**TEST ID: 91026**

IIT KALRASHUKLA

A Class Apart

# CLASS – 10th (ENGINEERING)

**Time : 90 minutes** **Maximum Marks : 180**

***-: Important Instructions :-***

(i) Use only Black Ball Point pen.

(ii) This test booklet contains 3 Sections of question paper consisting of

| | | | |
|---|---|---|---|
| SECTION - I | → | PHYSICS | (15 Questions) |
| SECTION - II | → | CHEMISTRY | (15 Questions) |
| SECTION - III | → | MATHS | (15 Questions) |

(iii) Each question is allotted **4 marks for correct response**.

(iv) **1 mark will be deducted** for marking incorrect or multiple responses.

(v) No deduction will be made from total marks for unattempted questions.

(vi) For each question, there is **only 1 correct** response.

**Name of Student (in Capital Letter) :** _____

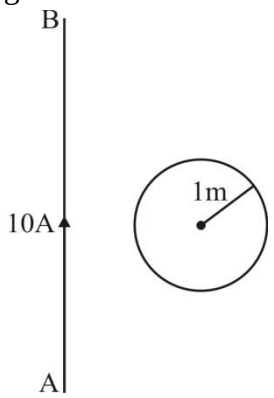
**Candidate Signature :** _____

**Invigilator Signature :** _____

# SECTION - I

## PHYSICS

1. A current 10 A is flowing through the conductor AB. What will be the current induced in the circular wire of radius 1 m. See figure.




(A) 0 A (B) 5 A (C) 10A (D) 20A

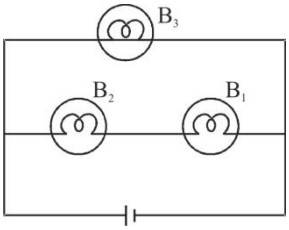
2. The maximum focal length of the eye-lens of a person is greater than its distance from the retina. The eye is :
(A) Always strained while looking at an object.
(B) Strained for objects at large distances only.
(C) Strained for objects at short distances only.
(D) Unstrained for all distances.

3. The refracting angle of a prism is A and refractive index of the material of prism is cot(A/2). The angle of minimum deviation is
(A) 180° – 3A (B) 180° + 2A (C) 90° – A (D) 180° – 2A

4. A particle's q/m value is given by s and it is moving with a speed v towards a wall at a distance d, in a direction which is perpendicular to the wall. What minimum magnitude of magnetic field should exist in this region so that the particle doesn't hit the wall?
(A) $\frac{v}{sd}$ (B) $\frac{2v}{sd}$ (C) $\frac{v}{2sd}$ (D) $\frac{v}{4sd}$

***Space for Rough Work***

5. A 100 W, 250 V bulb $B_1$, and two 60 W, 250 V bulbs $B_2$ and $B_3$, are connected to a 250 V source, as shown in the figure. Now $W_1$, $W_2$ and $W_3$ are the output power of the bulbs $B_1$, $B_2$ and $B_3$ respectively. Then :



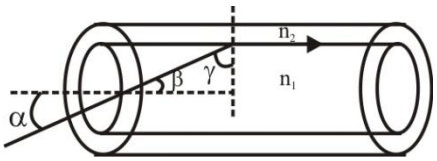

(A) $W_1 > W_2 = W_3$ (B) $W_1 > W_2 > W_3$
(C) $W_1 < W_2 = W_3$ (D) $W_1 < W_2 < W_3$

6. The refractive index of a certain medium X is 1.6 and light travels in a medium Y. The velocity of light in Y is 'z' time in X. Calculate the refractive index of medium Y.
(A) 1.6 z (B) z/1.6 (C) 1.6/z (D) 1.6

7. In the fission reaction $^{235}U + {}^{1}n_0 \rightarrow {}^{141}Ba + {}^{92}Kr +$ neutrons, the number of neutron produced is, (The atomic number of U, Ba and Kr are 92, 56 and 36 respectively).
(A) 0 (B) 1 (C) 2 (D) 3

8. Choose the correct option for name of colour obtain from following colour equations.
(i) White – Blue = _____ (ii) White – Blue – Green = _____
(A) Red, Yellow (B) Yellow, Red (C) Blue, Red (D) Blue, Yellow

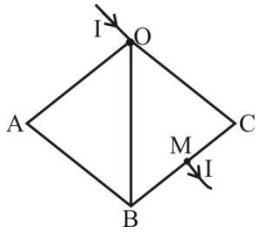
9. Value of $\beta$ such that final refracted ray move parallel to $n_1$, $n_2$ interface (where $n_1 = 5/3$, $n_2 = 4/3$ & $\tan 53° = 4/3$).




(A) 90° (B) 37° (C) 53° (D) 45°

***Space for Rough Work***

10. In figure $R_{OC} = R_{OA} = R_{AB} = R_{BC} = r$, and M is a mid point so $R_{CM} = R_{BM} = \frac{R_{BC}}{2} = \frac{r}{2}$, find net resistance across O and M. (where OC, OA, OB, AB, BC and BM are resistances).




