FIITJEE

IOQJS MOCK TEST – I
PART – I

Time: 1 Hour **Max Marks: 120**

Instructions:

Section A) 24 multiple choice questions with one alternative correct.

- +3 marks credit for correct choice.
- - 1 mark penalty for incorrect choice.

Section B) 08 multiple choice questions with one or more than one correct alternatives.

- +6 marks credit for correct choice. To get credit, all the correct option(s) and no incorrect option(s) should be marked. No Negative Marking.

Name of the Candidate : .....

Enroll Number : .....

Date of Examination : .....

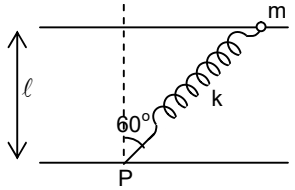
SECTION – A
PHYSICS

1. Two particle of equal mass go round a circle of radius R under the action of their mutual gravitational attraction. The speed of each particle is

(A) $v = \frac{1}{2R}\sqrt{\frac{1}{Gm}}$ (B) $v = \sqrt{\frac{Gm}{2R}}$

(C) $v = \frac{1}{2}\sqrt{\frac{Gm}{R}}$ (D) $v = \sqrt{\frac{4Gm}{R}}$

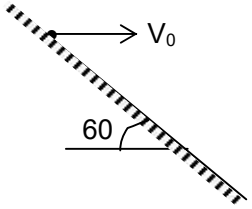
2. One end of a spring of natural length ℓ and spring constant k is fixed at the ground and the other is fitted with a smooth ring of mass m which is allowed to slide on a horizontal rod fixed at a height ℓ as shown. Initially, the spring makes an angle of 60° with the vertical when the system is released from rest. Find the speed of the ring when the spring becomes vertical.



(A) $\ell\sqrt{\frac{k}{m}}$ (B) $\sqrt{\frac{k^2\ell}{m}}$

(C) $\sqrt{\frac{k^2\ell^2}{m^2}}$ (D) $\sqrt{\frac{k\ell^2}{m}}$

3. A ball is projected horizontally from an inclined plane with a velocity v_0 as shown in the figure. It will strike the plane after a time



(A) $\frac{v_0}{\sqrt{3}g}$ (B) $\frac{2v_0}{\sqrt{3}g}$

(C) $\frac{v_0}{g}$ (D) $2\sqrt{3}\frac{v_0}{g}$

4. A vehicle is moving on a circular path of radius R with constant speed $\sqrt{gR}$. A simple pendulum of length ℓ hangs from the ceiling of the vehicle. The time period of oscillations of the pendulum in a vertical plane containing centre of circular path is

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

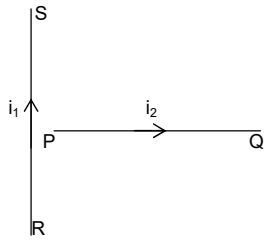
(C) $2\pi\sqrt{\frac{\sqrt{2}\ell}{g}}$ (D) none of these

5. A body of density ρ enters a tank of water of density ρ_1 ($\rho_1 > \rho$) after falling through a height h. The maximum depth to which it sinks in water is

(A) $\frac{h\rho_1}{(\rho_1 - \rho)}$ (B) $\frac{h\rho}{(\rho_1 - \rho)}$

(C) $\frac{h\rho_1}{\rho_1}$ (D) $\frac{h\rho_1}{\rho}$

6. A current carrying wire PQ is placed near another long current carrying wire RS. If free to move, wire PQ will have



(A) linear motion only
(B) rotational motion only
(C) linear as well as rotational
(D) neither linear nor rotational motion

CHEMISTRY

7. 10 g sample of $CaCO_3$ is treated with 0.5 M HCl solution and the volume of acid used in complete reaction is 300 mL. Calculate the percentage purity of $CaCO_3$ in the sample.

