Solution

11TH STD MSAT

Class 11 - Admission Test

Physics

1.

(d) Between the pole of the mirror and its principal focus.

Explanation:

When an object is placed between the pole and the principal focus of a concave mirror, a virtual and erect, and an enlarged image is formed behind the mirror.

2. **(a)** At X

Explanation:

If the image is to be produced at 2F, in case of a convex lens, then the object needs to be placed at X (2F)

3.

(d) straight line

Explanation:

If a graph drawn between the potential difference and current the graph is found to be a straight line passing through the origin. From the graph, we see that Potential difference (V) and current (I) directly proportional to one another.

4.

(b) Half

Explanation:

When the potential difference is constant and the resistance of a circuit is doubled, the current becomes half.

5.

(d) 2Ω

Explanation:

The resistance of each resistor = $\frac{1}{2}\Omega$

Maximum resistance can be found when the resistors are conned in series combination.

Thus for series combination

$Re = R_1 + R_2 + R_3 + R_4$

$Re = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{4}{2}$

$Re = 2\ \Omega$

6.

(b) Kilowatt-hour

Explanation:

Kilowatt-hour is the commercial unit of energy.

7.

(d) 6W

Explanation:

We know that power is calculated as P = VI. Substituting the values of V and I we get P = 6W.

8.

(d) (i) straight, (ii) circular

Explanation:

(i) straight, (ii) circular

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9.

(d) Current flowing through the solenoid is saturated.

Explanation:

Current flowing through the solenoid is saturated.

10. **(a)** Soft iron

Explanation:

Soft iron

11.

(b) 15 A

Explanation:

The power circuit with a 15 A fuse is used for running the electric heater, electric iron, geyser, refrigerator, etc. as it draws more current.

12.

(b) Focus

Explanation:

Focus is the point where the rays parallel to the principal axis on reflection from a concave mirror converge (real point) after reflection, or in case of a convex mirror, rays seem to diverge away (virtual point) from focus after reflection. The distance of focus from pole is called focal length (f).

13.

(d) Refraction

Explanation:

Refraction

14.

(c) Convex lens

Explanation:

Convex lens

15.

(d) Is scattered the least by smoke or fog

Explanation:

The red color of the danger signal installed at the top of a tall building can be easily seen from a distance than other colors because red color, having the longest wavelength, is scattered least by smog or fog than other colors and that's why it is visible from a distance.

16.

(b) ∞

Explanation:

Image of an object at 2f will be at 2f, while it will be at ∞, if object is at f.

17. **(a)** Potential difference

Explanation:

Potential difference is the measure of the work done in moving a unit charge across two points in an electric circuit.

18.

(c) 15000 J

Explanation:

The heat developed in 30 seconds is 15000 Joules.

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19. **(a)** $\lambda v < \lambda y < \lambda r$

Explanation:

Colors and corresponding wavelengths of visible spectrum.

Color	Wavelength (nm)
Violet	380-450
Blue	450-475
Cyan	476-495
Green	495-570
Yellow	570-590
Orange	590-620
Red	620-750

20.

(c) 1.414

Explanation:

The sine of the critical angle is equal to the reciprocal of the refractive index of that material i.e.

sin c = $\frac{1}{\mu}$

sin 45o = $\frac{1}{\mu}$

$\frac{1}{\sqrt{2}} = \frac{1}{\mu}$

$\mu = \sqrt{2} = 1.414$

Chemistry

21.

