SECTION-1
PHYSICS

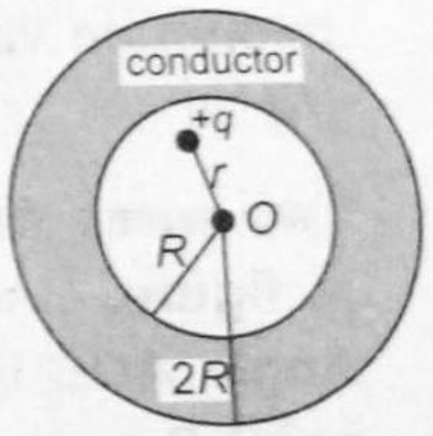
1. Two short bar magnets have magnetic moments 1.20 A m^2 and 1.00 A m^2 respectively. They are placed on horizontal table parallel to each other with their north poles pointing towards the south. They have a common magnetic equator and are separated by a distance of 20.0 cm. The value of the resultant horizontal magnetic induction at the mid-point *O* of the line joining their centres is (horizontal component of the Earth's magnetic induction is 3.6×10^{-5} Wb/m^2)

(A) 3.60×10^{-5} Wb/m^2 (B) 2.56×10^{-4} Wb/m^2
(C) 3.50×10^{-4} Wb/m^2 (D) 5.80×10^{-4} Wb/m^2

2. A thin rod is bent in the shape of a small circle of radius *r*. If the charge per unit length of the rod is σ, and if the circle is rotated about its axis at a rate of *n* rotations per second, the magnetic induction at a point on the axis at a large distance *y* from the center is

(A) $\mu_0 \pi r^3 n \frac{\sigma}{y^3}$ (B) $2\mu_0 \pi r^3 n \frac{\sigma}{y^3}$ (C) $\left(\frac{\mu_0}{4\pi}\right) r^3 n \frac{\sigma}{y^3}$ (D) $\left(\frac{\mu_0}{2\pi}\right) r^3 n \frac{\sigma}{y^3}$

3. A point charge *q* is placed at a distance *r* from the centre *O* of an uncharged spherical shell of inner radius *R* and outer radius 2*R*. The distance $r < R$. The electric potential at the centre of the shell will be

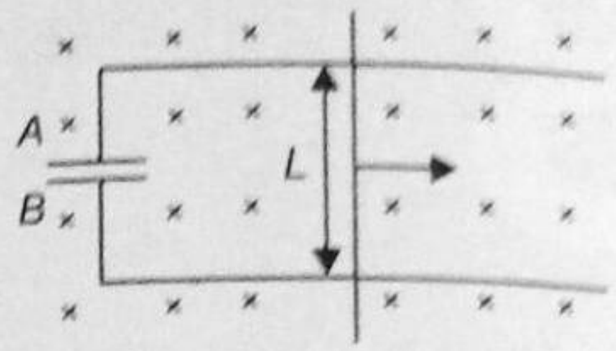


(A) $\frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r} - \frac{1}{2R}\right)$ (B) $\frac{q}{4\pi\varepsilon_0 r}$
(C) $\frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r} + \frac{1}{2R}\right)$ (D) $\frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r} - \frac{1}{R}\right)$

4. In a Young's double slit experiment the intensity of the resultant wave at a point *P* on the screen is *I* where the path difference between the waves from coherent sources S_1 and S_2 is λ. Then the intensity of the resultant wave at a point where the path difference is λ/4 is given by

(A) $I/\sqrt{2}$ (B) $2I$ (C) $4I$ (D) $I/2$

5. **A conducting rod of length $L = 0.1$ m is moving with a uniform speed $v = 0.2$ m/s on conducting rails in a magnetic field $B = 0.5$ T as shown. On one side, the end of the rails is connected to a capacitor of capacitance $C = 20$ μF. Then the charges on the capacitor plates are**



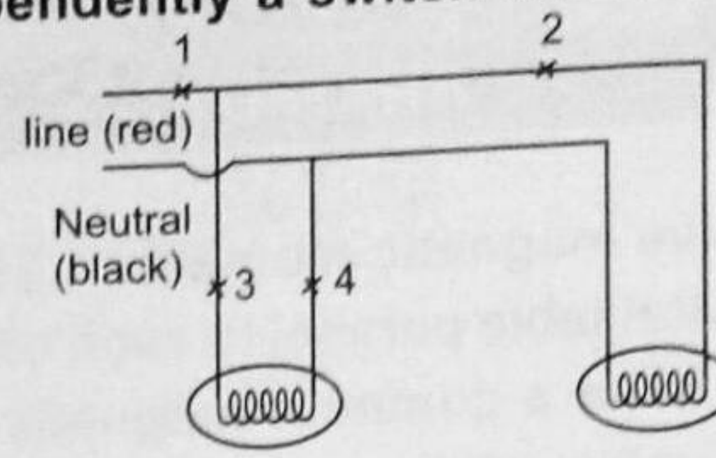
(A) $q_A = 0 = q_B$

(B) $q_A = +20$ μC and $q_B = -20$ μC

(C) $q_A = +0.2$ μC and $q_B = -0.2$ μC

(D) $q_A = -0.2$ μC and $q_B = +0.2$ μC

6. **The diagram shows an extra lamp wired into an existing 220 V A.C. lighting system. To operate extra lamp independently a switch should be placed at**



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

7. **Statement 1 : When the cell is the open circuit, there is no force on a test charge inside the electrolyte of the cell.**

Statement 2 : There is no field inside the cell when the cell is the open circuit.

(A) Statement 1 is true, Statement 2 is true, Statement 2 is the correct explanation of Statement 1.

(B) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation of Statement 1.

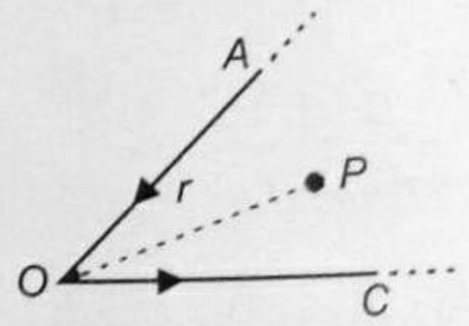
(C) Statement 1 is true, Statement 2 is false.

(D) Statement 1 is false, Statement 2 is true.