(A) 25% (B) 36%
(C) 68% (D) 75%

8. How many structural isomers are possible as product, during monochlorination of isopentane in presence of uv light

(A) 4 (B) 6
(C) 2 (D) 5

9. The electron affinity of N, O, S and Cl are such that

(A) N < O < S < Cl (B) O < N < Cl < S
(C) O $\approx$ S < Cl < N (D) N < O < S $\simeq$ Cl

10. 3 L of SO_2 gas at 750 mm Hg are transferred to 9 L flask containing CO_2 at a particular temperature, the partial pressure of SO_2 in the flask is

(A) 250 mm Hg (B) 150 mm Hg
(C) 350 mm Hg (D) 750 mm Hg

11. Calculate the energy required to excite an electron from ground state to second excited state in He^+.

(A) 13.6 eV (B) 48.35 eV
(C) 28.25 eV (D) 32 eV

12. The greenish colour substance formed on the surface of copper when exposed to moist air for long time

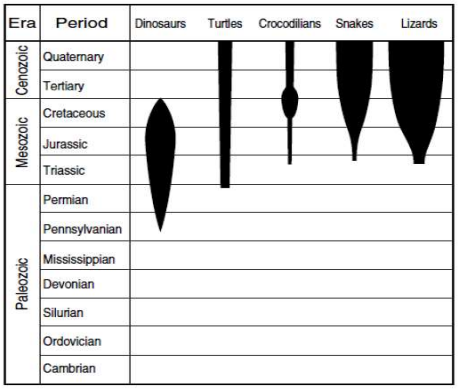
(A) combination of $Cu(OH)_2$ and CuO (B) combination of $Cu(OH)_2$ and $CuCO_3$
(C) combination of Cu(OH) and CuO (D) combination of Cu(OH) and $CuCO_3$

BIOLOGY

13. Most of the mass of organic material of a plant comes from:
(A) Water (B) Carbon dioxide
(C) Soil minerals (D) Atmospheric oxygen

Direction (Q.14 and Q.15): Use the following information to answer the questions.

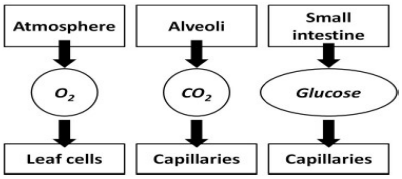
Numbers of Representative Species



14. According to this information, which group demonstrated the greatest biodiversity during the Cretaceous period?
(A) Dinosaurs (B) Crocodilians
(C) Lizards (D) Snakes

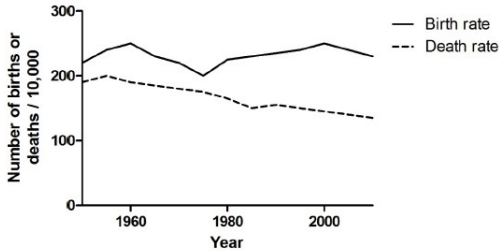
15. According to this information, which group has persisted for the longest period?
(A) Dinosaurs (B) Crocodilians
(C) Snakes (D) Turtles

16. The diagram below shows examples of how substances in organisms are moved.



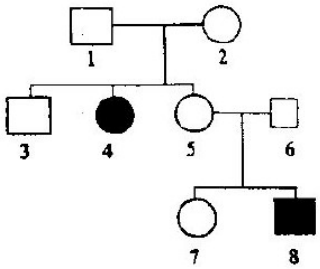
Which process is taking place in all three examples?
(A) Absorption (B) Accommodation
(C) Assimilation (D) Diffusion

17. The graph below shows the birth rate and death rate for a population in country Z.



From 1950 to 2010, the population has:
(A) Increased (B) Decreased
(C) Stayed the same (D) Increased until 1960 then decreased

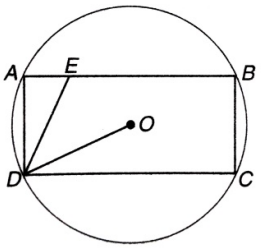
18. The pedigree below shows the inheritance of a recessive characteristic in a family. Which of the lists given in the answer key below contains individuals in this pedigree who are definitely heterozygous for this characteristic?



(A) 1, 2 and 7
(B) 3, 6 and 7
(C) 1, 3 and 6
(D) 1, 2, 5 and 6

MATHEMATICS

19. In the figure below (not drawn to scale), rectangle ABCD is inscribed in the circle with centre at O. The length of side AB is greater than that of side BC. The ratio of the area of the circle to the area of the rectangle ABCD is $\pi:\sqrt{3}$. The line segment DE intersects AB at E such that $\angle ODC = \angle ADE$. What is the ratio AE : AD?