(b) $CaO + H_2O \rightarrow Ca(OH)_2$ + Heat

Explanation:

$CaO + H_2O \rightarrow Ca(OH)_2$ + Heat

22. **(a)** Fe, $CuSO_4$, Cu

Explanation:

Metal X is iron(Fe) which is found in earth's crust.

$$\underset{\text{(X)}}{\underset{\text{Iron}}{2Fe}} + \frac{3}{2}O_2 + xH_2O \rightarrow \underset{\text{(Reddish brown)}}{\underset{\text{Rust}}{Fe_2O_3.xH_2O}}$$
$$\underset{\text{(X)}}{\underset{\text{Iron}}{Fe_{(s)}}} + \underset{\text{(Blue coloured solution) (Y)}}{\underset{\text{Copper sulphate}}{CuSO_{4(aq)}}} \rightarrow \underset{\text{(Green coloured solution)}}{\underset{\text{Iron sulphate}}{FeSO_{4(aq)}}} + \underset{\text{(reddish brown) (Z)}}{\underset{\text{Copper}}{Cu_{(s)}}}$$

23.

(b) cathode, anode

Explanation:

According to electrolysis reaction, H^+ ions pick up electrons from the cathode and get reduced to H_2 gas, while oxide ions lose their electrons at the anode and get oxidized to oxygen gas.

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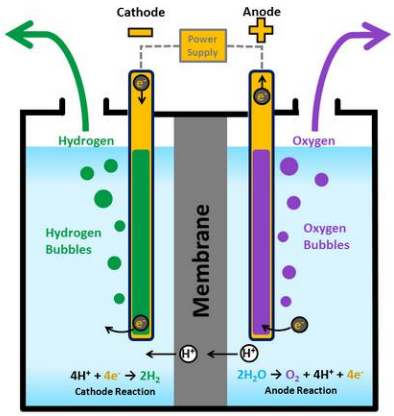

24.

(b) $FeSO_4 \cdot 7H_2O$, Fe_2O_3 and SO_2, SO_3

Explanation:

$$\underset{\text{Green vitriol (X)}}{Fe\ SO_4 \cdot 7H_2O} \xrightarrow{\text{heat}} \underset{\text{Ferrous sulphate}}{FeSO_4} + 7H_2O$$

$$\underset{\text{Ferrous Sulphate}}{2FeSO} \xrightarrow{Heat} \underset{\text{Reddish brown residue (Y)}}{Fe_2O_3} + \underbrace{\underset{\text{Sulphur dioxide}}{SO_2} + \underset{\text{Sulphur trioxide}}{SO_3}}_{(Z)}$$

SO_2 and SO_3 are acidic in nature, turn blue litmus red as they react with water to form acids as follows :

$$SO_2 + H_2O \rightarrow \underset{\text{(Sulphuriours acid)}}{H_2SO_3}$$

$$SO_3 + H_2O \rightarrow \underset{\text{(Sulphuric acid)}}{H_2SO_4}$$

25. **(a)** Copper carbonate

Explanation:

The green colour that occurs when copper is exposed to air and water is copper carbonate. It forms from the reaction of carbon dioxide in the atmosphere with copper-catalyzed by water vapour.

26.

(c) HCl

Explanation:

Egg shells contains calcium carbonate. On reaction with HCl they liberate CO_2 gas which turns lime water to milky according to the following equation:

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

27. **(a)** Hydrogen chloride gas and water

Explanation:

Hydrogen chloride gas and water

28.

(b) Option (b)

Explanation:

The bases that dissolve in water are known as alkalis. While $Fe(OH)_3$ is not soluble in water, NaOH is only weakly so. NaOH is therefore an alkali, whereas $Fe(OH)_3$ is not. All bases are alkalis, but not all alkalis are bases.

29.

(c) $Na_2CO_3 \cdot 10H_2O$

Explanation:

Chemical formula of washing soda is $Na_2CO_3 \cdot 10H_2O$

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30. **(a)** A metal used in joining electric wires - Magnesium
Explanation:
Copper metal is used in joining electric wires due to its high electrical conductivity, enough tensile strength and ductility.

31. **(c)** copper
Explanation:
copper

32. **(b)** The solubility of NH_3 in H_2O
Explanation:
The ammonia fountain demonstrates the solubility of ammonia in water.

