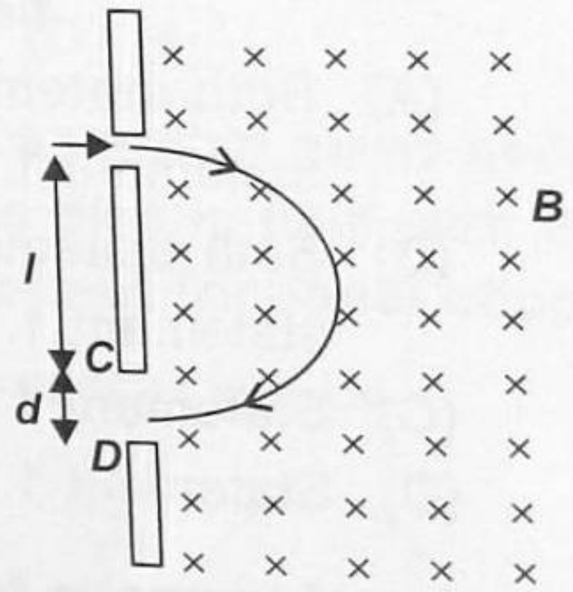
## SECTION-1
## PHYSICS

1. A beam of equally charged particles after being accelerated through a voltage $V$ enters into a magnetic field $B$ as shown in the figure. It is found that all the particles hit the plate between $C$ and $D$. The ratio between the masses of the heaviest and lightest particles of the beam is



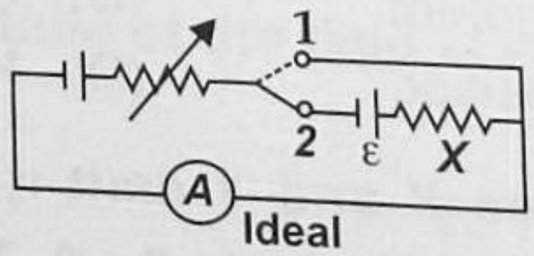

(A) $\left(1+\frac{d}{l}\right)^2$

(B) $\left(\frac{d}{l}\right)$

(C) $\left(1-\frac{d}{l}\right)^2$

(D) None of these

2. In the circuit shown, the variable resistance is so adjusted that the ammeter reading is same in both the position 1 and 2 of the key. The reading of ammeter is 2 A. If $\varepsilon$ = 10 V, then $X$ is



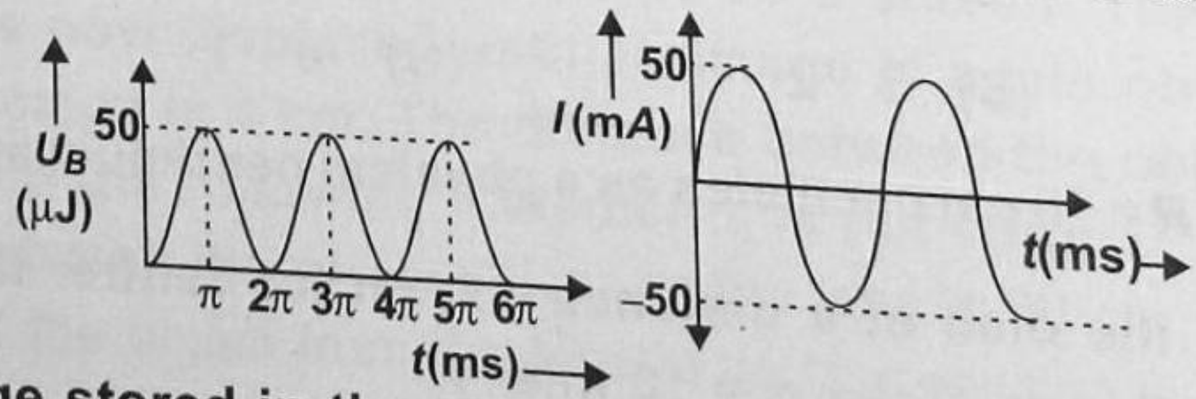

(A) 2 Ω

(B) 5 Ω

(C) 10 Ω

(D) 20 Ω

3. In an $L$-$C$ circuit the graph of magnetic energy and current is as shown in figure.




The maximum charge stored in the capacitor is

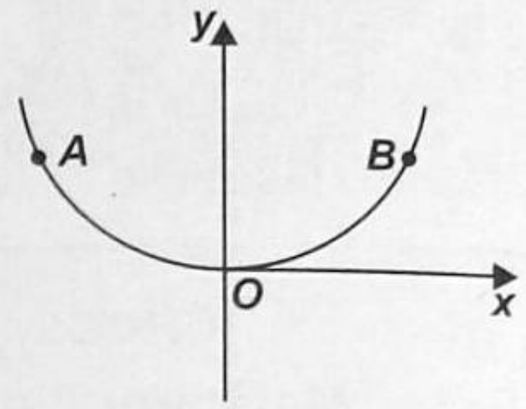
(A) 200 μC

(B) 300 μC

(C) 100 μC

(D) Can't be calculated.

4. A smooth parabolic wire track described by equation $x^2 = 2ay$ is fixed in $x - y$ plane as shown in figure in a gravity free space. An electric field defined by equation $\vec{E} = \alpha(y\,\hat{i} + x\,\hat{j})$ is present in space. A ring of mass $m$ and charge $+q$ is released from rest from a point $A\left(-a, \frac{a}{2}\right)$ reaches at an another point $B\left(a, \frac{a}{2}\right)$. Then velocity of ring at $B$ will be [ring just fits in wire track]




(A) $\sqrt{\frac{q\alpha a^2}{m}}$ (B) $\sqrt{\frac{q\alpha a^2}{2m}}$

(C) $\sqrt{\frac{2q\alpha a^2}{m}}$ (D) $\sqrt{\frac{2q\alpha a^2}{3m}}$

5. Read the given statements and mark the correct option.

Statement 1 : If a metal block is placed near a large uniformly charged non-conducting sheet, it does not experience any net force.

Statement 2 : A dipole does not experience any net force in a uniform electric field.

(A) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

(B) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is true but statement 2 is false.

(D) Statement 1 is false but statement 2 is true.

6. A real image is formed by a convex lens for an object placed at distance $d$ from the lens. A concave lens is put in contact with the convex lens and again a real image is formed when the object is placed at same distance $d$ from the lens system. This image will (as compared to the earlier image)

(A) Shift towards the lens system (B) Shift away from the lens system

(C) Remain in its original position (D) None of these.

7. Two radioactive substances $X$ and $Y$ emit $\alpha$ and $\beta$ particles respectively. Their disintegration constants are in the ratio 2 : 3. To have equal probabilities of getting emission of $\alpha$ and $\beta$ particles, the ratio of number of atoms of $X$ to that of $Y$ at any time instant is

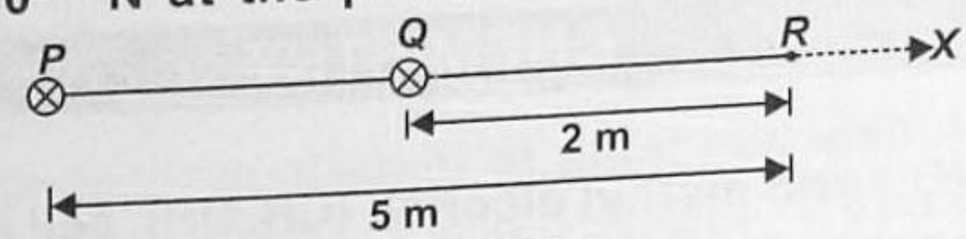
(A) 2 : 3 (B) 3 : 2 (C) $e$ : 1 (D) $(e - 1)$ : 1

8. A disc of radius $R = 10$ cm oscillates as a physical pendulum about an axis perpendicular to the plane of the disc at a distance $r$ from its centre. If $r = \frac{R}{4}$, the approximate period of oscillation is (Take $g = 10\ \text{m s}^{-2}$)

(A) 0.84 s (B) 0.94 s (C) 1.26 s (D) 1.42 s

**DIRECTIONS : Read the passage carefully and answer Q. nos. 9, 10 and 11.**

**Two long parallel wires carrying currents 2.5 A and *I* A in the same direction (directed into the plane of the paper) are held at *P* and *Q* respectively such that they are perpendicular to the plane of the paper. The points *P* and *Q* are located at a distance of 5 m and 2 m, respectively, from a collinear point *R* as shown in figure. An electron moving with a velocity of $4 \times 10^5$ m $s^{-1}$ along the positive *X*-direction experiences a force of magnitude $3.2 \times 10^{-20}$ N at the point *R*.**




