


IIT
KALRASHUKLA
A Class Apart

CLASS – 11th (ENGINEERING)

Time : 90 minutes

Maximum Marks : 180

-: Important Instructions :-

- (i) Use only Black Ball Point pen.
- (ii) This test booklet contains 4 Sections of question paper consisting of
SECTION - I → PHYSICS (10 Questions)
SECTION - II → CHEMISTRY (10 Questions)
SECTION - III → MATHS (10 Questions)
SECTION - IV → MENTAL ABILITY & REASONING (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.

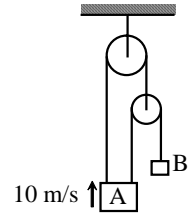
Name of Student (in Capital Letter) : _____

Candidate Signature : _____

Invigilator Signature : _____

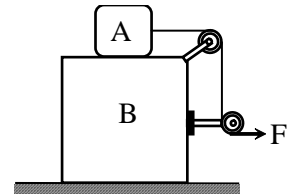
SECTION - I**PHYSICS**

1. At a certain moment of time velocity of A is 10 m/s upward. The velocity of B at that time will be
 (A) 30 m/s downward
 (B) 20 m/s downward
 (C) 10 m/s downward
 (D) 5 m/s downward



2. A body has an initial velocity of 3 ms^{-1} and has an acceleration of 1 ms^{-2} normal to the direction of the initial velocity. Then its velocity, 4 second after the start is
 (A) 7 ms^{-1} along the direction of initial velocity
 (B) 7 ms^{-1} along the normal to the direction of the initial velocity
 (C) 7 ms^{-1} mid-way between the two directions
 (D) 5 ms^{-1} at an angle of $\tan^{-1} \frac{4}{3}$ with the direction of the initial velocity
3. A particle moves one quarter of a circular path of radius 20 m in 10 s. The magnitude of average velocity of the particle is
 (A) 2.83 m/s (B) 2.73 m/s (C) 2.93 m/s (D) 2.63 m/s

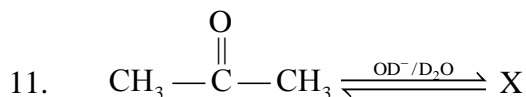
4. In the arrangement shown in figure $m_A = m_B = 2\text{kg}$. String is massless and pulley is frictionless. Block B is resting on a smooth horizontal surface, while friction coefficient between blocks A and B is $\mu = 0.5$. The maximum horizontal force F can be applied so that block A does not slip over the block B is. ($g = 10 \text{ m/s}^2$)
 (A) 25 N (B) 40 N (C) 30 N (D) 20 N



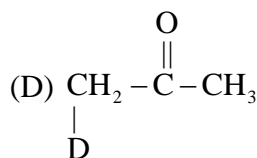
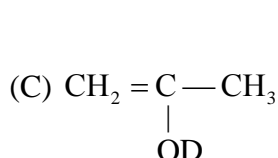
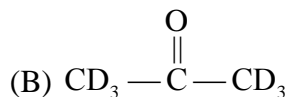
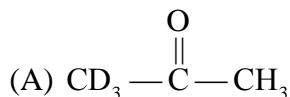
Space for Rough Work

5. Work done in time t on a body of mass m accelerated from rest to a speed v in time t_1 as function of time t is
- (A) $\frac{1}{2} \frac{mvt^2}{t_1}$ (B) $\frac{mvt^2}{t_1}$ (C) $\frac{1}{2} \left(\frac{mv}{t_1} \right)^2 t^2$ (D) $\frac{1}{2} m \left(\frac{vt}{t_1} \right)^2$
6. Two particles having position vectors $\vec{r}_1 = (3\hat{i} + 5\hat{j})$ metres and $\vec{r}_2 = (-5\hat{i} - 3\hat{j})$ metres are moving with velocities $\vec{v}_1 = (4\hat{i} + 3\hat{j})$ and $\vec{v}_2 = (a\hat{i} + 7\hat{j})$ m/s. If they collide after 2 seconds, the value of a is
- (A) 2 (B) 4 (C) 6 (D) 8
7. Under a constant torque, the angular momentum of a body changes from A to $4A$ in 4 seconds, the torque is
- (A) $\left(\frac{3}{4} \right) A$ (B) $\left(\frac{1}{4} \right) A$ (C) $3A$ (D) $\left(\frac{4}{3} \right) A$
8. If the value of escape velocity on a planet is $2\sqrt{\frac{GM}{K}}$ the radius of the planet will be
- (A) $0.5 K$ (B) K (C) $2K$ (D) $5K$
9. An elongation of 0.1% in a wire of cross-sectional area 10^{-6} m^2 causes a tension of 100 N. The Young's modulus is
- (A) 10^{12} N/m^2 (B) 10^{11} N/m^2 (C) 10^{10} N/m^2 (D) 10^2 N/m^2
10. The pressure just below the meniscus of water
- (A) is greater than just above it (B) is lesser than just above it
(C) is same as just above it (D) is always equal to atmospheric pressure