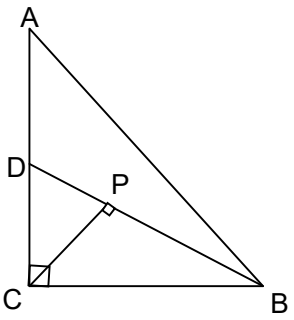


(A) $1:\sqrt{3}$
(B) $1:\sqrt{2}$
(C) $1:2\sqrt{3}$
(D) 1 : 2

20. The least degree of a polynomial with integer coefficient whose one of the roots may be $\cos 12^\circ$ is
(A) 3
(B) 4
(C) 5
(D) None of these

21. If the sides of a regular pentagon is 'a' and its diagonal is of length 'b', then $\frac{a^2}{b^2}+\frac{b^2}{a^2}=?$
(A) 3
(B) 2
(C) 4
(D) 1

22. In ΔABC, angle C is right angle. AC = BC = 1 and D is the midpoint of $\overline{AC}$. $\overline{BD}$ is drawn and a line perpendicular to $\overline{BD}$ at P is drawn from C. Find the distance from P to the intersection of the medians of ΔABC.



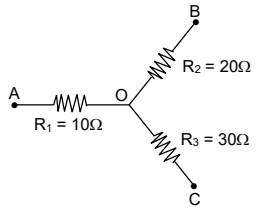
(A) $\frac{1}{\sqrt{5}}$
(B) $\frac{\sqrt{5}}{3}$
(C) $\frac{\sqrt{5}}{15}$
(D) $\frac{5}{\sqrt{15}}$

23. If $x=\left(16^3+17^3+18^3+19^3\right)$, then x divided by 70 leaves a remainder of:
(A) 0
(B) 1
(C) 69
(D) 35

24. First terms in 50th group of (1), (2, 3), (4, 5, 6) , (7, 8, 9, 10) ,…….is
(A) 1226 (B) 1236
(C) 1272 (D) 2500

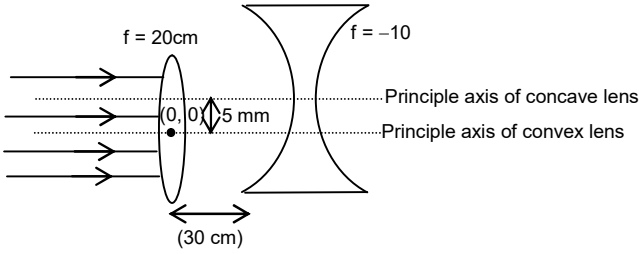
SECTION – B
PHYSICS

1. In the circuit shown, R_1 = 10 ohm, R_2 = 20 ohm and R_3 = 30 ohm. The potentials of points A, B and C are 10 V, 6 V and 5 V respectively. Then choose the incorrect statement.



(A) Current through R1 is 0.2A
(B) Potential at point O is 7V
(C) Current through R2 is 0.15A
(D) Current through R3 is 0.8A

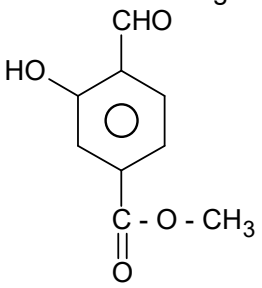
2. If the optic axis of convex and concave lenses are separated by a distance 5 mm as shown in the figure. Find the correct statement for the final image formed by the combination if parallel beam of light is incident on convex lens. (Take origin at the optical centre of convex lens.)



(A) Final image is formed at 25cm from origin.
(B) Height of image is 5mm.
(C) Final image is formed at 5cm from origin.
(D) Height of image is 0.25cm.

CHEMISTRY

3. Which of the following functional groups are present in the following structure?



(A) Aldehyde
(B) Alcohol
(C) Ester
(D) Ketone

4. 250 mL of 0.5 M, H_2SO_4 is mixed with another 250 mL of 0.25 M, H_2SO_4 and the final solution is treated with 300 mL of 0.5 M, NaOH. Which of the following statements are correct about the above solution.
(Given log 2.8125 = 0.449)
(A) The solution is partially neutralized and acidic in nature.
(B) 0.1875 moles of H_2SO_4 was present initially in the above solution.
(C) 0.15 mol of base was added to the solution
(D) pH of final solution is 0.551

BIOLOGY

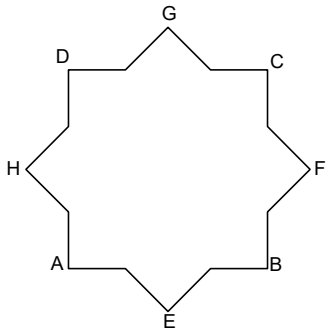
5. Which one of the following statement/s in regard to the excretion by the human kidneys is/are correct?
(A) Descending limb of Loop of Henle is permeable to water
(B) Distal convoluted tubule is capable of reabsorbing HCO3
(C) Nearly 99 per cent of the glomerular filtrate is reabsorbed by the renal tubules
(D) Ascending limb of Loop of Henle is impermeable to electrolytes

