D) 2 : 1

**25.** Find the word nearest in meaning to the word underlined in the sentence.

I turned away in <u>revulsion</u> when they showed a close-up of the operation.

(A) loathing
(B) piaffe
(C) primeval
(D) emulate

**26.** An annular disc of mass 100gm, inner radius 10cm, outer radius 15cm, rolls such a way that its centre has a velocity of 50cm/s. The total kinetic energy of the disc is approximately

(A) $13{\cdot}71 \times 10^3$ erg
(B) $23{\cdot}14 \times 10^7$ erg
(C) $5{\cdot}4 \times 10^4$ erg
(D) $21{\cdot}53 \times 10^4$ erg

**27.** If $\vec{a}$ is a nonzero vector of magnitude '$a$' and $\lambda$ is a nonzero scalar, then $\lambda\vec{a}$ is a unit vector if

(A) $\lambda = 1$
(B) $\lambda = -1$
(C) $a = |\lambda|$
(D) $a = \frac{1}{|\lambda|}$

**28.** $f(x) = \sin x$ is increasing in

(A) $\left(\frac{\pi}{2}, \pi\right)$
(B) $\left(\pi, \frac{3\pi}{2}\right)$
(C) $(0, \pi)$
(D) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

**29.** The distance(d) traversed by a particle in time '$t$' is governed by the relation: $d = a + bt + ct^2$, where $a$, $b$, $c$ are constants. The dimensions of $a$, $b$, $c$ are

(A) $[a] = [L], [b] = [LT^{-1}], [c] = [LT^{-2}]$

(B) $[a] = [LT^{-1}], [b] = [L], [c] = [LT]$

(C) $[a] = [L^2], [b] = [L^2T^{-1}], [c] = [L^2T^{-3}]$

(D) $[a] = [L], [b] = [L], [c] = [L]$

where $L$, $T$ represent the dimensions of length and time respectively.

**30.** If the function $f(x) = \begin{cases} \frac{kx}{|x|}, & \text{for } x < 0 \\ 3, & \text{for } x \geq 0 \end{cases}$ is continuous at $x = 0$, then the value of the constant $k$ is

(A) 3

(B) –3

(C) $\frac{1}{3}$

(D) $-\frac{1}{3}$

**31.** Which property distinguishes super refractories from other refractories?

(A) Ability to withstand temperatures above 2000°C

(B) Low density and high porosity

(C) Resistance to thermal shock

(D) Low cost of production

**32.** Fill in the blank by choosing the appropriate preposition:

It is 9 O'clock _____ my watch.

(A) by

(B) in

(C) on

(D) at

**33.** If $\alpha$ and $\beta$ be the roots of the equation $ax^2 + bx + c = 0$, then the value of $\frac{a\alpha^2}{b\alpha + c} - \frac{a\beta^2}{b\beta + c}$ is

(A) 1

(B) –1

(C) ½

(D) 0

**34.** In the reaction $MnO_4^- + 8H^+ + Ze^- \rightarrow Mn^{2+} + 4H_2O$, the value of 'Z' is

(A) 5

(B) 4

(C) 2

(D) 7

**35.** The function $f(x) = |x|$, for all real $x$ is

(A) continuous but not differentiable at $x = 0$.

(B) differentiable but not continuous at $x = 0$.

(C) neither continuous nor differentiable at $x = 0$.

(D) None of the above

**36.** If $y = \tan^{-1}\left(\frac{\cos x + \sin x}{\cos x - \sin x}\right)$ then $\frac{dy}{dx} = ?$

(A) 1

(B) –1

(C) $\frac{1}{2}$

(D) $-\frac{1}{2}$

**37.** The Fischer-Tropsch process is used to produce

(A) Coal Gas from Coal.

(B) Synthetic liquid fuels from syngas.

(C) Hydrogen from methane.

(D) Biogas from organic matter.

**38.** Which of the following chemicals are used in the soda lime process?

(A) Sodium hydroxide and Calcium carbonate
(B) Sodium bicarbonate and Magnesium oxide
(C) Sodium carbonate and Calcium hydroxide
(D) Calcium chloride and Sodium chloride

**39.** The mass of 1 litre of hydrogen is 0·08987g. at N.T.P. The r.m.s. velocity of hydrogen at N.T.P. is

(A) $18{\cdot}4 \times 10^4$cm/s
(B) $8{\cdot}9 \times 10^3$cm/s
(C) $3{\cdot}14 \times 10^4$cm/s
(D) None of the above

**40.** Which of the following statements about CNG is incorrect?

(A) It has a high octane number.
(B) It is safer than LPG due to its higher ignition temperature.
(C) It consists mainly of propane and butane.
(D) It is used as a cleaner alternative to petrol and diesel.

**41.** If the pH of a solution changes from 3 to 6, the hydrogen ion concentration decreases by a factor of

(A) 1000
(B) 10
(C) 100
(D) 3

**42.** If a water sample contains 12.2mg of calcium ions ($Ca^{2+}$) per liter, calculate the hardness of the water in ppm assuming all the hardness is due to calcium.

(A) 50ppm
(B) 30.5ppm
(C) 122ppm
(D) 244ppm

**43.** The value of $\sin^{-1}\left(\cos\frac{3\pi}{5}\right)$ is

(A) $\frac{\pi}{10}$
(B) $\frac{3\pi}{5}$
(C) $-\frac{\pi}{10}$
(D) $-\frac{3\pi}{5}$

**44.** The boy has turned over a new leaf. The meaning of the underlined part is:

(A) turned a new page in his book.
(B) begun a new phase in his life.
(C) has planted a new tree.
(D) None of the above

**45.** If $\log x^2 - \log(2x) = 3\log 3 - \log 6$, then the value of $x$ is

(A) 3
(B) 6
(C) 9
(D) 12

**46.** When 0.5 A current is passed for 1 hour through aqueous solution of a divalent metal salt, 0.59 g metal was deposited at cathode. The metal might be

(A) Al
(B) Fe
(C) Na
(D) Cu

**47.** If $A$ and $B$ are coefficients of $x^n$ in the expansion of $(1+x)^{2n}$ and $(1+x)^{2n-1}$ respectively, then $\frac{A}{B}$ is equal to

(A) 1

(B) 2

(C) $\frac{1}{2}$

(D) $\frac{1}{n}$

**48.** He is a reputed man. The noun form of 'reputed' is

(A) reputation

(B) reputitive

(C) reputitively

(D) famous

**49.** Water is flowing through a tube of diameter 5mm at a speed of 1m/s. The coefficient of viscosity of water is $\eta = 1$ centipoise. Reynold's no. is

(A) 5000

(B) 10000

(C) 1500

(D) 1780

**50.** The antonym of the word 'Demolition' is

(A) Construction

(B) Destruction

(C) Destroy

(D) Unbuild