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Knowledge is Discipline
BJNP
Learning with the Speed of Mumbai and the Tradition of Kota

Max. Marks: 300 **Date: 22.10.2022**

ABHIMANYU BATCH
PHYSICS : PART TEST SET-B
Topic: FLT

1. In double slit experiment, the angular width of the fringes is 0.20° for the sodium light (λ = 5890 Å). In order to increase the angular width of the fringes by 10%, the necessary change in wavelength is
   (a) zero (b) increased by 6479 Å
   (c) decreased by 589 Å (d) increased by 589 Å
2. In a double slit interference experiment, the fringe width obtained with a light of wavelength 5900 Å was 12 mm for parallel narrow slits placed 2 mm apart. In this arrangement, if the slit separation is increased by one-and-half times the previous value, then the fringe width is
   (a) 0.9 mm (b) 0.8 mm (c) 1.8 mm (d) 1.6 mm
3. In Young's double slit experiment, the seventh maximum with wavelength λ_1 is at a distance d_1 and the same maximum with wavelength λ_2 is at a distance d_2. Then, d_1/d_2 is equal to
   (a) $\frac{\lambda_1}{\lambda_2}$ (b) $\frac{\lambda_2}{\lambda_1}$ (c) $\frac{\lambda_1^2}{\lambda_2^2}$ (d) $\frac{\lambda_2^2}{\lambda_1^2}$
4. In Young's double slit experiment, the intensity on screen at a point where path difference is $\lambda / 4$?
   (a) K4 (b) K/2 (c) K (d) Zero
5. In a Young's double slit experiment, the source is white light. One of the holes is covered by a red filter and another by a blue filter. In this case
   (a) there should be no interference fringe
   (b) there should be an interference pattern for red mixing with one for blue
   (c) there should be alternate interference pattern for red mixing with one for blue
   (d) None of the above

Space for Rough Work

6. The angular width of the central maximum of the diffraction pattern in a single slit (of width a) experiment, with λ as the wavelength of light, is

(a) $\frac{3\lambda}{2a}$ (b) $\frac{\lambda}{2a}$ (c) $\frac{2\lambda}{a}$ (d) $\frac{\lambda}{a}$

7. A parallel monochromatic beam of light is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction pattern, the phase difference between the rays coming from the edges of the slit is

(a) 0 (b) $\frac{\pi}{2}$ (c) π (d) 2π

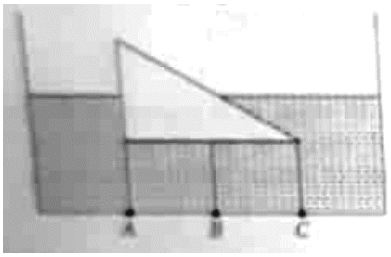
8. The source is at some distance from an obstacle. Distance between obstacle and the point of observation is b and wavelength of light is λ. Then the average distance of nth Fresnel zone will be at a distance … from the point of observation

(a) $\frac{bn\lambda}{2}$ (b) $b - \frac{n\lambda}{2}$ (c) $b + \frac{n\lambda}{2}$ (d) $b - n\lambda$

9. When light is incident on a diffraction grating, then zero order principal maximum will be

(a) spectrum of the colours (b) white
(c) one of the component colours (d) absent

10. An object of uniform density is allowed to float in water kept in a beaker. The object has triangular cross-section as shown in the figure. If the water pressure measured at the three points A, B and C below the object are p_x, p_y and p_z respectively. Then



(a) $p_x > p_y > p_z$ (b) $p_x > p_z < p_z$ (c) $p_x = p_y = p_z$ (d) $p_x = p_y < p_z$

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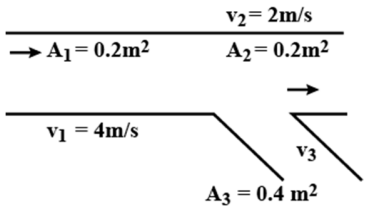
11. In the given figure, the velocity v_1 will be