6. The cell membrane of the red blood cell will allow water, oxygen, carbon dioxide and glucose to pass through. Because other substances are blocked from entering, this membrane is called:
(A) Perforated
(B) Semi-permeable
(C) Non-conductive
(D) Permeable

MATHEMATICS

7. If $x^2 + y^2 + z^2 = 2(x - y - z) - 3$ then:
(A) $x^{99} - y^{999} + z^{9999} = 1$
(B) $1260x^{1260} - 1259y^{1259} + 1261z^{1261} = 1258$
(C) $\frac{1995}{x} + \frac{1997}{y} - \frac{2001}{z} = 1999$
(D) $\frac{1237}{x^{1239}} + \frac{1239}{y^{1237}} + \frac{1241}{z^{1243}} = -1243$

8. ABCD is a square. Another square EFGH with the same area is placed on the square ABCD such that the point of intersection of diagonals of square ABCD and square EFGH coincide and the sides of square EFGH are parallel to the diagonals of square ABCD. Thus a new figure is formed as shown in the figure. If each side of the square ABCD is 4 cm then the area enclosed by the given figure is $K\left(2-\sqrt{2}\right)$ then K cannot be equal to:



(A) 8 (B) 16
(C) 32 (D) 64

ANSWER KEYS

SECTION B

1.	**C**	2.	**A**	3.	**D**	4.	**B**
5.	**B**	6.	**C**	7.	**D**	8.	**A**
9.	**A**	10.	**A**	11.	**B**	12.	**B**
13.	**B**	14.	**C**	15.	**D**	16.	**D**
17.	**A**	18.	**D**	19.	**A**	20.	**B**
21.	**A**	22.	**C**	23.	**A**	24.	**A**

SECTION B

1.	**BCD**	2.	**AD**	3.	**ABC**	4.	**ABCD**
5.	**ABC**	6.	**B**	7.	**ABCD**	8.	**ABD**

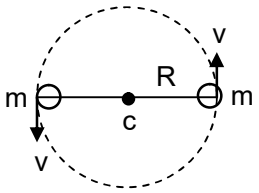
HINTS & SOLUTIONS

SECTION A

1. **C**

Sol.

$$\frac{Gm^2}{(2R)^2} = \frac{mv^2}{R}$$

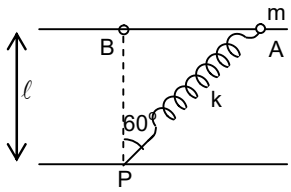


2. **A**

Sol.

Using conservation of energy at point A and point B

$E_A = E_B$



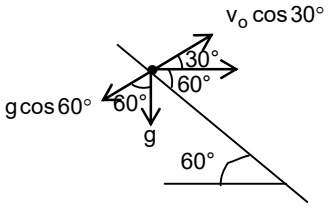
$$\frac{1}{2}kx^2 = \frac{1}{2}mv^2$$

where $x = PA - PB = 2\ell - \ell = \ell$

3. **D**

Sol.

$$T = \frac{2v_o \cos 30°}{g\cos 60°}$$



$$= \frac{2\sqrt{3}v_o}{g}$$

4. **B**

Sol. $$T = 2\pi\sqrt{\frac{\ell}{g_{eff}}} = 2\pi\sqrt{\frac{\ell}{\sqrt{g^2 + a^2}}}$$

where $a = \frac{v^2}{R} = \frac{gR}{R} = g$

$$T = 2\pi\sqrt{\frac{R}{\sqrt{g^2 + g^2}}} = 2\pi\sqrt{\frac{\ell}{\sqrt{2}g}}$$

5. **B**

Sol. Let x be the maximum depth, by work energy theorem

$Mg(h + x) = F_B x$

$\rho V_b(h + x) = \rho_1 V_b x$

$$x = \frac{h\rho}{\rho_1 - \rho}$$

6. **C**

Sol. Force at P and Force at Q are unequal, hence it will move as well as rotate.

