Global Education of Science

Subject : Mathematics, Science
Standard : 10,9
Total Mark : 400

MCQ and Numeric

Paper Set : 1
Date : 26-07-2024
Time : 0H:20M

Mathematics - Section A (MCQ)

(1) Jamila sold a table and a chair for $Rs.1050$, thereby making a profit of 10% on the table and 25% on the chair. If she had taken a profit of 25% on the table and 10% on the chair she would have got $Rs.1065$. Find the cost price of each. (in $Rs.$)

(A) $100, 900$ (B) $100, 300$

(C) $500, 400$ (D) $600, 800$

(2) For a quadratic equation, if ....., then both the roots are equal.

(A) $D < 0$ (B) $D > 0$

(C) $D = 1$ (D) $D = 0$

(3) When a ladder leans on a wall to reach the height of $8\,m$, its lower end rests $6\,m$ away from the base of the wall. If the same ladder leans on the wall to reach the height of $6\,m$, find the distance of its lower end from the base of the wall.

(A) 8 (B) 10

(C) 15 (D) 20

(4) The distance between the points $A(-4, -6)$ and $B(6, b)$ is 10, then $b =$ .....

(A) 4 (B) 3

(C) -6 (D) -4

(5) For any $A.P.$, $T_{25} - T_{20} =$ .....

(A) $5d$ (B) $5a$

(C) $5n$ (D) S_5

(6) Solve the following pairs of linear equations in two variables using graph : $x + 2y = -4$, $3x + 4y = -6$

(A) $(2, 3)$ (B) $(-2, -3)$

(C) $(-2, 3)$ (D) $(2, -3)$

(7) Find the altitude of an equilateral triangle of side $8\,cm$. (in cm)

(A) $3\sqrt{3}$ (B) $4\sqrt{3}$

(C) $5\sqrt{3}$ (D) $7\sqrt{5}$

(8) If -3 is a solution of $2x^2 + 5x + k = 0$, then $k =$ .....

(A) 3 (B) -3

(C) 2 (D) -2

(9) In $\Delta PQR, m\angle Q = 90$. If $PR = 17$ and $PQ = 8$, then $QR =$ .....

(A) 15 (B) 13

(C) 12.5 (D) 9

(10) Find the area of a pentagon having the vertices $(1, 5), (-2, 4), (-3, -1), (2, -3)$ and $(5, 1)$

(A) 40 (B) 30

(C) 20 (D) 10

(11) If $P(1, 12)$ divides $\overline{AB}$ from A in ratio $2 : 1$ and $A(3, 8)$, then the coordinates of B are .....

(A) $(0, 14)$ (B) $(14, 0)$

(C) $(-14, 0)$ (D) $(0, -14)$

(12) If the zeros of cubic polynomial $p(x) = ax^3 + bx^2 + cx + d; a \neq 0; a, b, c, d \in R$ are α, β and γ then $\alpha^2\beta\gamma + \alpha\beta^2\gamma + \alpha\beta\gamma^2 =$ .....

(A) $\frac{cd}{a^2}$ (B) $\frac{bc}{a^2}$

(C) $\frac{bd}{a^2}$ (D) $\frac{ad}{a^2}$

(13) If $x^2 + 6x + 10$ is divided by $x + 2$, then the remainder is.....

(A) -2 (B) 2

(C) 6 (D) 4

(14) In $\Delta ABC, m\angle B = 90, AB = 2x + 3, BC = x + 2$ and $AC = 3x - 1$. Find the value of x.

(A) 6 (B) 5

(C) 4 (D) 2

(15) The roots of quadratic equation $x^2 - 2x - 15 = 0$ are ..... .

(A) -5 and -3 (B) 5 and 3

(C) -5 and 3 (D) 5 and -3

(16) In a two−digit number, the digit at unit's place is x and the digit at ten's place is y. then the number is .....

(A) $10x + y$ (B) $x + y$

(C) $10(x + y)$ (D) $10y + x$

(17) 49 students in a class are alloted roll numbers from 1 to 49. Find a roll number such that the sum of all the roll numbers smaller than that is same as the sum of all the roll numbers greater than that.

(A) 40 (B) 35

(C) 30 (D) 25

(18) Solve the following equations by using the general formula, if the equation has a solution in R : $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4};\ x \neq 1, -2, -4$

(A) $1 + 7\sqrt{3}, 1 - 7\sqrt{3}$ (B) $12 + 2\sqrt{3}, 12 - 2\sqrt{3}$

(C) $2 + 2\sqrt{3}, 2 - 2\sqrt{3}$ (D) $4 + \sqrt{14}, 4 - \sqrt{14}$

(19) For a given $A.P.$, $S_{10} = 50$ and $a = 0.5$. Then, $d =$ .....

(A) 4 (B) 3

(C) 2 (D) 1

(20) In which ratio $P(-4, 3)$ divides the line segment joining $A(1, -2)$ and $B(-6, 5)$ from A?

(A) $6 : 2$ (B) $5 : 2$

(C) $5 : 6$ (D) $1 : 3$

(21) If $(3, 2)$ is one of the solutions of $5x - ay = 7$, then $a =$ .....

(A) 4 (B) 6

(C) 12 (D) 1

(22) On dividing $p(x) = 3x^3 - 6x^2 + 5x - 10$ by $(x - 2)$, find the remainder.

(A) 1 (B) 2

(C) 3 (D) 0

(23) The number of interwoven isosceles triangles in Sriyantra (in the Atharva Veda) is:

(A) 7 (B) 8

(C) 11 (D) 9

(24) ..... is one of the zeros of $p(x) = x^3 + 7x^2 + 11x + 5$

(A) 1 (B) 5

(C) -5 (D) -1

(25) Any point on the line $y = x$ is of the form

(A) $(a, -a)$ (B) $(a, 0)$

(C) $(0, a)$ (D) (a, a)

(26) A solid has.....

(A) shape, size and location (B) size and location

(C) shape and location (D) shape and size

(27) If $a + b + c = 9$ and $ab + bc + ca = 26$, find $a^2 + b^2 + c^2$.

(A) 81 (B) 29

(C) 52 (D) 26

(28) One of the zeroes of the polynomial $2x^2 + 7x - 4$ is

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

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

(29) $\sqrt{10} \times \sqrt{15}$ is equal to

(A) $6\sqrt{5}$ (B) $10\sqrt{5}$

(C) $\sqrt{25}$ (D) $5\sqrt{6}$

(30) Find the zero of the polynomial : $p(x) = 2x + 5$

(A) 2 (B) 5

(C) $\frac{5}{2}$ (D) $\frac{-5}{2}$

(31) If $(5x - 3)^2 = 25x^2 + kx + 9$, then find k

(A) -45 (B) 20

(C) 15 (D) -30

(32) For each question, select the proper option from four options given, to make the statement true : (Final answer only)
$\sqrt{5^2 + 12^2}$ is a / an ..... number.

(A) irrational (B) negative

(C) fraction (D) natural

(33) Without actually calculating the cubes, find the value of :
$\left(\frac{1}{2}\right)^3 + \left(\frac{1}{3}\right)^3 - \left(\frac{5}{6}\right)^3$

(A) $\frac{7}{12}$ (B) $\frac{5}{12}$

(C) $-\frac{5}{12}$ (D) $-\frac{7}{12}$

(34) If $x^2 + kx + 6 = (x + 2)(x + 3)$ for all x, then the value of k is

(A) 5 (B) 1

(C) -1 (D) 3

(35) Write the degree of each of the following polynomials
$ax^3 + bx^2 + cx + d$

(A) 7 (B) 3

(C) 11 (D) 15

(36) If $2^{x-2} \cdot 3^{2x-6} = 36$, then find x.

(A) 14 (B) 6

(C) 4 (D) 8

(37) The product $\sqrt[3]{2} \cdot \sqrt[4]{2} \cdot \sqrt[12]{32}$ equals

(A) $\sqrt[12]{2}$ (B) $\sqrt{2}$

(C) 2 (D) $\sqrt[12]{32}$

(38) In ancient India, altars [or vedis] with combinations of shapes like rectangles. triangles and trapeziums were required for .....

(A) household rituals (B) educational programme

(C) public worship (D) Vedic rituals

(39) A point both of whose coordinates are negative will lie in

(A) III quadrant (B) I quadrant

(C) II quadrant (D) IV quadrant

(40) Evaluate
$(1002)^2$

(A) 1005041 (B) 1003665

(C) 1004004 (D) 100254

Mathematics - Section B (NUMERIC)

(41) The eighth term of an AP is half its second term and the eleventh term exceeds one third of its fourth term by 1. Find the 15^{th} term.

(42) Had Ajita scored 10 more marks in her mathematics test out of 30 marks, 9 times these marks would have been the square of her actual marks. How many marks did she get in the test?

