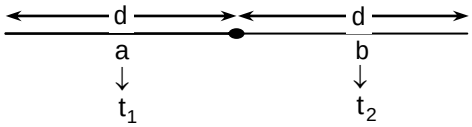
SOLUTION BOOKLET
9th moving 10th

MAGNET TALENT SEARCH EXAM
(FOR CLASS: VII, VIII, IX, X, & XI STUDYING STD'S)
SUNDAY, 01 OCTOBER 2023

EASY LEVEL

PHYSICS

Sol.1 **[C]**

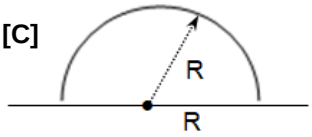


$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

$$v_{av} = \frac{2d}{t_1 + t_2} = \frac{2d}{\frac{d}{a} + \frac{d}{b}} = \frac{2d}{\frac{db + ad}{ab}}$$

$$v_{av} = \frac{2abd}{d(a+b)} = \frac{2ab}{a+b}$$

Sol.2 **[C]**



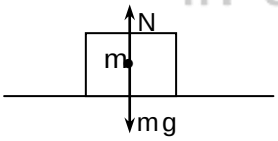
$$\text{Distance}(L) = \pi R \Rightarrow \frac{\text{Dist}}{\text{Disp}} = \frac{\pi R}{2R} = \frac{\pi}{2}$$

Sol.3 **[B]** $f = 5N,\ a_1 = 8\,m/s^2$ | $f = 5N, a_2 = 24\ m/s^2$ | $f = 5N, M = (m_1 + m_2) = \frac{5}{8} + \frac{5}{24} = \frac{15+5}{24} = \frac{20}{24} = \frac{5}{6}kg$

$m_1 = \frac{f}{a_1} = \frac{5}{8}kg,$ | $m_2 = \frac{f}{a_2} = \frac{5}{24}kg$ | $M = \frac{5}{6}kg,\ a = \frac{f}{M} = \frac{5}{6} = 6\,m/s^2$

Sol.4 **[A]** Due to inertia of motion.

Sol.5 **[A]** $W = mg = 2 \times 9.8 = 19.6N$



CHEMISTRY

Sol.6 **[D]** Filtration as a method of separation can be used for mixtures that are heterogeneous and solid-in-liquid mixtures. Example: Sand in water.

Sol.7 **[C]**

1. Charge on electron = 1.6022×10^{-19} coulombs
Charge on proton = 1.6022×10^{-19} coulomb
So first option is correct

2. Neutron is a neutral in nature so second option is also correct.

3. Mass of electron = $9.1093837 \times 10^{-31}$ kilograms
Mass of proton = $1.67262192 \times 10^{-27}$ kilograms
So, this is incorrect.

4. Mass of proton = $1.67262192 \times 10^{-27}$ kilograms
Mass of neutron = $1.674*10^{-27}$ kg.

Sol.8 **[C]** Formula unit mass of K_2CO_3 = 2 × Atomic mass of K + Atomic mass of C + 3 × Atomic mass of O = 2 × 39 u + 12 u + 3 × 16 u = 78 u + 12 u + 48 u = 138 u Therefore , the formula unit of K_2CO_3 is 138 g.

Sol.9 **[A]**

Sol.10 **[C]**

BIOLOGY

Sol.11 [C]

Sol.12 [C]

Sol.13 [A]

Sol.14 [B]

Sol.15 [A]

MATHS

Sol.16 [D]

Sol.17 [B]

Sol.18 [B] $\sqrt[3]{\left(\frac{1}{64}\right)^{-2}} = \left(\frac{1}{64}\right)^{-2/3}$

$= (64)^{2/3}$

$= 16$

Sol.19 [D]

Sol.20 [C] Area of square $= x^2$

Area of triangle $= \frac{1}{2} x\, h$

Given $x^2 = \frac{1}{2} x h$

$h = 2x$

Sol.21 [D] All three points satisfied the equation x + y = 0

Sol.22 [B]