(A) $\frac{3}{8}r$ (B) $\frac{21}{26}r$ (C) $\frac{3}{7}r$ (D) $\frac{5}{7}r$

11. Which one of the following can be used as a box type solar cooker?
(A) A double walled cooker made of plastic and its inner wall is painted white.
(B) A double walled cooker made of copper and its inner wall is painted black.
(C) A double walled cooker made of plastic and its inner wall is painted black.
(D) A Single walled cooker made of copper and its inner wall is painted white.

12. The power of a DC motor can be increased by
(A) Increasing the area of the cross section of the coil.
(B) Increasing the current flowering through the coil.
(C) Laminating the soft iron core.
(D) All of the above.

***Space for Rough Work***

13. Arrange the following steps of determine the resistively of a material in the proper sequence.
(a) Switch on the circuit and take the voltmeter and ammeter readings.
(b) Determine the resistance of the wire as resistance R = V/I
(c) Connect the wire, battery and ammeter in series.
(d) Determine the length (*l*) and area of cross-section (A) of the wire
(e) Connect a voltmeter across the wire.
(f) The resistivity of the material is $\rho = RA/l$
(A) e b c d f a (B) a c b e d f (C) c e a b d f (D) b c a d f e

14. A bird is flying 12 m above the surface of a pond. What is the apparent position of the bird as viewed by a fish 1m below the surface? $\left( {}_a\mu_w = \frac{4}{3} \right)$
(A) 16 (B) 17 (C) 18 (D) 12

15. Total reflecting prisms are _____ prism.
(A) right angled (B) acute angled isosceles
(C) right angled isosceles (D) obtuse angled isosceles

***Space for Rough Work***

# SECTION - II

## CHEMISTRY

16. In given compounds which one is most ionic compound ?
(A) NaCl (B) CsF (C) $MgCl_2$ (D) LiBr

17. pH of 0.00005 M $H_2SO_4$ solution is :
(A) 4 (B) 5 (C) 6 (D) 7

18. $CH_3COOH + CH_3CH_2OH \xrightarrow{dil\ H_2SO_4} A$ ; A is :
(A) Ethyl methanoate (B) Methyl ethanoate
(C) Ethyl ethanoate (D) Methyl methanoate

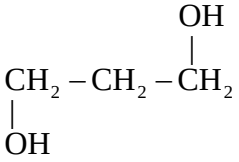
19. Nitric acid can't be used in place of sulphuric acid in labs for the preparation of hydrogen chloride as :
(A) It is more volatile that hydrochloric acid
(B) It is more volatile that sulphuric acid
(C) It reacts with hydrochloric acid
(D) It decomposes easily

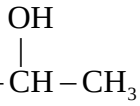
20. The IUPAC name of oxalic acid is :
(A) Ethanoic acid (B) Ethanol
(C) Ethanedioic acid (D) Ethanediol

***Space for Rough Work***

21. $CH_3 - CH = CH_2 \xrightarrow[dil\, H_2SO_4]{H_2O} A$; A is :

(A) $CH_3 - CH_2 - CH_2 - OH$

(B) 

(C) 

(D) $CH_3 - CH_2 - CH_2 - SO_3H$

22. What is aqua regia?
(A) 1 : 2 Mixture of Chromic acid and sulphuric acid
(B) 1 : 3 Mixture of Conc. HCl and Conc. $HNO_3$
(C) 1 : 1 Mixture of Conc. $H_2SO_4$ and Conc. HCl
(D) 1 : 3 Mixture of Conc. $HNO_3$ and Conc. HCl

23. From the list of elements given below which of the following option contains three metalloids?
(A) Si, Ge, Zr, Te (B) Si, P, S, Cl (C) As, Bi, Br, Kr (D) Po, Co, Fe, Xe

24. A student set-up an apparatus for finding the melting point of ice. When half the ice melted, the temperature shown by thermometer is :
(A) more than 0°C (B) less than 0°C
(C) zero degree Celsius (D) 100°C

25. In Benzene number of covalent bonds present :
(A) 18 (B) 12 (C) 6 (D) 15

***Space for Rough Work***

26. In following option, chose incorrect statement :
(A) Alcohols are colourless liquid and have fruity smell.
(B) On the oxidation of alcohols, we will obtain the aldehydes, ketones, carboxylic acids.
(C) Only primary alcohols can be obtained by using Grignard reagent.
(D) Alcohols are soluble in most of the organic liquid.

