

MATHEMATICS

1. If $a_1, a_2, a_3, \dots, a_n$ be an A.P. of non-zero terms, then find the sum:

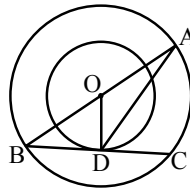
$$\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + \dots + \frac{1}{a_{n-1} a_n}$$

- (A) $\frac{n-1}{a_1 a_n}$ (B) $\frac{n}{a_1 a_n}$ (C) $\frac{(n-1)}{a_1 a_{n-1}}$ (D) $\frac{n}{a_2 a_{n-1}}$

2. If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then

- (A) ab^2, bc^2, ca^2 , are in A.P. (B) bc^2, ab^2, ca^2 are in A.P.
 (C) ab^2, ca^2, bc^2 are in A.P. (D) ca^2, bc^2, ab^2 are in A.P.

3. The radii of two concentric circles are 13 cm and 8 cm respectively. AB is a diameter of the bigger circle. BD is a tangent to the smaller circle touching it at D. The length of AD is



- (A) 19 cm (B) 17 cm (C) 16 cm (D) 14 cm

4. If $\frac{x^3 + ax^2 + bx + 6}{x^2 - x - 2}$ is a polynomial of degree 1 in x , then value of $a + b$ is:

- (A) -5 (B) -4 (C) -2 (D) -3

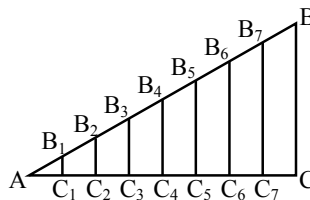
5. If the zeroes of the polynomial $x^3 - ax^2 + bx - c$ are three consecutive integers then, what is the smallest possible value of b ?

- (A) $-\frac{1}{\sqrt{3}}$ (B) -1 (C) -2 (D) 1

6. For what value of k will the roots of the quadratic equation $kx^2 - 5x + 6 = 0$ be in the ratio 2 : 3 ?

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

7. Side AC of a right triangle ACB, right angled at C, is divided into 8 equal parts. Seven line segments parallel to BC are drawn to AB from the points of division. If $BC = 10$ cm, then the sum of the lengths of the seven line segments is

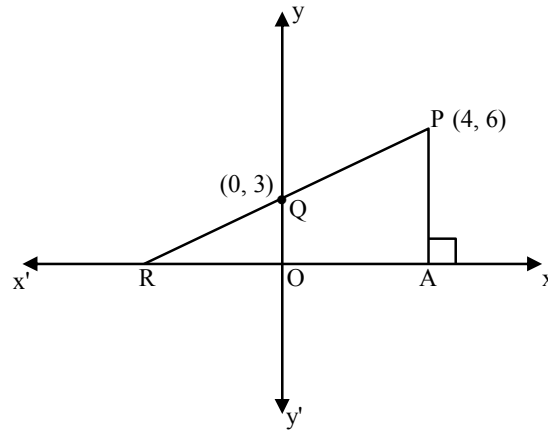


- (A) 35 cm (B) 34 cm (C) 33 cm (D) 45 cm

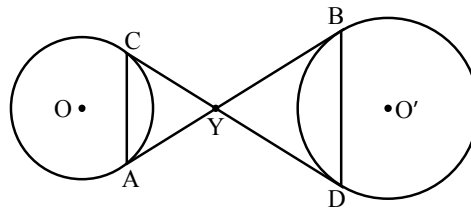
8. If $\sin^4 x + \sin^2 x = 1$, then the value of $\frac{1}{\cot^4 x + \cot^2 x}$ is

- (A) 1 (B) $\cos^2 x$ (C) $\sin^2 x$ (D) $\tan^2 x$

9. If $\tan^2 y \operatorname{cosec}^2 x - 1 = \tan^2 y$, then which one of the following is correct?
 (A) $x = 2y$ (B) $y = 2x$ (C) $x - y = 0$ (D) $x - y = 1$
10. In the adjoining figure, P and Q have coordinates (4, 6) and (0, 3) respectively. Area of ΔRAP is