33. **(c)** Calcined dolomite
Explanation:
Refractory materials that retain their strength at high temperatures are used in linings for furnaces, kilns, incinerators, and reactors. Calcined dolomite is used in areas where slags and atmosphere are basic; it is stable to alkaline materials but could react with acids.
$CaMg(CO_3)_2(s) + heat \rightarrow CaO.MgO(s) + 2CO_2(g)$

34. **(c)** Zn
Explanation:
Galvanization is the process of applying a protective coating of zinc to iron to prevent the rusting of iron. The most common method is hot-dip galvanizing, in which steel sections are submerged in a bath of molten zinc.

35. **(b)** carbon dioxide only
Explanation:
Carbon exists in the atmosphere in the form of carbon dioxide gas (CO_2) in the air (only 0.03%). Carbon also occurs in the earth's crust in the form of minerals likes carbonates. It also occurs in the form of fossil fuels, organic compounds, wood, cotton, and wool, etc.

36. **(a)** A, B and D
Explanation:
A, B and D are isomers of hexane - they have the same molecular formula but different structural formulae. C represents an isomer of pentane C_5H_{12}

37. **(a)** 9 and 3
Explanation:
9 and 3

38. **(d)** presence of sunlight
Explanation:
This is a free-radical reaction in which the reagent is the chlorine atom. The sunlight, specifically, ultraviolet light, is required to provide the necessary energy to dissociate the chlorine molecule so that the reaction can start. It really is termed homolytic fission (homolysis). Homolytic fission in basic terms means that the covalent bond breaks both and each and each and every atom receives an electron.

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39.

(d) Sodium carbonate

Explanation:

Compound X is ethanol (CH_3CH_2OH) and compound Vis ethanoic acid (CH_3COOH). Alcohols and acids can be distinguished by sodium carbonate as alcohols do not react with sodium carbonate while acids react with sodium carbonate to give a brisk effervescence of CO_2.

$2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + CO_2 + H_2O$

$CH_3CH_2OH + Na_2CO_3 \rightarrow$ No reaction

40.

(b) C_2H_5OH

Explanation:

C_2H_5OH

Maths

41.

(d) $\frac{4}{5}$

Explanation:

Total number of tickets = 6 + 24 = 30.

Number of blanks = 24.

∴P{not getting a prize} = $\frac{24}{30} = \frac{4}{5}$

42.

(d) 29

Explanation:

Mean of first n natural number = 15

$\frac{n(n+1)}{2n}$ = 15

$\frac{n+1}{2}$ = 15

⇒ n + 1 = 30

⇒n = 30 - 1 = 29

43. **(a)** 82

Explanation:

Required no. of athletes = sum of all frequencies upto 16-17

= 2 + 4 + 5 + 71

= 82

44.

(c) –m, m + 3

Explanation:

Given: equation $x^2 - 3x - m(m + 3) = 0$, where m is a constant

The given equation is the form of $ax^2 + bx + c = 0$

∴ a = 1, b = −3, c = −m(m + 3)

We know the roots of the equation can be find out using the formula,

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

Substituting the values of a, b, c, we get

$x = \frac{-(-3) \pm \sqrt{(-3)^2-4(1)(-m(m+3)}}{2}$

$\Rightarrow x = \frac{3 \pm \sqrt{9+4m^2+12m}}{2}$

$\Rightarrow x = \frac{3 \pm (2m+3)}{2}$

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or $x = \frac{3+(2m+3)}{2}$, $x = \frac{3-(2m+3)}{2}$

$\Rightarrow$ x = m + 3 and x = −m are the required roots of the equation.

45.