8. **A point object is placed on the optic axis of a convex lens of focal length f at a distance of $2f$ to the left of it. The diameter of the lens is d. An eye is placed at a distance of $3f$ to the right of the lens and a distance h below the optic axis. The maximum value of h to see the image is**

(A) d (B) $d/2$ (C) $d/3$ (D) $d/4$

9. **Two wires AO and OC carry equal currents I as shown in figure. One end of both the wire extends to infinity. Angle AOC is α. The magnitude of magnetic field at a point P on the bisector of these two wires at a distance r from point O is**

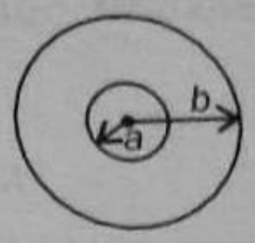


(A) $\frac{\mu_0}{2\pi}\frac{I}{r}\cot\left(\frac{\alpha}{2}\right)$ (B) $\frac{\mu_0}{4\pi}\frac{I}{r}\cot\left(\frac{\alpha}{2}\right)$ (C) $\frac{\mu_0}{2\pi}\frac{I}{r}\frac{\left(1+\cos\frac{\alpha}{2}\right)}{\sin\left(\frac{\alpha}{2}\right)}$ (D) $\frac{\mu_0}{4\pi}\frac{I}{r}\sin\left(\frac{\alpha}{2}\right)$

10. **Two concentric and coplanar circular coils have radii *a* and *b* (>> a) as shown in figure. Resistance of the inner coil is *R*. Current in the outer coil is increased from 0 to *I*, then the total charge circulating in the inner coil is**

(A) $\frac{\mu_0 I a^2}{2Rb}$ (B) $\frac{\mu_0 I ab}{2R}$

(C) $\frac{\mu_0 I}{2a}\frac{\pi b^2}{R}$ (D) $\frac{\mu_0 I b}{2\pi R}$



11. **White light may be considered to be a mixture of waves with λ ranging between 3900 Å and 7800 Å. An oil film thickness 10,000 Å is examined normally by the reflected light. If μ = 1.4, then the film appears bright for**

(A) 4308 Å, 5091 Å, 6222 Å (B) 4000 Å, 5091 Å, 5600 Å

(C) 4667 Å, 6222 Å, 7000 Å (D) 4000 Å, 4667 Å, 5600 Å, 7000 Å

12. **Two copper balls, each weighting 10 g are kept in air 10 cm apart. If one electron from every 10^6 atom is transferred from one ball to the other, the coulomb fork between them is (atomic weight of copper is 63.5).**

(A) 2×10^{10} N (B) 2×10^{4} N (C) 2×10^{8} N (D) 2×10^{6} N

13. **An ionized gas contains both positive and negative ions. If it is subjected simultaneously to an electric field along the + *X* direction and a magnetic field along the + Z direction, then**

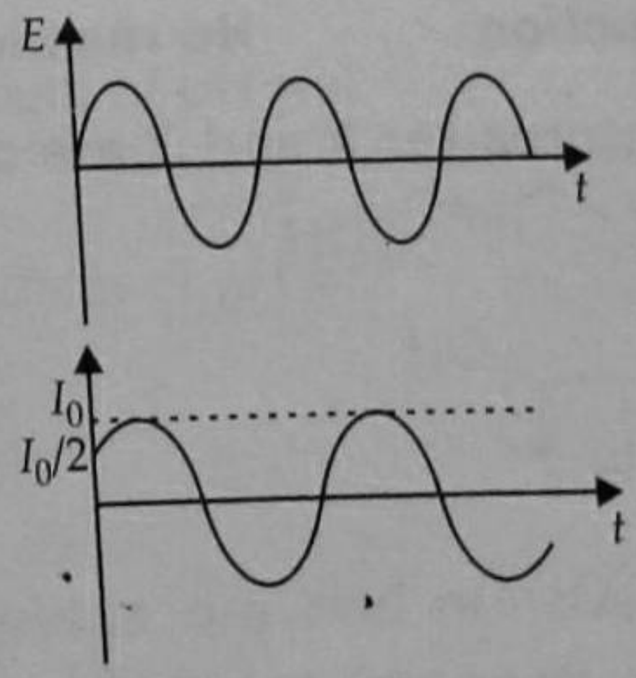
(A) Positive ions deflect towards + *Y* direction and negative ions towards – *Y* direction

(B) All ions deflect towards + *Y* direction

(C) All ions deflect towards – *Y* direction

(D) Positive ions deflect towards – *Y* direction and negative ions towards + *Y* direction

14. **In an ac circuit consist resistance *R* in series with inductor (*L*) or capacitor (*C*). The plot of current and source emf with time is shown in figure. If angular frequency of source is 100π rad s^{-1} and value of *R* is $\frac{10\sqrt{3}}{\pi}\Omega$ then *C* or *L* is equal to**



(A) $\frac{100}{\pi^2}$ mH (B) $100\sqrt{3}$ μF (C) 1000 μF (D) 1000 mH

15. **In the Bohr model of a hydrogen atom, the centripetal force is furnished by the coulomb attraction between the proton and the electron. If a_0 is the radius of the ground state orbit, m is the mass and e is the charge on the electron and ε_0 is the vacuum permittivity, the speed of the electron is**

(A) 0 (B) $\frac{e}{\sqrt{\varepsilon_0 a_0 m}}$ (C) $\frac{e}{\sqrt{4\pi\varepsilon_0 a_0 m}}$ (D) $\sqrt{\frac{4\pi\varepsilon_0 a_0 m}{e}}$

CHEMISTRY

16. **ZnS exists in two crystalline structures. Mark the correct statement about their structure.**

(A) In zinc blende, S^{2-} ions are arranged in *ccp* while Zn^{2+} occupy half of the tetrahedral sites.

(B) In zinc blende, S^{2-} ions are arranged in *hcp* and Zn^{2+} ions occupy all octahedral voids.

(C) In Wurtzite structure, S^{2-} ions are arranged in *ccp* and Zn^{2+} ions occupy half of tetrahedral voids.

(D) In Wurtzite structures, S^{2-} ions are in *hcp* arrangement and Zn^{2+} ions are occupying all octahedral voids.