Sol.23 [C] x + 4 = - 8

x = - 12

Sol.24 [D] Let angle is x

complement angle of $x = 90^o - x$

supplement angle of $x = 180^o - x$

given $3\left(90^o - x\right) = 180^o - x$

$270^o - 3x = 180^o - x$

$90^o = 2x$

$x = 45^o$

Sol.25 [B] $\angle ECD = \angle B$

[corresponding angle]

$\angle B = 65^o$

$\angle A = 60^o$

Then $\angle C = 55^o$ (By Angle sum property of Triangle)

Sol.26 [C] (a – b) + (b – c) + (c – a) = 0

So $(a-b)^3 + (b-c)^3 + (c-a)^3 = 3\,(a-b)\,(b-c)\,(c-a)$

Sol.27 [C]

Sol.28 [C]

Sol.29 [A] By Reminder theorem

$x+1=0$

$x = -1$

Put in $x^{11}+1$

$P(-1)=(-1)^{11}+1=0$

Sol.30 [C]

$\angle A+\angle B+\angle C = 180^\circ$

$\angle B+\angle C = 180^\circ - \angle A$

In $\triangle BOC$, we have

$\frac{\angle B}{2} + \frac{\angle C}{2} + \angle O = 180^\circ$

$\angle BOC = 90^\circ + \frac{\angle A}{2}$

Sol.31 [C]

MODERATE LEVEL

PHYSICS

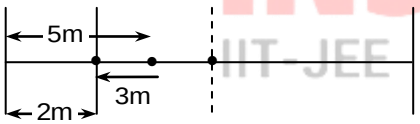
Sol.32 [B] Slope of displacement time graph gives us = velocity of object.

slope (m) = $\tan\theta$

$$\frac{\text{Velocity of P}}{\text{Velocity of Q}} = \frac{\tan 30^o}{\tan 60^o} = \frac{1}{\sqrt{3}\times\sqrt{3}} = \frac{1}{3}$$

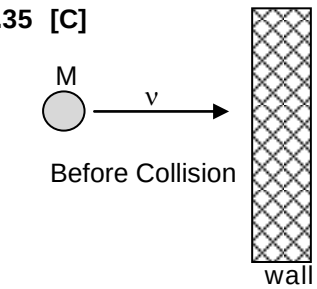
Sol.33 [D] When body reaches its maximum height, its velocity (vertical component of velocity) becomes zero, but it is acted upon by acceleration due to gravity towards center of earth.

Sol.34 [B]



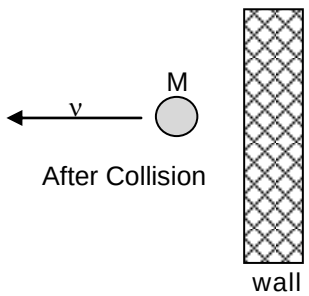
in Ist 8 secs the drunkard is 2m away from his initial position, similarly in next 8 sec (16sec) drunkard is 4m away from his initial position. Similarly in next 8 sec (24 sec) drunkard is at 6m away from his initial position. Now as drunkard take 5 step forward, drunkard will fall into the pit at 29 sec.

Sol.35 [C]



Sign convention ⟶ +ve (left to right) are taken +ve.

⟵ -ve



$P_i = m\nu$

$P_f = m(-\nu) = -m\nu$

Change in momentum.

$\Delta P = P_f - P_i = -M\nu - (m\nu)$

$\Delta P = -2m\nu$

Sol.36 [B] m = 400 kg initial speed (u) = 20m/s, t = 20s, final speed (ν)=0 m/s using

$v = u + at \Rightarrow 20a = -20$

$O = 20 + a(20) \qquad a = \frac{-20}{20} = -1\ m/s^2$

$F = ma$

$F = 400\ (-1)$

$F = -400\ N$

-ve sign shows regarding force.

CHEMISTRY

Sol.37 [B] $S = Calcium(Ca)$ with valency of calcium is two

R = Sulpher (S) with valency of also two so it form molecule CaS. and act as SR.

Sol.38 [C] When electron goes from lower to higher orbital it absorb energy when it goes from higher to lower it release energy.

Sol.39 [A] Isotopes it is that atom which have same atomic number but different atomic mass so Q,R,S have same atomic number and different atomic mass.