27. A mixture of iron filings and sulphur is heated gently in a hard glass test tube. The observation would be :
(A) sulphur will start melting first (B) iron will start melting first
(C) sulphur will sublime (D) both will melt at the same time

28. In given compounds. Which is present in red ant?
(A) HCOOH (B) $CH_3COOH$ (C) $CH_3CH_2O$ (D) $CH_4$

29. Marsh gas is :
(A) $CH_4$ (B) $C_2H_6$ (C) $CHCl_3$ (D) $NH_3$

30. The correct order of radii is :
(A) N < Be < B (B) $F^- < O^{2-} < N^{3-}$
(C) Na < Li < K (D) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

***Space for Rough Work***

# SECTION - III

## MATHS

31. If the LCM of the Polynomial $f(x) = (x + 1)^5 (x + 2)^a$ and $g(x) = (x + 1)^b (x + 2)^5$ is $(x + 1)^a (x + 2)^b$ then find the minimum value of a + b.
(A) 10 (B) 14 (C) 15 (D) 5

32. In a test of 50 questions, each correct answer fetches two marks and each wrong answer fetches –1/2 marks. A candidate attempted all the questions and scored 40 marks. How many questions did he/she attempt correctly.
(A) 24 (B) 26 (C) 22 (D) 20

33. If $y^2 + 6y – 3m = 0$ and $y^2 – 3y + m = 0$ have a common root then find the possible values of m.
(A) $0, -\frac{27}{16}$ (B) $0, -\frac{81}{16}$ (C) $0, \frac{81}{16}$ (D) $0, \frac{27}{16}$

34. Find the sum of the series 1 + (1 + 2) + (1 + 2 + 3) + ---------- + (1 + 2 + 3 + -------- +20).
(A) 1470 (B) 1540 (C) 1610 (D) 1370

35. Value of $\frac{\tan^3\theta - 1}{\tan\theta - 1}$ is
(A) $\sec^2\theta + \tan\theta$ (B) $\sec^2\theta – \tan\theta$ (C) 0 (D) $\tan\theta – \sec^2\theta$

***Space for Rough Work***

36. Value of $\sqrt{-4+\sqrt{8+16\cos ec^4\alpha+\sin^4\alpha}}$ is :

(A) cosec$\alpha$ - sin $\alpha$ (B) 2cosec $\alpha$ + sin $\alpha$

(C) 2cosec $\alpha$ - sin $\alpha$ (D) cosec $\alpha$ - 2sin $\alpha$

37. From a point on the ground, the angle of elevation of an aeroplane flying at an altitude of 500 m changes from 45° to 30° in 5 seconds. Find the speed of aeroplane (in km/h).

(A) 720 ($\sqrt{3}-1$) (B) 720 ($\sqrt{3}+1$) (C) 360 ($\sqrt{3}-1$) (D) 360 ($\sqrt{3}+1$)

38. Given f(x) is a cubic polynomial in x. If f(x) is divided by (x + 3), (x + 4), (x + 5) and (x + 6) then it leaves the remainder 0, 0, 4 and 6 respectively. Find the remainder when f(x) is divided by (x + 7).

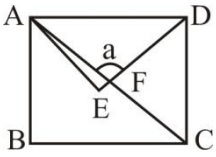
(A) 0 (B) 1 (C) 2 (D) 3

39. The arithmetic mean of the squares of first n natural numbers is :

(A) $\frac{(n+1)(2n+1)}{6}$ (B) $\frac{2n+1}{6}$ (C) $\frac{n^2-1}{6}$ (D) $\frac{n(n+1)}{4}$

***Space for Rough Work***

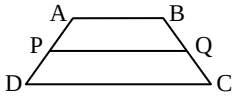
40. In the following figure ABCD is a square and AED is an equilateral triangle. Find the value of a.



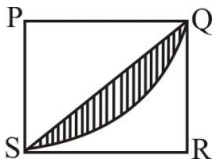

(A) 30° (B) 45° (C) 60° (D) 75°

41. In the given figure (not to scale) ABCD is an isosceles trapezium. $\overline{AB} \,||\, \overline{CD}$, AB = 9 cm and CD = 12 cm, AP : PD = BQ : QC = 1 : 2 find PQ.

(A) 11 cm
(B) 10.5 cm
(C) 10 cm
(D) 9.5 cm




42. In the figure PQRS is a square of diagonal $7\sqrt{2}$ cm. with P as the centre, the arc QS is drawn. Find the area of the shaded region (in $cm^2$)




(A) $\frac{49}{4}(\pi-2)$ (B) $\frac{49}{4}(\pi-1)$

(C) $\frac{49}{4}(\pi-3)$ (D) $\frac{49}{2}(\pi-2)$

***Space for Rough Work***

43. A rectangular sump has an inner length and breadth of 24m and 20m respectively. Water flows through an inlet pipe at 180 m per minute. The cross sectional area of the pipe is 0.5 $m^2$. The tank takes half an hour to get filled. Find the depth of the sump (in m)

(A) 4.625 (B) 6.125

(C) 5.625 (D) 5.125

44. Find the area of triangle formed by the line $5x-3y+15=0$ with co-ordinate axes.

(A) 15 $cm^2$ (B) 5 $cm^2$ (C) 8 $cm^2$ (D) $\frac{15}{2}cm^2$

45. The distance between the points $(2k+4, 5k)$ and $(2k, -3+5k)$ in units is :

(A) 1 (B) 2 (C) 4 (D) 5

***Space for Rough Work***