Space for Rough Work

SECTION - II**CHEMISTRY**

The compound X will be :



12. In the given reversible reaction $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$ According to Le-chatitier's principle if we increase the pressure of the reversible system then :-

- (A) Concentration of all will increase
 (B) Concentration of all will decrease
 (C) Concentration of PCl_3 will decrease
 (D) Concentration of PCl_5 will decrease

13. The oxidation number of sulphur(s) in $\text{Na}_2\text{S}_2\text{O}_3$ is :

- (A) 2 (B) 0, + 4 (C) -2, + 6 (D) 3, 3

14. One gm of dry green algae absorbs 4.7×10^{-3} moles of CO_2 per hour by photosynthesis if the fixed carbon atoms after photosynthesis stored in the form of starch [Mole formula $(\text{C}_6\text{H}_{10}\text{O}_5)_n$]. Calculate how much time will it take to algae to double its own weight.

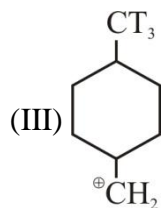
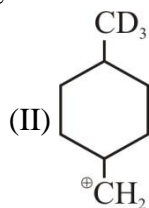
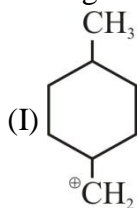
- (A) 2.2 hour (B) 8.8 hour (C) 10.0 hour (D) 1.2 hour

Space for Rough Work

15. In nature of π -bond in the compound XeOF_4 is
(A) $3d_{\pi} - 2p_{\pi}$ (B) $5d_{\pi} - 2p_{\pi}$ (C) $4d_{\pi} - 2p_{\pi}$ (D) $4d_{\pi} - 3p_{\pi}$
16. 10 mL of gaseous organic compound contain C, H and O only was mixed with 100 mL of O_2 and exploded under identical conditions and then cooled. The volume left after cooling was 90 mL. On treatment with KOH a contraction of 20 mL was observed. If vapour density of compound is 23, if molecular formula of the compound is $\text{C}_x\text{H}_y\text{O}_z$, then find $(x + y + z)$.
(A) 8 (B) 9 (C) 6 (D) 11
17. According to Bohr's model of hydrogen atom the electric current generated due to motion of electron in n^{th} orbit is :
(A) $\frac{4\pi^2 m k^2 e^4}{n^2 h^2}$ (B) $\frac{4\pi^2 m k^2 e^5}{n^2 h^2}$ (C) $\frac{n^2 h^2}{4\pi^2 m k^2 e^5}$ (D) $\frac{4\pi^2 m k^2 e^5}{n^3 h^3}$

Space for Rough Work

18. Arrange the following in the correct order of their stability.



(A) I = II = III

(B) III > II > I

(C) I > II > III

(D) I > III > II

19. The correct order of solubility of sulphates of alkaline earth metals are

(A) $\text{BeSO}_4 > \text{MgSO}_4 > \text{SrSO}_4 > \text{CaSO}_4$

(B) $\text{BeSO}_4 > \text{MgSO}_4 > \text{CaSO}_4 > \text{SrSO}_4$

(C) $\text{BeSO}_4 > \text{MgSO}_4 < \text{CaSO}_4 < \text{SrSO}_4$

(D) $\text{MgSO}_4 < \text{CaSO}_4 < \text{SrSO}_4 > \text{BeSO}_4$

20. The volume of 10 volume H_2O_2 solution that decolourizes 200 ml of 2N KMnO_4 solution in acidic medium is

(A) 112 ml

(B) 336 ml

(C) 200 ml

(D) 224 ml

Space for Rough Work

SECTION - III**MATHS**

21. Numbers greater than 1000 but not greater than 4000 which can be formed with the digits 0, 1, 2, 3, 4 (repetition of digits is allowed), are
(A) 350 (B) 375 (C) 450 (D) 576
22. If the arithmetic and geometric means of a and b be A and G respectively, then the value of $A - G$ will be
(A) $\frac{a-b}{a}$ (B) $\frac{a+b}{2}$ (C) $\left[\frac{\sqrt{a}-\sqrt{b}}{\sqrt{2}}\right]^2$ (D) $\frac{2ab}{a+b}$
23. Let α, β be the roots of $x^2 + (3-\lambda)x - \lambda = 0$. The value of λ for which $\alpha^2 + \beta^2$ is minimum, is
(A) 0 (B) 1 (C) 2 (D) 3
24. The number of integral terms in the expansion of $(5^{1/2} + 7^{1/6})^{642}$ is
(A) 106 (B) 108 (C) 103 (D) 109
25. If $\sin \theta + \sin \phi = a$ and $\cos \theta + \cos \phi = b$, then $\tan \frac{\theta - \phi}{2}$ is equal to
(A) $\sqrt{\frac{a^2 + b^2}{4 - a^2 - b^2}}$ (B) $\sqrt{\frac{4 - a^2 - b^2}{a^2 + b^2}}$ (C) $\sqrt{\frac{a^2 + b^2}{4 + a^2 + b^2}}$ (D) $\sqrt{\frac{4 + a^2 + b^2}{a^2 + b^2}}$

