



## COOCH BEHAR PANCHANAN BARMA UNIVERSITY

B.Sc. Honours 3rd Semester Examination, 2020, held in 2021

### CHEMISTRY

### FUEL CHEMISTRY

### SEC-1

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*All symbols are of usual significance.*

**Answer any two questions from the following**

20×2 = 20

1. (a) What is calorific value of fuels? What do you mean by renewable energy resources? Give one example. 2+2+1
- (b) Write short note about: Water gas and Producer gas.  $2\frac{1}{2}+2\frac{1}{2}$
- (c) What is Petroleum? Write down the composition of crude petroleum. 2+3
- (d) What do you mean by synthetic lubricants? Write uses of coal tar based chemicals. What is ignition temperature? 2+2+1
  
2. (a) What are Petrochemicals? Give two examples along with their industrial application. 2+3
- (b) What is coal? Classify coal on the basis of percentage of carbon. 2+3
- (c) Distinguish between conventional and non-conventional sources of energy with suitable examples. How does liquid fuel differ from gaseous fuel? 3+2
- (d) Write short note about semisolid lubricants. What are the requisites of a good metallurgical coke? 3+2
  
3. (a) What do you mean by carbonization of coal? How can you prepare coal gas via carbonization of coal (give flow-chart diagram also)? 1+4
- (b) What do you mean by Thermal and Catalytic cracking in petrochemical industry?  $2\frac{1}{2}+2\frac{1}{2}$
- (c) Write short note on: Cetane number and LPG.  $2\frac{1}{2}+2\frac{1}{2}$
- (d) What are lubricants? How can you use the solar energy in your house as an alternative source of energy? 2+3

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**ZOOLOGY (PRACTICAL)****AQUARIUM FISH KEEPING AND MANAGEMENT****SEC-1****FIELD REPORT**

Time Allotted: 1 Hour

Full Marks: 10

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Write a report on the basis of the field study done or project undertaken for "Aquarium Fish Keeping and Management" paper. 10

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**ZOOLOGY****AQUARIUM FISH KEEPING AND MANAGEMENT****SEC-1**

Time Allotted: 2 Hours

Full Marks: 30

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable.*

**Answer any two questions from the following**

15×2 = 30

1. Write the distinguish characteristics, feeding habit, behavior of Blue morph, Sword tail and Gold fishes.
2. With the help of a flow chart describe briefly the various maintenance systems in a tropical fish aquarium.
3. Prepare a budget require to set up a 3'×1.5'×1' household tropical fish aquarium along with proper sketches.

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## COOCH BEHAR PANCHANAN BARMA UNIVERSITY

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### PHYSICS

#### ELECTRIC CIRCUITS AND NETWORK SKILLS

#### SEC-1

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.*

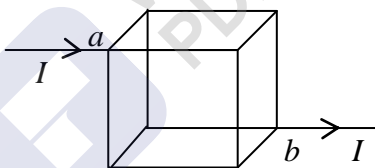
*Candidates are required to give their answers in their own words as far as practicable.*

*All symbols are of usual significance.*

**Answer any two questions from the following**

20×2 = 40

1. (a) Establish the vector form of the Ohm's law,  $\vec{J} = \sigma \vec{E}$  5
- (b) Explain how a galvanometer can be converted into 4+4
  - (i) a voltmeter
  - (ii) an ammeter
- (c) Twelve wires, each having equal resistance  $R$  are joined to form a cube as shown in figure. Find the equivalent resistance between the diagonally opposite points 'a' and 'b' 7



2. (a) State Kirchhoff's laws of distribution of currents and voltages in an electric network. Show that, law of conservation of charge and law of conservation of energy can be established from Kirchhoff's laws. 10
- (b) Find out the expression for average power over one cycle of an ac circuit containing resistor (R), capacitor (C) and inductor (L). Write down function of bypass capacitor and blocking capacitor of an electric circuit. 10
3. (a) Design and explain working principle of a transformer. Hence establish the transformation ratio of a transformer in terms of number of turns in the primary and secondary coil. What are the energy losses of a transformer? 10
- (b) What is back emf of an electric DC motor? When back emf becomes large? Show that, for maximum efficiency of a D.C. motor, the back emf developed should be half of the applied voltage. 10