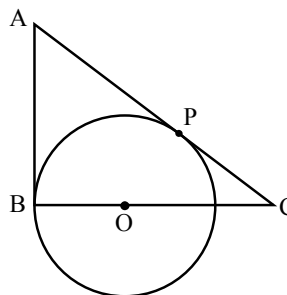


- (A) 16 sq. units (B) 18 sq. units (C) 20 sq. units (D) 24 sq. units
11. Two poles, one is double in length of other, are standing opposite to each other at a distance of y meter. If angle of elevation of their top from mid point of the line joining their feet are complementary, then height of the shorter pole (in meters) is:
 (A) $\frac{y}{\sqrt{2}}$ (B) $\frac{y}{2\sqrt{2}}$ (C) $\frac{y}{2}$ (D) $y\sqrt{2}$
12. The given figure shows two circles with centre O and O'. AB and CD are tangents to the circles. Also $AC = 4.2$ cm, $AY = 4$ cm and $BY = 6$ cm.



What is the sum of the length of the chords AC and BD?

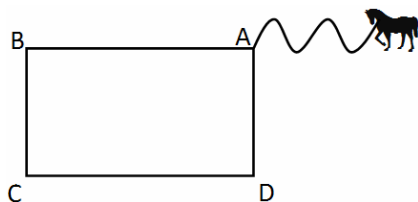
- (A) 6.2 cm (B) 9.8 cm (C) 10.5 cm (D) 12.9 cm
13. The given figure shows a circle with centre O and radius 6 cm. AB and AC are tangents to the circle. It is also given that $BC = 16$ cm



Area of ΔABC is:

- (A) 50 cm^2 (B) 96 cm^2 (C) 128 cm^2 (D) 144 cm^2

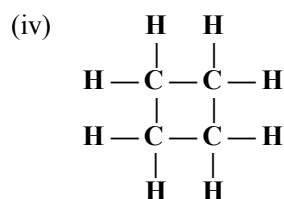
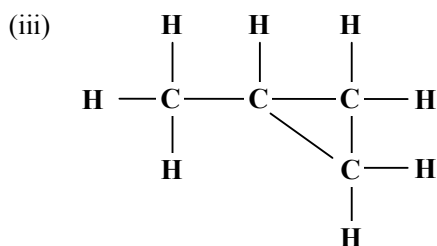
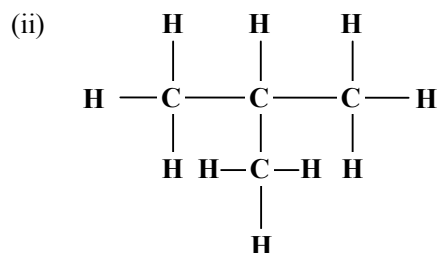
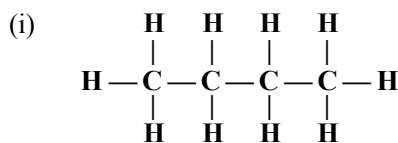
14. If $(n^2 + 9n + 20)$ is the product of two prime numbers, where n is some integer, then value of $n^4 - n^3 + n^2 - n$ is
 (A) 120 (B) 60 (C) 10 (D) 30
15. A horse is tied at corner A of a rectangular field ABCD by a rope. Neither the horse nor the rope is allowed to enter the rectangle ABCD. $AB = r$ units and $AD = \frac{r}{2}\sqrt{3}$ units. What is the maximum possible area that can be grazed by the horse if the length of the rope is r units?



- (A) $\frac{5\pi r^2}{6}$ sq. units (B) $\frac{6\pi r^2}{5}$ sq. units
 (C) $\frac{5\pi r^2}{6} - \frac{r^2\sqrt{3}}{8}$ sq. units (D) $\frac{6\pi r^2}{5} + \frac{r^2\sqrt{3}}{8}$ sq. units

CHEMISTRY

16. A substance X, which is an oxide of a group 2 element, is used intensively in the cement industry. This element is present in bones also. On treatment with water it forms a solution which turns red litmus blue. Identify X.
 (A) BeO (B) MgO (C) CaO (D) All of the above
17. 10 mL of a solution of NaOH is found to be completely neutralized 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 neutralize it will be:
 (A) 4 mL (B) 8 mL (C) 12 mL (D) 16 mL
18. Which of the following methods is most suitable for preventing an iron frying pan from rusting?
 (A) applying grease (B) applying paint
 (C) applying a coating of zinc (D) all of the above
19. Which of the following are correct structural isomers of butane?