7. **D**

Sol. $CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2$

Moles of HCl = 2 × moles of $CaCO_3$

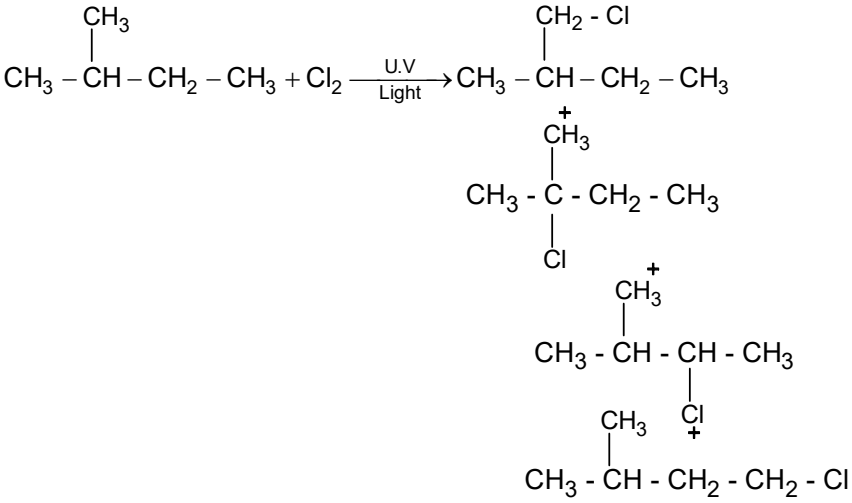
$\Rightarrow 0.5 \times 0.3 = 2 \times \frac{W}{100}$

$\Rightarrow W = \frac{15}{2} = 7.5$

% purity = $\frac{7.5}{10} \times 100 = 75$

8. **A**

Sol.



9. **A**

Sol. The order is N < O < S < Cl.

10. **A**

Sol. 3 L of SO_2 gas at 750 mm Hg transferred to 9 L flask

$P_1V_1 = P_2V_2 \Rightarrow 750 \times 3 = P_2 \times 9$

$\Rightarrow P_2 = \frac{750 \times 3}{9} = 250$ mm of Hg

11. **B**

Sol. $n_1 = 1 \quad n_2 = 3$

$\Delta E = 13.6 \times 2^2 \left[\frac{1}{1} - \frac{1}{9}\right]$

$= 13.6 \times 4 \times \frac{8}{9} = 48.35$ eV

12. **B**

Sol. It is the basic copper carbonate having formula $CuCO_3.Cu(OH)_2$

13. **B**

Sol. Most of the mass of organic material of a plant comes from carbon dioxide.

14. **C**

Sol. Lizards occupy the broadest part which describe the biodiversity in that region.

15. **D**

Sol. Turtles present in Cenozoic, Mesozoic and a little into Paleozoic so they persisted for longest period.

16. **D**

Sol. Diffusion is taking place in all the three examples.

17. **A**

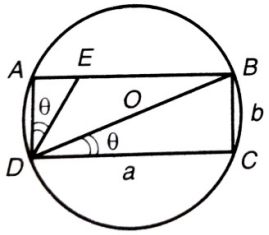
Sol. As the graph indicates, from 1950 to 2010, the population has increased.

18. **D**

Sol. As mentioned in the question that it is recessive trait so the must heterozygote's are parents which are 1,2,5 and 6.

19. **A**

Sol. We have, $\frac{\pi R^2}{ab} = \frac{\pi}{\sqrt{3}}$



$\Rightarrow \quad \sqrt{3}R^2 = ab$ …(i)

From ΔDBC,

$$\tan\theta = \frac{BC}{DC} = \frac{b}{a} \quad \text{…(ii)}$$

From ΔDAE

$$\tan\theta = \frac{AE}{AD} = \frac{AE}{b} \quad \text{…(iii)}$$

From Eqs. (ii) and (iii), we get

$$\frac{AE}{AD} = \frac{b}{a}$$

From ΔDBC, $4R^2 = a^2 + b^2$

$\Rightarrow \quad 4R^2 = a^2 + \frac{3R^4}{a^2}$

$\Rightarrow \quad a^4 - 4R^2a^2 + 3R^4 = 0$

$\Rightarrow \quad a^4 - 3R^2a^2 - R^2a^2 + 3R^4 = 0$

$\Rightarrow \quad a^2\left(a^2 - 3R^2\right) - R^2\left(a^2 - 3R^2\right) = 0$

$\Rightarrow \quad a^2 = R^2$ and $a^2 = 3R^2$

$\Rightarrow \quad a = R$ and $a = \sqrt{3}R$

and $b = \sqrt{3}R$, when $a = R$.