(43) The perpendicular distance of the point $(6, 2)$ from the $X-$ axis is.....

(44) Find the HCF and LCM of $6, 72$ and 120, using the prime factorisation method.

(45) In a competitive examination, one mark is awarded for each correct answer while $\frac{1}{2}$ mark is deducted for every wrong answer. Jayanti answered 120 questions and got 90 marks. How many questions did she answer correctly?

(46) Find the value of a :
$\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - 6\sqrt{3}$

(47) Find the value of the polynomial $5x - 4x^2 + 3$ at $x = 0$.

(48) Multiply $5\sqrt{3}$ and $4\sqrt{12}$.

(49) Fill in the blanks so as to make each of the following statements true (Final answer only)
$(729)^{\frac{1}{3}} = ...$

(50) Find the value
$\frac{8^{\frac{1}{3}} \times 16^{\frac{1}{3}}}{32^{-\frac{1}{3}}}$

Science - Section A (MCQ)

(51) During refining of copper by electrolysis; copper deposits at the .... .

(A) cathode (B) Electrolytic solution

(C) anode (D) bottom of anode

(52) Which among the following elements has the largest atomic radii ?

(A) K (B) Mg

(C) Na (D) Ca

(53) Lack of oxygen in muscles often leads to cramps among cricketers. This results due to

(A) conversion of pyruvate to lactic acid

(B) conversion of pyruvate to glucose

(C) non conversion of glucose to pyruvate

(D) conversion of pyruvate to ethanol

(54) A solution turns red litmus blue, its pH is likely to be

(A) 1 (B) 4

(C) 10 (D) 5

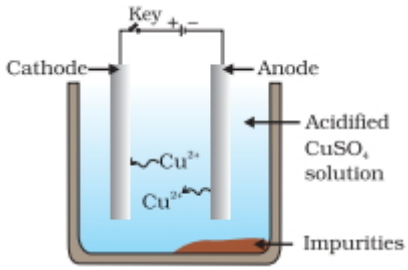
(55) Which of the following metals exists in nature in liquid state?

(A) Copper (B) Iron

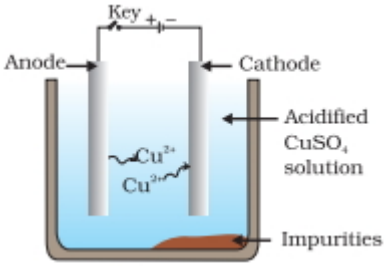
(C) Aluminium (D) Gallium

(56) Which one of the following figures correctly describes the process of electrolytic refining ?

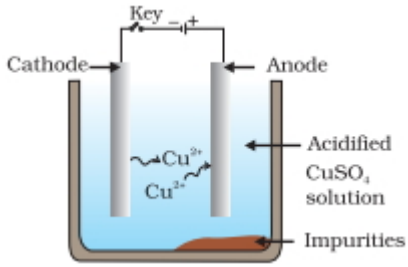
(A)



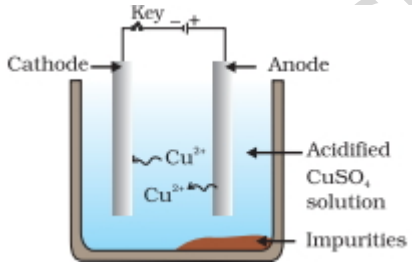
(B)



(C)



(D)



(57) Which is the correct sequence of air passage during inhalation?

(A) Nostrils $\rightarrow$ larynx $\rightarrow$ pharynx $\rightarrow$ trachea $\rightarrow$ lungs

(B) Nasal passage $\rightarrow$ trachea $\rightarrow$ pharynx $\rightarrow$ larynx $\rightarrow$ alveoli

(C) Nostrils $\rightarrow$ pharynx $\rightarrow$ larynx $\rightarrow$ trachea $\rightarrow$ alveoli

(D) larynx $\rightarrow$ nostrils $\rightarrow$ pharynx $\rightarrow$ lungs

(58) Which gas is released when acid reacts with metal?

(A) Dioxygen (B) Dihydrogen

(C) Dinitrogen (D) Diclorine

(59) Which one of the following types of medicines is used for treating indigestion ?

(A) Antibiotic (B) Antacid

(C) Analgesic (D) Antiseptic

(60) Which of the following substances is hygroscopic?

(A) Cryolite (B) Feldspar

(C) Anhydrous calcium chloride (D) Slag

(61) According to Bronsted-Lowry acid-base theory, the substance which donates a proton (H^+) to other substance is called .....

(A) a neutral solution (B) a base

(C) an acid (D) a phenolic solution

(62) What is used to preserve the dead bodies of animals?

(A) Rectified Spirit (B) Formalin

(C) Acetic acid (D) Acetone

(63) Which gas is responsible for acid rain?

(A) Dihydrogen (B) Sulfur dioxide

(C) Ammonia (D) Dinitrogen

(64) What is the reaction to form soap known as?

(A) Esterification (B) Saponification

(C) Polymerisation (D) hydrogenation

(65) The element with atomic number 14 is hard and forms acidic oxide and a covalent halide. To which of the following categories does the element belong ?

(A) Metal (B) Metalloid

(C) non-Metal (D) Left-hand side element

(66) Generally metals react with acids to give salt and hydrogen gas. Which of the following acids does not give hydrogen gas on reacting with metals (except Mn and Mg) ?

(A) H_2SO_4 (B) HCl

(C) HNO_3 (D) All of these

(67) Pentane has the molecular formula C_5H_{12}. It has

(A) 5 covalent bonds (B) 12 covalent bonds

(C) 16 covalent bonds (D) 17 covalent bonds

(68) Which of the following monomers is in polythene?

(A) $CH_3 - CH_3$ (B) $CH_3 - CH = CH - CH_3$

(C) $CH_2 = CH_2$ (D) $CH \equiv CH$

(69) $pH + pOH = ?$

(A) 7 (B) 0

(C) 14 (D) 10

(70) Which of following metals is soft enough to be cut easily with knife?

(A) Silicone (B) Sodium

(C) Copper (D) Aluminium

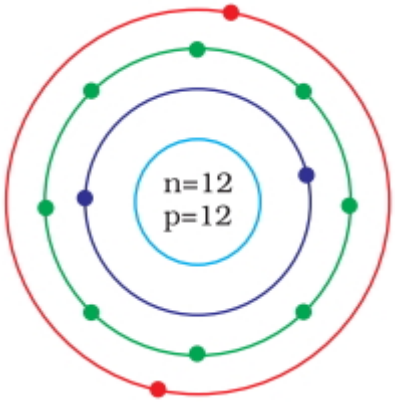
(71) Amphibians do not have the following

(A) Three chambered heart (B) Gills or lungs

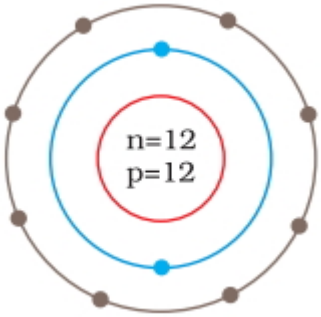
(C) Scales (D) Mucus glands

(72) Identify the Mg^{2+} ion from the Fig. where, n and p represent the number of neutrons and protons respectively

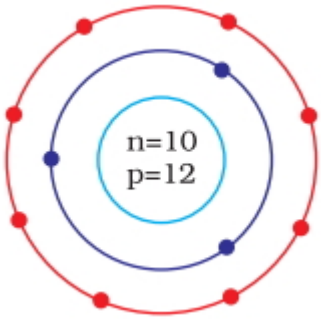
(A)



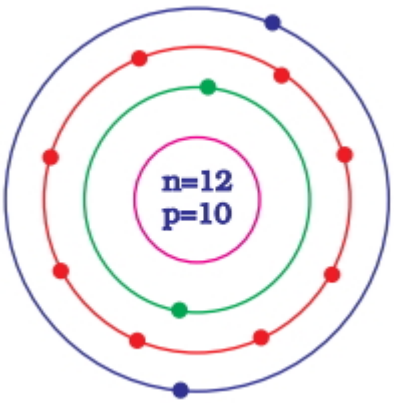
(B)



(C)



(D)



(73) Calculate the molecular masses of H_2, O_2 and Cl_2.

(A) $9\,u$, $36\,u$ and $84\,u$ (B) $6\,u$, $18\,u$ and $36\,u$

(C) $2\,u$, $32\,u$ and $71\,u$ (D) $12\,u$, $36\,u$ and $84\,u$

(74) Corals are

(A) Poriferans attached to some solid support

(B) Cnidarians, that are solitary living

(C) Poriferans present at the sea bed

(D) Cnidarians that live-in colonies

(75) Compute the difference in masses of one mole each of aluminium atoms and one mole of its ions. (Mass of an electron is $9.1 \times 10^{-28}\,g$). Which one is heavier ?