**9. The magnitude of magnetic field at point *R* is**

(A) $2.5 \times 10^{-7}$ T (B) $5.0 \times 10^{-7}$ T (C) $5.0 \times 10^{-6}$ T (D) $2.5 \times 10^{-6}$ T

**10. The magnitude of magnetic field at point *R* due to current 2.5 A in wire *P* is**

(A) $1 \times 10^{-7}$ T (B) $2 \times 10^{-7}$ T (C) $3 \times 10^{-7}$ T (D) $4 \times 10^{-7}$ T

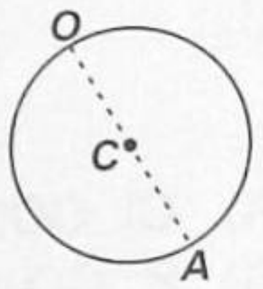
**11. The current *I* in wire *Q* is**

(A) 1 A (B) 2 A (C) 3 A (D) 4 A

**12. A uniform circular disc of mass *m* and radius *a* can rotate in a vertical plane about a horizontal axis through a point *O*, on its circumference. The disc is held with the diameter *OA* through *O* horizontal and then released. If a constant frictional couple of $\frac{mga}{2\pi}$ opposes the motion, the angular speed when *OA* is vertical will be**

(A) $\sqrt{\frac{g}{2a}}$ (B) $\sqrt{\frac{g}{a}}$

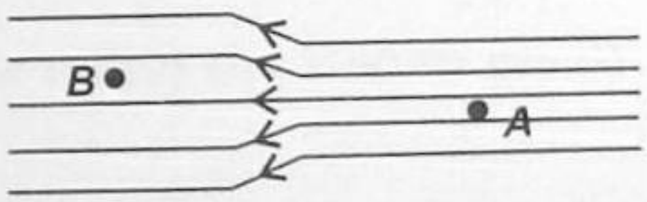
(C) $2\sqrt{\frac{g}{3a}}$ (D) None of these




**13. In the given figure, the electric field lines on the left have twice the separation of those on the right. If the magnitude of the field at *A* is 40 N/C. What is the magnitude of the field at *B*?**

(A) 40 N/C (B) 20 N/C

(C) 80 N/C (D) 10 N/C




**14. A convex lens forms an image of an object on a screen. The height of the image is 9 cm. The lens is now displaced until an image is again obtained on the screen. The height of this image is 4 cm. The distance between the object and the screen is 90 cm. Which among the following statements is not correct?**

(A) The distance between the two positions of the lens is 30 cm.

(B) The distance of the object from the lens in its first position is 36 cm.

(C) The height of the object is 6 cm.

(D) The focal length of the lens is 21.6 cm.

15. **A point mass of 1 kg collides elastically with a stationary point mass of 5 kg. After their collision, the 1 kg mass reverses its direction and moves with a speed of 2 m $s^{-1}$. Which of the following statements is correct for the system of these two masses?**

(A) Total momentum of the system is 4 kg m $s^{-1}$.
(B) Momentum of 5 kg mass after collision is 4 kg m $s^{-1}$.
(C) Kinetic energy of the centre of mass is 0.75 J.
(D) Total kinetic energy of the system is 4 J.

## CHEMISTRY

16. **If glycerin, ($C_3H_5(OH)_3$) and methyl alcohol, ($CH_3OH$), sell at the same price per pound, which would be cheaper for preparing an antifreeze solution for the radiator of an automobile?**

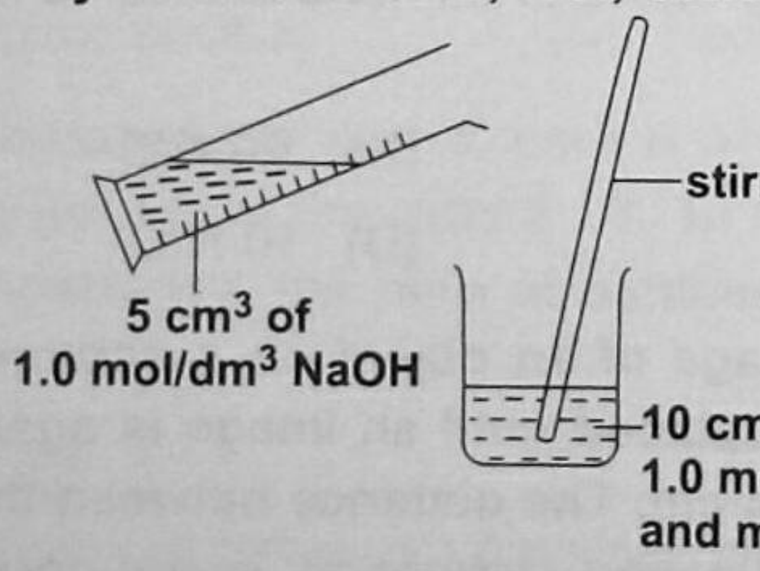
(A) Glycerin
(B) Methyl alcohol
(C) Theoretically methyl alcohol but practically glycerin
(D) Theoretically glycerin but practically methyl alcohol

17. **Characteristic property of element/compound is written against each triad. Pick the element/compound from each triad with that property.**

| Element/compound | Property |
|---|---|
| Cl, Ar, K | Smallest ionisation enthalpy |
| $CO_2$, $NH_3$, CO | Zero dipole moment |
| $CH_4$, $NH_3$, HF | Highest boiling point |
| $Cl_2$, $Br_2$, $I_2$ | Lowest boiling point |

(A) Cl, CO, $CH_4$, $I_2$
(B) Cl, $NH_3$, HF, $Br_2$
(C) K, $CO_2$, HF, $Cl_2$
(D) Ar, $NH_3$, $CH_4$, $I_2$

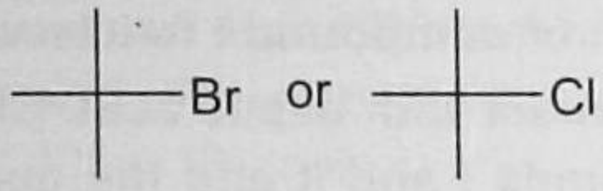
18. **In an experiment, 5 $cm^3$ of 1.0 mol/$dm^3$ sodium hydroxide, NaOH, is gradually added to 10 $cm^3$ of 1.0 mol/$dm^3$ hydrochloric acid, HCl, containing methyl orange indicator.**

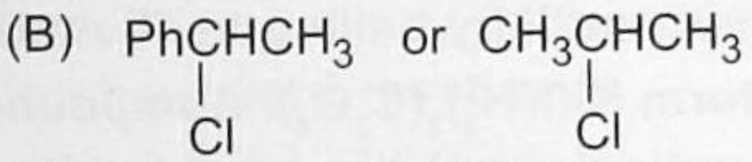


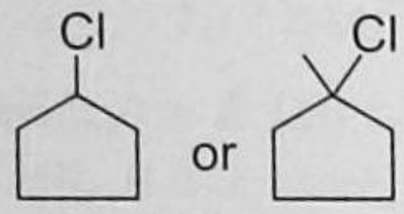

**Identify the change that occurs in the mixture.**

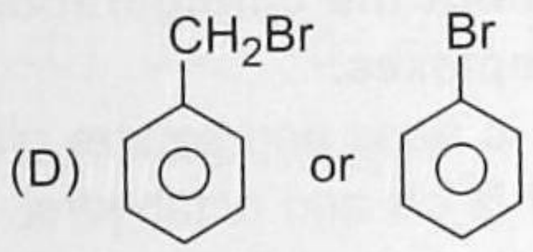
(A) The concentration of the $H^+$ ions increases.
(B) The methyl orange changes colour.
(C) More water molecules are formed.
(D) A precipitate is formed.