Sol.40 [A] A nucleon is either a proton or a neutron, considered in its role as a component of an atomic nucleus. The number of nucleons in a nucleus defines the atom's mass number (nucleon number).

Atomic mass = number of proton + number of neutron.

$x^{3-} = phosphorus(P)$

Number of proton in phosphorus is 15 and number of neutron is 16.

So atomic mass is 31.

Sol.41 [C] Which gas have low boiling point that convert first into gas and this gas convert into liquid by condensation process.

BIOLOGY

Sol.42 [D]

Sol.43 [D]

Sol.44 [B]

Sol.45 [A]

Sol.46 [B]

MATHS

Sol.47 [B] Given, $x = 7 + 4\sqrt{3}$

$$\therefore \frac{1}{x} = \frac{1}{(7+4\sqrt{3})} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$$

$$= \frac{7-4\sqrt{3}}{(49-48)}$$

$$= 7 - 4\sqrt{3}$$

Now,

$$x + \frac{1}{x} = (7 + 4\sqrt{3}) + (7 - 4\sqrt{3})$$

$= 14$

$$\Rightarrow \left(x + \frac{1}{x}\right)^2 = (14)^2$$

$$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 196$$

$$\therefore x^2 + \frac{1}{x^2} = 194$$

Sol.48 [C]

Area of parallelogram ABCD= ar△ABD + ar△BDC

But ar△ABD = ar△BDC

∴Area of parallelogram ABCD= 2ar△ABD

Now, $ar\triangle ABD = \sqrt{s(s-a)(s-b)(s-c)}, s = \frac{a+b+c}{2} = \frac{51+20+37}{2} = 54cm$

$\therefore ar\triangle ABD = \sqrt{54(54-51)(54-20)(54-37)} = \sqrt{54\times 3\times 34\times 17}$

$= \sqrt{9\times 2\times 3\times 3\times 2\times 17\times 17} = 2\times 3\times 3\times 17 = 306cm^2$

∴area of parallelogram ABCD= $2\times 306 = 612cm^2$

Sol.49 [D]

Area of the square = a^2

Area of an equilateral triangle with length of side a = $\frac{\sqrt{3}}{4}a^2$

$\therefore$ ratio of their areas = $a^2 : \frac{\sqrt{3}}{4}a^2 = 1 : \frac{\sqrt{3}}{4} = 4 : \sqrt{3}$

Sol.50 [D]

Sol.51 [C]

Sol.52 [B] $\angle ECD + 150^o = 180^o$ (Cointerior angles are supplementary)

$\angle ECD = 30^o$

$\angle BCD = 30^o + 25^o = 55^o$

$x = 55^o$ (alternate interior angles)

Sol.53 [A] $9^{x-1} = 3^{2x-1} - 486$

$\Rightarrow 3^{2x-2} = 3^{2x-1} - 486$

$\frac{(3^x)^2}{9} = \frac{(3^x)^2}{3} - 486$

Let $3^x = y$

$\frac{y^2}{9} = \frac{y^2}{3} - 486$

$486 = \frac{y^2}{3} - \frac{y^2}{9}$

$486 = \frac{2y^2}{9}$

$y^2 = 2187$

$2x = 3^7$

$2x = 7$

$x = 3.5$

Sol.54 [A] $\left[(x^{a-a^{-1}})^{\frac{1}{a-1}}\right]^{\frac{a}{a+1}}$

$= \left[(x^{\frac{a^2-1}{a}})^{\frac{1}{a-1}}\right]^{\frac{a}{a+1}}$

$= \left[x^{\frac{a+1}{a}}\right]^{\frac{a}{a+1}}$

$= x$

Sol.55 [B] $\frac{2}{\sqrt{5}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{2}}-\frac{3}{\sqrt{5}+\sqrt{2}}$

Rationalization all terms

$\sqrt{5}-\sqrt{3}+\sqrt{3}-\sqrt{2}-\sqrt{5}+\sqrt{2}$

= 0

Sol.56 [D] $\left(x^3-\frac{1}{x^3}\right)=14$

$\left(x-\frac{1}{x}\right)^3=x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)$

$\left(x-\frac{1}{x}\right)^3+3\left(x-\frac{1}{x}\right)=14$

Let $\left(x-\frac{1}{x}\right)=y$

$y^3+3y-14=0$

y = 2 is root of the given equation.