(A) $0.0016\,g$ (B) $0.0025\,g$

(C) $0.0035\,g$ (D) $0.0055\,g$

(76) Match items of column (A) with items of column (B)

Column (A)	Column (B)
(a) Naked seed	(A) Angiosperms
(b) Covered seed	(B) Gymnosperms
(c) Flagella	(C) Bryophytes
(d) Marchantia	(D) Euglena
(e) Marsilea	(E) Thallophyta
(f) Cladophora	(F) Pteridophyta
(g) Penicillium	(G) Fungi

(A) $(a)-B\,;(b)-A\,;(c)-D\,;(d)-C\,;(e)-F\,;(f)-E\,;(g)-G$

(B) $(a)-B\,;(b)-C\,;(c)-D\,;(d)-A\,;(e)-E\,;(f)-F\,;(g)-G$

(C) $(a)-G\,;(b)-C\,;(c)-E\,;(d)-A\,;(e)-D\,;(f)-F\,;(g)-B$

(D) $(a)-B\,;(b)-A\,;(c)-D\,;(d)-G\,;(e)-F\,;(f)-E\,;(g)-C$

(77) Which of these is not related to endoplasmic reticulum ?

(A) It can be the site of energy generation

(B) It transports materials between various regions in cytoplasm

(C) It behaves as transport channel for proteins between nucleus and cytoplasm

(D) It can be the site for some biochemical activities of the cell

(78) Match items of column (A) with items of column (B)

Column (A)	Column (B)
(a) Pore bearing animals	(A) Arthropoda
(b) Diploblastic	(B) Coelenterata
(c) Metameric segmentation	(C) Porifera
(d) Jointed legs	(D) Echinodermata
(e) Soft bodied animals	(E) Mollusca
(f) Spiny skinned animals	(F) Annelida

(A) $(a)-C\,;(b)-A\,;(c)-F\,;(d)-B\,;(e)-D\,;(f)-E$

(B) $(a)-C\,;(b)-B\,;(c)-F\,;(d)-A\,;(e)-E\,;(f)-D$

(C) $(a)-B\,;(b)-C\,;(c)-F\,;(d)-E\,;(e)-A\,;(f)-D$

(D) $(a)-C\,;(b)-D\,;(c)-A\,;(d)-F\,;(e)-E\,;(f)-B$

(79) Meena and Hari observed an animal in their garden. Hari called it an insect while Meena said it was an earthworm. Choose the character from the following which confirms that it is an insect.

(A) Bilateral symmetrical body (B) Cylindrical body

(C) Body with jointed legs (D) Body with little segmentation

(80) A gold sample contains 90% of gold and the rest copper. How many atoms of gold are present in one gram of this sample of gold ?

(A) 8.34×10^{21} (B) 2.77×10^{21}

(C) 5.51×10^{21} (D) 3.73×10^{21}

(81) Pteridophyta do not have

(A) root (B) stem

(C) leaves (D) flowers

(82) Which of the following statement is always correct ?

(A) An atom has equal number of electrons and protons.

(B) An atom has equal number of electrons and neutrons.

(C) An atom has equal number of protons and neutrons.

(D) An atom has equal number of electrons, protons and neutrons.

(83) For the following statements, write T for True and F for False.

(a) J.J. Thomson proposed that the nucleus of an atom contains only nucleons.

(b) A neutron is formed by an electron and a proton combining together. Therefore, it is neutral.

(c) The mass of an electron is about $\frac{1}{2000}$ times that of proton.

(d) An isotope of iodine is used for making tincture iodine, which is used as a medicine.

(A) $(a)-(T)\ ;\ (b)-(F)\ ;\ (c)-(T)\ ;\ (d)-(F)$

(B) $(a)-(F)\ ;\ (b)-(T)\ ;\ (c)-(T)\ ;\ (d)-(F)$

(C) $(a)-(F)\ ;\ (b)-(F)\ ;\ (c)-(T)\ ;\ (d)-(F)$

(D) $(a)-(T)\ ;\ (b)-(F)\ ;\ (c)-(F)\ ;\ (d)-(T)$

(84) Calculate the number of molecules of sulphur (S_8) present in $16\,g$ of solid sulphur.

(A) 5.59×10^{23} (B) 0.376×10^{23}

(C) 37.6×10^{23} (D) 3.76×10^{23}

(85) The proteins and lipids, essential for building the cell membrane, are manufactured by

(A) mitochondria (B) golgi apparatus

(C) plasma membrane (D) endoplasmic reticulum

(86) Match the column (A) with the column (B)

Column (A)	Column (B)
(a) Parenchyma	(i) Thin walled, packing cells
(b) Photosynthesis	(ii) Carbon fixation
(c) Aerenchyma	(iii) Localized thickenings
(d) Collenchyma	(iv) Buoyancy
(e) Permanent tissue	(v) Sclerenchyma

(A) $a-(i)\ ;\ b-(ii)\ ;\ c-(iv)\ ;\ d-(iii)\ ;\ e-(v)$

(B) $a-(i)\ ;\ b-(ii)\ ;\ c-(v)\ ;\ d-(iii)\ ;\ e-(iv)$

(C) $a-(ii)\ ;\ b-(iii)\ ;\ c-(iv)\ ;\ d-(i)\ ;\ e-(v)$

(D) $a-(iii)\ ;\ b-(i)\ ;\ c-(iv)\ ;\ d-(ii)\ ;\ e-(v)$

(87) The 'Origin of Species' is written by

(A) Linnaeus (B) Darwin

(C) Hackel (D) Whittaker

(88) Differentiation in segmental fashion occurs in

(A) Leech (B) Starfish

(C) Snails (D) Ascaris

(89) Well defined nucleus is absent in

(A) blue green algae (B) diatoms

(C) algae (D) yeast

(90) Following are a few definitions of osmosis
Read carefully and select the correct definition

(A) Movement of solvent molecules from its higher concentration to lower concentration

(B) Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane

(C) Movement of solvent molecules from higher concentration to lower concentration of solution through a permeable membrane

(D) Movement of solute molecules from lower concentration to higher concentration of solution through a semipermeable membrane

Science - Section B (NUMERIC)

(91) $10\,mL$ of a solution of $NaOH$ is found to be completely neutralised by $8\,mL$ of a given solution of HCl. If we take $20\,mL$ of the same solution of $NaOH$, the amount of HCl solution (the same solution as before) required to neutralise it will be ..... mL

(92) Write down the electron distribution of chlorine atom. How many electrons are there in the L shell ? (Atomic number of chlorine is 17).

(93) The ion of an element has 3 positive charges. Mass number of the atom is 27 and the number of neutrons is 14. What is the number of electrons in the ion ?

(94) Calculate the number of neutrons present in the nucleus of an element X which is represented as $^{31}_{15}X$.

(95) Number of valence electrons in Cl^- ion are :

(96) If K and L shells of an atom are full, then what would be the total number of electrons in the atom ?

Global Education of Science

Subject : Mathematics, Science
Standard : 10,9
Total Mark : 400

MCQ and Numeric

(Answer Key)

Paper Set : 1
Date : 26-07-2024
Time : 0H:20M

Mathematics - Section A (MCQ)

1 - C	2 - D	3 - A	4 - C	5 - A	6 - D	7 - B	8 - B	9 - A	10 - A
11 - A	12 - C	13 - B	14 - A	15 - D	16 - D	17 - B	18 - C	19 - D	20 - B
21 - A	22 - D	23 - D	24 - D	25 - D	26 - A	27 - B	28 - C	29 - D	30 - D
31 - D	32 - D	33 - C	34 - A	35 - B	36 - C	37 - C	38 - C	39 - A	40 - C

Mathematics - Section B (NUMERIC)

41 - 3	42 - 15	43 - 2	44 - 6; 360	45 - 100	46 - 11	47 - 3	48 - 120	49 - 9	50 - 16

Science - Section A (MCQ)

51 - A	52 - A	53 - A	54 - C	55 - D	56 - D	57 - C	58 - B	59 - B	60 - C
61 - C	62 - B	63 - B	64 - B	65 - B	66 - C	67 - C	68 - C	69 - C	70 - B
71 - C	72 - B	73 - C	74 - D	75 - A	76 - A	77 - A	78 - B	79 - C	80 - B
81 - D	82 - A	83 - B	84 - C	85 - D	86 - A	87 - B	88 - A	89 - A	90 - B

Science - Section B (NUMERIC)

91 - 16	92 - 8	93 - 10	94 - 16	95 - 8	96 - 10

Global Education of Science

Subject : Mathematics, Science
Standard : 10,9
Total Mark : 400

MCQ and Numeric

(Solutions)

Paper Set : 1
Date : 26-07-2024
Time : 0H:20M

Mathematics - Section A (MCQ)