17. **The coagulation value in millimoles per litre of electrolytes used for the coagulation of As_2O_3 are as given.**

I. NaCl = 52 II. KCl = 5 III. $BaCl_2$ = 0.69 IV. $MgSO_4$ = 0.22

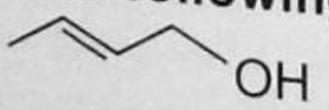
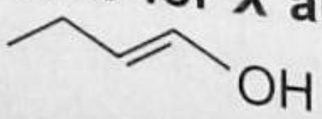
The correct order of their flocculating power is

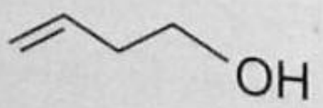
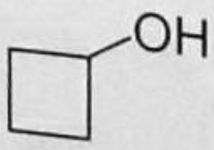
(A) I > II > III > IV (B) I > II > III = IV (C) IV > III > II > I (D) IV = III > II > I

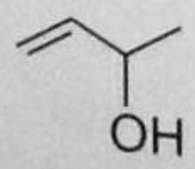
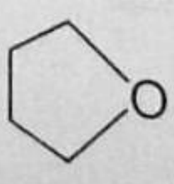
18. **Compounds *X* and *Y* both have the same molecular formula (C_4H_8O), and they give the following results with some characteristic tests :**

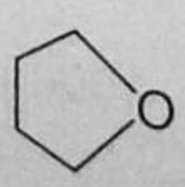
Tests	Compound *X*	Compound *Y*
Bromine water	Decolourises	No reaction
Na Metal	Bubbles	No reaction
Chromic acid	Orange to green	No reaction
Lucas reagent	No reaction	No reaction

Which of the following structures for *X* and *Y* are consistent with the test results?

(A) *X* =  ; *Y* = 

(B) *X* =  ; *Y* = 

(C) *X* =  ; *Y* = 

(D) *X* =  ; *Y* = 

19. **A keto ester (*X*) with molecular formula $C_6H_{10}O_3$ on treatment with NaOH and I_2 does not give iodoform but on boiling with dilute KOH gives a compound (*Y*) with molecular formula $C_4H_5O_3K$ which upon acidification followed by heating undergoes decarboxylation to give acetone. The keto ester (*X*) is**

(A) $CH_3COCH_2CH_2COOCH_3$ (B) $CH_3COCH_2COOC_2H_5$

(C) $CH_3CH_2OCH_2COOCH_3$ (D) $CH_3COCH(CH_3)COOCH_3$

20. **The radio nucleide $^{234}_{90}Th$ undergoes two successive β-decays followed by one α-decay. The atomic number and the mass number respectively of the resulting radionucleide are**

(A) 94 and 230 (B) 90 and 230 (C) 92 and 230 (D) 92 and 234

21. **$(Me)_2SiCl_2$ on hydrolysis will produce**

(A) $(Me)_2Si(OH)_2$ (B) $(Me)_2SiO$

(C) $+O-(Me)_2Si-O+_n$ (D) $Me_2SiCl(OH)$.

22. **Which of the following is not correct?**

(A) Red phosphorus shows chemiluminescence.

(B) A mixture of $CaCN_2$ and C is known as nitrolim.

(C) A mixture of $Ca(H_2PO_4)_2$ and $CaSO_4 \cdot 2H_2O$ is known as superphosphate of lime.

(D) Hydrolysis of NCl_3 gives NH_3 and HOCl.

23. **There is very little difference in acid strength in the series H_3PO_3 and H_3PO_2 because**

(A) phosphorus in these acids exists in same oxidation states.

(B) number of unprotonated oxygen responsible for increase of acidity remains the same

(C) phosphorus is not a highly electronegative element

(D) phosphorus oxides are less basic.

24. **Alanine forms Zwitter ion which exists as**

(A) $CH_3-\underset{\underset{{}^+NH_3}{|}}{CH}COO^-$ in a medium of pH = 12

(B) $CH_3-\underset{\underset{{}^+NH_3}{|}}{CH}COOH$ in a medium of pH = 4

(C) $CH_3-\underset{\underset{NH_2}{|}}{CH}-COO^-$ in a medium of pH = 7

(D) None of these.

25. **Extraction of Ag from sulphide ore and removal of unreacted silver halide from photographic plate involve complexes (respectively)**

(A) $[Ag(CN)_2]^-$, $[Ag(S_2O_3)_2]^{3-}$ (B) $[Ag(S_2O_3)_2]^{3-}$, $[Ag(CN)_2]^-$

(C) $[Ag(CN)_2]^-$ in both (D) $[Ag(S_2O_3)_2]^{3-}$ in both.

26. **Potassium manganate (K_2MnO_4) is formed when**

(A) chlorine is passed into aqueous $KMnO_4$ solution

(B) manganese dioxide is fused with potassium hydroxide in air

(C) formaldehyde reacts with potassium permanganate in presence of a strong alkali

(D) potassium permanganate reacts with concentrated sulphuric acid.

27. **A solution contains Pb^{2+} and Fe^{2+} ions. To it some quantity of Fe and Pb is added. Then $[E^{\circ}_{Fe^{2+}|Fe} = -0.44, E^{\circ}_{Pb^{2+}|Pb} = -0.126]$**

(A) concentration of Pb^{2+} ions will remain unaffected

(B) concentration of Pb^{2+} ions will increase

(C) concentration of Fe^{2+} ions will increase

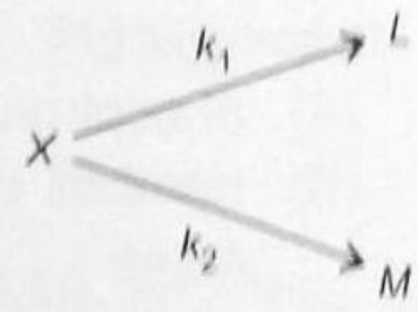
(D) concentration of Fe^{2+} ions will decrease.

28. **A current of dry air was bubbled through two bulbs, first containing 26.66 g of an organic substance in 200 g of water, second containing pure water and a tube containing fused $CaCl_2$. The loss of weight of water bulb = 0.0870 g and the gain of the weight of $CaCl_2$ tube = 2.036 g. The molecular weight of the organic substance is**

(A) 56 (B) 41 (C) 78 (D) 67

29. **A substance undergoes first order decomposition. The decomposition follows two parallel first order reactions as :**

$k_1 = 1.21 \times 10^{-4}\ s^{-1}$; $k_2 = 3.8 \times 10^{-5}\ s^{-1}$



The percentage distribution of *L* and *M* respectively are

(A) 75% and 25% (B) 80% and 20%

(C) 90.5% and 9.5% (D) 76.1% and 23.9%

30. **An organic compound '*X*' having molecular formula C_2H_3N on reduction gave another compound '*Y*'. Upon treatment with nitrous acid, '*Y*' gave ethyl alcohol and on warming with chloroform and alcoholic KOH, it formed an offensive smelling compound 'Z'. The compound 'Z' is**

(A) $CH_3C \equiv N$ (B) $CH_3CH_2N \equiv C$ (C) $CH_3CH_2NH_2$ (D) CH_3CH_2OH

SECTION-2
MATHEMATICS

31. **The line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$**

(A) lies in $3x + 2y + 6z - 12 = 0$

(B) is parallel to $2x + y - 2z = 11$

(C) is perpendicular to $4x + 7y + 6z = 0$

(D) passes through $(-2, -3, -4)$

32. The function $f(\theta) = \frac{d}{d\theta}\int_0^{\theta} \frac{dx}{1-\cos\theta\cos x}$ satisfies

(A) $\frac{df}{d\theta} + 2f(\theta)\cot\theta = 0$ (B) $\frac{df}{d\theta} - 2f(\theta)\cot\theta = 0$