**19. In which of the following option, second compound gives a precipitate more rapidly than the first compound when reacted with $AgNO_3$ in ethanol?**

(A)  or 

(B) 

(C)  or 

(D) 

**20. Cellulose, the most important constituent of plant cell wall, is made up of**

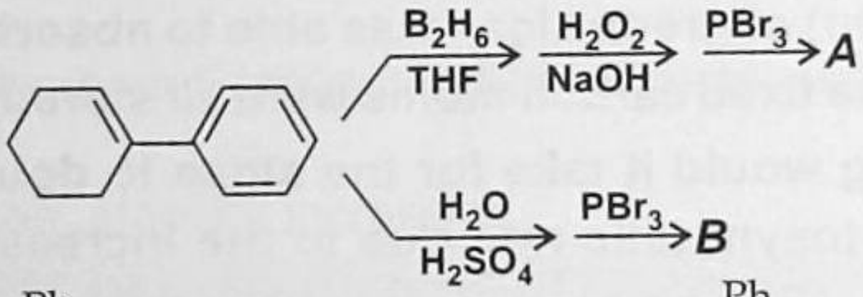
(A) Branched chain of glucose molecules linked by $\alpha$ $(1 \rightarrow 6)$ glycosidic bonds at the site of branching

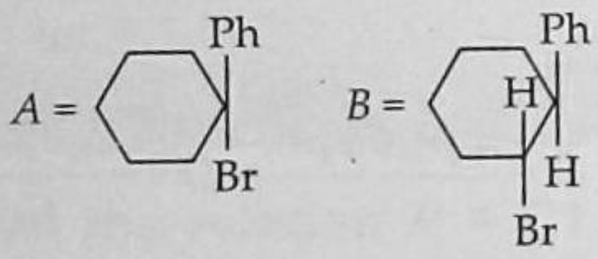
(B) Unbranched chain of glucose molecules linked by $\alpha$ $(1 \rightarrow 4)$ glycosidic bonds

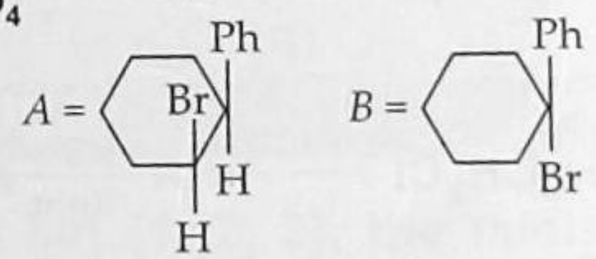
(C) Branched chain of glucose molecules linked by $\beta$ $(1 \rightarrow 4)$ glycosidic bond in straight chain and $\alpha$ $(1 \rightarrow 6)$ glycosidic bond at the site of branching

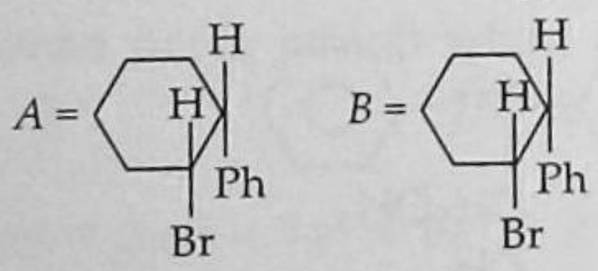
(D) Unbranched chain of glucose molecules linked by $\beta$ $(1 \rightarrow 4)$ glycosidic bonds

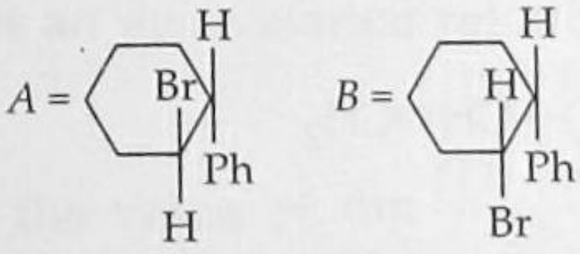
**21. Check the sequence of reactions. Considering probable stereochemistry of bromide formation due to $PBr_3$ reaction, find the option that correctly represents the product?**




(A) 

(B) 

(C) 

(D) 

**22. Match Column-I with Column-II and select the correct answer using the codes given below.**

| Column-I | | Column-II | |
|---|---|---|---|
| (1) | Anticancer drug | (i) | $(PPh_3)_3RhCl$ |
| (2) | Calibrant in Guoy's magnetic tube | (ii) | *Cis*-platin |
| (3) | Hydrogenation of alkenes | (iii) | $C_2H_5HgCl$ |
| (4) | Measuring the hardness of water | (iv) | $Hg[Co(SCN)_4]$ |
| (5) | Fungicide | (v) | EDTA |

(A) (1) - (iv), (2) - (ii), (3) - (i), (4) - (v), (5) - (iii)

(B) (1) - (ii), (2) - (iv), (3) - (i), (4) - (v), (5) - (iii)

(C) (1) - (ii), (2) - (iv), (3) - (i), (4) - (iii), (5) - (v)

(D) (1) - (ii), (2) - (i), (3) - (iv), (4) - (v), (5) - (iii)

23. **When $[Ni(NH_3)_4]^{2+}$ is treated with concentrated HCl, two compounds having the formula $Ni(NH_3)_2Cl_2$ (designated I and II) are formed. Compound I can be converted into compound II by boiling in dilute HCl. A solution of compound I reacts with oxalic acid to form $Ni(NH_3)_2(C_2O_4)$. Compound II does not react with oxalic acid. Choose the correct option about the configurations of compounds I and II and the geometry of the nickel(II) complexes.**

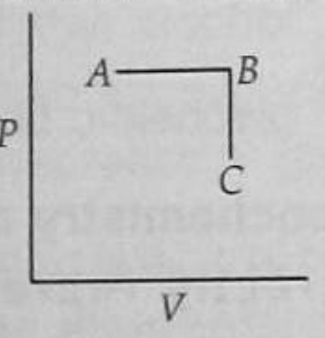
(A) Compound I is *trans* and square planar.

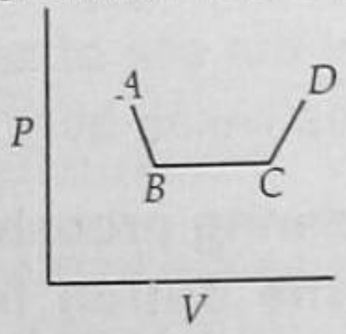
(B) Compound II is *cis* and octahedral.

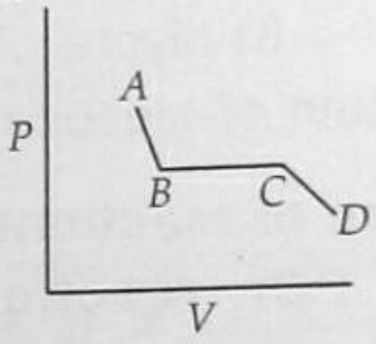
(C) Compound I is *cis* and both compound I and II are square planar.

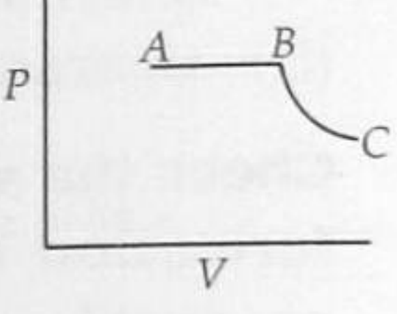
(D) Compound II is *trans* and tetrahedral.