(1) Jamila sold a table and a chair for $Rs.\,1050$, thereby making a profit of 10% on the table and 25% on the chair. If she had taken a profit of 25% on the table and 10% on the chair she would have got $Rs.\,1065$. Find the cost price of each. (in $Rs.$)

(A) $100, 900$ (B) $100, 300$

(C) $500, 400$ (D) $600, 800$

Solution:(Correct Answer:C)

Let the cost price of the table be Rs . x and the cost price of the chair be $Rs.\,y$
The selling price of the table, when it is sold at a profit of 10%
$=$ Rs. $x + \frac{10}{100}x =$ Rs. $\frac{110}{100}x$
The selling price of the chair when it is sold at a profit of 25%
$= Rs.\,y + \frac{25}{100}y =$ Rs. $\frac{125}{100}y$
So, $\frac{110}{100}x + \frac{125}{100}y = 1050$ ....(1)
When the table is sold at a profit of 25%, its selling price
$=$ Rs. $\left(x + \frac{25}{100}x\right) =$ Rs. $\frac{125}{100}x$
When the chair is sold at a profit of 10% price
$=$ Rs. $\left(y + \frac{10}{100}y\right) =$ Rs. $\frac{110}{100}y$
So, $\frac{125}{100}x + \frac{110}{100}y = 1065$
From Equations (1) and (2), we get
$110x + 125y = 105000$
and $125x + 110y = 106500$
On adding and subtracting these equations, we get
$235x + 235y = 211500$
and $15x - 15y = 1500$
i.e., $x + y = 900$....(3)
and $x - y = 100$....(4)
Solving Equations (3) and (4), we get
$x = 500, y = 400$
So, the cost price of the table is $Rs.\,500$ and the cost price of the chair is Rs. 400.

(2) For a quadratic equation, if ....., then both the roots are equal.

(A) $D < 0$ (B) $D > 0$

(C) $D = 1$ **(D)** $D = 0$

Solution:(Correct Answer:D)

null

(3) When a ladder leans on a wall to reach the height of $8\,m$, its lower end rests $6\,m$ away from the base of the wall. If the same ladder leans on the wall to reach the height of $6\,m$, find the distance of its lower end from the base of the wall.

(A) 8 (B) 10

(C) 15 (D) 20

Solution:(Correct Answer:A)

(4) The distance between the points $A(-4, -6)$ and $B(6, b)$ is 10, then $b =$ .....

(A) 4 (B) 3

(C) -6 (D) -4

Solution:(Correct Answer:C)

$AB = 10$
$\therefore AB^2 = 100$
$\therefore (-4-6)^2 + (-6-b)^2 = 100$
$\therefore (-10)^2 + (b+6)^2 = 100$
$\therefore 100 + (b+6)^2 = 100$
$\therefore (b+6)^2 = 0$
$\therefore b + 6 = 0$
$\therefore b = -6$

(5) For any $A.P.$, $T_{25} - T_{20} =$ .....

(A) $5d$ (B) $5a$

(C) $5n$ (D) S_5

Solution:(Correct Answer:A)

(6) Solve the following pairs of linear equations in two variables using graph : $x + 2y = -4,\ 3x + 4y = -6$

(A) $(2,\ 3)$ (B) $(-2,\ -3)$

(C) $(-2,\ 3)$ **(D)** $(2,\ -3)$

Solution:(Correct Answer:D)

$(2,\ -3)$

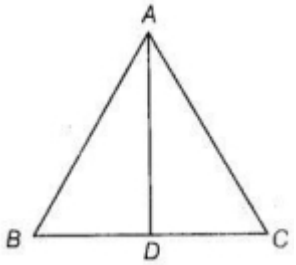
(7) Find the altitude of an equilateral triangle of side $8\,cm$. (in cm)

(A) $3\sqrt{3}$ **(B)** $4\sqrt{3}$

(C) $5\sqrt{3}$ (D) $7\sqrt{5}$

Solution:(Correct Answer:B)

Let ABC be an equilateral triangle of side $8\,cm$ i.e., $AB = BC = CA = 8\,cm$. Draw altitude AD which is perpendicular to BC. Then, D is the mid-point of BC.
$\therefore BD = CD = \frac{1}{2}BC = \frac{8}{2} = 4\,cm$
Now, $AB^2 = AD^2 + BD^2$ [by Pythagoras theorem]
$\Rightarrow \quad (8)^2 = AD^2 + (4)^2$
$\Rightarrow \quad 64 = AD^2 + 16$
$\Rightarrow \quad AD^2 = 64 - 16 = 48$
$\Rightarrow \quad AD = \sqrt{48} = 4\sqrt{3}\,cm$
Hence, altitude of an equilateral triangle is $4\sqrt{3}\,cm$.



(8) If -3 is a solution of $2x^2 + 5x + k = 0$, then $k =$ .....

(A) 3 **(B) -3**

(C) 2 (D) -2

Solution:(Correct Answer:B)

Substituting $x = -3$ in $2x^2 + 5x + k = 0$

$2(-3)^2 + 5(-3) + k = 0 \quad \therefore 18 - 15 + k = 0 \quad \therefore k + 3 = 0 \quad \therefore k = -3$

(9) In $\Delta PQR, m\angle Q = 90$. If $PR = 17$ and $PQ = 8$, then $QR =$ .....

(A) 15 (B) 13

(C) 12.5 (D) 9

Solution:(Correct Answer:A)

(10) Find the area of a pentagon having the vertices $(1, 5), (-2, 4), (-3, -1), (2, -3)$ and $(5, 1)$

(A) 40 (B) 30

(C) 20 (D) 10

Solution:(Correct Answer:A)

40

(11) If $P(1, 12)$ divides $\overline{AB}$ from A in ratio $2 : 1$ and $A(3, 8)$, then the coordinates of B are .....

(A) $(0, 14)$ (B) $(14, 0)$

(C) $(-14, 0)$ (D) $(0, -14)$

Solution:(Correct Answer:A)

$(0, 14)$

(12) If the zeros of cubic polynomial $p(x) = ax^3 + bx^2 + cx + d; a \neq 0; a, b, c, d \in R$ are α, β and γ then $\alpha^2\beta\gamma + \alpha\beta^2\gamma + \alpha\beta\gamma^2 =$ .....

(A) $\frac{cd}{a^2}$ (B) $\frac{bc}{a^2}$

(C) $\frac{bd}{a^2}$ (D) $\frac{ad}{a^2}$

Solution:(Correct Answer:C)

$\alpha^2\beta\gamma + \alpha\beta^2\gamma + \alpha\beta\gamma^2 = \alpha\beta\gamma(\alpha + \beta + \gamma)$

$= -\frac{d}{a}\left(-\frac{b}{a}\right) = \frac{bd}{a^2}$

(13) If $x^2 + 6x + 10$ is divided by $x + 2$, then the remainder is.....

(A) -2 **(B) 2**

(C) 6 (D) 4

Solution:(Correct Answer:B)

(14) In $\Delta ABC, m\angle B = 90, AB = 2x + 3, BC = x + 2$ and $AC = 3x - 1$. Find the value of x.

(A) 6 (B) 5

(C) 4 (D) 2

Solution:(Correct Answer:A)

In $\Delta ABC, \quad m\angle B = 90$

$\therefore AC^2 = AB^2 + BC^2$

$\therefore (3x - 1)^2 = (2x + 3)^2 + (x + 2)^2$

$\therefore 9x^2 - 6x + 1 = 4x^2 + 12x + 9 + x^2 + 4x + 4$

$\therefore 4x^2 - 22x - 12 = 0$

$\therefore 2x^2 - 11x - 6 = 0$

$\therefore 2x^2 - 12x + x - 6 = 0$

$\therefore 2x(x - 6) + 1(x - 6) = 0$

$\therefore (x - 6)(2x + 1) = 0$

$\therefore x - 6 = 0$ or $2x + 1 = 0$

$\therefore x = 6$ or $x = -\frac{1}{2}$

But, for $x = -\frac{1}{2}, \quad AC = -\frac{5}{2}$ which is not possible.

$\therefore x = 6$

(15) The roots of quadratic equation $x^2 - 2x - 15 = 0$ are ..... .

(A) -5 and -3 (B) 5 and 3

(C) -5 and 3 **(D) 5 and -3**

Solution:(Correct Answer:D)

null

(16) In a two−digit number, the digit at unit's place is x and the digit at ten's place is y. then the number is .....

(A) $10x + y$ (B) $x + y$

(C) $10(x + y)$ **(D) $10y + x$**

Solution:(Correct Answer:D)

(17) 49 students in a class are alloted roll numbers from 1 to 49. Find a roll number such that the sum of all the roll numbers smaller than that is same as the sum of all the roll numbers greater than that.

(A) 40 **(B) 35**

(C) 30 (D) 25

Solution:(Correct Answer:B)

Suppose the roll number possessing the given property is n.
Then, by the given property,
the sum of roll numbers smaller than n
= the sum of roll numbers greater than n.