- (A) (i) and (iii) (B) (ii) and (iv) (C) (i) and (ii) (D) (iii) and (iv)

20. Match the reactions given in Column (A) with the names given in Column (B).

Sr. No.	Column (A)	Column (B)
a.	$\text{CH}_3\text{OH} + \text{CH}_3\text{COOH} \xrightarrow{\text{H}^+} \text{CH}_3\text{COOCH}_3 + \text{H}_2\text{O}$	i. Addition reaction
b.	$\text{CH}_2 = \text{CH}_2 + \text{H}_2 \xrightarrow{\text{Ni}} \text{CH}_3 - \text{CH}_3$	ii. Substitution reaction
c.	$\text{CH}_4 + \text{Cl}_2 \xrightarrow{\text{Sunlight}} \text{CH}_3\text{Cl} + \text{HCl}$	iii. Neutralisation reaction
d.	$\text{CH}_3\text{COOH} + \text{NaOH} \longrightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$	iv. Esterification reaction

(A) a-iii; b-i; c-iv, d-ii

(B) a-iii; b-ii; c-i, d-iv

(C) a-i; b-ii; c-iii, d-iv

(D) a-iv; b-i; c-ii, d-iii

21. 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

22. Which of the following are not ionic compounds?

(i) KCl

(ii) HCl

(iii) CCl_4

(iv) NaCl

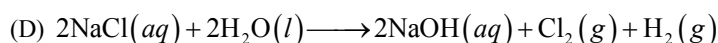
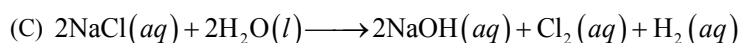
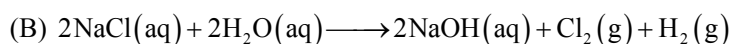
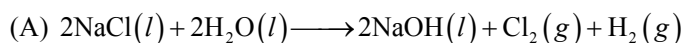
(A) (i) and (ii)

(B) (ii) and (iii)

(C) (iii) and (iv)

(D) (i) and (iii)

23. Identify the correct representation of reaction occurring during chlor-alkali process :



24. If a few drops of a concentrated acid accidentally spill over the hand of a student, what should be done?

(A) Wash the hand with plenty of saline solution.

(B) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate.

(C) After washing hand with plenty of water apply solution of sodium hydroxide on the hand.

(D) Neutralise the acid with a strong alkali by washing hand with conc. KOH.

25. Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by liberation of heat. This process is called slaking of lime. Calcium hydroxide dissolves in water to form its solution called lime water. Which among the following (s) is (are) true about slaking of lime and the solution formed?

(i) It is an endothermic reaction

(ii) It is an exothermic reaction

(iii) The pH of the resulting solution will be more than seven

(iv) The pH of the resulting solution will be less than seven

(A) (i) and (ii)

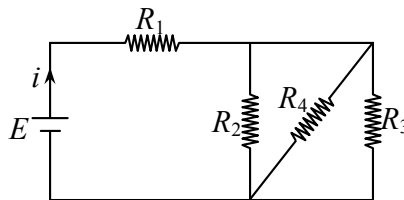
(B) (ii) and (iii)

(C) (i) and (iv)

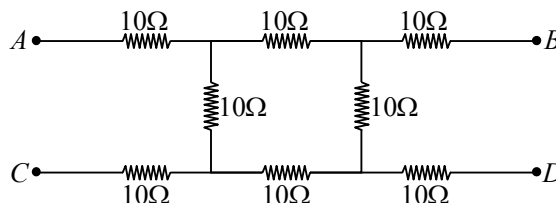
(D) (iii) and (iv)

PHYSICS

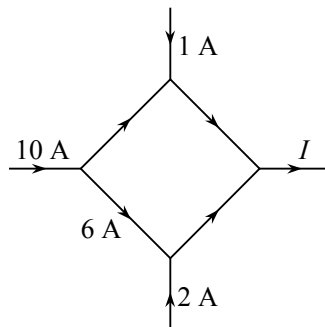
26. A material 'B' has twice the specific resistance of 'A'. A circular wire made of 'B' has twice the diameter of a wire made of 'A'. Then for the two wires to have the same resistance, the ratio $\frac{l_B}{l_A}$ of their respective lengths must be
- (A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) 2 (D) 1
27. The length of a given cylindrical wire is increased by 100 %. Due to the consequent decrease in diameter the change in the resistance of the wire will be
- (A) 300% (B) 200% (C) 100% (D) 50%
28. The resistance of an incandescent lamp is
- (A) Greater when switched off (B) Smaller when switched on
(C) Greater when switched on (D) The same whether it is switched off or switched on
29. In the circuit given $E = 6.0 V$, $R_1 = 100 \text{ ohm}$, $R_2 = R_3 = 50 \text{ ohm}$, $R_4 = 75 \text{ ohm}$. The equivalent resistance of the circuit, in ohm , is