(a) 2 ms^{-1} (b) 4 ms^{-1} (c) 1 ms^{-1} (d) 3 ms^{-1}

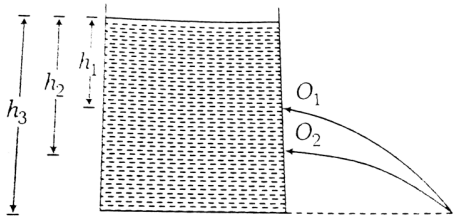
12. An ideal fluid flows through two pipes of circular cross-section with diameters 2.5 cm and 3.75 cm connected one after another. The ratio of the velocities in the two pipes is

(a) 3 : 4 (b) 3 : 2 (c) $\sqrt{3} : \sqrt{2}$ (d) $\sqrt{2} : \sqrt{3}$

13. Water is in streamline flows along a horizontal pipe with non-uniform cross-section. At a point in the pipe where the area of cross-section is 10 cm^{-1}, the velocity of water is 1 ms^{-1} and the pressure is 2000 Pa. The pressure at another point where the cross-section area is 5 cm^2 is

(a) 4000 Pa (b) 2000 Pa (c) 1000 Pa (d) 500 Pa

14. There are two holes O_1 and O_2 in a tank of height H. The water emerging from O_1 and O_2 strikes the ground at the same points, as shown in figure. Then



(a) $H = h_1 + h_2$ (b) $H = h_2' - h_1$ (c) $H = \sqrt{h_1 h_2}$ (d) None of these

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15. As the temperature of water increases, its viscosity
    (a) remains unchanged
    (b) decreases
    (c) increases
    (d) increases or decreases depending on the external pressure

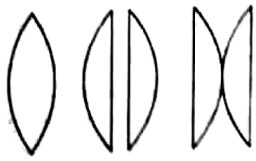
16. A point object is placed at a distance of 30 cm from a convex mirror of focal length 30 cm. The image will form at
    (a) infinity (b) pole
    (c) focus (d) 15 cm behind the mirror

17. The image formed by a convex mirror of focal length 30 cm is a quarter of the size of the object. The distance of the object from the mirror is
    (a) 30 cm (b) 90 cm (c) 120 cm (d) 60 cm

18. Object is placed 15 cm from a concave mirror of focal length 10 cm, then the nature of image formed will be
    (a) magnified and inverted (b) magnified and erect
    (c) small in size and inverted (d) small in size and erect

19. Two thin lenses, one of focal length +60 cm and the other of focal length – 20 cm are put in contact. The combined focal length is
    (a) + 15 cm (b) – 15 cm (c) + 30 cm (d) – 30 cm

20. Two similar plano-convex lenses are combined together in three different ways as shown in the adjoining figure. The ratio of the focal lengths in three cases will be



    (a) 2 : 2 : 1 (b) 1 : 1 : 1 (c) 1 : 2 : 2 (d) 2 : 1 : 1

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21. A is an essential condition for coherent sources. Here, A refers to

(a) constant phase difference (b) equal amplitude

(c) Both (a) and (b) are correct (d) Both (a) and (b) are incorrect

22. Two periodic waves of intensities I_1 and I_2 pass through a region at the same time in the same direction. The sum of the maximum and minimum intensities is

(a) $I_1 + I_2$ (b) $(\sqrt{I_1} + \sqrt{I_2})^2$ (c) $(\sqrt{I_1} - \sqrt{I_2})^2$ (d) $2(I_1 + I_2)$

23. Interference was observed in interference chamber when air was present, now the chamber is evacuated and if, the same light is used, a careful observer will see

(a) interference in which width of the fringe will be slightly increased

(b) interference with bright bond

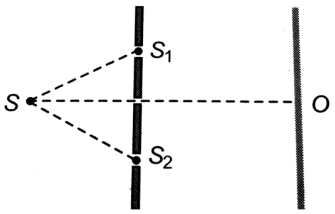
(c) interference with dark bond

(d) All of the above

24. Two coherent waves are represent by $y_1 = a_1 \cos \omega t$ and $y_2 = a_2 \sin \omega t$, superimposed on each other. The resultant intensity is proportional to