$\therefore 1 + 2 + 3 + \ldots + (n - 1) =$
$(n + 1) + (n + 2) + (n + 3) + \ldots + 49$

$\therefore \frac{(n-1)n}{2} = (1 + 2 + \ldots + n + (n + 1) + \ldots + 49)$
$-(1 + 2 + 3 + \ldots + n)$

$\therefore \frac{(n-1)n}{2} = \frac{49 \times 50}{2} - \frac{n(n+1)}{2}$

$\therefore n(n - 1) = 49 \times 50 - n(n + 1)$

$\therefore n^2 - n + n^2 + n = 49 \times 50$

$\therefore 2n^2 = 49 \times 50$

$\therefore n^2 = 49 \times 25$

$\therefore n = 7 \times 5$

$\therefore n = 35$

Hence, the required roll number is 35.

(18) Solve the following equations by using the general formula, if the equation has a solution in R :

$\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}; \; x \neq 1, -2, -4$

(A) $1 + 7\sqrt{3}, 1 - 7\sqrt{3}$ (B) $12 + 2\sqrt{3}, 12 - 2\sqrt{3}$

(C) $2 + 2\sqrt{3}, 2 - 2\sqrt{3}$ (D) $4 + \sqrt{14}, 4 - \sqrt{14}$

Solution:(Correct Answer:C)

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

(19) For a given $A.P., S_{10} = 50$ and $a = 0.5$. Then, $d =$ .....

(A) 4 (B) 3

(C) 2 **(D) 1**

Solution:(Correct Answer:D)

$S_n = \frac{1}{2}n[2a + (n - 1)d]$

$\therefore S_{10} = \frac{1}{2} \times 10[1 + (9)d]$

$\therefore 50 = 5(1 + 9d) \quad \therefore 10 = 1 + 9d \quad \therefore 9 = 9d \quad \therefore d = 1$

(20) In which ratio $P(-4, 3)$ divides the line segment joining $A(1, -2)$ and $B(-6, 5)$ from A?

(A) $6 : 2$ **(B) $5 : 2$**

(C) $5 : 6$ (D) $1 : 3$

Solution:(Correct Answer:B)

$5:2$

(21) If $(3,2)$ is one of the solutions of $5x-ay=7$, then $a=\ldots\ldots\ldots$

(A) 4 (B) 6

(C) 12 (D) 1

Solution:(Correct Answer:A)

4

(22) On dividing $p(x)=3x^3-6x^2+5x-10$ by $(x-2)$, find the remainder.

(A) 1 (B) 2

(C) 3 **(D)** 0

Solution:(Correct Answer:D)

0

(23) The number of interwoven isosceles triangles in Sriyantra (in the Atharva Veda) is:

(A) 7 (B) 8

(C) 11 **(D)** 9

Solution:(Correct Answer:D)

The number of interwoven isosceles triangle in Sriyantra (in the Atharva Veda) is nine.

(24) $\ldots\ldots$ is one of the zeros of $p(x)=x^3+7x^2+11x+5$

(A) 1 (B) 5

(C) -5 **(D)** -1

Solution:(Correct Answer:D)

-1

(25) Any point on the line $y=x$ is of the form

(A) $(a,-a)$ (B) $(a,0)$

(C) $(0,a)$ **(D)** (a,a)

Solution:(Correct Answer:D)

Any point on the line $y=x$ will have x and y coordinate same.
So, any point on the line $y=x$ is of the form (a,a)

(26) A solid has.....

(A) shape, size and location (B) size and location

(C) shape and location (D) shape and size

Solution:(Correct Answer:A)

shape, size and location

(27) If $a+b+c=9$ and $ab+bc+ca=26$, find $a^2+b^2+c^2$.

(A) 81 **(B)** 29

(C) 52 (D) 26

Solution:(Correct Answer:B)

We have that
$(a+b+c)^2=a^2+b^2+c^2+2ab+bc+2ca$
$\Rightarrow (a+b+c)^2=\left(a^2+b^2+c^2\right)+2(ab+bc+ca)$
$\Rightarrow 9^2=\left(a^2+b^2+c^2\right)+2(26)$
[Putting the value of $a+b+c$ and $ab+bc+ca$]
$\Rightarrow 81=\left(a^2+b^2+c^2\right)+52$
$\Rightarrow \left(a^2+b^2+c^2\right)=81-52=29$

(28) One of the zeroes of the polynomial $2x^2+7x-4$ is

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

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

Solution:(Correct Answer:C)

We have $p(x)=2x^2+7x+4$
(a) $p(2)=2(2)^2+7(2)-4$
$=8+14-4$
$=18\neq 0$
(b) $p\left(-\frac{1}{2}\right)=2\left(-\frac{1}{2}\right)^2+7\left(-\frac{1}{2}\right)-4$
$=2\times\frac{1}{4}-\frac{7}{2}-4=\frac{1}{2}-\frac{7}{2}-4$
$=-3-4$
$=-7\neq 0$
(C) $p\left(\frac{1}{2}\right)=2\left(\frac{1}{2}\right)^2+7\left(\frac{1}{2}\right)-4$
$=2\times\frac{1}{4}+\frac{7}{2}-4=\frac{1}{2}+\frac{7}{2}-4=4-4=0$
(d) $p(-2)=2(-2)^2+7(-2)-4$
$=8-14-4=-10\neq 0$
As $p\left(\frac{1}{2}\right)=0$, we say that $\frac{1}{2}$ is a zero of the polynomial.
Hence, $\frac{1}{2}$ is one of the zero of the polynomial $2x^2+7x-4$.
Hence, (c) is the correct answer.

(29) $\sqrt{10}\times\sqrt{15}$ is equal to

(A) $6\sqrt{5}$ (B) $10\sqrt{5}$

(C) $\sqrt{25}$ **(D)** $5\sqrt{6}$

Solution:(Correct Answer:D)

We have $\sqrt{10}\times\sqrt{15}=\sqrt{10\times 15}=\sqrt{5\times 2\times 5\times 3}=5\sqrt{6}$
Hence, (b) is the correct answer.

(30) Find the zero of the polynomial : $p(x)=2x+5$

(A) 2 (B) 5

(C) $\frac{5}{2}$ **(D)** $\frac{-5}{2}$

Solution:(Correct Answer:D)

We have $p(x)=2x+5\therefore p(x)=0$
$\Rightarrow 2x+5=0$ or $2x=-5$
Or $x=\frac{-5}{2}$
Thus, a zero of $2x+5$ is $\frac{-5}{2}$.

(31) If $(5x-3)^2=25x^2+kx+9$, then find k

(A) -45 (B) 20

(C) 15 **(D)** -30

Solution:(Correct Answer:D)

-30

(32) For each question, select the proper option from four options given, to make the statement true : (Final answer only)
$\sqrt{5^2+12^2}$ is a / an $\ldots\ldots$ number.

(A) irrational (B) negative

(C) fraction **(D)** natural

Solution:(Correct Answer:D)

natural

(33) Without actually calculating the cubes, find the value of : $\left(\frac{1}{2}\right)^3+\left(\frac{1}{3}\right)^3-\left(\frac{5}{6}\right)^3$

(A) $\frac{7}{12}$ (B) $\frac{5}{12}$

(C) $-\frac{5}{12}$ (D) $-\frac{7}{12}$

Solution:(Correct Answer:C)

Let $a=\frac{1}{2},b=\frac{1}{3},c=-\frac{5}{6}$
$\therefore \quad a+b+c=\frac{1}{2}+\frac{1}{3}-\frac{5}{6}$

$= \frac{3+2-5}{6} = \frac{0}{6} = 0$
$\Rightarrow \quad a^3 + b^3 + c^3 = 3abc$
$\therefore \quad \left(\frac{1}{2}\right)^3 + \left(\frac{1}{3}\right)^3 - \left(\frac{5}{6}\right)^3 = \left(\frac{1}{2}\right)^3 + \left(\frac{1}{3}\right)^3 + \left(-\frac{5}{6}\right)^3$
$= 3 \times \frac{1}{2} \times \frac{1}{3}\left(-\frac{5}{6}\right) = -\frac{5}{12}$

(34) If $x^2 + kx + 6 = (x+2)(x+3)$ for all x, then the value of k is

(A) 5 (B) 1

(C) -1 (D) 3

Solution:(Correct Answer:A)

(35) Write the degree of each of the following polynomials
$ax^3 + bx^2 + cx + d$

(A) 7 **(B)** 3

(C) 11 (D) 15

Solution:(Correct Answer:B)
3

(36) If $2^{x-2} \cdot 3^{2x-6} = 36$, then find x.