24. **Two moles of helium gas occupy 10 litres at 27°C. The gas is first expanded at constant pressure until the volume is double. It then undergoes adiabatic change until the temperature returns to its initial value. Which graph is correct for this process?**

(A) 

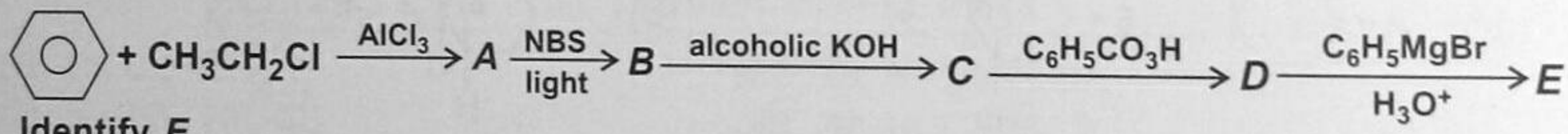

(B) 


(C) 

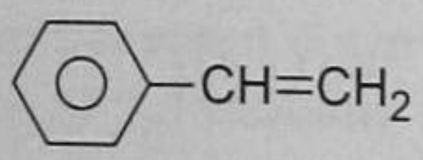

(D) 

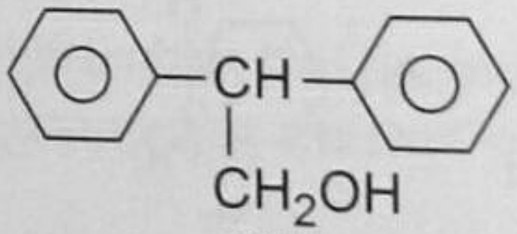

25. **One gram (dry weight) of green algae was able to absorb $5.5 \times 10^{-3}$ mol $CO_2$ per hour by photosynthesis. If the fixed carbon atoms were all stored after photosynthesis as starch, $(C_6H_{10}O_5)_n$, how long would it take for the algae to double their own weight? Neglect the increase in photosynthetic rate due to the increasing amount of living matter.**

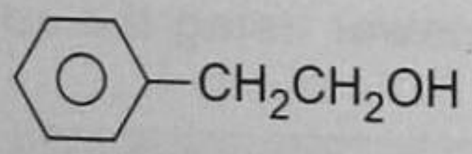
(A) 1 hr (B) 2.8 hr (C) 6.7 hr (D) 7.2 hr

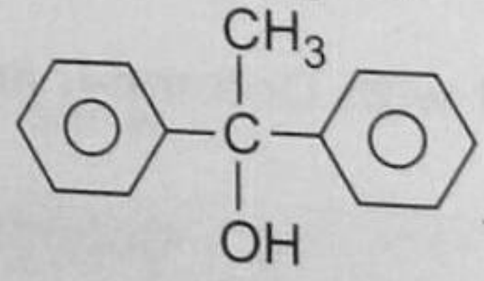
26. 


**Identify *E*.**

(A) 


(B) 


(C) 


(D) 


27. **The following electrochemical cell has been set up :**
**$Pt_{(s)}/Fe^{3+}, Fe^{2+}(a = 1) \parallel Ce^{4+}, Ce^{3+}\ (a = 1)/Pt_{(s)}$**
**$E°(Fe^{3+}/Fe^{2+}) = 0.77$ V, $E°(Ce^{4+}/Ce^{3+}) = 1.61$ V**
**If an ammeter is connected between two platinum electrodes, what is the direction of flow of current?**

(A) From cerium electrode to iron electrode

(B) From iron electrode to cerium electrode

(C) Both (A) and (B)

(D) Neither (A) nor (B)

28. For a general reaction $A_{(g)} + B_{(g)} \rightleftharpoons C_{(g)} + D_{(g)}$, the specific rate constant is $k_{forward} = 2.0 \times 10^{-3}$ mol$^{-1}$ L s$^{-1}$ at a certain temperature. Reaction starts with equimolar amounts of *A* and *B*. Reaching at equilibrium, it is observed that amount of *A* is twice that of *C*. The specific rate constant for the backward reaction is

(A) $1.5 \times 10^{2}$ mol$^{-1}$ L s$^{-1}$ (B) $5.0 \times 10^{-4}$ mol$^{-1}$ L s$^{-1}$

(C) $8.0 \times 10^{-3}$ mol$^{-1}$ L s$^{-1}$ (D) $0.5 \times 10^{-3}$ mol$^{-1}$ L s$^{-1}$

29. $P_4$ (white) + *P* (an alkaline solution) $\longrightarrow$ *Q* (reducing gas) + *R*

*R* + dil. $H_2SO_4 \longrightarrow$ *T* (ppt.) + *S* (oxyacid of P)

*T* gives apple green colour in the flame. Thus *P*, *Q*, *R*, *S* and *T* respectively are

(A) $Ba(OH)_2$; $PH_3$; $Ba(H_2PO_2)_2$; $H_3PO_2$; $BaSO_4$

(B) $Ca(OH)_2$; $P_2H_4$; $Ca(H_2PO_2)_2$; $H_3PO_2$; $CaSO_4$

(C) $Ba(OH)_2$; $PH_3$; $Ba(H_2PO_2)_3$; $H_3PO_3$; $BaSO_4$

(D) $Ba(OH)_2$; $P_2H_4$; $Ba(H_2PO_2)_2$; $H_3PO_3$; $BaSO_4$

30. On combustion in excess of air, lithium forms mainly the oxide, sodium forms peroxide while potassium or rubidium or caesium form superoxides. It suggests that as cationic size increases the

(A) Anionic polarisability increases, thus stability decreases

(B) Anionic size increases, polarisability increases, covalency increases, thus stability increases

(C) Anionic size increases, coordination number increases, lattice energy increases, thus stability increases

(D) Anionic size decreases, stability increases

## SECTION-2
## MATHEMATICS

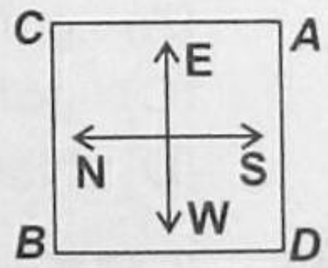
31. Given the relation $R = \{(1, 2), (2, 3)\}$ in the set $\{1, 2, 3\}$, the minimum number of ordered pairs which when added to *R* make it an equivalence relation is _____.

(A) 5 (B) 6 (C) 7 (D) 8

32. If $f(x) = 3x^{10} - 7x^8 + 5x^6 - 21x^3 + 3x^2 - 7$, then the value of $\lim\limits_{\alpha \to 0} \dfrac{f(1-\alpha) - f(1)}{\alpha^3 + 3\alpha}$ is _____.

(A) $\dfrac{53}{3}$ (B) $\dfrac{22}{3}$ (C) 13 (D) None of these

33. The given question is based on the diagram given below showing four persons stationed at the four corners of a square piece of plot as shown. From the original position *B* and *D* move one and a half length of sides clockwise and anti-clockwise respectively. Which one of the following statements is true?




(A) *B* and *D* are both at the midpoint between *A* and *C*.

(B) *D* is at the midpoint between *A* and *C*, and *B* at the corner originally occupied by *C*.

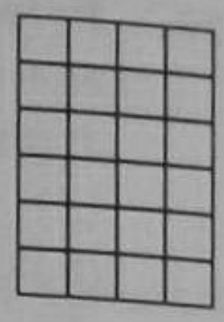
(C) *B* is at the midpoint between *A* and *C*, and *D* at the corner originally occupied by *A*.

(D) *B* and *D* are both at the midpoint between *A* and *D*.

34. If (sec $A$ – tan $A$) (sec $B$ – tan $B$) (sec $C$ – tan $C$) = (sec $A$ + tan $A$) (sec $B$ + tan $B$) (sec $C$ + tan $C$), then each side is equal to _____.
(A) 0 (B) 1 (C) –1 (D) ± 1

35. Introducing a man, a woman said, "His wife is the only daughter of my father". How is that man related to the woman?
(A) Brother (B) Father-in-law (C) Husband (D) None of these

36. A rectangle with sides $2m - 1$ and $2n - 1$ is divided into squares of unit length by drawing parallel lines as shown in the diagram, then the number of rectangles possible with odd side lengths is _____.



(A) $(m + n + 1)^2$ (B) $4^{m+n-1}$
(C) $m^2n^2$ (D) $mn(m + 1)(n + 1)$

37. In the given question, $\alpha$ stands for 'equal to' and $\beta$ for 'greater than'; if $abxy \; \alpha \; c^2z$, $bx \; \beta \; ay$ and $b^2 \alpha \; ac$, then _____.
(A) $ax^2 \; \beta \; cz$ (B) $a^2x^2 \; \beta \; cz$ (C) $b^2x \; \beta \; c^2z$ (D) $bx^2 \; \beta \; c^2z$

38. If $A$ and $B$ are two matrices such that $A + B$ and $AB$ are both defined, then _____.
(A) $A$ and $B$ can be any matrices
(B) $A$, $B$ are square matrices not necessarily of same order
(C) $A$, $B$ are square matrices of same order
(D) Number of columns of $A$ = number of rows of $B$

39. In a class, there are 18 boys who are over 160 cm tall. If these constitute three-fourths of the boys and the total number of boys is two-thirds of the total number of students in the class, what is the number of girls in the class?
(A) 6 (B) 12 (C) 18 (D) 24

40. An insurance salesman sells policies to 5 men, all of identical age and in good health. The probability that a man of this particular age will be alive after 30 years is 2/3. The probability that after the lapse of 30 years, all the five persons will be alive, is _____.
(A) $\frac{1}{15}$ (B) $\frac{16}{81}$ (C) $\frac{32}{243}$ (D) None of these.