(a) $(a_1 + a_2)$ (b) $(a_1 - a_2)$ (c) $(a_1^2 + a_2^2)$ (d) $(a_1^2 - a_2^2)$

25. In the setup shown in figure, the two slits, S_1 and S_2 are not equidistant from the slit S. The central fringe at O is, then



(a) always bright

(b) always dark

(c) either dark or bright depending on the position of

(d) neither dark nor bright

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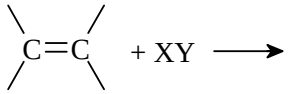
Date: 22.10.2022

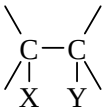
ABHIMANYU BATCH
CHEMISTRY : PART TEST SET-B
Topic: FLT

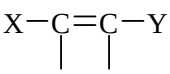
26. Molecular formula of amyl alcohol is

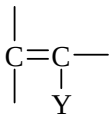
(a) $C_7H_{14}O$ (b) $C_6H_{13}O$ (c) $C_5H_{12}O$ (d) $C_5H_{10}O$

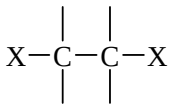
27. Write the products of the addition reaction



(a) 

(b) 

(c) 

(d) 

28. Which of the following is a biodegradable polymer?

(a) Polythene (b) PVC (c) Bakelite (d) PHBV

29. "The negative part of addenda adds on the carbon atom linkedwith least number of hydrogen atoms". This statement is called

(a) Lechatelier principle (b) Bayer's strain theory

(c) Markownikoff's rule (d) Peroxide effect

30. The number of moles of proton which can be easily given bybutyne-1(1 mole) is

(a) 1 (b) 2 (c) 3 (d) 6

31. The homologue of ethyne is

(a) C_2H_4 (b) C_2H_6 (c) C_3H_8 (d) C_3H_4

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32. Glycerol is extracted from spent soap lye by using

(a) Simple distillation (b) Sublimation

(c) Distillation under reduced pressure (d) Paper chromatography

33. The heating of phenylmethyl ether with HI produces

(a) iodobenzene (b) phenol (c) benzene (d) ethyl chloride

34. The synthesis of ethene from electrolysis of an aqueoussolution of potassium succinate is known as

(a) Faraday's electrolysis (b) Kolbe - Schmidt reaction

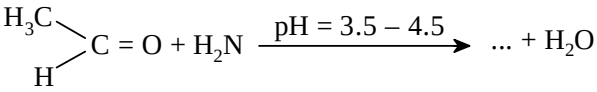
(c) Hoffmann's rearrangement (d) Kolbe's electrolytic synthesis

35. Coupling reaction is given by

(a) Nitrobenzene (b) aniline

(c) Benzenediazonium chloride (d) Both 2 and 3

36. The number of organic products (oxime) is:



(a) 1 (b) 2 (c) 3 (d) 4

37. Among the following, the essential amino acid is:

(a) Alanine (b) Valine (c) Aspartic acid (d) Serine

38. During nitration of benzene with nitrating mixture, HNO_3 acts as

(a) an acid (b) a base (c) catalyst (d) reducing agent

39. Which one of the following is a linear polymer

(a) Amylopectin (b) Glycogen (c) Starch (d) Amylose

40. 0.12 g of an organic compound gave 0.22 g of $Mg_2P_2O_7$ byusual analysis. The percentage of phosphorus in the compoundis

(a) 15.23 (b) 38.75 (c) 51.20 (d) 60.92

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41. The IUPAC name of $C_2H_5 - O - CH(CH_3)_2$

(a) 1-Ethoxy propane (b) 1, 1-dimethyl ether

(c) 2-Ethoxy isopropane (d) 2–Ethoxy propane

42. Identify the product D in the following series of reaction

$$CH_3COOH \xrightarrow{LiAlH_4} A \xrightarrow[443\,K]{H^+} B \xrightarrow{Br_2} C \xrightarrow{NaNH_2} D$$