(A) 14 (B) 6

(C) 4 (D) 8

Solution:(Correct Answer:C)
4

(37) The product $\sqrt[3]{2} \cdot \sqrt[4]{2} \cdot \sqrt[12]{32}$ equals

(A) $\sqrt[12]{2}$ (B) $\sqrt{2}$

(C) 2 (D) $\sqrt[12]{32}$

Solution:(Correct Answer:C)
We have,
$\sqrt[3]{2} \cdot \sqrt[4]{2} \cdot \sqrt[12]{32} = 2^{\frac{1}{2}} \times 2^{\frac{1}{4}} \times \left(2^5\right)^{\frac{1}{12}} = 2^{\frac{1}{3}} \times 2^{\frac{1}{4}} \times 2^{\frac{5}{12}}$
$= 2^{\frac{1}{3}+\frac{1}{4}+\frac{5}{12}} = 2^{\frac{4+3+5}{12}} = 2^{\frac{12}{12}} = 2^1 = 2$
Hence, (c) is the correct answer.

(38) In ancient India, altars [or vedis] with combinations of shapes like rectangles. triangles and trapeziums were required for . . . . . .

(A) household rituals (B) educational programme

(C) public worship (D) Vedic rituals

Solution:(Correct Answer:C)
public worship

(39) A point both of whose coordinates are negative will lie in

(A) III quadrant (B) I quadrant

(C) II quadrant (D) IV quadrant

Solution:(Correct Answer:A)
A point whose both of the coordinate are negative will lie in the III quadrant.

(40) Evaluate
$(1002)^2$

(A) 1005041 (B) 1003665

(C) 1004004 (D) 100254

Solution:(Correct Answer:C)
1004004

Mathematics - Section B (NUMERIC)

(41) The eighth term of an AP is half its second term and the eleventh term exceeds one third of its fourth term by 1. Find the 15^{th} term.

Solution:
Let a and d be the first term and common difference of an AP respectively.
Now, by given condition, $a_8 = \frac{1}{2}a_2$
$\Rightarrow a + 7d = \frac{1}{2}(a+d)$ $[\because a_n = a + (n-1)d]$
$\Rightarrow 2a + 14d = a + d$
$\Rightarrow a + 13d = 0$ .....(i)
and $a_{11} = \frac{1}{3}a_4 + 1$
$\Rightarrow a + 10d = \frac{1}{3}[a + 3d] + 1$
$\Rightarrow 3a + 30d = a + 3d + 3$
$\Rightarrow 2a + 27d = 3$ .....(ii)
From Eqs. (i) and (ii),
$2(-13d) + 27d = 3$
$-26d + 27d = 3$
$d = 3$
From Eq. (i),
$a + 13(3) = 0$
$a = -39$
$a_{15} = a + 14d = -39 + 14(3)$
$= -39 + 42 = 3$

(42) Had Ajita scored 10 more marks in her mathematics test out of 30 marks, 9 times these marks would have been the square of her actual marks. How many marks did she get in the test?

Solution:
Let her actual marks be x
Therefore, $\quad 9(x+10) = x^2$
i.e., $x^2 - 9x - 90 = 0$
i.e. $x^2 - 15x + 6x - 90 = 0$
i.e., $x(x-15) + 6(x-15) = 0$
i.e. $(x+6)(x-15) = 0$
Therefore, $\quad x = -6 \quad$ or $\quad x = 15$
since x is the marks obtained, $x \neq -6$. Therefore, $x = 15$.
So, Ajita got 15 marks in her mathematics test.

(43) The perpendicular distance of the point $(6, 2)$ from the $X-$ axis is.....

Solution:
2

(44) Find the HCF and LCM of $6, 72$ and 120, using the prime factorisation method.

Solution:
We have
$6 = 2 \times 3, 72 = 2^3 \times 3^2, 120 = 2^3 \times 3 \times 5$
Here, 2^1 and 3^1 are the smallest powers of the common factors 2 and 3, respectively.
So, $HCF(6, 72, 120) = 2^1 \times 3^1 = 2 \times 3 = 6$
$2^3, 3^2$ and 5^1 are the greatest powers of the prime factors $2, 3$ and 5 respectively involved in the three numbers.
So, $\quad \text{LCM}(6, 72, 120) = 2^3 \times 3^2 \times 5^1 = 360$

(45) In a competitive examination, one mark is awarded for each correct answer while $\frac{1}{2}$ mark is deducted for every wrong answer. Jayanti answered 120 questions and got 90 marks. How many questions did she answer correctly?

Solution:

Let x be the number of correct answers of the questions in a competitive examination, then $(120-x)$ be the number of wrong answers of the questions.
Then, by given condition,
$x \times 1-(120-x) \times \frac{1}{2}=90$
$x-60+\frac{x}{2}=90$
$\frac{3x}{2}=150$
$x=\frac{150 \times 2}{3}=50 \times 2=100$
Hence, Jayanti answered correctly 100 questions.

(46) Find the value of a :
$\frac{5+2\sqrt{3}}{7+4\sqrt{3}}=a-6\sqrt{3}$

Solution:

$L.H.S.=\frac{5+2\sqrt{3}}{7+4\sqrt{3}}=\frac{5+2\sqrt{3}}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$
$=\frac{(5+2\sqrt{3})(7-4\sqrt{3})}{(7)^2-(4\sqrt{3})^2}$
$=\frac{35-20\sqrt{3}+14\sqrt{3}-24}{49-48}$
$=\frac{11-6\sqrt{3}}{1}=11-6\sqrt{3}$
Now, $11-6\sqrt{3}=a-6\sqrt{3}$
$a=11$

(47) Find the value of the polynomial $5x-4x^2+3$ at $x=0$.

Solution:

$p(x)=5x-4x^2+3$
$p(0)=5(0)-4(0)^2+3$
$=3$

(48) Multiply $5\sqrt{3}$ and $4\sqrt{12}$.

Solution:

120

(49) Fill in the blanks so as to make each of the following statements true (Final answer only)
$(729)^{\frac{1}{3}}=\ldots\ldots$

Solution:

9

(50) Find the value
$\frac{8^{\frac{1}{3}} \times 16^{\frac{1}{3}}}{32^{-\frac{1}{3}}}$

Solution:

16

Science - Section A (MCQ)

(51) During refining of copper by electrolysis; copper deposits at the .... .
(A) cathode
(B) Electrolytic solution
(C) anode
(D) bottom of anode

Solution:(Correct Answer:A)

(52) Which among the following elements has the largest atomic radii ?
(A) K
(B) Mg
(C) Na
(D) Ca

Solution:(Correct Answer:A)

(53) Lack of oxygen in muscles often leads to cramps among cricketers. This results due to
(A) conversion of pyruvate to lactic acid
(B) conversion of pyruvate to glucose
(C) non conversion of glucose to pyruvate
(D) conversion of pyruvate to ethanol

Solution:(Correct Answer:A)

(54) A solution turns red litmus blue, its pH is likely to be
(A) 1
(B) 4
(C) 10
(D) 5

Solution:(Correct Answer:C)

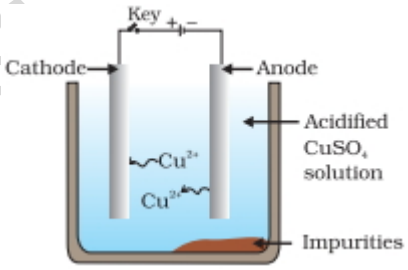
Bases turn red litmus blue and acids turn blue litmus red. Basic solution has a pH value more than 7. Since the solution turns red litmus blue, its pH is likely to be 10.

(55) Which of the following metals exists in nature in liquid state?
(A) Copper
(B) Iron
(C) Aluminium
(D) Gallium

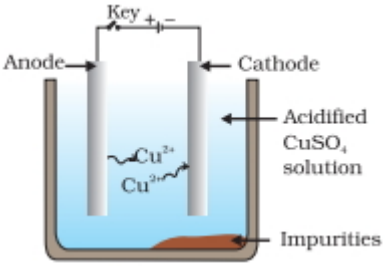
Solution:(Correct Answer:D)

(56) Which one of the following figures correctly describes the process of electrolytic refining ?

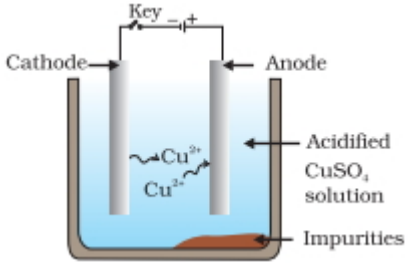
(A)



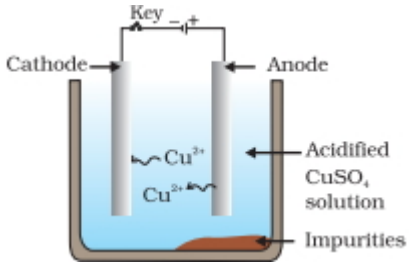
(B)



(C)



(D)



Solution:(Correct Answer:D)

(57) Which is the correct sequence of air passage during inhalation?