41. How many days will there be from 26th January 2004, to 15th May, 2004 (both days included)?
(A) 110 (B) 111 (C) 112 (D) 113

42. If $f$ and $g$ are two decreasing functions such that $gof$ exists, then _____.
(A) $gof$ is an increasing function (B) $gof$ is a decreasing function
(C) $gof$ is neither increasing nor decreasing
(D) None of these

43. If $x^2 + px + q = 0$ is the quadratic equation whose roots are $a - 2$ and $b - 2$ where $a$ and $b$ are the roots of $x^2 - 3x + 1 = 0$, then _____.
(A) $p = 1, q = 5$ (B) $p = 1, q = -1$ (C) $p = -1, q = 1$ (D) None of these

44. **Which of the following statements is not correct?**

(A) If each item of a series is increased by *a*, then mean is increased by *a*.

(B) If each item of a series is decreased by *a*, then mean is also decreased by *a*.

(C) If each item of a series is multiplied by *a*, then the mean is also multiplied by *a*.

(D) Mean remains unaffected in each case.

45. **How many such letters are there in the word BACKLASH each of which is as far away from the beginning of the word as it is from the beginning of the English alphabet?**

(A) None (B) One (C) Two (D) Three

46. **Value of** $\int_{-4}^{-5} e^{(x+5)^2}\,dx + 3\int_{1/3}^{2/3} e^{9\left(x-\frac{2}{3}\right)^2}\,dx$ **is** _____.

(A) $e^5$ (B) $e^4$ (C) $3e^2$ (D) 0

47. **A cube of white material is painted black on all its surfaces. If it is cut into 125 smaller cubes of the same size, then how many cubes will have two sides painted black?**

(A) 36 (B) 16 (C) 22 (D) 44

48. **If** $f(x) = x^5, g(x) = \sqrt{x}$ **and** $h(x) = x^4 + 4$, **then** $\int \frac{f(x)}{(goh)(x)}\,dx =$ _____.

(A) $(g(x))^4(goh)(x) - \log(g(x))^4 + (goh)(x) + C$

(B) $\frac{1}{2}(g(x))^4(goh)(x) - \log(g(x))^4 + (goh)(x) + C$

(C) $\frac{1}{2}(g(x))^4(goh)(x) + \log(g(x))^4 + (goh)(x) + C$

(D) None of these

49. **If** $y = \log^n x$ **where** $\log^n$ **means log log log....(repeated** *n* **times), then** $x \log x \log^2 x \log^3 x$ **.... log**$^{n-1}$ $x \log^n x \frac{dy}{dx}$ **is equal to** _____.

(A) log x (B) $x$ (C) $(\log x)^{-1}$ (D) 1

50. **In the given question, from amongst the options, select the one which satisfies the same conditions of placement of the dots as in figure (X).**

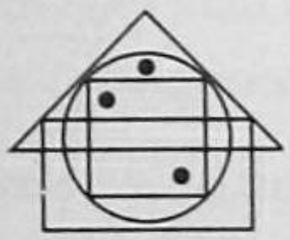
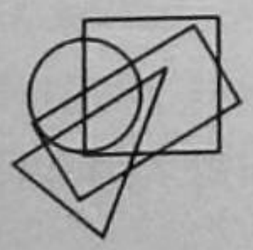
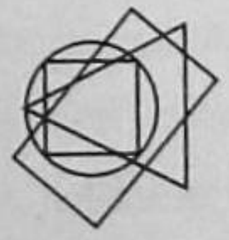
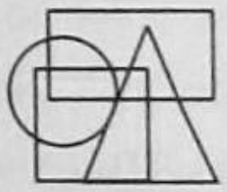
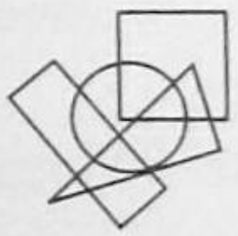


**Fig. (X)**

(A) 

(B) 

(C) 

(D) 

OR

## BIOLOGY

31. **Which of the following is a correct match?**

(A) Membrane potential – The voltage difference between the inside and outside of a cell

(B) Pacemaker potential – A spontaneously occurring graded potential change that occurs in a cell

(C) Action potential – A brief all-or-none repolarization of the membrane, which reverses polarity in neurons

(D) Synaptic potential – A graded potential change produced in the pre-synaptic neuron in response to the release of neurotransmitters by a post-synaptic terminal

32. **The given table shows the results of an investigation regarding absorption of products of digestion in the presence and absence of oxygen.**

| Products of digestion | Absorption in the presence of oxygen (arbitrary units) | Absorption in the absence of oxygen (arbitrary units) |
|---|---|---|
| Amino acid | 5.3 | 1.7 |
| Fatty acids | 1.9 | 2.0 |
| Glucose | 6.4 | 2.3 |
| Glycerol | 4.8 | 4.7 |

**Which conclusion can be drawn from these results?**

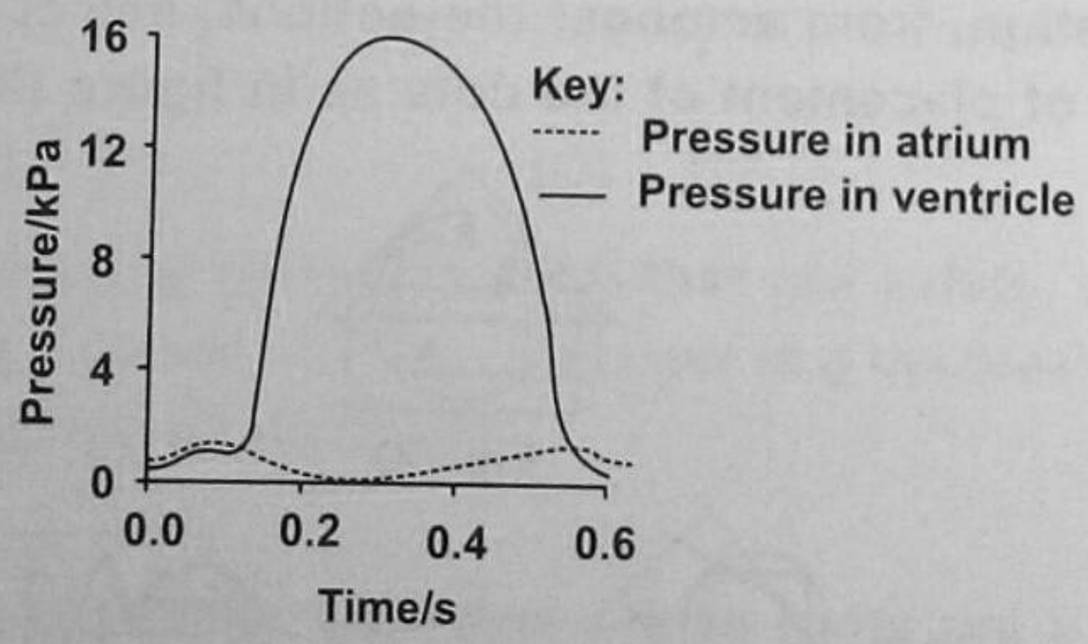
(A) All products of digestion are absorbed by both active transport and diffusion.

(B) All products of digestion are absorbed by diffusion only.

(C) Amino acids and glucose are absorbed by active transport only.

(D) Fatty acids and glycerol are absorbed mainly by diffusion.

33. **The given graph shows pressure changes in the left side of the heart at rest during a single heart beat. What is the number of times that this person's heart beats in one minute while at rest?**




(A) 60 (B) 70 (C) 100 (D) 120

34. **Which of the following options incorrectly matches the characteristics of muscle cells with the muscle cell types? [(+) sign indicates the relative amount of sarcoplasmic reticulum present in a given muscle type]**

| | Characteristic | Skeletal muscle | Smooth muscle | Cardiac muscle |
|---|---|---|---|---|
| (A) | Sarcomeres banding pattern | Yes | No | Yes |
| (B) | Sarcoplasmic reticulum | ++++ | + | ++ |
| (C) | Gap junctions between cells | Yes | Yes | Yes |
| (D) | Effect of nerve stimulation | Excitation | Excitation or inhibition | Excitation or inhibition |

35. **Which of the following is incorrect about phylum chordata?**

(A) Phylum chordata has fundamental features as the presence of a notochord, a dorsal hollow nerve cord, and paired pharyngeal gill slits.