(C) $\frac{df}{d\theta} + 2f(\theta) = 0$ (D) $\frac{df}{d\theta} - 2f(\theta) = 0$

33. The integral $\int_{-1/2}^{1/2}\left([x] + \ln\left(\frac{1+x}{1-x}\right)\right)dx =$

(A) $-\frac{1}{2}$ (B) 0 (C) $2\ln\left(\frac{1}{2}\right)$ (D) 1

34. All the points on the curve $y^2 = 4a\left(x + a\sin\frac{x}{a}\right)$ at which the tangents are parallel to the axis of x, lie on a

(A) circle (B) parabola (C) line (D) None of these

35. Find the value of 'a' for which the volume of parallelopiped formed by the vectors $\hat{i} + a\hat{j} + \hat{k}$, $\hat{j} + a\hat{k}$ and $a\hat{i} + \hat{k}$ is minimum.

(A) 0 (B) $\frac{1}{\sqrt{3}}$ (C) $\sqrt{3}$ (D) $2\sqrt{3}$

36. If $y = \sin^3 x$, then $\frac{d^4y}{dx^4}$ at $x = \frac{\pi}{2}$ is equal to

(A) –15 (B) 12 (C) –6 (D) 21

37. If f, g are functions from R to R such that $f(x) = [x]$ and $g(x) = \frac{2+3x}{4}$, then

(A) f is one-one and g is onto (B) g is one-one but is not onto

(C) f is neither one-one nor onto (D) Neither f is onto nor g is

38. If $(\omega \neq 1)$ is a cubic root of unity, then $\begin{vmatrix} 1 & 1+\omega^2 & \omega^2 \\ 1-i & -1 & \omega^2-1 \\ -i & -1+\omega & -1 \end{vmatrix} =$

(A) 0 (B) 1 (C) i (D) ω

39. Find the maximum value of $f(x) = -x\log_e x$ in (0, 1) _____.

(A) $1/e$ (B) e (C) $1/e^2$ (D) e^2

40. $\lim_{x\to 1^+} \frac{\int_1^x |t-1|\,dt}{\sin(x-1)} =$

(A) 0 (B) 1 (C) –1 (D) None of these

41. If $\sin^{-1}\frac{x}{3}+\sin^{-1}\frac{y}{4}=\frac{\pi}{6}$, then the value of $\frac{x^2}{9}+\frac{xy}{4\sqrt{3}}+\frac{y^2}{16}$ is

(A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{1}{4}$ (D) None of these

42. If $\begin{bmatrix}1 & a & 2\\ 1 & 2 & 5\\ 2 & 1 & 1\end{bmatrix}$ is non-invertible, then a =

(A) 2 (B) 1 (C) 0 (D) –1

DIRECTION (43-44) : Answer the questions based on the following information.

A, B, C, D, E, F and G are brothers. Two brothers had an argument and A said to B, "You are as old as C was when I was twice as old as D, and will be as old as E was when as old as C is now". B said to A, "You are older than F." But G is as old as I was when you were as old as G is, and D will be as old as F was when F will be as old as G is

43. **Which two are probably twins?**

(A) D and G (B) E and C
(C) A and B (D) Cannot be determined

44. **Which of the following is false?**

(A) G has four elder brothers
(B) A is older than G but younger than E
(C) B has three elder brothers
(D) There is a pair of twins among the brothers

45. **$5^6 - 1$ is divisible by**

(A) 13 (B) 19 (C) 31 (D) 37

46. **In an equilateral triangle, 3 coins of radii 1 unit each are kept so that they touch each other and also the sides of the triangle. Area of the triangle is**

(A) $4+2\sqrt{3}$ (B) $6+4\sqrt{3}$ (C) $12+\frac{7\sqrt{3}}{4}$ (D) $3+\frac{7\sqrt{3}}{4}$

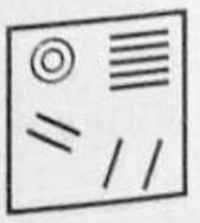
47. **You are given a key figure (X). Under the key figure (X), four answer figures are given. You have to determine which of the choices contains all the elements needed to make the key figure.**

Fig. (X)

(A) 

(B) 

(C) 

(D) 

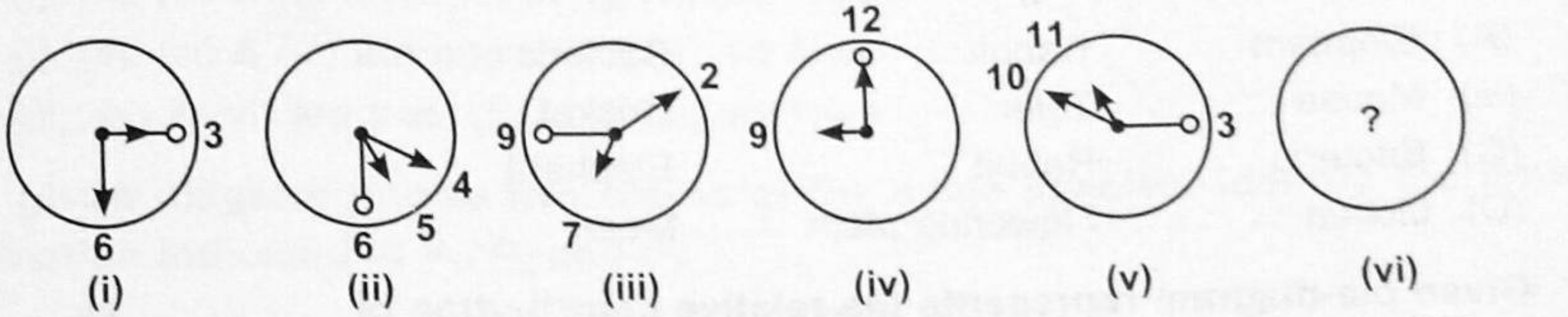
48. **A + B means B is brother of A; A × B means B is husband of A; A – B means A is mother of B; and A ÷ B means A is father of B. Then which of the following expressions indicates 'P' is maternal grandmother of 'T'?**

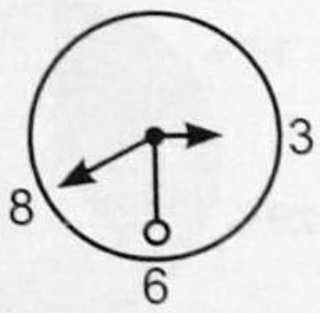
(A) Q – P + R ÷ T (B) P × Q ÷ R – T (C) P × Q ÷ R + T (D) P + Q ÷ R – T