(A) Nostrils $\rightarrow$ larynx $\rightarrow$ pharynx $\rightarrow$ trachea $\rightarrow$ lungs

(B) Nasal passage $\rightarrow$ trachea $\rightarrow$ pharynx $\rightarrow$ larynx $\rightarrow$ alveoli

(C) Nostrils $\rightarrow$ pharynx $\rightarrow$ larynx $\rightarrow$ trachea $\rightarrow$ alveoli

(D) larynx $\rightarrow$ nostrils $\rightarrow$ pharynx $\rightarrow$ lungs

Solution:(Correct Answer:C)

(58) Which gas is released when acid reacts with metal?

(A) Dioxygen **(B)** Dihydrogen

(C) Dinitrogen (D) Diclorine

Solution:(Correct Answer:B)

(59) Which one of the following types of medicines is used for treating indigestion ?

(A) Antibiotic **(B)** Antacid

(C) Analgesic (D) Antiseptic

Solution:(Correct Answer:B)

Antacid is used for treating indigestion.

(60) Which of the following substances is hygroscopic?

(A) Cryolite (B) Feldspar

(C) Anhydrous calcium chloride (D) Slag

Solution:(Correct Answer:C)

(61) According to Bronsted-Lowry acid-base theory, the substance which donates a proton (H^+) to other substance is called .....

(A) a neutral solution (B) a base

(C) an acid (D) a phenolic solution

Solution:(Correct Answer:C)

(62) What is used to preserve the dead bodies of animals?

(A) Rectified Spirit **(B)** Formalin

(C) Acetic acid (D) Acetone

Solution:(Correct Answer:B)

(63) Which gas is responsible for acid rain?

(A) Dihydrogen **(B)** Sulfur dioxide

(C) Ammonia (D) Dinitrogen

Solution:(Correct Answer:B)

(64) What is the reaction to form soap known as?

(A) Esterification **(B)** Saponification

(C) Polymerisation (D) hydrogenation

Solution:(Correct Answer:B)

(65) The element with atomic number 14 is hard and forms acidic oxide and a covalent halide. To which of the following categories does the element belong ?

(A) Metal **(B)** Metalloid

(C) non-Metal (D) Left-hand side element

Solution:(Correct Answer:B)

(66) Generally metals react with acids to give salt and hydrogen gas. Which of the following acids does not give hydrogen gas on reacting with metals (except Mn and Mg) ?

(A) H_2SO_4 (B) HCl

(C) HNO_3 (D) All of these

Solution:(Correct Answer:C)

(67) Pentane has the molecular formula C_5H_{12}. It has

(A) 5 covalent bonds (B) 12 covalent bonds

(C) 16 covalent bonds (D) 17 covalent bonds

Solution:(Correct Answer:C)

(68) Which of the following monomers is in polythene?

(A) $CH_3 - CH_3$ (B) $CH_3 - CH = CH - CH_3$

(C) $CH_2 = CH_2$ (D) $CH \equiv CH$

Solution:(Correct Answer:C)

(69) $pH + pOH = ?$

(A) 7 (B) 0

(C) 14 (D) 10

Solution:(Correct Answer:C)

(70) Which of following metals is soft enough to be cut easily with knife?

(A) Silicone **(B)** Sodium

(C) Copper (D) Aluminium

Solution:(Correct Answer:B)

(71) Amphibians do not have the following

(A) Three chambered heart (B) Gills or lungs

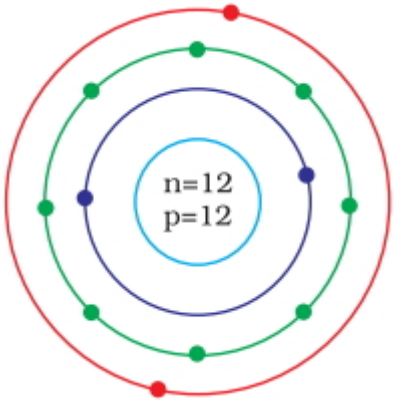
(C) Scales (D) Mucus glands

Solution:(Correct Answer:C)

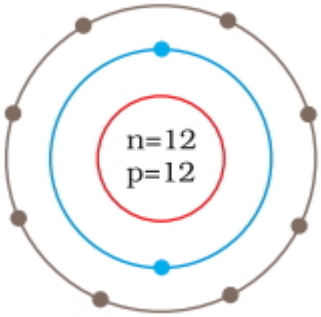
Three chambered heart is found in amphibians. Lungs are present in adults and gills are present in tadpoles. Mucus gland is present on skin of amphibians.

(72) Identify the Mg^{2+} ion from the Fig. where, n and p represent the number of neutrons and protons respectively

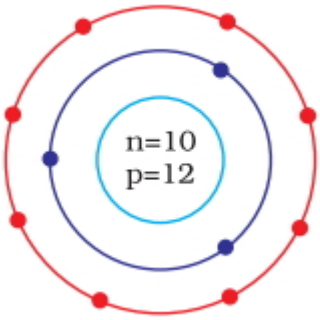
(A)



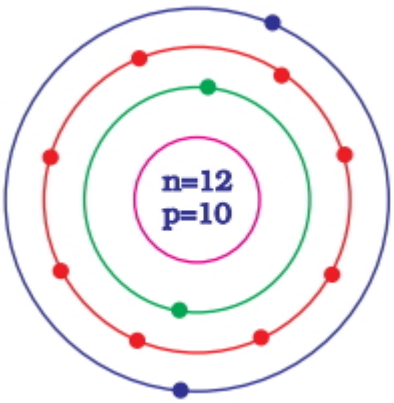
(B)



(C)



(D)



Solution:(Correct Answer:B)

Electronic configuration of Mg atom is : $2,\ 8,\ 2$
So, electronic configuration of Mg^{2+} ion is : $2,\ 8$.

(73) Calculate the molecular masses of H_2, O_2 and Cl_2.

(A) $9\,u$, $36\,u$ and $84\,u$ (B) $6\,u$, $18\,u$ and $36\,u$

(C) $2\,u$, $32\,u$ and $71\,u$ (D) $12\,u$, $36\,u$ and $84\,u$

Solution:(Correct Answer:C)

(i) Molecular mass of H_2 (hydrogen)
$=$ Atomic mass of hydrogen $\times 2$
$= 1 \times 2 = 2\,u$
(ii) Molecular mass of O_2 (oxygen)
$=$ Atomic mass of oxygen $\times 2$
$= 16 \times 2 = 32\,u$
(iii) Molecular mass of Cl_2 (chlorine)
$=$ Atomic mass of chlorine $\times 2$
$= 35.5 \times 2 = 71\,u$

(74) Corals are

(A) Poriferans attached to some solid support

(B) Cnidarians, that are solitary living

(C) Poriferans present at the sea bed

(D) Cnidarians that live-in colonies

Solution:(Correct Answer:D)

Cnidarians that live-in colonies

(75) Compute the difference in masses of one mole each of aluminium atoms and one mole of its ions. (Mass of an electron is $9.1 \times 10^{-28}\,g$). Which one is heavier ?

(A) $0.0016\,g$ (B) $0.0025\,g$

(C) $0.0035\,g$ (D) $0.0055\,g$

Solution:(Correct Answer:A)

Mass of $1\,M$ of aluminium atom $=$ the molar mass of aluminium $= 27\,g\,mol^{-1}$
An aluminium atom needs to lose three electrons to become an ion, Al^{3+}
For one mole of Al^{3+} ion, three moles of electrons are to best lost.
The mass of three moles of electrons
$= 3 \times \left(9.1 \times 10^{-28}\right) \times 6.022 \times 10^{23}\,g$
$= 27.3 \times 6.022 \times 10^{-5}\,g$
$= 164.400 \times 10^{-5}\,g$
$= 0.0016\,g$
Molar mass of
$Al^{3+} = (27 - 0.00164)\,g\,mol^{-1} = 26.998\,g\,mol^{-1}$
Difference $= 27 - 26.9984 = 0.0016\,g$

(76) Match items of column (A) with items of column (B)

Column (A)	Column (B)
(a) Naked seed	(A) Angiosperms
(b) Covered seed	(B) Gymnosperms
(c) Flagella	(C) Bryophytes
(d) Marchantia	(D) Euglena
(e) Marsilea	(E) Thallophyta
(f) Cladophora	(F) Pteridophyta
(g) Penicillium	(G) Fungi

(A) $(a) - B$; $(b) - A$; $(c) - D$; $(d) - C$; $(e) - F$; $(f) - E$; $(g) - G$

(B) $(a) - B$; $(b) - C$; $(c) - D$; $(d) - A$; $(e) - E$; $(f) - F$; $(g) - G$

(C) $(a) - G$; $(b) - C$; $(c) - E$; $(d) - A$; $(e) - D$; $(f) - F$; $(g) - B$

(D) $(a) - B$; $(b) - A$; $(c) - D$; $(d) - G$; $(e) - F$; $(f) - E$; $(g) - C$

Solution:(Correct Answer:A)

$(a) - B$; $(b) - A$; $(c) - D$; $(d) - C$; $(e) - F$; $(f) - E$; $(g) - G$.