$x-\frac{1}{x}=2.$

Sol.57 [C] By remainder theorem

$R_1=2^3+2\,(2)^2+2(2)-4$

= 16

$R_2=2^3+2(2)^2-3(2)+6$

= 16

Sol.58 [A]

Sol.59 [B] According to the condition in the △ABC, 2∠A=3∠B=6∠C

⇒∠A=3∠C and, ∠B=2∠C

Sum of interior angles of the triangle is 180^o

Hence $\angle A+\angle B+\angle C=180^o$

$\Rightarrow 3\angle C+2\angle C+\angle C=180^o$

$\Rightarrow \angle C=30^o$

$\therefore \angle A=90^o, \angle B=60^o, \angle C=30^o$

Sol.60 [A]

Sol.61 [B] Both line intersect at (-1, 1)

Sol.62 [B] Given straight line is 3x−4y=12

this line have x intercept (4) & y- intercept (-3)

Length of line segment between (4, 0) and (0, -3) is 5 (By Pythagoras Theorem)
Let h is perpendicular from origin on straight line

Area of triangle formed by both axis and given straight line = $\frac{1}{2} \times 3 \times 4 = 6$ units

Area of triangle perpendicular from origin on straight line = $\frac{1}{2} \times 5 \times h$

$h = \frac{12}{5} = 2.4$

DIFFICULT LEVEL

PHYSICS

Q63. **(D)** $F_1 = 5N, \quad u = 10 m/s, \nu = 20 m/s, t_1 = 5 sec; F_2 = ? \quad t_2 = 2 sec.$

using $\nu = \upsilon + at$

$a_1 = \frac{\nu - u}{t_1} \Rightarrow a_1 = \frac{20-10}{5} = \frac{10}{5} = 2\ m/s^2$

so using F = ma

$m = \frac{F_1}{a_1} = \frac{5}{2} = 2.5\ kg$

Again using $\nu = u + at$

$a_2 = \frac{\nu - u}{t_2} = \frac{20-10}{2} = \frac{10}{2} = 5 m/s^2$

$a_2 = 5 m/s^2$

so $F_2 = ma_2 = 2.5 \times 5 = 12.5 N$

Q64. **(A)** Length of train = ℓ meter.

Speed = $\frac{\ell}{15} m/s$ .....(1)

length to cross tunnel = $\ell + 450$

speed $= \frac{450 + \ell}{45}$ .....(2)

using equation (1) & (2)

$\frac{\ell}{15} \times \frac{450 + \ell}{45} \Rightarrow 15(450 + \ell) = 45\ell$

$\Rightarrow \ell = 225 m$

Q65. **(D)** Using sign convention as in question number 35.

total linear momentum of system before collision = total linear momentum of system after collision

$m_1u_1 + m_2u_2 = m_1\nu_1 + m_2\nu_2$

$\left(\frac{400}{1000}\right)(10) + (0.01)(-\nu) = \left(\frac{400}{1000} + 0.01\right) 0 \Rightarrow 4 - \frac{\nu}{100} = 0 \Rightarrow 4 = \frac{\nu}{100} \Rightarrow \quad \nu = 400$

CHEMISTRY

Sol.66 **[B]** Because this sample have not any components. Which are given

Sol.67 **[C]** Bakelite is insulator in nature.

Sol.68 **[A]** Which gas have low boiling point that convert first into gas and this gas convert into liquid by condensation process.

