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2B2M21348 (Pages :2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester BSc Degree Examination, March/April 2021

BCH2B02 - Theoretical and Inorganic Chemistry – II

(2020 Admission onwards)

Time: 2 hours Max. Marks: 60

Section A (Short answers)

(Answer questions up to 20 marks. Each question carries 2marks)

1. Calculate the mass of a particle moving with a velocity of 10^{-5} m/s^{-1} and having a wavelength 7.3×10^{-6} m.
2. Draw the radial distribution curves for *3p* and *3d* orbitals.
3. How can we determine the temperature inside a star?
4. Explain the effect of intensity and frequency of incident light on photoelectric effect. Mention two practical applications of photoelectric effect.
5. Draw the shape of *d*-orbitals.
6. Explain the conditions for a well behaved wave function.
7. If the length of hexatriene is 0.73 nm, calculate the wavelength of radiation required for the excitation.
8. The 19th electron in potassium atom goes to 4*s* orbital and not to 3*d* orbital. Justify
9. Explain the importance of Born-Oppenheimer approximation in quantum mechanics.
10. Give reasonable explanation for the stability of half filled and fully filled orbitals.
11. $1s^2, 2s^2, 2p^6$electronic configuration exists but not $1s^2, 2s^3, 2p^5$. Justify
12. Calculate the uncertainty in the velocity of a particle of mass 5×10^{-27} kg with uncertainty in position is 10^{-8} cm.

[Ceiling of marks: 20]

Section B (Paragraph)

(Answer questions up to 30 marks. Each question carries 5 marks)

13. Calculate the wavelength of the second line in the Paschen series and show that this line lies in the near IR region. ($R_H = 109677.57$ cm^{-1})
14. Elucidate the importance of Stern-Gerlach experiment.
15. Prove that the product of two linear operators is another linear operator.

16. Which of the following functions are eigen functions of d^2/dx^2? (a) e^x; (b) x^2; (c) $\sin x$; (d) $3 \cos x$; (e) $\sin x + \cos x$. Give the eigen value.

17. With the help of molecular orbital theory prove that Be_2 does not exist.

18. Give explanation for the paramagnetic nature of NO.

19. Identify the bond angles in $SnCl_2$, NH_3 and ClF_3

[Ceiling of marks: 30]

Section C (Essay)
(Answer any one. Each question carries 10 marks)

20. Give expression for the Schrodinger wave equation of particle in one dimensional box and origin of quantum numbers n from the equation.

21. Explain the shape and hybridization of CH_4, PCl_5, SF_6 and IF_7.

[1 x 10 = 10]

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, March/April 2021

BMT2C02 – Mathematics – 2

(2020 Admission onwards)

Time: 2 hours Max. Marks : 60

PART A

Answer all questions. Each question carries 2 marks.

Maximum marks from this section is 20.

1. Convert the polar coordinate $(4, -\pi)$ into cartesian coordinate.
2. Differentiate $\cosh^{-1} x^2$
3. Consider the curve $x = 3\cos t, y = \sin t$. Find the points where the tangent is horizontal.
4. Find $\lim_{n\to\infty} \frac{3n^2+1}{n^2+n}$
5. Evaluate $\int_0^{\frac{\pi}{2}} \cos x \ dx$ by using Trapezoidal rule with $n = 4$.
6. Show that the series $\sum_{i=1}^{\infty} 1 + \frac{1}{2^i}$ diverges.
7. Test the convergence of $\sum_{n=1}^{\infty} \frac{3^n}{n^2}$.
8. Give an example of a vector space. Explain your answer
9. Check whether the set of vectors (3,5), (2,10) are linearly independent or not.
10. Find the inverse of the matrix $\begin{bmatrix} 1 & 3 \\ 4 & 10 \end{bmatrix}$
11. Verify that the matrix $A = \begin{bmatrix} \cos t & \sin t \\ -\sin t & \cos t \end{bmatrix}$ is orthogonal.
12. Evaluate the determinant of the matrix $A = \begin{bmatrix} 6 & 5 & 0 \\ -1 & 8 & -7 \\ -2 & 4 & 0 \end{bmatrix}$

PART B

Answer all questions. Each question carries 5 marks

Maximum mark from this section is 30

13. Show that $\sinh^2 x = \frac{\cosh 2x - 1}{2}$
14. Find the length of the curve $f(x) = (x-1)^{\frac{3}{2}} + 2$ on $[1, 2]$.

15. (a) Write Alternating series test.

(b) Show that the series $1-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+\frac{1}{5}-\cdots$ converges.

16. Find the Taylor series generated by $f(x)=e^x$ at $x_0=0$.

17. Let $B=\{u_1, u_2\}$, where $u_1=(3,1), u_2=(1,1)$ is a basis for R^2. Find an orth basis for R^2 using the Gram - Schmidt orthonormalization process.

18. Solve the linear system

$$x_1+2x_2-x_3=0$$
$$2x_1+x_2+2x_3=9$$
$$x_1-x_2+x_3=3$$

Using Gaussian elimination.

19. Find the rank of the matrix $\begin{bmatrix}1 & 1 & 1\\ 1 & 0 & 4\\ 1 & 4 & 1\end{bmatrix}$

PART C

Answer any ONE question. One question carries 10 marks

20. (a) Graph the polar curve $r=\cos 2\theta$.

(b) Find the area enclosed by the cardioids, $r=1+\cos\theta, 0\le\theta\le 2\pi$.

21. Find the eigen values and corresponding eigen vectors of the matrix $A=\begin{bmatrix}7 & 3\\ 3 & \end{bmatrix}$

Also verify Cayley Hamilton theorem.

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, March/April 2021

BPH2C02 – Optics , Laser, Electronics & Communication

(2020 Admission onwards)

Time: 2 hours Max. Marks : 60

Section A

Answer all questions. Answer in two or three sentences. Each correct answer carries a maximum of two marks.

1. What are coherent sources? Give an example.
2. What are Newton's rings? Give two of its uses.
3. State and explain grating law.
4. Distinguish between Fraunhofer and Fresnel's diffraction.
5. What is a half wave plate? What is its use?
6. Draw the intensity distributioncurve of the single slit diffraction pattern
7. Obtain the relation between current amplification factors a and b
8. Draw the diagram of exclusive OR gate. Also draw its truth table.
9. What is negative feedback? What is its need?
10. What is stimulated emission?
11. Distinguish between **e** rays and **o** rays.
12. What is specific rotation?

(Ceiling: 20 Marks)

Section B (Paragraph/Problem)

(Answer all questions in a paragraph of about half a page to one page. Each correc carries a maximum five marks)

13. What are constructive and destructive interferences? Give the conditions.
14. In Newton's Ring experiment the radius of curvature of the curved side of a plan lens is 100cm. Wavelength of light used is $6x10^{-5}$ cm. What will be the radius of 10^{th} brightrings?
15. If the critical angle of glass air boundary is 42^0, calculate the polarising angle for
16. What are the conditions for brightness and darkness of normal incidence of light plane film producing interference?
17. Write a short note on Ruby laser.
18. How will you distinguish between planes, elliptically and circularly polarised lig
19. Explain the working of a transistor oscillator.

(Ceiling:3

Section C (Essay)

Answer anyone in about two pages .Each question carries ten marks)

20. Give the theory of plane diffraction grating and explain how it is used to measure wavelength of light.
21. Describe the principle and working of a full wave rectifier. Obtain the expression efficiency and ripple factor.

(1x10=10