(d) 2, -4

Explanation:

A(5, 3), B(11, -5) and P(12, y) are the vertices of a right triangle, right-angled at P

$\therefore AB^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$ [BY P.G.T]

$= (11 - 5)^2 + (-5 - 3)^2 = (6)^2 + (-8)^2$

$= 36 + 64 = 100$

Similarly $BP^2 = (12 - 11)^2 + (y + 5)^2 = (1)^2 + y^2 + 10y + 25$

$= y^2 + 10y + 26$

and $AP^2 = (12 - 5)^2 + (y - 3)^2 = (7)^2 + (y - 3)^2$

$= 49 + y^2 - 6y + 8 = y^2 - 6y + 58$

$\because \triangle ABP$ is a right triangle

$\therefore AB^2 = BP^2 + AP^2$

$100 = y^2 + 10y + 26 + y^2 - 6y + 58$

$100 = 2y^2 + 4y + 84$

$\Rightarrow 2y^2 + 4y + 84 - 100 = 0 \Rightarrow 2y^2 + 4y - 16 = 0$

$\Rightarrow y^2 + 2y - 8 = 0$ (Dividing by 2)

$\Rightarrow y^2 + 4y - 2y - 8 = 0 \left\{ \begin{matrix} \because -8 = 4 \times (-2) \\ 2 = 4 - 2 \end{matrix} \right\}$

$\Rightarrow y(y + 4) -2(y + 4) = 0$

$\Rightarrow (y + 4) (y - 2) = 0$

Either y + 4 = 0, then y = -4

or y - 2 = 0, then y = 2

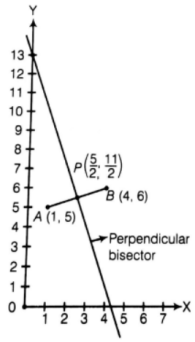
y = 2, -4

46.

(c) (0, 13)

Explanation:

First, we have to plot the points of the line segment on the paper and join them.



As we know that the perpendicular bisector of line segment AB, perpendicular at AB and passes through the mid-point of AB.

Let P be the mid-point of AB

Now find the mid-point,

Mid-point of AB = $\frac{1+4}{2}, \frac{5+6}{2}$

$\because$ Mid-point of line segment passes through the points (x_1, y_1) and (x_2, y_2)

$= \left[\frac{(x_1+x_2)}{2}, \frac{(y_1+y_2)}{2}\right]$

$\Rightarrow P = \frac{5}{2}, \frac{11}{2}$

Find the slope of the bisector:

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Slop of the given line = $\frac{(y_1-y_2)}{(x_1-x_2)}$

Slope = $\frac{5-6}{1-4} = \frac{1}{3}$

Slope of given line multiplied by slope of bisector = - 1

Slope of bisector = $\frac{-1}{\frac{1}{3}} = \frac{-3}{1}$

= - 3

Now, we find the bisector's formula by using the point slope form;

Which is;

$-3 = \frac{\frac{11}{2}-y}{\frac{3}{2}-x} = \frac{5.5-y}{2.5-x}$

- 3(2.5 – x) = 5.5 - y

- 7.5 + 3x = 5.5 - y3x + y - 13 = 0

Transform the formula into slope - intercept form

3x + y - 13 = 0y = - 3x + 13

because, slope - intercept form is y = mx + c,

Where, m is the slope and c is the y - intercept

Thus, perpendicular bisector cuts the y - axis at (0, 13)

So, the required point is (0, 13).

47.

(b) (5, 0)

Explanation:

If the graph of the linear equation 2*x* + 5*y* = 10 meets the *x*-axis, then *y* = 0.

Substituting the value of *y* = 0 in equation 2*x* + 5*y* = 10, we get

2x + 5(0) = 10

$\Rightarrow$ 2x = 10

$\Rightarrow x = \frac{10}{2}$

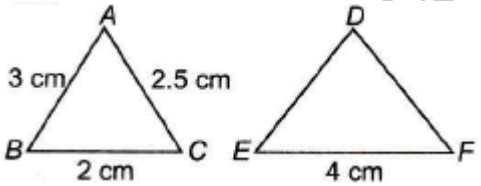
$\Rightarrow$ x = 5

So, the point of meeting is (5, 0)

48.