BIOLOGY

Sol69. **[C]**

Sol70. **[D]**

Sol71. **[A]**

Sol72. **[C]**

Sol.73 [C] $\frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{125}}$

$\Rightarrow \frac{15}{\sqrt{10}+2\sqrt{5}+2\sqrt{10}-5\sqrt{5}} = \frac{15}{3\sqrt{10}-3\sqrt{5}}$

$\Rightarrow \frac{15}{3(\sqrt{10}-\sqrt{5})} = \frac{5}{\sqrt{10}-\sqrt{5}} \times \frac{\sqrt{10}+\sqrt{5}}{\sqrt{10}+\sqrt{5}}$

$= \sqrt{5}\left[\sqrt{2}+1\right]$

Sol.74 [D] $\sqrt{2+\sqrt{3}} = \sqrt{\left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{\sqrt{3}}{\sqrt{2}}\right)^2 + 2 \times \frac{\sqrt{3}}{\sqrt{2}} \times \frac{1}{\sqrt{2}}}$

$= \sqrt{\left(\frac{\sqrt{3}}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right)^2}$

$= \frac{\sqrt{3}}{\sqrt{2}} + \frac{1}{\sqrt{2}}$

Similarly $\sqrt{2-\sqrt{3}} = \frac{\sqrt{3}}{\sqrt{2}} - \frac{1}{\sqrt{2}}$

$\sqrt{2+\sqrt{3}} + \sqrt{2-\sqrt{3}}$

$= \frac{\sqrt{3}}{\sqrt{2}} + \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{\sqrt{2}} - \frac{1}{\sqrt{2}}$

$= 2\frac{\sqrt{3}}{\sqrt{2}} = \sqrt{2} \times \sqrt{3} = \sqrt{6}$

Sol.75 [C]

Heron's formula states for a triangle with sides of lengths a,b,c

$A = \sqrt{[s * (s-a) * (s-b) * (s-c)]}$

where s = (a+b+c)/2

If you double the sides $A = \sqrt{[2s * (2s-2a) * (2s-2b) * (2s-2c)]}$

$= 4*A = \sqrt{[s * (s-a) * (s-b) * (s-c)]} = 4*A$

The increase in area is 4*A-A = 3*A so the

Answer (C) 300%

Sol.76 [A] Let $2^x = 4^y = 8^z = k$

$2 = k^{\frac{1}{x}}$

$4 = k^{\frac{1}{y}}$

$2^2 = k^{\frac{1}{y}}$

$k^{\frac{2}{x}} = k^{\frac{1}{y}}$

$$\frac{2}{x}=\frac{1}{y}$$

$$y=\frac{x}{2}$$

$$8=k^{\frac{1}{z}}$$

$$2^3=k^{\frac{1}{z}}$$

$$k^{3/x}=k^{\frac{1}{z}}$$

$$\frac{3}{x}=\frac{1}{z}$$

$$z=\frac{x}{3}$$

$$\frac{1}{2x}+\frac{1}{4y}+\frac{1}{4z}=4$$

$$\frac{1}{2x}+\frac{2}{4x}+\frac{3}{4x}=4$$

$$\frac{2+2+3}{4x}=4$$

$$7=16x$$

$$x=\frac{7}{16}$$

Sol.77 [D] $x=\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}$

$x=2+\sqrt{3}$

Put value of x in x^3-2x^2-7x+5

$(2+\sqrt{3})^3-2(2+\sqrt{3})^2-7(2+\sqrt{3})+5$

$=(2+\sqrt{3})\left[(2+\sqrt{3})^2-2(2+\sqrt{3})-7\right]+5$

$=(2+\sqrt{3})[4+3+4\sqrt{3}-4-2\sqrt{3}-7]+5$

$=(2+\sqrt{3})[-4+2\sqrt{3}]+5$

$=-2[2+\sqrt{3}][\sqrt{3}-2]+5$

$=-2(1)+5$

$=3$

Sol.78 [D] Here since ABCD is a square, A has same x-co-ordinate as that of b and same y co-ordiante as that D

$\therefore m=-2, n=-3,$

Similarly for C, p = 7 and q = 6

$y=x-1$, is satisfying (-2, -3) and (7, 6)

Sol.79 [C]

Since the divisor is quadratic, the remainder in general is assumed to be linear.

Thus remainder =ax+b.

∴f(x)= Quotient ×(x−1)(x+1)+ Remainder

But by remainder theorem,

f(1)=2 and f(−1)=6

∴a+b=2 and −a+b=6

By Solving, we have

a=-2 and b=4

∴ The remainder is -2x + 4

Sol.80 [C]

circle inscribed in it.