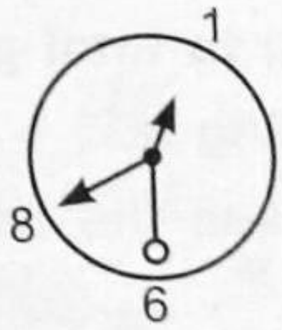
49. **'Barin' village is 30 kilometres to the north of village 'Khanot'. Village 'Banoha' is 18 kilometres to the east of village 'Khanot'. Village 'Palasi' is 12 kilometres to the west of 'Barin'. If Amitabh starts from village Banoha and goes to village Palasi by using shortest distance, in which direction is he from his starting point?**

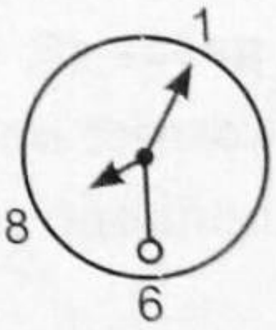
(A) North-East (B) North-West (C) South-East (D) North

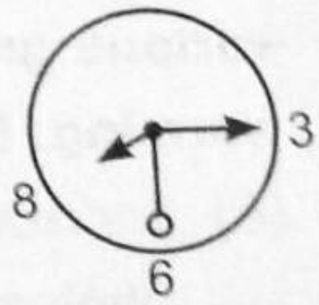
50. **On a particuliar clock shown here, the hands move in an unusual way. Discover the system as revealed from the five positions, (i to v) shown below, and find the next position form the answer figures (A to D) given below.**



(A) 

(B) 

(C) 

(D) 

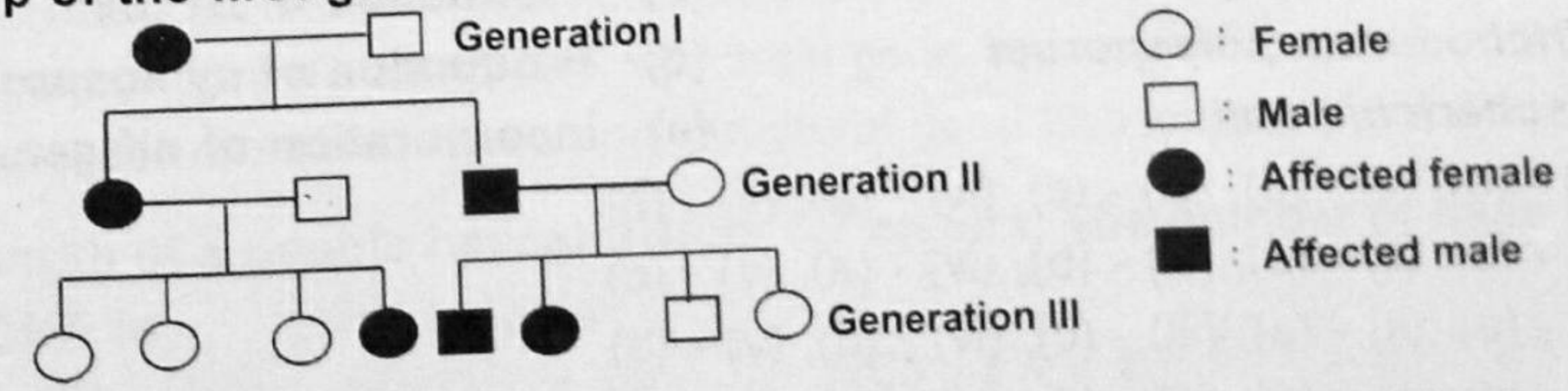
OR

BIOLOGY

31. **Select the correct match from the following**

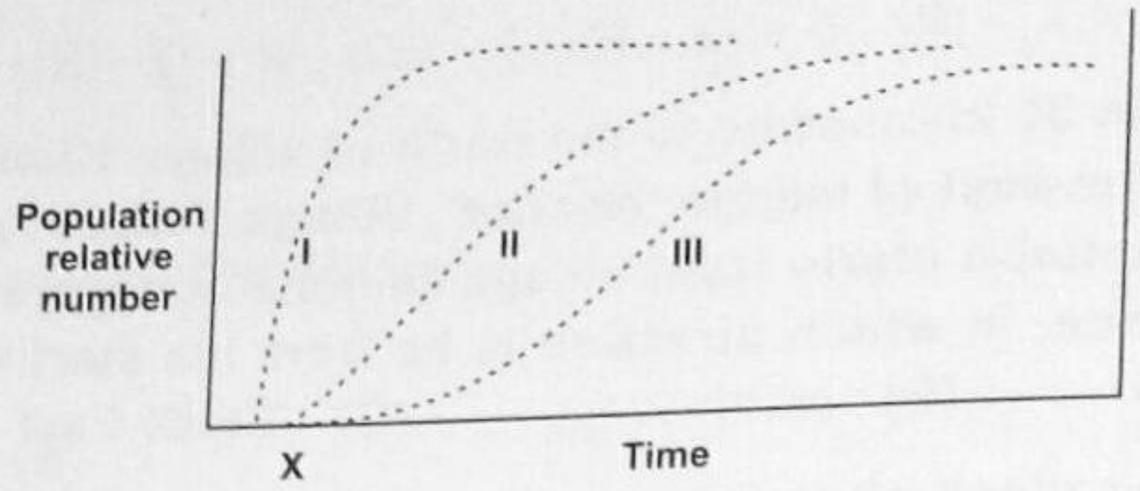
	Genetic disorder	Affected chromosome	Effects
(A)	Sickle cell anaemia	7	Sickle-shaped WBC
(B)	Down's syndrome	22	Sterile female
(C)	Phenylketonuria	12	Mental retardation
(D)	Turner's syndrome	23	Super female

32. **A pedigree is shown below for a disease that is autosomal dominant. The ger make up of the first generation is**



(A) AA, Aa (B) Aa, aa (C) Aa, AA (D) Aa, Aa

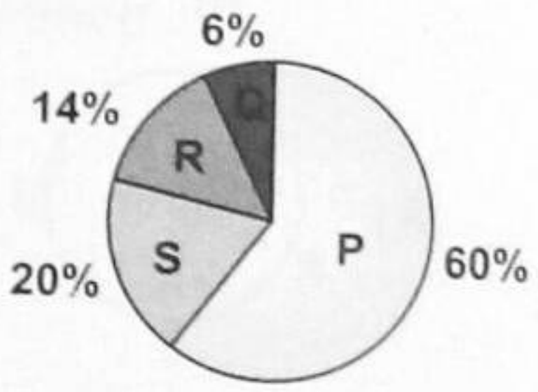
33. **Three lines(I, II and III) represent the relative population number of three different organisms where food is the only limiting factor to the carrying capacity (number of individuals).**



Which of the following best matches the three lines (I, II, III) with the organisms comprising each population given access to an unlimited food supply at time X ?