(b) 15 cm

Explanation:



$\triangle DEF \sim \triangle ABC$

AB = 3CM, BC = 2 CM, CA = 2.5 CM, EF = 4CM

Since $\triangle's$ are similar, we have

$\frac{DE}{AB} = \frac{EF}{BC} = \frac{FD}{CA}$

$\Rightarrow \frac{DE}{3} = \frac{4}{2} = \frac{FD}{2.5}$

Now $\frac{DE}{3} = \frac{4}{2}$

$\Rightarrow DE = \frac{3\times4}{2} = 6cm$

and $FD = \frac{4}{2} \Rightarrow FD = \frac{4\times2.5}{2} = 5cm$

perimeter of $\triangle DEF$

= 6 + 4 + 5 = 15cm

49.

(d) $\left(\frac{AB}{AC}\right)^2$

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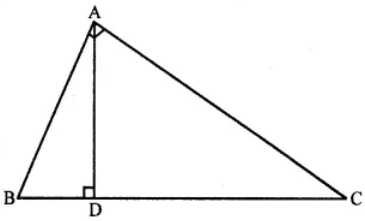
Explanation:

In right angled $\triangle ABC$, $\angle A = 90^\circ$

$AD \perp BC$

$\therefore \triangle ABD \sim \triangle ABC$



$\frac{AB}{BC} = \frac{BD}{AB} \Rightarrow AB^2 = BD \times BC$ .....(i)

Similarly $\triangle ACD \sim \Delta ABC$

$DC \times BC = AC^2$ .....(ii)

Dividing (ii) by (i)

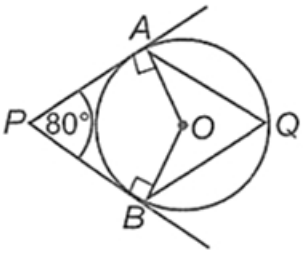
$\frac{BD \times BC}{DC \times BC} = \frac{AB^2}{AC^2} \Rightarrow \frac{BD}{DC} = \frac{AB^2}{AC^2}$

Hence $\frac{BD}{DC} = \frac{AB^2}{AC^2}$

50.

(c) 50^o

Explanation:



Since, PA and PB are tangents.

Also, tangent is perpendicular to radius at the point of contact.

$\therefore \angle PAO = 90^o$ and $\angle PBO = 90^o$

In quadrilateral APBO;

$\angle APB + \angle PAO + \angle PBO + \angle AOB = 360^o$

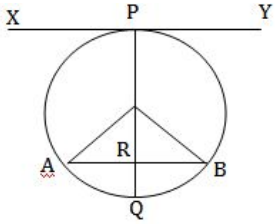
$80^o + 90^o + 90^o + \angle AOB = 360^o$

$\Rightarrow \angle AOB = 100^o \Rightarrow \angle AQB = \frac{1}{2}\angle AOB = 50^o$

51.

(d) 8 cm

Explanation:



Here, OP = OQ = 5 cm [Radii]

And OR = PR – OP = 8 – 5 = 3 cm

Also, OA = 5 cm [Radius]

Now, in right angled triangle AOR, $OA^2 = OR^2 + AR^2$

$\Rightarrow 5^2 = 3^2 + AR^2$

$\Rightarrow AR^2 = 25 - 9 = 16$

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$\Rightarrow$ AR = 4 cm

Since perpendicular from the centre of a circle to a chord bisects the chord.

$\therefore$ AB = AR + BR = 4 + 4 = 8 cm

52. **(a)** x(x + 1) = 240

Explanation:

Let one of the two consecutive integers be x

then the other consecutive integer will be (x + 1)

$\therefore$ According to question, (x) $\times$ (x + 1) = 240

$\Rightarrow$ x(x + 1) = 240

53.