(a) Methane (b) Alcohol (c) Acetylene (d) Benzaldehyde

43. Among the following sets of reactions which one producesanisole ?

(a) C_6H_5OH ; neutral $FeCl_3$ (b) $C_6H_5CH_3$; CH_3COCl / $AlCl_3$

(c) CH_3CHO ; RMgX (d) C_6H_5OH ; NaOH ; CH_3Cl

44. Select the molecule which has only one π -bond

(a) $CH \equiv CH$ (b) $CH_2 = CHCHO$

(c) $CH_3CH = CH_2$ (d) $CH_3CH = CHCOOH$

45. CH_3COCH, can be obtained by

(a) Heating acetaldehyde with methanol (b) Oxidation of n-propyl alcohol

(c) Oxidation of isopropyl alcohol (d) Reduction of propionic acid

46. Which one of the following class of compounds is obtained bypolymerization of acetylene?

(a) Poly-ene (b) Poly-amide (c) Poly-yne (d) Poly-ester

47. Aniline on treatment with excess of bromine water gives

(a) Aniline bromide (b) o-bromoaniline

(c) p-bromoaniline (d) 2,4,6-tribromoaniline

48. $CHCl_3$ on reaction with acetone gives a compound used as

(a) Tear gas (b) Hypnotic (c) Pesticide (d) Anaesthetic

49. One litre oxygen gas at STP will weigh

(a) 1.43 g (b) 2.24 g (c) 11.2 g (d) 22.4 g

50. Acidic nature of alcohols is in the order :

(a) 1° > 2° > 3° (b) 3° > 2° > 1° (c) 2° > 3° > 2° (d) 2° > 1° > 3°

Space for Rough Work

Date: 22.10.2022

ABHIMANYU BATCH
MATHEMATICS : PART TEST SET-B
Topic: FLT

51. A ladder 15 meter long is leaning against a vertical wall. If the bottom of the ladder is pulled out the ground away from the wall at the rate of 3 m/sec. Then the rate at which height on the wall decreases when the foot of ladder is 12 meter away from the wall is ….

(a) 12 m/sec (b) 24 m/sec (c) 36 m/sec (d) 48 m/sec

52. An open box is to be cutout of piece of square card board at side 24 cm by cutting of equal square from the corners and turning up the sides, then the maximum volume of the box is ….

(a) 512 cm^3 (b) 1024 cm^3 (c) 2048 cm^3 (d) 256 cm^3

53. If $\int \sec(x^{101}).x^{100}\,dx = \frac{1}{101}\log|f(x)| + c$, then $f(x) = $ ….

(a) $\cot\left(\frac{\pi}{4} + \frac{x^{101}}{2}\right)$ (b) $\sec\left(\frac{\pi}{4} + \frac{x^{101}}{2}\right)$ (c) $\tan\left(\frac{\pi}{4} + \frac{x^{101}}{2}\right)$ (d) $\frac{\pi}{4} + \frac{x^{101}}{2}$

54. If $\int \tan^{-1}\sqrt{x}\,dx = P(x)\tan^{-1}\sqrt{x} - Q(x) + c$, then $P(x) - [Q(x)]^2 = $ ….

(a) 0 (b) 1 (c) –1 (d) 2x + 1

55. If $\int \frac{\cos x}{(1+\sin x)(2+\sin x)(3+\sin x)}\,dx$

$= p\log\left|\frac{(1+\sin x)(3+\sin x)}{(2+\sin x)^2}\right| + c,$

then p = …..

(a) 3 (b) $-\frac{1}{2}$ (c) 2 (d) $\frac{1}{2}$

Space for Rough Work

56. If $\int_{\pi/4}^{\pi/2} \cos 2x \ . \log \sin x \, dx = A \log 2 - \frac{\pi}{8} + B$, then $A + B = \ldots$.

(a) 0 (b) $\frac{1}{2}$ (c) 2 (d) 1

57. $\int_{0}^{\pi/4} \sec x \ \log (\sec x + \tan x) dx = \ldots$.