(77) Which of these is not related to endoplasmic reticulum ?

(A) It can be the site of energy generation

(B) It transports materials between various regions in cytoplasm

(C) It behaves as transport channel for proteins between nucleus and cytoplasm

(D) It can be the site for some biochemical activities of the cell

Solution:(Correct Answer:A)

Energy generation is the function of mitochondria.

(78) Match items of column (A) with items of column (B)

Column (A)	Column (B)
(a) Pore bearing animals	(A) Arthropoda
(b) Diploblastic	(B) Coelenterata
(c) Metameric segmentation	(C) Porifera
(d) Jointed legs	(D) Echinodermata
(e) Soft bodied animals	(E) Mollusca
(f) Spiny skinned animals	(F) Annelida

(A) $(a)-C\,;(b)-A\,;(c)-F\,;(d)-B\,;(e)-D\,;(f)-E$

(B) $(a)-C\,;(b)-B\,;(c)-F\,;(d)-A\,;(e)-E\,;(f)-D$

(C) $(a)-B\,;(b)-C\,;(c)-F\,;(d)-E\,;(e)-A\,;(f)-D$

(D) $(a)-C\,;(b)-D\,;(c)-A\,;(d)-F\,;(e)-E\,;(f)-B$

Solution:(Correct Answer:B)

$(a)-C\,;(b)-B\,;(c)-F\,;(d)-A\,;(e)-E\,;(f)-D$

(79) Meena and Hari observed an animal in their garden. Hari called it an insect while Meena said it was an earthworm. Choose the character from the following which confirms that it is an insect.

(A) Bilateral symmetrical body

(B) Cylindrical body

(C) Body with jointed legs

(D) Body with little segmentation

Solution:(Correct Answer:C)

Presence of jointed legs is a salient feature of arthropoda and insects belong to arthropoda.

(80) A gold sample contains 90% of gold and the rest copper. How many atoms of gold are present in one gram of this sample of gold ?

(A) 8.34×10^{21}

(B) 2.77×10^{21}

(C) 5.51×10^{21}

(D) 3.73×10^{21}

Solution:(Correct Answer:B)

One gram of gold sample will contain $\frac{90}{100}=0.9\,g$ of gold

Number of moles of gold $=\frac{\text{mass of gold}}{\text{atomic mass of gold}}$

$=\frac{0.9}{197}=0.0046$

One moles of gold contains N_A atoms $=6.022\times10^{23}$

$\therefore 0.0046$ mole of gold will contain $=0.0046\times6.022\times10^{23}$

$=2.77\times10^{21}$

(81) Pteridophyta do not have

(A) root

(B) stem

(C) leaves

(D) flowers

Solution:(Correct Answer:D)

Flower are present only in angiosperms.

(82) Which of the following statement is always correct ?

(A) An atom has equal number of electrons and protons.

(B) An atom has equal number of electrons and neutrons.

(C) An atom has equal number of protons and neutrons.

(D) An atom has equal number of electrons, protons and neutrons.

Solution:(Correct Answer:A)

An atom has equal number of electrons and protons.

(83) For the following statements, write T for True and F for False.

(a) J.J. Thomson proposed that the nucleus of an atom contains only nucleons.

(b) A neutron is formed by an electron and a proton combining together. Therefore, it is neutral.

(c) The mass of an electron is about $\frac{1}{2000}$ times that of proton.

(d) An isotope of iodine is used for making tincture iodine, which is used as a medicine.

(A) $(a)-(T)\,;\ (b)-(F)\,;\ (c)-(T)\,;\ (d)-(F)$

(B) $(a)-(F)\,;\ (b)-(T)\,;\ (c)-(T)\,;\ (d)-(F)$

(C) $(a)-(F)\,;\ (b)-(F)\,;\ (c)-(T)\,;\ (d)-(F)$

(D) $(a)-(T)\,;\ (b)-(F)\,;\ (c)-(F)\,;\ (d)-(T)$

Solution:(Correct Answer:B)

(a) False
(b) True
(c) True
(d) False

(84) Calculate the number of molecules of sulphur (S_8) present in $16\,g$ of solid sulphur.

(A) 5.59×10^{23}

(B) 0.376×10^{23}

(C) 37.6×10^{23}

(D) 3.76×10^{23}

Solution:(Correct Answer:C)

Molar mass of sulphur $(S_8)=32\times8=256\,g$

Number of S_8 molecules in $256\,g$ of solid sulphur $=6.022\times10^{23}$

Number of S_8 molecules in $16\,g$ of solid sulphur $=\frac{6.022\times10^{23}}{256}\times16\,g$

$=3.76\times10^{23}$ molecules

(85) The proteins and lipids, essential for building the cell membrane, are manufactured by

(A) mitochondria

(B) golgi apparatus

(C) plasma membrane

(D) endoplasmic reticulum

Solution:(Correct Answer:D)

Endoplasmic reticulum synthesise both lipids and proteins. However, RER mainly synthesise proteins and SER mainly synthesise lipids.

(86) Match the column (A) with the column (B)

Column (A)	Column (B)
(a) Parenchyma	(i) Thin walled, packing cells
(b) Photosynthesis	(ii) Carbon fixation
(c) Aerenchyma	(iii) Localized thickenings
(d) Collenchyma	(iv) Buoyancy
(e) Permanent tissue	(v) Sclerenchyma

(A) $a-(i)\,;b-(ii)\,;c-(iv)\,;d-(iii)\,;e-(v)$

(B) $a-(i)\,;b-(ii)\,;c-(v)\,;d-(iii)\,;e-(iv)$

(C) $a-(ii)\,;b-(iii)\,;c-(iv)\,;d-(i)\,;e-(v)$

(D) $a-(iii)\,;b-(i)\,;c-(iv)\,;d-(ii)\,;e-(v)$

Solution:(Correct Answer:A)

$a-(i)\,;b-(ii)\,;c-(iv)\,;d-(iii)\,;e-(v)$

(87) The 'Origin of Species' is written by

(A) Linnaeus **(B)** Darwin

(C) Hackel (D) Whittaker

Solution:(Correct Answer:B)

Darwin

(88) Differentiation in segmental fashion occurs in

(A) Leech (B) Starfish

(C) Snails (D) Ascaris

Solution:(Correct Answer:A)

Leech belongs to annelida which show segmentation in body.

(89) Well defined nucleus is absent in

(A) blue green algae (B) diatoms

(C) algae (D) yeast

Solution:(Correct Answer:A)

Blue green algae belong to monera which are prokaryotes and hence welldefined nucleus in absent in them.

(90) Following are a few definitions of osmosis
Read carefully and select the correct definition

(A) Movement of solvent molecules from its higher concentration to lower concentration

(B) Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane

(C) Movement of solvent molecules from higher concentration to lower concentration of solution through a permeable membrane

(D) Movement of solute molecules from lower concentration to higher concentration of solution through a semipermeable membrane

Solution:(Correct Answer:B)

Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane

Science - Section B (NUMERIC)

(91) $10\,mL$ of a solution of $NaOH$ is found to be completely neutralised by $8\,mL$ of a given solution of HCl. If we take $20\,mL$ of the same solution of $NaOH$, the amount of HCl solution (the same solution as before) required to neutralise it will be ..... mL

Solution:

$16\,mL$ of HCl solution will be required.

(92) Write down the electron distribution of chlorine atom. How many electrons are there in the L shell ? (Atomic number of chlorine is 17).

Solution:

$2,\ 8,\ 7$. The L shell has eight electrons

(93) The ion of an element has 3 positive charges. Mass number of the atom is 27 and the number of neutrons is 14. What is the number of electrons in the ion ?

Solution:

Mass number $=27$ and number of neutrons $=14$
Hence, number of electrons in atom $=27-14=13$
Now, ion has 3 positively charges, so number of electrons in the ion $=13-3=10$

(94) Calculate the number of neutrons present in the nucleus of an element X which is represented as ${}^{31}_{15}X$.

Solution:

Mass number $=$ No. of protons $+$ No. of neutrons $=31$
$\therefore$ Number of neutrons $=31-$ number of protons
$=31-15=16$

(95) Number of valence electrons in Cl^- ion are :

Solution:

8

(96) If K and L shells of an atom are full, then what would be the total number of electrons in the atom ?

Solution:

The maximum capacity of K shell is 2 electrons and L shell can accommodate maximum 8 electrons in it. Therefore, there will be ten electrons in the atom.