- (A) 11.875 (B) 26.31 (C) 118.75 (D) None of these
30. What will be the equivalent resistance between the two points A and D

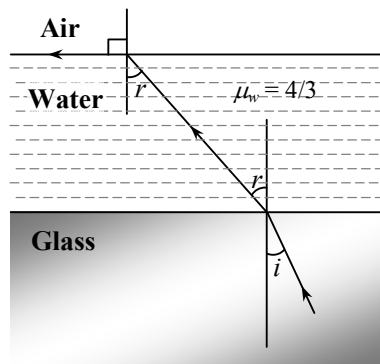


- (A) 10Ω (B) 20Ω (C) 30Ω (D) 40Ω
31. An electron is moving in the north direction. It experiences a force in vertically upward direction. The magnetic field at the position of the electron is in the direction of
- (A) East (B) West (C) North (D) South
32. The figure shows a network of currents. The magnitude of currents is shown here. The current I will be



- (A) 3 A (B) 9 A (C) 13 A (D) 19 A

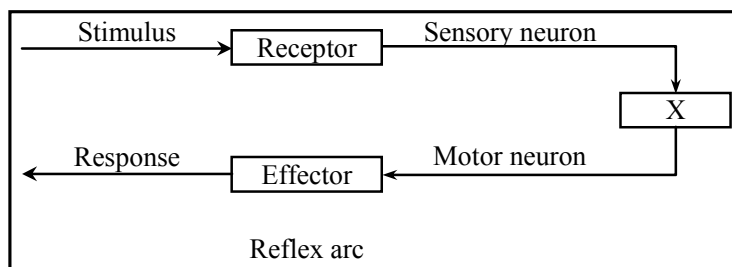
33. Two mirrors are inclined at an angle of 90° . The number of images formed for an object placed in between the mirrors is
 (A) 5 (B) 6 (C) 3 (D) 8
34. Colour of the sky is blue due to
 (A) Scattering of light (B) Total internal reflection
 (C) Total emission (D) None of the above
35. A ray of light is incident at the glass-water interface at an angle i , it emerges finally parallel to the surface of water, then the value of μ_g would be



- (A) $(4/3)\sin i$ (B) $1/\sin i$ (C) $4/3$ (D) 1

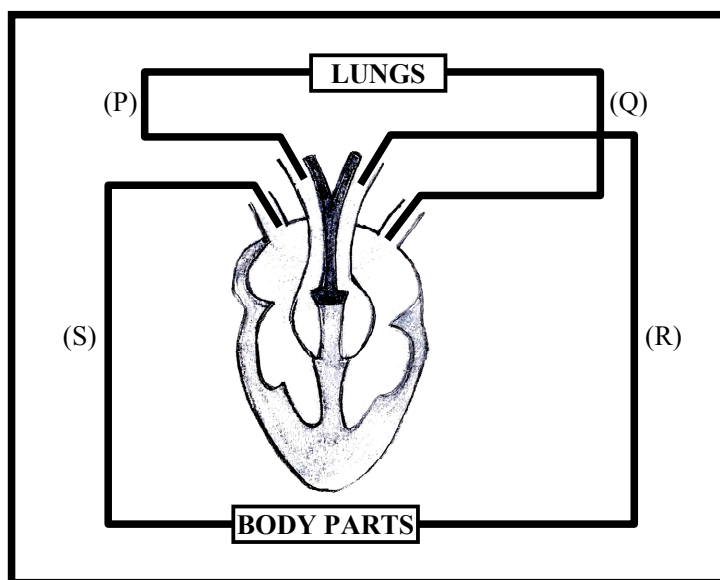
BIOLOGY

36. In peas, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plants to pure short plants in F_2 generation will be:
 (A) 1 : 3 (B) 3 : 1 (C) 1 : 1 (D) 2 : 1
37. A pregnant woman has an equal chance of her baby being blood group A or blood group AB. Which one of the following shows the possible genotypes of the woman and the father of her child?
 (A) $I^A I^A$ and $I^B I^O$ (B) $I^A I^B$ and $I^B I^O$ (C) $I^A I^O$ and $I^B I^O$ (D) $I^O I^B$ and $I^A I^O$
38. Observe the flow chart and identify 'X'.