(B) In subphylum urochordata, notochord extends from head to tail region and is persistent throughout their life while in subphylum cephalochordata, notochord is present only in larval tail.

(C) In subphylum vertebrata, embryonic notochord is replaced by a cartilaginous or bony vertebral column in the adult.

(D) None of these.

36. **A woman has missed her menstruation. She performed pregnancy test at home which came out negative. She is suffering with extreme abdominal pain and vaginal bleeding. What would be the cause for these symptoms?**

(A) Abortion

(B) Ectopic pregnancy

(C) Hepatitis - B

(D) Genital warts

37. **The primary follicle when gets surrounded with more layers of granulosa cells and new theca, it is called secondary follicle. The secondary follicle soon transforms into a _____ follicle which is characterized by a fluid filled cavity called antrum. The _____ within the tertiary follicle grows in size and completes its _____ division. It is an unequal division resulting in the formation of a large _____ and a tiny _____.**

**Select the correct sequence of words to complete the above paragraph.**

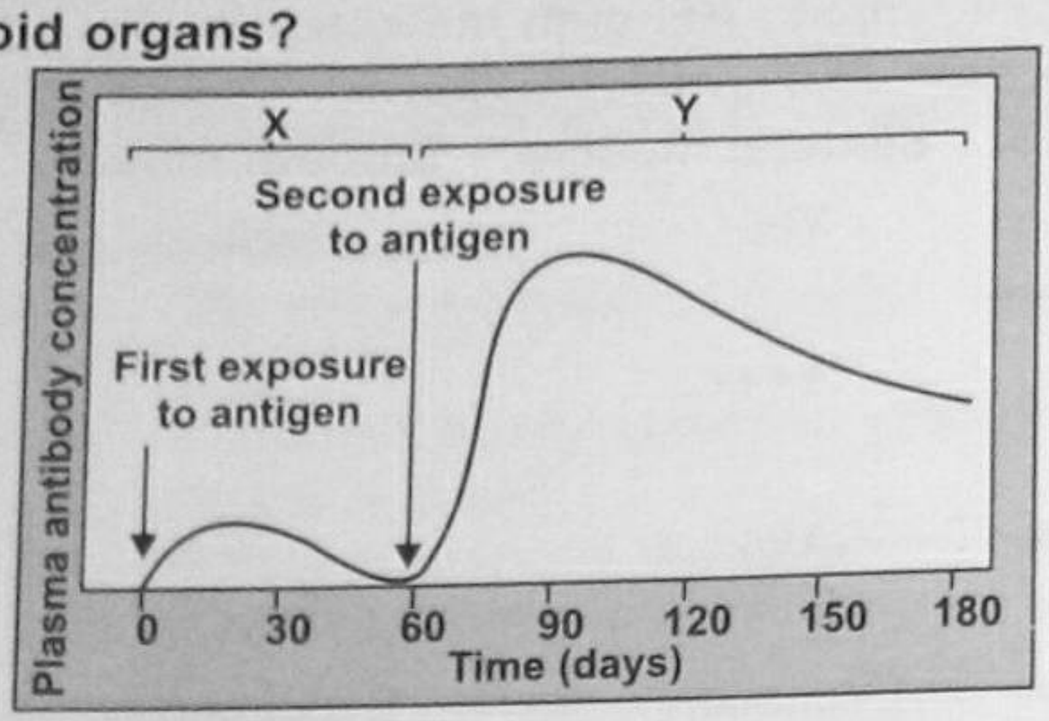
(A) Graafian, primary oocyte, first, secondary oocyte, first polar body

(B) Graafian, primary oocyte, second, secondary oocyte, second polar body

(C) Tertiary, primary oocyte, first, secondary oocyte, first polar body

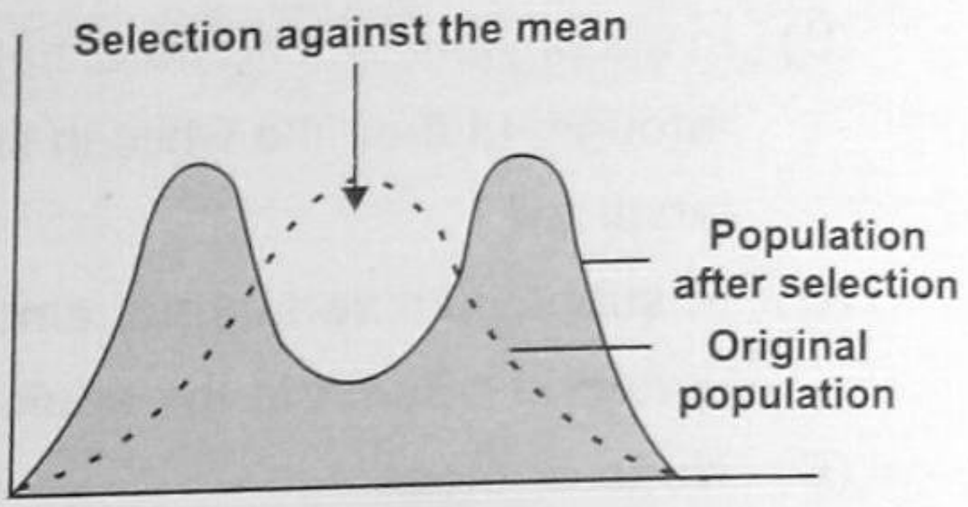
(D) Tertiary, primary oocyte, second, secondary oocyte, second polar body

38. **Observe the given graph of immune response towards antigen. The X and Y chiefly include which lymphoid organs?**




| X | Y |
|---|---|
| (A) Secondary lymphoid organs | Primary lymphoid organs |
| (B) Central lymphoid organs | Peripheral lymphoid organs |
| (C) Peripheral lymphoid organs | Central lymphoid organs |
| (D) Primary lymphoid organs | Central lymphoid organs |

39. **The given graphical representation shows a type of natural selection. Which of the following is correct regarding this?**



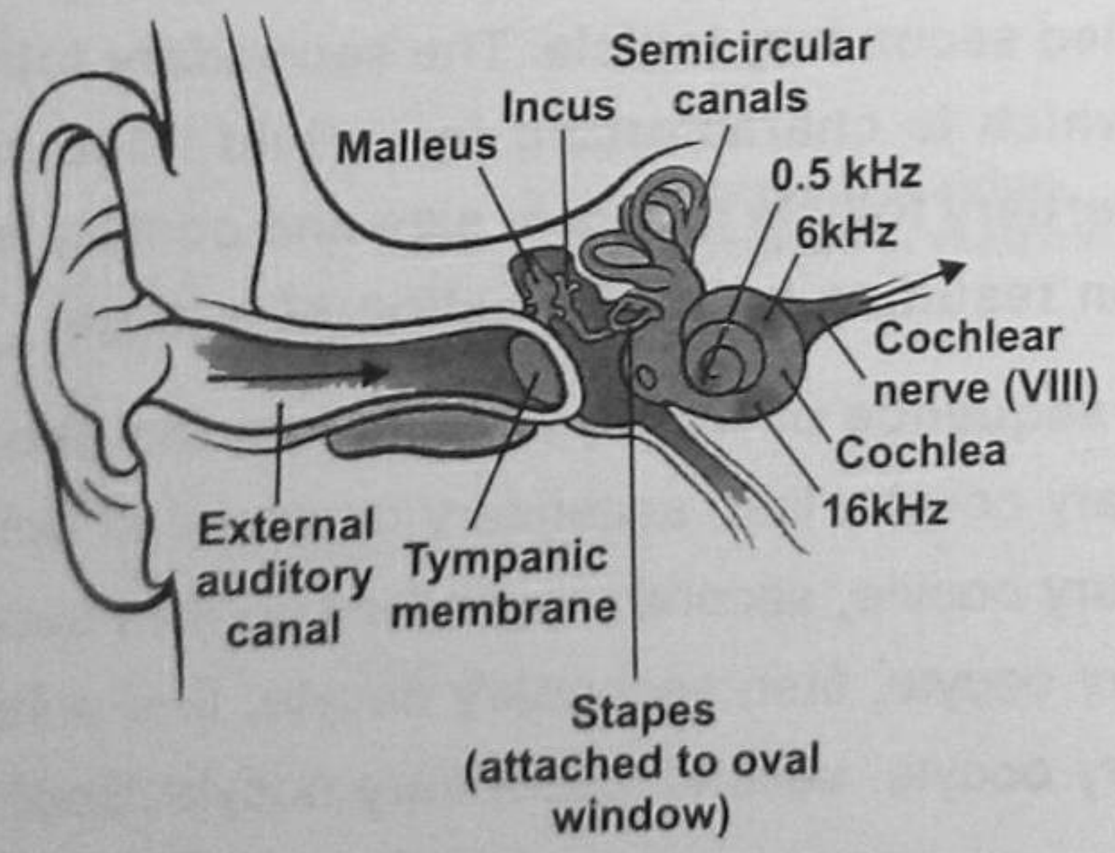

(A) It gives rise to new types from the original population which have the ability to survive in the changing environment.