(a) $[\log(\sqrt{2} - 1)]^2$ (b) $[\log(\sqrt{2} + 1)]^2$ (c) $\frac{[\log(1 + \sqrt{2})]^2}{2}$ (d) $\frac{[\log(\sqrt{2} - 1)]^2}{2}$

58. The area of the region common to the circle $x^2 + y^2 = 9$ and the parabola $y^2 = 8x$ is …. sq. units.

(a) $\frac{\sqrt{2}}{3} + \frac{9}{2}\sin^{-1}\left(\frac{2}{3}\right)$ (b) 8

(c) $\frac{\sqrt{2}}{3} + \frac{9}{2}\sin^{-1}\left(\frac{2\sqrt{2}}{3}\right)$ (d) 4

59. The common area between the circle $x^2 + y^2 = 16$ and $x + y \leq 4$ is $A(3\pi + B)$, then the value of $A + B$ is ….

(a) 6 (b) 2 (c) –2 (d) –6

60. If the differential equation of the equation $y = a + be^{5x} + ce^{-7x}$ is $Ay''' + By'' + Cy' = 0$, then the value of $A + B + C$ is ….

(a) 32 (b) –11 (c) –32 (d) 2

61. The general solution of $\frac{dy}{dx} = x\sqrt{100 - x^2}$ is

(a) $3y = c + (100 - x^2)^{3/2}$ (b) $3y = c - (100 + x^2)^{3/2}$

(c) $3y = c + (x - 100)^{3/2}$ (d) $3y = c - (100 + x^2)^{3/2}$

Space for Rough Work

62. The general solution of

$$\left[xy\cos\left(\frac{y}{x}\right)+y^2\sin\left(\frac{y}{x}\right)\right]dx+\left[x^2\cos\left(\frac{y}{x}\right)-xy\sin\left(\frac{y}{x}\right)\right]dy=0$$

is $xy\,.\,p(x)=c$, then $p(x)=$ ….

(a) $\cos\left(\frac{x}{y}\right)$ (b) $\cos\left(\frac{y}{x}\right)$ (c) $\sin\left(\frac{x}{y}\right)$ (d) $\sin\left(\frac{y}{x}\right)$

63. Water flows from the base of rectangular tank of depth 16 meter. The rate of flowing the water is proportional to the square root of depth at any time t. If depth is 4 m when t = 2 hours, then after 3.5 hours the depth is ….

(a) 0 m (b) 0.25 m (c) 0.5 m (d) 3 m

64. The equation of the curve passing through (2, 5) and having the area of triangle formed by the X-axis. the ordinate of a point on the curve and the tangent at the point 5 sq. units is ….

(a) $xy = 10$ (b) $x^2 = 10y$ (c) $y^2 = 10x$ (d) $xy^{1/2} = 10$

65. According to Newton's law of cooling, the body at temperature 100° C cools in 10 minutes to 88° C in a room temperature 25° C. After 20 minutes, the temperature of a body is approximately

(a) 78° C (b) 87° C (c) 77° C (d) 52° C

66. If $f(x)=\begin{vmatrix}1 & x & x+1\\ 2x & x(x-1) & (x+1)x\\ 3x(x-1) & x(x-1)(x-2) & x(x-1)(x+1)\end{vmatrix}$ then $f(0)+f(1)+f(2)+\ldots+f(2021)=$ ….

(a) 2021 (b) 1 (c) 4041 (d) 0

67. The domain of the function

$f(x)=\sqrt{\frac{1-|x|}{|x|-3}}$ is ….

(a) $(-3, 3)$ (b) $(-3, 3)-\{1\}$ (c) $(-3, 3)-\{0\}$ (d) $(-3, 3)-\{0, 1\}$

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68. $\lim\limits_{x\to\infty} \dfrac{(x+1)^{20} + (x+2)^{20} + (x+3)^{20} + ... + (x+1000)^{20}}{(6x-5)^{30}} = ...$

(a) 1000 ! (b) 1000 (c) 1000^2 (d) 9991

69. If β is the repeated root of the equation $ax^2 + bx + c = 0$, then

$\lim\limits_{x\to\beta} \dfrac{\sin(ax^2 + bx + c)}{(x-\beta)^2} = ...$

(a) β (b) $\alpha - \beta$ (c) α (d) $a + b + c$

70. If $f(x) = \begin{cases} \dfrac{\log x - \log 2}{x-2} + a & , \ x > 2 \\ 1 & , \ x = 2 \\ \dfrac{1 - \cos 3(x-2)}{(x-2)^2} + 2b & , \ x < 2 \end{cases}$

is continuous at x = 2, then a – 2b is ....