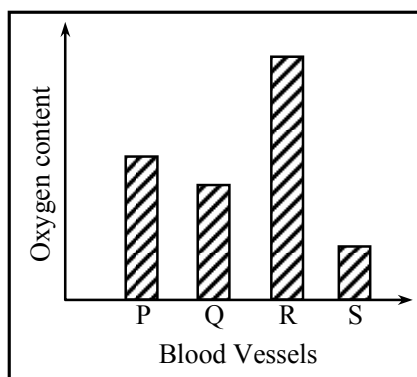
- (A) Spinal cord (B) Brain (C) Cranial nerves (D) Neuromuscular junction
39. Along the path of the vas deferens the secretion of which gland provide nutrition to the sperms?
 (A) Testes (B) Seminal vesicles (C) Scrotum (D) Urinary bladder
40. Which of the following statements about transmission of nerve impulse is incorrect?
 (A) Nerve impulse travels from dendritic end towards axonal end.
 (B) At the dendritic end electrical impulses bring about the release of some chemicals which generate an electrical impulse at the axonal end of another neuron.
 (C) The chemicals released from the axonal end of one neuron cross the synapse and generate a similar electrical impulse in a dendrite of another neuron.
 (D) A neuron transmits electrical impulses not only to another neuron but also to muscle and gland cells.

41. A patient was advised by the doctor to take an injection of insulin because his–
- (A) blood pressure was low (B) heart was beating slowly
(C) sugar level in blood was low (D) sugar level in blood was high
42. Some dinosaurs had feathers although they could not fly but birds have feathers that help them to fly. In the context of evolution this means that
- (A) Reptiles have evolved from birds.
(B) There is no evolutionary connection between reptiles and birds.
(C) Feathers are homologous structures in both the organisms.
(D) Birds have evolved from reptiles.
43. Pure-bred pea plant (P) is crossed with pure-bred pea plant (Q). It is found that the plants which look like (P) do not appear in F_1 generation but reappear in F_2 generation. Which of the plants (P) and (Q) are tall and dwarf?
- (A) P are tall and Q are dwarf (B) P are tall and Q are also tall
(C) P are dwarf and Q are also dwarf (D) P are dwarf and Q are tall
44. Which of the following is true about the amount of oxygen and the direction of blood flow in blood vessels P, Q, R and S?



	Oxygen content		Direction of blood flow	
	Highest	Lowest	To the heart	From the heart
(A)	Q	P	S	R
(B)	S	R	P	Q
(C)	R	Q	S	P
(D)	S	Q	P	R

45. The chart given below shows the oxygen content in four samples of blood taken from four different blood vessels of the body.



Which sample is most probably taken from a pulmonary artery?

- (A) P (B) Q (C) R (D) S
46. The following statements describe how the transport system in a plant works.

P → Xylem tubes carry water and mineral salts to other parts of the plant.

Q → The leaves make food in the presence of sunlight.

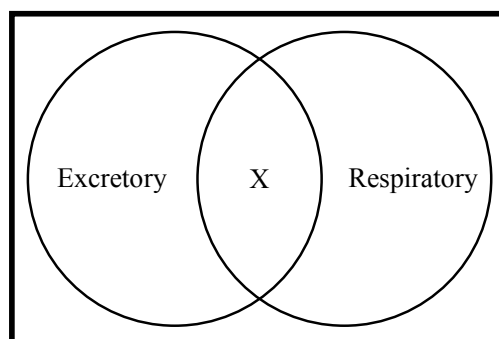
R → The leaves receive water and mineral salts.

S → Phloem tubes transport food to other parts of the plant.

T → Root hairs absorb water and mineral salts from the soil.

Which of these is a correct sequence?

- (A) P → T → Q → R → S (B) T → P → R → Q → S
- (C) P → R → Q → S → T (D) R → Q → T → P → S
47. Which organ is represented by 'X' in the human body?



- (A) Buccal cavity (B) Heart (C) Lungs (D) Kidneys