(B) It gives rise to polymorphism and is maintained in the population to exploit different types of ecological conditions by different forms.

(C) It operates in stable environmental conditions and population gets perfectly adapted to live in it.

(D) It favours average characters and reduces variations.

40. **Observe the given diagrammatic view of ear. What do you understand by labels 0.5 kHz, 6kHz and 16kHz?**



(A) A low-frequency sound wave travels only a short distance along the basilar membrane.
(B) A high-frequency sound wave travels only a short-distance along the basilar membrane.
(C) A medium-frequency sound wave travels the entire distance along the basilar membrane.
(D) A low-frequency sound wave travels about halfway along the basilar membrane.

41. **In humans, an abnormality of the large intestine called intestinal polyposis is due to a dominant gene *A*, and a nervous disorder called Huntington's chorea, is determined by a dominant gene *H*. A man with genotype *Aahh* married a woman with genotype *aaHh*. Assume that *A* and *H* are on nonhomologous chromosomes. What is correct about the proportion of the children that would be expected?**
(A) About ¼th of all children would be expected to have only the gene for intestinal polyposis.
(B) About ¼th of all children would be expected to have only the gene for Huntington's chorea.
(C) About ¼th of all children would be expected to have both the genes, while ¼th would have neither of the genes.
(D) All of the above.

42. **In crop improvement programmes genetic variations are required to develop new varieties. Hybridization is the most common method of creating genetic variations. Which of the following is the correct sequence for carrying out hybridization?**
(A) Selection of parents → Emasculation → Selfing → Bagging → Crossing
(B) Selection of parents → Crossing → Emasculation → Selfing → Bagging
(C) Selection of parents → Selfing → Emasculation → Bagging → Crossing
(D) Selection of parents → Selfing → Bagging → Emasculation → Crossing

43. **Match Column-I with Column-II and select the correct option from the codes given below.**

| Column-I | | Column-II |
|---|---|---|
| (a) | Meiosis I | (i) Occurs after cytokinesis |
| (b) | Cytokinesis | (ii) Terminalization |
| (c) | Prophase II | (iii) Zygotene |
| (d) | Anaphase II | (iv) Equational division |
| (e) | Diakinesis | (v) Cell plate method |
| (f) | Meiosis II | (vi) Splitting of the centromere |

(A) (a)-(iii), (b)-(v), (c)-(i), (d)-(vi), (e)-(ii), (f)-(iv)
(B) (a)-(ii), (b)-(v), (c)-(vi), (d)-(i), (e)-(iii), (f)-(iv)
(C) (a)-(iv), (b)-(vi), (c)-(i), (d)-(v), (e)-(ii), (f)-(iii)
(D) (a)-(iii), (b)-(v), (c)-(i), (d)-(ii), (e)-(vi), (f)-(iv)

44. **Read the given statements and select the correct option.**

**Statement 1 : Entomophilous plants produce less pollen when compared to anemophilous plants.**

**Statement 2: The wastage of pollen is reduced to the minimum in entomophilous plants because of the directional pollination.**

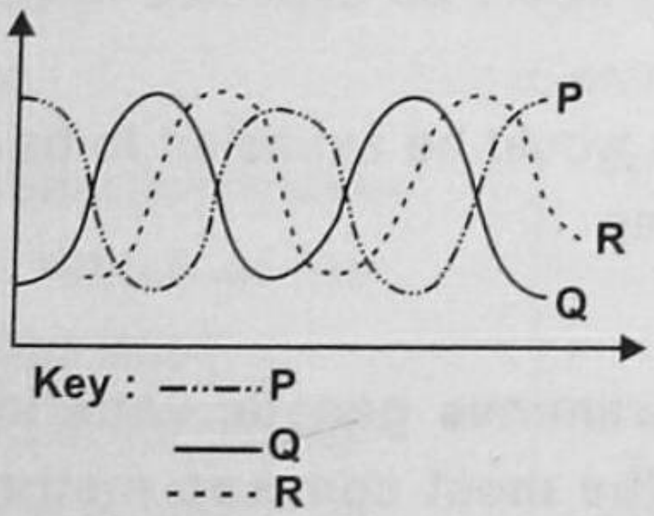
(A) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1

(B) Both statements 1 and 2 are correct but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is correct but statement 2 is incorrect.

(D) Both statements 1 and 2 are incorrect.

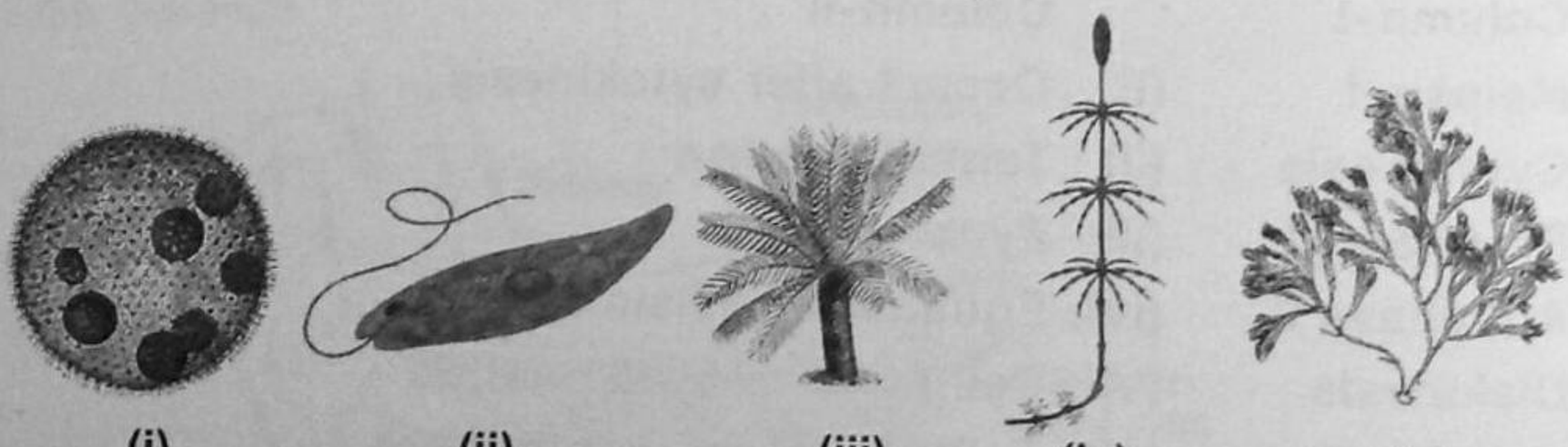
45. **In a water system, variations in the population of producers, population of consumers and the amount of dissolved mineral salts were measured over a period of 3 years. The results are shown in the given graph.**




**What does each line represent?**

| | Dissolved mineral salts | Producer population | Consumer population |
|---|---|---|---|
| (A) | R | Q | P |
| (B) | Q | R | P |
| (C) | R | P | Q |
| (D) | P | Q | R |