	I	II	III
(A)	Elephant	Rabbit	Bacteria
(B)	Mouse	Tiger	Cricket
(C)	Bacteria	Rabbit	Elephant
(D)	Lichen	Flowering plant	Moss

34. **Given pie-diagram represents the relative contribution of various greenhouse gases (P, Q, R and S) to total global warming. Select the correct option regarding it.**



(A) Increase in 'Q' concentration increases the rate of photosynthesis.

(B) 'R' are used in aerosols cans, jet fuel and as refrigerants in air conditioners.

(C) 'S' is produced by combustion of nitrogen rich fuels, livestock wastes and breakdown of nitrogen fertilisers in soil.

(D) 'P' is a potent secondary pollutant.

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

Column-I	Column - II
(i) *Rhizobium meliloti*	(a) Scavenging of oil spills
(ii) *Pseudomonas putida*	(b) Production of human insulin
(iii) *Bacillus thuringiensis*	(c) Production of Bt toxin
(iv) *Trichoderma polysporum*	(d) Production of cyclosporin A
(v) *Escherichia coli*	(e) Incorporation of nif gene

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

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

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

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

36. **Which of the following statements about the structure of DNA is true or false?**

(i) A + T = G + C

(ii) A/T = C/G

(iii) **Hydrogen bonding provides stability to the double helical DNA in aqueous cytoplasm.**

(iv) **When separated the two strands of a double helix are identical.**

(v) **Hydrophobic bonding provides stability to the double helical DNA in aqueous cytoplasm.**

(vi) **Each nucleotide pair contains two phosphate groups, two deoxyribose sugar molecules and two bases.**

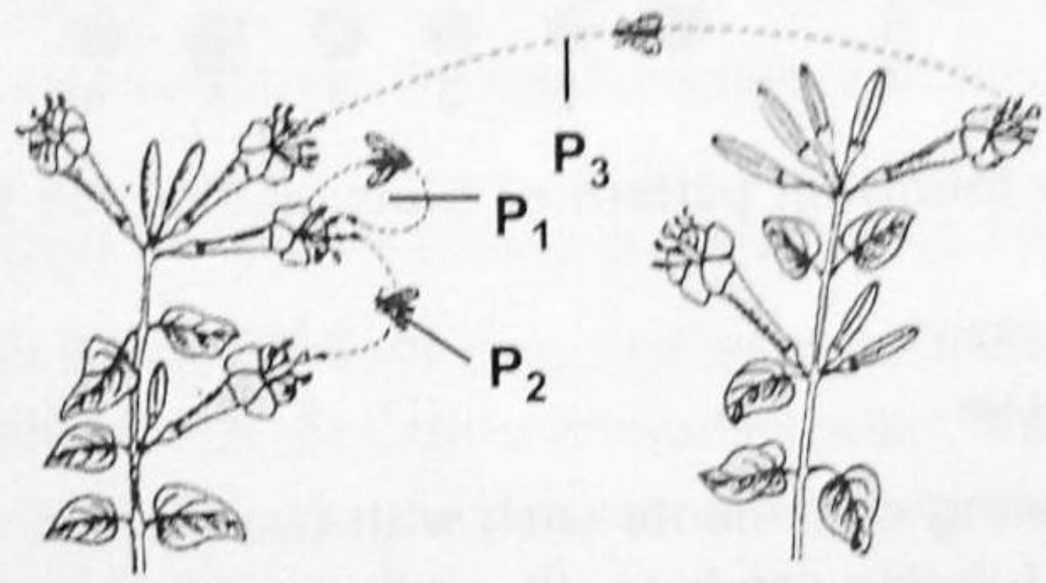
(A) (ii), (iii), (v) & (vi) are true; (i) & (iv) are false

(B) (i), (ii), (iii) & (v) are true; (iv) & (vi) are false

(C) (i), (ii), (iii) & (vi) are true; (iv) & (v) are false

(D) (iii), (v) & (vi) are true; (i), (ii) & (iv) are false

37. **The given diagram shows two plants of the same species. Identify the types of pollination indicated at P_1, P_2 and P_3.**



	P_1	P_2	P_3
(A)	Allogamy	Chasmogamy	Cleistogamy
(B)	Autogamy	Xenogamy	Geitonogamy
(C)	Autogamy	Geitonogamy	Xenogamy
(D)	Geitonogamy	Allogamy	Autogamy

38. **In *E. coli* cell, according to operon theory, an operator gene combines with**

(A) Inducer to 'switch on' structural gene transcription

(B) Repressor protein to 'switch off' structural gene transcription

(C) Regulator gene to 'switch on' structural gene transcription

(D) Repressor protein to 'switch on' structural gene transcription.

39. **If the length of a double helical DNA is 1.7 meters. The number of base pairs present in the DNA is**

(A) 5×10^9 (B) 1.7×10^9 (C) 3.4×10^9 (D) 1.7×10^5.

36. **Which of the following statements about the structure of DNA is true or false?**

(i) A + T = G + C

(ii) A/T = C/G

(iii) **Hydrogen bonding provides stability to the double helical DNA in aqueous cytoplasm.**

(iv) **When separated the two strands of a double helix are identical.**

(v) **Hydrophobic bonding provides stability to the double helical DNA in aqueous cytoplasm.**