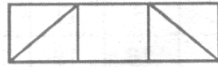
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26. The equation of the base of an equilateral triangle is $x + y = 2$ and the vertex is $(2, -1)$. The length of the side of the triangle is
(A) $\sqrt{3/2}$ (B) $\sqrt{2}$ (C) $\sqrt{2/3}$ (D) $\sqrt{3}$
27. If the line $x + 2by + 7 = 0$ is a diameter of the circle $x^2 + y^2 - 6x + 2y = 0$, then b is equal to
(A) 3 (B) -5 (C) -1 (D) 5
28. The latus rectum of a parabola whose directrix is $x + y - 2 = 0$ and focus is $(3, -4)$, is
(A) $-3\sqrt{2}$ (B) $3\sqrt{2}$ (C) $-3/\sqrt{2}$ (D) $3/\sqrt{2}$
29. If the eccentricities of the hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$ be e and e_1 , then $\frac{1}{e^2} + \frac{1}{e_1^2} =$
(A) 1 (B) 2 (C) 3 (D) 4
30. If in a triangle ABC, angle C is 45° , then $(1 + \cot A)(1 + \cot B) =$
(A) -1 (B) 2 (C) 3 (D) $1/\sqrt{2}$

Space for Rough Work

SECTION -IV**MENTAL ABILITY & REASONING**

31. How many quadrilaterals are there in the following figure ?



- (A) 11 (B) 8 (C) 2 (D) 4
32. Find the wrong term -
9, 11, 15, 23, 39, 70, 135
(A) 23 (B) 39 (C) 70 (D) 135
33. A watch reads 4 : 30. If the minute - hand points to East, in which direction does the hour-hand point ?
(A) North-East (B) South-East (C) North-West (D) North
34. The time in the clock is 4 : 46, what is the mirror image ?
(A) 7 : 24 (B) 7 : 14 (C) 7 : 14 (D) 7 : 24
35. Neelam, who is Rohit's daughter, says to Indu, "Your mother Reeta is the younger sister of my father, who is the third child of Sohanji. " How is Sohanji related to Indu ?
(A) Maternal-uncle (B) Grandfather
(C) Father (D) Father-in-law

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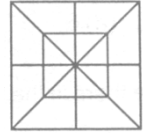
36. If the seventh day of month is three days earlier than Friday, what day will it be one the nineteenth day of the month ?
(A) Sunday (B) Monday (C) Wednesday (D) Friday
37. Sum of the Proper divisors of 100.
(A) 217 (B) 216 (C) 116 (D) 117
38. Sanjay went 70 metres in the East before turning to his right. He went 10 metres before turning to his right again and went 10 metres from this point. From here he went 90 metres to the North. How far was he from the starting point ?
(A) 80 metres (B) 100 metres (C) 140 metres (D) 260 metres
39. If **RAT** = 42 and **CAT** = 57, then **LATE** = ?
(A) 60 (B) 70 (C) 64 (D) 74
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Space for Rough Work

Direction 40: Which sequence of letter when placed at the blanks one after the other will complete the given letter series ?

40. abc_d_bc_d_db_cda
(A) bacdc (B) cdabc (C) dacab (D) dccbd

41. Count the number of triangles and squares in the following figure ?
(A) 28 triangles, 10 squares
(B) 28 triangles, 8 squares
(C) 32 triangles, 10 squares
(D) 32 triangles, 8 squares.



Direction 42 : Six friends are sitting around a circular table at equal distances from each other. Ramola is sitting two places right of Komolika who is exactly opposite to Anu. Anu is sitting on the immediate left of Pallavi, who is exactly opposite to Mandira, natasha is also sitting at the table.

42. Which of the following statements is not correct ?
(A) Natasha and Ramola are exactly opposite to each other.
(B) Mandira and Natasha are at equal distance from Komolika.
(C) Angle subtended by Manidra and Natasha is same at the angle subtended by Ramola and Pallavi at the centre of the table.
(D) Natasha is on the immediate left of Pallavi.

Space for Rough Work