(d) 16

Explanation:

In the equation $x^2 + kx + 64 = 0$

a = 1, b = k, c = 64

$D = b^2 - 4ac = k^2 - 4 \times 1 \times 64$

$= k^2 - 256$

$\because$ The roots are real

$\therefore D \geq 0 \Rightarrow k^2 \geq (\pm 16)2$

$\Rightarrow k \geq 16$ .....(i)

Only positive value is taken.

Now in second equation

x2 - 8x + k = 0

D =(-8)2 - 4 $\times$ 1 $\times$ k = 64 - 4k

$\because$ Roots are real

$\therefore D \geq 0 \Rightarrow 64 - 4k \geq 0 \Rightarrow 64 \geq 4k$

16 $\geq$ k .....(ii)

From (i) and

$16 \geq k \geq 16 \Rightarrow k = 16$

54.

(b) $\frac{9}{14}$

Explanation:

we know that if a, b, c are in AP then

2b = a + c

If $\frac{-5}{7}$, a, 2 are in AP

$2a = \frac{-5}{7} + 2$

$2a = \frac{-5+14}{7}$

$2a = \frac{9}{7}$

$a = \frac{9}{14}$

55.

(c) 5

Explanation:

Given: a = -7.2

d = 3.6

$a_n = 7.2$

$n = \frac{a_n - a}{d} + 1$

$= \frac{7 \cdot 2 - (-7 \cdot 2)}{3 \cdot 6} + 1$

n = 5

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56.

(b) 80

Explanation:

We have, $S_n = \frac{3n^2}{2} + \frac{13n}{2}$

$\therefore$ 25th term = Sum of first 25 terms - Sum of first 24 terms

$= S_{25} - S_{24}$

Now, S_{25} = 1100 and S_{24} = 1020

$\therefore 25^{th}$ term = 1100 - 1020 = 80

57. **(a)** $\frac{3}{4}$

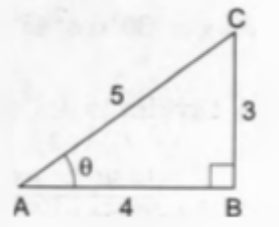
Explanation:

$\cos\theta = \frac{4}{5} = \frac{AB}{AC}$

$\therefore \quad BC^2 = AC^2 - AB^2 = 25 - 16 = 9$

$\Rightarrow$ BC = 3

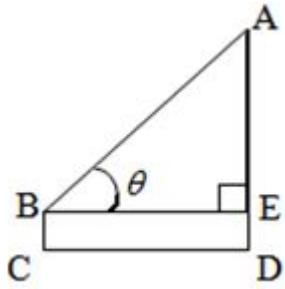
$\therefore \tan\theta = \frac{BC}{AB} = \frac{3}{4}$



58.

(d) 45°

Explanation:



Let θ be the angle of elevation,

The height of the tower AD = 25 m

And CD = 23.5 m

In triangle ABE,

$\therefore \tan\theta = \frac{AE}{BE} = \frac{AD-ED}{CD}$

$\Rightarrow \tan\theta = \frac{25-1.5}{23.5} = \frac{23.5}{23.5} = 1$

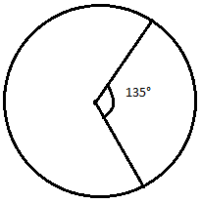
$\Rightarrow \tan\theta = \tan 45^\circ \ \ \theta$

$\Rightarrow \theta = 45^\circ$

59.

(c) 24π cm^2

Explanation:



It is given that the radius of circle = 8 cm

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and angle, θ = 135^o

Therefore, area of sector $= \frac{\theta}{360^\circ} \times \pi r^2$

$= \frac{135^\circ}{360^\circ} \times \pi \times 8 \times 8$

$= \frac{135^\circ}{360^\circ} \times \pi \times 64$

$= 24\pi$ cm^2

60.

(d) cot^{4}A

Explanation:

Given: cosec^{4}A - 2 cosec^{2}A + 1

= (cosec^{2}A - 1)^2

= (cot^{2}A)^2

= cot^{4}A

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