(a) 1 (b) 2 (c) 3 (d) 4

71. If $f(x) = \begin{cases} \dfrac{4^{x-\pi} + 4^{\pi-x} - 2}{(x-\pi)^2} & , \ \text{for } x \neq \pi \\ k & , \ \text{for } x = \pi \end{cases}$

is continuous at $x = \pi$, then k = ...

(a) $4 (\log 2)^2$ (b) $8 (\log 2)^2$ (c) $(\log 2)^2$ (d) $2 \log 2$

Space for Rough Work

72. If $y = \cfrac{\cos x}{1+\cfrac{\sin x}{1+\cfrac{\cos x}{1+\cfrac{\sin x}{1+...\infty}}}}$, then $\frac{dy}{dx} = ...$

(a) $\frac{y\cos x + y\sin x + \cos x}{1 + 2y + \sin x - \cos x}$ (b) $\frac{y\cos x - y\sin x - \sin x}{1 + 2y + \sin x - \cos x}$

(c) $\frac{y\cos x + y\sin x - \sin x}{1 + 2y + \sin x + \cos x}$ (d) $\frac{y\cos x - y\sin x + \sin x}{1 + 2y + \sin x - \cos x}$

73. Derivative of $\tan^{-1}\left[\frac{3x - x^3}{1 - 3x^2}\right]$ with respect to $\tan^{-1}\left(\frac{2x}{1 - x^2}\right); x \in \left(-\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ is ....

(a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) 1 (d) –1

74. If $f(x) = \frac{|x|}{x}$; for $x \neq 0$

$= 1$; for $x = 0$

then the functions ....

(a) continuous and differentiable at x = 0 (b) neither continuous nor differentiable at x = 0

(c) continuous but not differentiable at x = 0 (d) differentiable but not continuous at x = 0

75. If $y = \tan^{-1}\left[\frac{\log(e / x^2)}{\log(ex^2)}\right] + \tan^{-1}\left[\frac{3 + 2\log x}{1 - 6\log x}\right]$, then $\frac{d^2y}{dx^2} = ...$

(a) 1 (b) 0 (c) $\frac{2}{1 + x^2}$ (d) $\frac{1}{1 + x^2}$

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PHYSICS : PART TEST SET-B ANSWER KEY
Topic: FLT

1.	(d)	2.	(b)	3.	(a)	4.	(b)	5.	(a)
6.	(c)	7.	(d)	8.	(c)	9.	(b)	10.	(c)
11.	(c)	12.	(a)	13.	(d)	14.	(a)	15.	(b)
16.	(d)	17.	(b)	18.	(a)	19.	(d)	20.	(b)
21.	(a)	22.	(d)	23.	(a)	24.	(c)	25.	(c)

CHEMISTRY : PART TEST SET-B ANSWER KEY
Topic: FLT

26.	(c)	27.	(a)	28.	(d)	29.	(c)	30.	(a)
31.	(d)	32.	(c)	33.	(b)	34.	(d)	35.	(d)
36.	(b)	37.	(b)	38.	(b)	39.	(d)	40.	(c)
41.	(d)	42.	(c)	43.	(d)	44.	(c)	45.	(c)
46.	(a)	47.	(d)	48.	(b)	49.	(a)	50.	(a)

MATHEMATICS : PART TEST SET-B ANSWER KEY
Topic: FLT

51.	(c)	52.	(b)	53.	(c)	54.	(b)	55.	(d)
56.	(b)	57.	(c)	58.	(c)	59.	(a)	60.	(c)
61.	(b)	62.	(b)	63.	(b)	64.	(a)	65.	(a)
66.	(d)	67.	(d)	68.	(b)	69.	(c)	70.	(d)
71.	(a)	72.	(b)	73.	(a)	74.	(b)	75.	(b)