$b = R$, when $a = \sqrt{3}R$

Hence, required ratio is $1:\sqrt{3}$.

20. **B**

Sol. $\because \quad 12^\circ \times 5 = 60^\circ$

let $\quad 12^\circ = \theta$

$\therefore \quad 5\theta = 60^\circ$

$\Rightarrow \quad 3\theta + 2\theta = 60^\circ$

$\therefore \cos\left(3\theta + 2\theta\right) = \cos 60^\circ$

$\Rightarrow \quad \cos 3\theta\cos 2\theta - \sin 3\theta\sin 2\theta = \frac{1}{2}$

$\Rightarrow \left(4\cos^3\theta - 3\cos\theta\right)\left(2\cos^2\theta - 1\right)$

$-\left(3\sin\theta - 4\sin^3\theta\right)2\sin\theta\cos\theta = \frac{1}{2}$

Let $\cos\theta = x$

$$\therefore \left(4x^3-3x\right)\left(2x^2-1\right)-2x\left(3-4\left(1-x^2\right)\right)\left(1-x^2\right)=\frac{1}{2}$$

$$\Rightarrow \left(8x^5-10x^3+3x\right)-\left(2x-2x^3\right)\left(4x^2-1\right)=\frac{1}{2}$$

$$\Rightarrow \left(16x^5-20x^3+6x\right)-\left(4x-4x^3\right)\left(4x^2-1\right)-1=0$$

$$\Rightarrow 32x^5-40x^3+10x-1=0$$

$$\Rightarrow \left(x-\frac{1}{2}\right)\left(32x^4+16x^3-32x^2-16x+2\right)=0$$

but $x\neq\frac{1}{2}, \therefore 16x^4+8x^3-16x^2-8x+1=0$

$\therefore$ Degree is 4.

21. **A**

Sol. Use cosine rule in ΔABE

$$\frac{2a^2-b^2}{2a^2}=\cos\left(\frac{3\pi}{5}\right)$$

$$1-\frac{b^2}{2a^2}=\cos\frac{3\pi}{5}$$

$$\Rightarrow 2\left(1-\cos\frac{3\pi}{5}\right)=\frac{b^2}{a^2}$$

Now, let $\frac{3\pi}{5}=\theta\Rightarrow 2\theta=3\pi-3\theta$

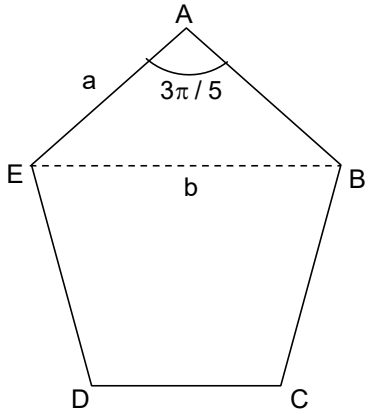
$$\Rightarrow \sin 2\theta=\sin 3\theta\Rightarrow 2\cos\theta=4\cos^2\theta-1$$

$$\Rightarrow \quad \cos\theta=\frac{2\pm\sqrt{4+16}}{8}=\frac{1\pm\sqrt{5}}{4}$$

But $\frac{3\pi}{5}$ is in IInd quadrant.

$$\Rightarrow \quad \cos\frac{3\pi}{5}=\frac{1-\sqrt{5}}{4}$$

$$\Rightarrow \quad \frac{b^2}{a^2}=2\left[1-\left(\frac{1-\sqrt{5}}{4}\right)\right]=\frac{3+\sqrt{5}}{2}$$



$$\frac{a^2}{b^2}+\frac{b^2}{a^2}=\frac{3+\sqrt{5}}{2}+\frac{2}{3+\sqrt{5}}$$

$$=\frac{3+\sqrt{5}}{2}+\frac{2\left(3-\sqrt{5}\right)}{4}$$

$$\frac{6+2\sqrt{5}+6-2\sqrt{5}}{4}=\frac{12}{4}=3$$

22. **C**

Sol. $BD=\sqrt{1^2+\left(\frac{1}{2}\right)^2}=\frac{\sqrt{5}}{2}$

$PC\times BD=BC\times CD$

$$PC\times\frac{\sqrt{5}}{2}=1\times\frac{1}{2}\Rightarrow PC=\frac{1}{\sqrt{5}}$$