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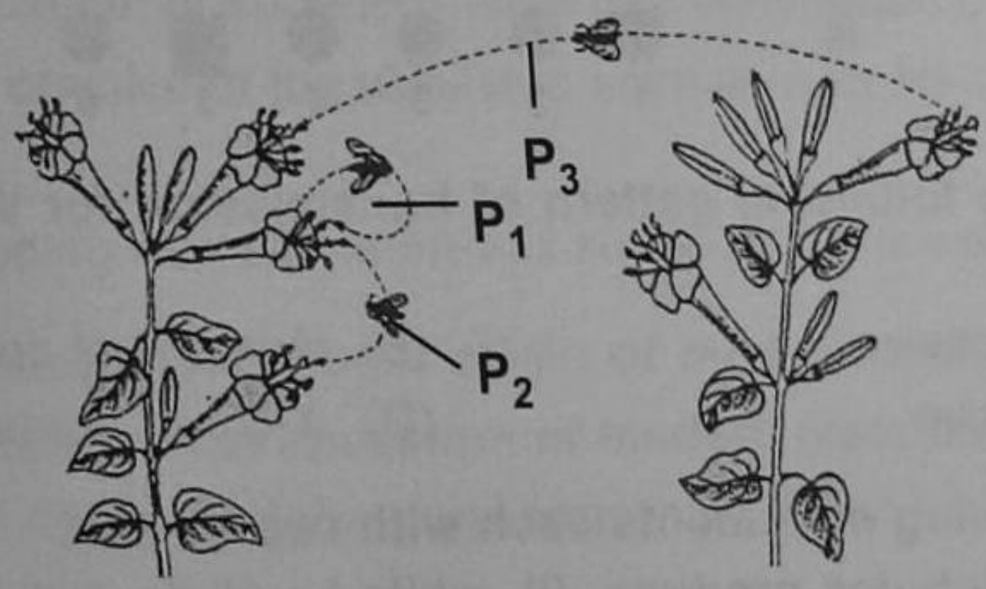
(A) (ii), (iii), (v) & (vi) are true; (i) & (iv) are false

(B) (i), (ii), (iii) & (v) are true; (iv) & (vi) are false

(C) (i), (ii), (iii) & (vi) are true; (iv) & (v) are false

(D) (iii), (v) & (vi) are true; (i), (ii) & (iv) are false

37. **The given diagram shows two plants of the same species. Identify the types of pollination indicated at P_1, P_2 and P_3.**



	P_1	P_2	P_3
(A)	Allogamy	Chasmogamy	Cleistogamy
(B)	Autogamy	Xenogamy	Geitonogamy
(C)	Autogamy	Geitonogamy	Xenogamy
(D)	Geitonogamy	Allogamy	Autogamy

38. **In *E. coli* cell, according to operon theory, an operator gene combines with**

(A) Inducer to 'switch on' structural gene transcription

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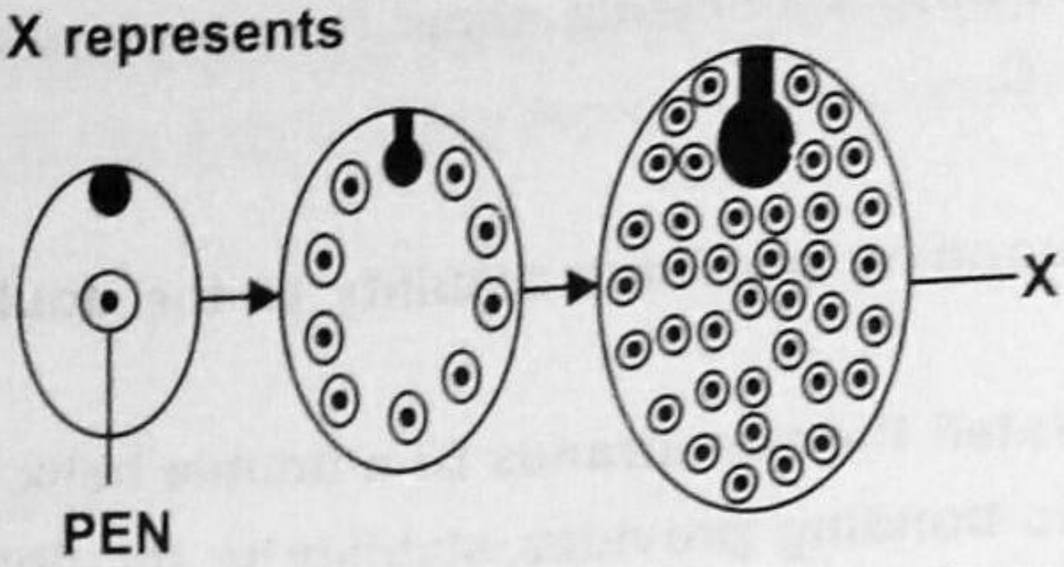
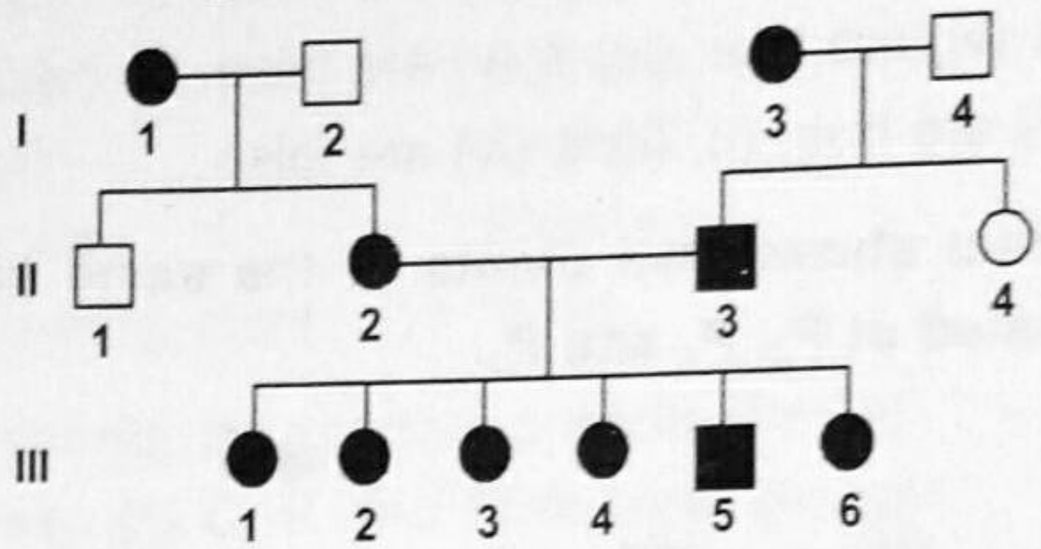
(A) 5×10^9 (B) 1.7×10^9 (C) 3.4×10^9 (D) 1.7×10^5.

40. **In the given diagram, X represents**



(A) Cellular endosperm
(B) Nuclear endosperm
(C) Helobial endosperm
(D) Ruminate endosperm.

41. **Assume the pedigree presented below to be straight forward, with no complication such as illegitimacy. Trait W, found in individuals represented by the shaded symbols, is rare in the population at large.**



State which of the following pattern of transmission for W are consistent with this pedigree ?

(A) Autosomal recessive
(B) Autosomal dominant
(C) X-linked recessive
(D) X-linked dominant

42. **Consider the following statements each with two blanks.**

(a) **Seminiferous tubules produce (i) while Leydig's cells produce (ii) .**
(b) **In females, urethra is small and conducts (iii) while in males it conducts urine and (iv) .**
(c) **The process of formation of spermatozoa from spermatogonia is called (v) and the process of maturation of spermatids into spermatozoa is called (vi).**

Which one of the following options, gives the correct fill ups for the respective blank numbers from (i) to (vi) in the statements?