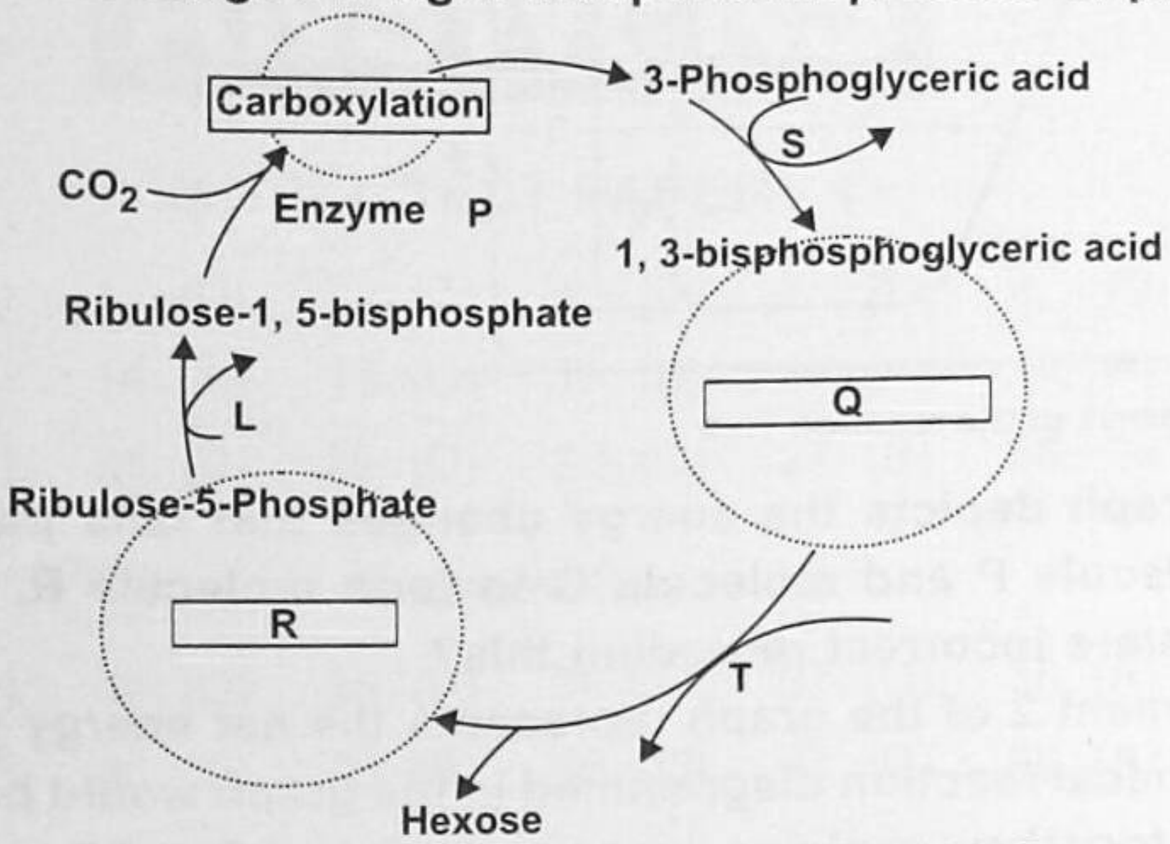
46. **Identify the given figures and select the correct option.**



**(i)** **(ii)** **(iii)** **(iv)** **(v)**

| | (i) | (ii) | (iii) | (iv) | (v) |
|---|---|---|---|---|---|
| (A) | Protista | Green alga | Brown alga | Bryophyte | Gymnosperm |
| (B) | Green alga | Protista | Pteridophyte | Red alga | Brown alga |
| (C) | Protista | Green alga | Red alga | Pteridophyte | Bryophyte |
| (D) | Green alga | Protista | Gymnosperm | Pteridophyte | Brown alga |

47. The given figure shows stages in light independent process of photosynthesis.




**Which of the given statements are incorrect regarding this?**

**(i) NADPH is oxidized at stages T and L.**
**(ii) P, Q and R represent phosphoglycerokinase, fixation and regeneration respectively.**
**(iii) ATP is converted to ADP at stage S only.**
**(iv) It is called Hatch and Slack cycle.**

(A) (i) and (iv) (B) (i), (ii), and (iv) (C) (ii) only (D) (i), (ii), (iii) and (iv)

48. **In the given paragraph, fill up the blanks and select the correct option.**
**The accepted mechanism used for the translocation of sugars from (i) to (ii) is called the pressure flow hypothesis. As (iii) is prepared by photosynthesis, it is converted to (iv). The sugar so formed is then moved into the companion cells and then into the living phloem sieve tube cells by (v) transport.**

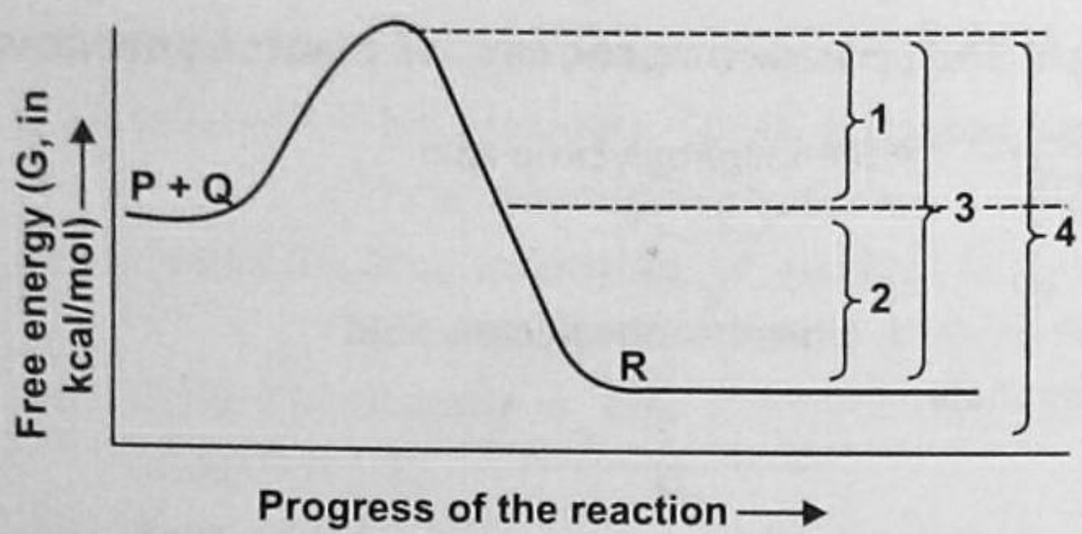
| | (i) | (ii) | (iii) | (iv) | (v) |
|---|---|---|---|---|---|
| (A) | Source | Sink | Starch | Glucose | Active |
| (B) | Source | Sink | Glucose | Starch | Passive |
| (C) | Sink | Source | Glucose | Sucrose | Passive |
| (D) | Source | Sink | Glucose | Sucrose | Active |

49. **Four students described the characters of a plant belonging to family solanaceae as given below :**
**Student P : Actinomorphic, cymose inflorescence, valvate aestivation, ovary superior and bilocular, axile placentation and fruit berry.**
**Student Q : Zygomorphic, cymose inflorescence, valvate aestivation, ovary inferior and bilocular, free central placentation and fruit berry.**
**Student R : Actinomorphic, cymose inflorescence, valvate aestivation, ovary superior and bilocular, marginal placentation and fruit capsule.**
**Student S : Zygomorphic, cymose inflorescence, imbricate aestivation, ovary superior and bilocular, axile placentation and fruit rarely berry.**

**Which student correctly described the family?**

(A) Student R (B) Student Q (C) Student P (D) Student S

50.




**The given graph depicts the energy changes that take place during the reaction between molecule P and molecule Q to form molecule R. Which of the following statements is/are incorrect regarding this?**

**(i) The segment 2 of the graph represents the net energy yield.**

**(ii) The chemical reaction diagrammed in the graph would be accelerated by heating P and Q together, applying pressure to P and Q, adding an appropriate catalyst, and, decreasing the concentration of R.**

**(iii) The segment 2 of the graph would be the same regardless of whether the reaction was catalyzed or not.**

**(iv) The segment 3 of the graph represents the energy of activation.**

**(v) The given chemical reaction is exergonic.**

(A) (ii) and (iv) (B) (ii) and (iii) (C) (iv) only (D) (i), (iii) and (iv)