$DP=\sqrt{\frac{1}{2^2}-\frac{1}{\left(\sqrt{5}\right)^2}}=\frac{1}{\sqrt{20}}$, $DG=\frac{1}{3}\times BD=\frac{\sqrt{5}}{6}$ (where G is centroid)

$$PG = DG - DP = \frac{\sqrt{5}}{6} - \frac{1}{\sqrt{20}} = \frac{\sqrt{5}}{15}$$

23. **A**

Sol. $$\frac{16^3 + 17^3 + 18^3 + 19^3}{70} = \frac{16^3 + 19^3 + 17^3 + 18^3}{70}$$

$$= \frac{(16+19)\left(16^2 + 19^2 - 16\times 19\right) + (17+18)\left(17^2 + 18^2 - 17\times 18\right)}{70}$$

$$= \frac{35\left(16^2 + 19^2 - 16\times 19 + 17^2 + 18^2 - 17\times 18\right)}{70}$$

$$= \frac{35\times 2m}{70}$$ (which is divisible by 70)

Hence, remainder is zero.

Here $2m = \left(16^2 + 19^2 - 16\times 19 + 17^2 + 18^2 - 17\times 18\right)$

24. **A**

Sol. Let $S = 1 + 2 + 4 + 7 + 11 + \ldots\ldots\ldots + t_n$ ……(1)

Also, $S = 1 + 2 + 4 + 7 + \ldots\ldots\ldots t_{n-1} + t_n$ ……..(2)

Subtract (2) from (1)

$0 = 1 + \underbrace{1 + 2 + 3 + \ldots\ldots\ldots\ldots\text{up to } (n-1) \text{ terms}} - t_n$

$$\Rightarrow t_n = \frac{n^2 - n + 2}{2}$$

$$\Rightarrow t_{50} = \frac{50^2 - 50 + 2}{2} = 1226$$

SECTION – B

1. **BCD**

Sol.

$$i_1 = i_2 + i_3$$

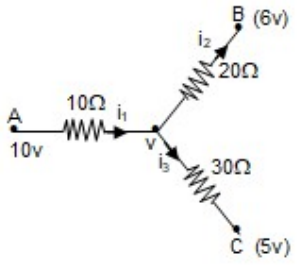
$$\frac{10 - v}{10} = \frac{v - 6}{20} + \frac{v - 5}{30}$$

$$\Rightarrow V = 8v$$

$$i_1 = \frac{10 - v}{10} = \frac{10 - 8}{10} = 0.2\,A$$

$$i_2 = \frac{v - 6}{20} = \frac{8 - 6}{20} = 0.1A$$

$$i_3 = \frac{v - 5}{30} = \frac{8 - 5}{30} = 0.1A$$



2. **AD**

Sol. For convex lens;

$u = \infty$ $v = f = 20$ cm

For concave lens

$u = -10$cm, $f = -10$ cm

Using $\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow v = -5$ cm (From concave lens)

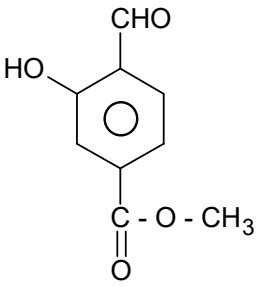
= 25 cm (From convex lens)

$\frac{h_i}{h_o} = +\frac{v}{u} \Rightarrow h_i = \frac{-5}{-10} \times 0.5 = 0.25\,cm$

Lens coordinate = (25 cm, 0.25 cm)

3. **ABC**

Sol.



The functional groups are aldehye(-CHO), alcohol(-OH) and ester - $\overset{\overset{O}{\|}}{C}$ - O - CH_3

4. **ABCD**

Sol. $H_2SO_4(1) = 0.5 \times 0.25 = 0.125$ moles

$H_2SO_4(2) = 0.25 \times 0.25 = 0.0625$ mol

Final moles of $H_2SO_4 = 0.1875$

NaOH added $= 0.5 \times 0.3 = 0.15$ mol

$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$

1 mol + 2 mol

$\frac{0.15}{2}$ + 0.15 mol

= 0.075 mol

$\Rightarrow$ H_2SO_4 left = 0.1875 – 0.075 = 0.1125 mol

$[H^+] = \frac{0.1125 \times 2}{0.8} = 0.28125$

$pH = -\log 0.28125 = -\log \frac{2.8125}{10}$

pH = 1 – 0.449 = 0.551

5. **ABC**

Sol. The correct statements are the unit of kidney is nephron, nearly 99% of the glomerular filtrate is reabsorbed by the renal tubules and Descending limb of Loop of Henle is permeable to water and distal convoluted tubules is absorbed by renal tubules.