In ΔABC,

Area of $\Delta ABC, \Delta = \frac{\sqrt{3}}{4}a^2$

Semi-perimeter of $\Delta ABC, s = \frac{3a}{2}$

$\therefore$ Radius of in-circle, $r = \frac{\Delta}{s} = \frac{\frac{\sqrt{3}}{4}a^2}{\frac{3a}{2}} = \frac{a}{2\sqrt{3}}$

Diagonal of square PQRS $= 2r = 2 \times \frac{a}{2\sqrt{3}} = \frac{a}{\sqrt{3}}$

$\therefore$ Area of square $= \frac{\text{diagonal}^2}{2} = \frac{\left(\frac{a}{\sqrt{3}}\right)^2}{2} = \frac{a^2}{6}$

SECTION – B

MENTAL ABILITY

Sol.81 [A]

Sol.82 [A]

Sol.83 [C] Clearly, the series is of pattern = x, x × 3 and so on.

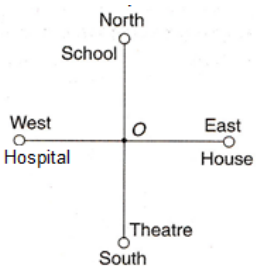
Sol.84 [D] Clearly as except (D) all are divisible by 3.

Sol.85 [B] By comparing the word 'SKY' and coded word 'RJX'. We get R is used for S, J is used for K and X is used for Y. Hence, it is clear that each letter of word SKY stands as corresponding letter of word RJX. By applying same principle for SNOW. We get coded word 'RMNV'. Therefore 'b' is the correct answer.

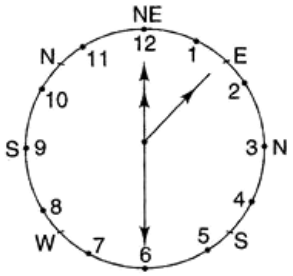
Sol.86 [D] In the second and third statements, the common word is 'gives' and the common code is 'wop'. So 'wop' means 'gives'. Hence, the answer the (D).

Sol.87 [D] From 2nd and 3rd statements, we can find the code for 'home'. To find the code for 'they', we need the code for 'go' which can not be determined from the data. Thus data is inadequate to find the code for 'they'.

Sol88. [A] Starting from his house which is eastward, and moves westward comes at O, the crossing. To his left is theatre (South) and straight i.e. towards West, there is a hospital. So obviously his school is toward North.



Sol.89 **[C]** Diagram is shown as per the conditions in the question. Clearly at 1 : 30 p.m. the hour hand shall point East.



Sol.90 **[C]** Sohan's son's uncle means Sohan's brother. So, the old man's son is Sohan's brother, i.e. the old man is the father of Sohan. The answer is (C).

Sol.91 **[D]** Studying the statements carefully, was find that B is the brother of A and A's son is the brother of D, so D is the daughter of A. Since C and D are sisters, so C is also the daughter of A. Thus B is the uncle of C.

Sol.92 **[B]**

Sol.93 **[A OR D]**

Sol.94 **[B]**

Sol.95 **[D]**

Sol.96 **[B]** As 1990 was not a leap year, it would have one odd day. Thus, the same date in the following year would fall on Tuesday.

Sol.97 **[B]** Number of odd days in 1600 years = 0
Number of odd days in 300 years = 1
Number of leap years in 46 years = 11
Number of odd days in 46 years = 35
$11\times 2+35\times 1=22+35=57=1$
Number of odd days in year 1980 up to 15th August = 31+28+31+30+31+30+31+15=227 = 1
Total number of odd days = 1+1+3=5
Therefore, the day on 15th August, 1947 was Friday.

Sol.98 **[C]**

(Left) ~~D~~ ~~M~~ 12^{th} (Right)

After Interchanges

22(Left) ~~D~~ 12(Right)

Total students = 22 + 12 – 1 = 33

Sol.99 **[D]** If first figure cube is rotated anticlockwise then it will look like third figure, so opposite to number 2, it is number 5.

Sol.100 **[C]** From figures-1 and 2 only we can see that opposite to face with number 6 is number 1.