(A) (v) - spermatogenesis, (vi) - spermiogenesis,
(i) - spermatozoa, (ii) - testosterone
(B) (i) - testosterone, (ii) - spermatozoa,
(iii) - urine, (iv) - semen
(C) (i) - estrogen, (ii) - testosterone,
(v) - spermiogenesis, (vi) - spermatogenesis
(D) (iii) - urine, (iv) - semen,
(v) - spermiogenesis, (vi) - spermatogenesis

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

Statement-1 : In insertional inactivation, blue colour produced by bacterial colonies indicates that the plasmid does not have an insert into the bacterial genome.

Statement-2 : Presence of insert results into insertional inactivation of β-galactosidase enzyme and the colonies do not produce any colour.

(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 and statement 2 is true.

(D) Both statements 1 and 2 are false.

44. **Why Multiple Ovulation Embryo Transfer Technology (MOET) is considered useful in animal breeding?**

(A) It is a breeding programme which successfully increases herd size in a short time.

(B) It helps in accumulation of superior genes and elimination of less desirable genes.

(C) It is the breeding practice of the unrelated animals with no common ancestors for 4-6 generations.

(D) It helps in developing new stable breeds superior to the existing breeds.

45. **There are two opposing views about origin of modern man. According to one view *Homo erectus* in Asia were the ancestors of modern man. A study of variation of DNA however suggested African origin of modern man. What kind of observation on DNA variation could suggest this?**

(A) Greater variation in Asia than in Africa

(B) Greater variation in Africa than in Asia

(C) Similar variation in Africa and Asia

(D) Variation only in Asia and no variation in Africa

46. **Which one of the following immune system components does not correctly match with its respective role?**

(A) Interferons - secreted by virus-infected cells and protect non-infected cells from further viral infection.

(B) B- lymphocytes - produce antibodies in response to pathogens into blood to fight with them.

(C) Macrophages - mucus secreting cells that trap microbes entering in the body.

(D) IgA - present in colostrum in early days of lactation to protect infant from diseases.

47. **During bleeding phase of menstrual cycle unfertilized secondary oocyte undergoes autolysis. The interplay of hormones then is**

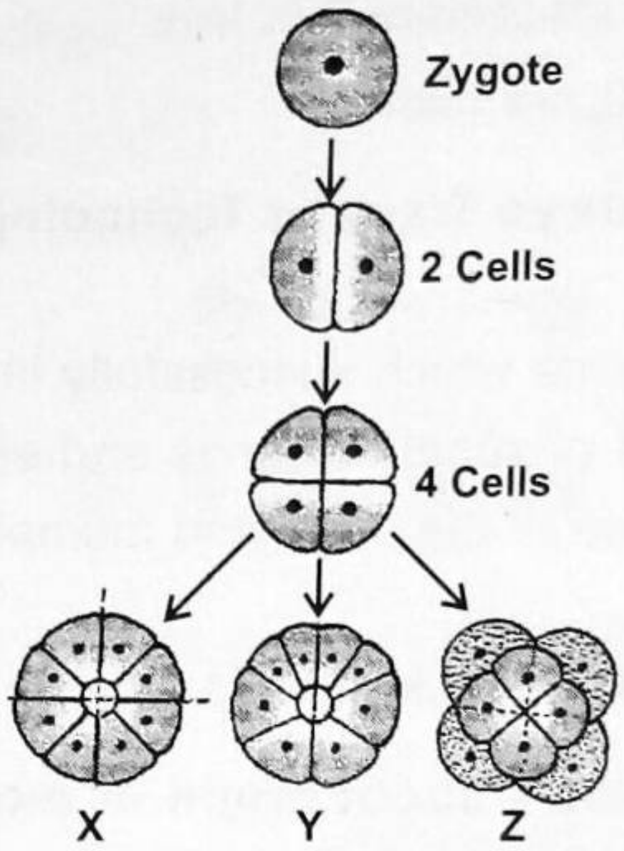
(A) Progesterone and estrogen continue the hypertrophy of endometrial lining

(B) Prolactin and progesterone reduce LH level causing regression of corpus luteum

(C) Progesterone inhibits the release of LH from pituitary causing regression of corpus luteum

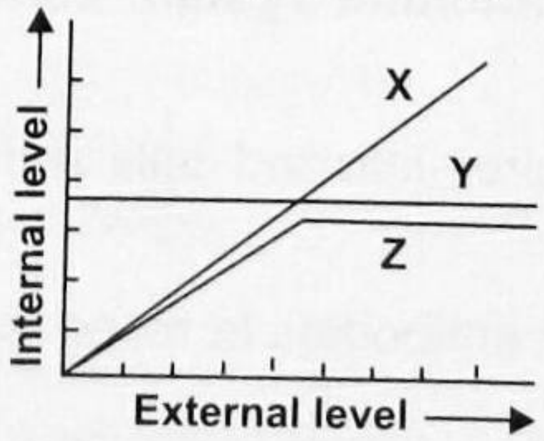
(D) Prolactin and estrogen inhibit progesterone secretion leading to sloughing off of uterine lining.

48. **Based upon symmetry, three patterns of cleavage have been recognised which are shown in the given figure. Identify X, Y and Z ?**



	X	Y	Z
(A)	Spiral cleavage	Radial cleavage	Bilateral cleavage
(B)	Radial cleavage	Spiral cleavage	Bilateral cleavage
(C)	Bilateral cleavage	Radial cleavage	Spiral cleavage
(D)	Radial cleavage	Bilateral cleavage	Spiral cleavage

49. **The given graph represents how three different living organisms (*X*, *Y* and *Z*) cope with the external environmental conditions.**
Study the graph and select the correct option regarding *X*, *Y* and *Z*.



(A) X could be a mammal.

(B) Y could be a bird.

(C) Z could be a mammal.

(D) X could be a bird.

50. **Which of the following statements is correct with regard to the biotic succession on bare rock?**

(A) The pioneer lichens are usually crustose lichens *e.g.*, *Dermatocarpon*, *Parmelia*, which are followed by foliiose lichens *e.g.*, *Graphis*, *Rhizocarpon*.

(B) Foliose lichens make the conditions favourable for the growth of mosses (Bryophytes).

(C) Moss stage is followed by perennial grasses *e.g.*, *Cymbopogon*, which are then replaced by annual grasses *e.g.*, *Poa*.

(D) All of these.