6. **B**

Sol. This membrane is called semi permeable.

7. **ABCD**

Sol. $\because x^2 + y^2 + z^2 - 2(x - y - z) + 3 = 0$

$\Rightarrow x^2 + y^2 + z^2 - 2x + 2y + 2z + 3 = 0$

$\Rightarrow (x^2 - 2x + 1) + (y^2 + 2y + 1) + (z^2 + 2z + 1) = 0$

$\Rightarrow (x-1)^2 + (y+1)^2 + (z+1)^2 = 0$

$\therefore x = 1, y = -1, z = -1$

$\therefore x^{99} - y^{999} + z^{9999} = 1^{99} - (-1)^{999} + (-1)^{9999}$

$= 1 + 1 - 1 = 1$

$1260x^{1260} - 1259y^{1259} + 1261z^{1261} = 1258$

$= 1260(1)^{1260} - 1259(-1)^{1259} + 1261(-1)^{1261}$

= 1260 + 1259 – 1261

$\frac{1995}{x} + \frac{1997}{y} + \frac{2001}{z} = \frac{1995}{1} + \frac{1997}{(-1)} - \frac{2001}{(-1)}$

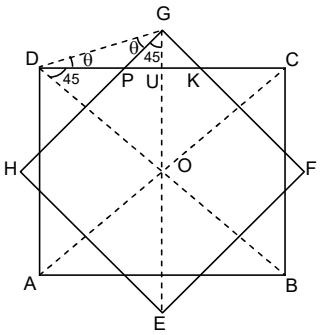
= 1995 – 1997 + 2001 = 1999

$\frac{1237}{x^{1239}} + \frac{1239}{y^{1237}} + \frac{1241}{z^{1243}} \Rightarrow \frac{1237}{1} - 1239 - 1241$

$= -1243$

8. **ABD**

Sol.



$\because$ AB = BC = CD = AD = 4

$\therefore$ AC = BD = $4\sqrt{2}$

$OD = \frac{4\sqrt{2}}{2} = 2\sqrt{2}$

Similarly, EF = FG = GH = EH = 4

$\therefore GO = \frac{4\sqrt{2}}{2} = 2\sqrt{2}$

In $\Delta DOG \rightarrow$

OD = OG = $2\sqrt{2}$

$\therefore \angle ODG = \angle DGO = 45 + \theta$

$\therefore$ Now in $\Delta DPG \rightarrow$ GP = DP

Let's say DP = GP = a

Similarly, KC= GK = a

Now in $\Delta PGU \rightarrow \frac{PU}{PG} = \sin 45 = PU = \frac{a}{\sqrt{2}}$

$\therefore PK = PU + UK = 2PU = 2 \times \frac{a}{\sqrt{2}} \Rightarrow a\sqrt{2}$

$\therefore DC = DP + PK + KC = a + a\sqrt{2} + a = 2a + a\sqrt{2} = a\left(2 + \sqrt{2}\right)$

Now In $\Delta PGK \rightarrow \frac{1}{2} \times PG \times GK = \frac{1}{2} \times a \times a = \frac{a^2}{2}$

Now area of all the triangle outside the square (ABCD) = $4 \times \frac{a^2}{2} = 2a^2$

$DC = a\left(2 + \sqrt{2}\right) = 4$

$\Rightarrow \quad a = \frac{4}{2 + \sqrt{2}}$

$\therefore \quad 2(a)^2 = 2 \times \left(\frac{4}{2 + \sqrt{2}}\right)^2$

$$= 2 \times \frac{16}{6 + 4\sqrt{2}}$$

$$= 2 \times \frac{16}{2\left(3 + 2\sqrt{2}\right)} \times \frac{3 - 2\sqrt{2}}{3 - 2\sqrt{2}}$$

$$= 16\left(3 - 2\sqrt{2}\right)$$

Area of square ABCD = 16 cm^2

$\therefore$ Total area = $16 + 16\left(3 - 2\sqrt{2}\right)$

$$= 32\left(2 - \sqrt{2}\right) cm^2$$