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## COOCH BEHAR PANCHANAN BARMA UNIVERSITY

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### MATHEMATICS

### LOGIC AND SETS

### SEC-1

Time Allotted: 2 Hours

Full Marks: 40

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Candidates are required to give their answers in their own words as far as practicable.  
All symbols are of usual significance.*

**Answer any two questions from the following**

20×2 = 40

1. (a) Show that  $\forall xP(x) \vee \forall xQ(x)$  and  $\forall x(P(x) \vee Q(x))$  are not logically equivalent. 6
- (b) In the set  $\mathbb{Z}^+ \times \mathbb{Z}^+$  define  $(a, b) \rho (c, d)$  iff  $a + d = b + c$ . Show that  $\rho$  is an equivalence relation on this set. Find  $\rho$  equivalence class of  $(1, 2)$ . 8
- (c) Give a proof by contraposition of the theorem “if  $n$  is an integer and  $3n + 2$  is odd, then  $n$  is odd.” 6
  
2. (a) Show that the proposition  $(p \vee q) \wedge (\sim q) \wedge (\sim p)$  is a contradiction. 6
- (b) Using Venn diagram check whether it is possible to find three sets  $A, B$  and  $C$  of  $U$  such that  $C \neq \Phi$ ,  $A \cap B \neq \Phi$ ,  $A \cap C = \Phi$ ,  $((A \cap B) - C) = \Phi$ . 8
- (c) Translate each of these statements into logical expressions using predicates, quantifiers and logical connectives. 6
  - (i) No one is perfect
  - (ii) At least one of your friends is perfect
  - (iii) Not everybody is your friend or someone is not perfect.
  
3. (a) If  $A, B, C$  be subsets of an universal set  $S$ , then prove that 10

$$A \cap (B \Delta C) = (A \cap B) \Delta (A \cap C)$$
- (b) Express the negation of the statement  $\forall x \exists y (xy = 1)$  so that no negation precedes a quantifier. 5
- (c) Show that  $\sim (p \vee (\sim p \wedge q))$  and  $\sim p \wedge \sim q$  are logically equivalent. 5

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**COMPUTER SCIENCE (PRACTICAL)****UNIX AND SHELL PROGRAMMING****SEC-1**

Time Allotted: 1 Hour

Full Marks: 15

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable.  
All symbols are of usual significance.*

**Answer any *one* question from the following**

15×1 = 15

1. Shell script to find factorial of a number. 15
2. Shell script to find the max-value from an array. 15
3. Shell script to find sum of the digit of a number. 15
4. Shell script to display number using array. 15
5. Shell script to find Greatest of three numbers by if-else statement. 15

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**COMPUTER SCIENCE****UNIX AND SHELL PROGRAMMING****SEC-1**

Time Allotted: 2 Hours

Full Marks: 25

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All symbols are of usual significance.*

**Answer any one question from the following**

25×1 = 25

1. Define Operating System. What are the important features of UNIX that make it unique as an operating system? Briefly trace the history of Unix. 10+10+5  
What is the difference between a process and a program? Explain various states of a process with diagram.  
Explain Unix architecture with a neat diagram.
2. Explain the various usages of cat command with examples. 5+(2+6+5  
+7)  
Define shell. Discuss various type of shell and editors may present in a UNIX system. Explain any five directory and editor commands with suitable example. Explain how “Users are added and removed” and “changing groups and password” are performed in UNIX.

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**BOTANY (PRACTICAL)****LABORATORY SKILLS****SEC-1**

Time Allotted: 1 Hour

Full Marks: 15

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.***Answer any one of the following**

15×1 = 15

1. Give a brief account on the procedure for proper staining (single, double and Gram staining) of biological specimens. 15
2. Discuss various methods of sectioning or cutting of plant specimen. 15

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**BOTANY****LABORATORY SKILLS****SEC-1**

Time Allotted: 2 Hours

Full Marks: 25

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25×1 = 25

1. Discuss different general safety and operational rules followed in scientific laboratory. 15+10 = 25  
With suitable sketches, describe the different parts of a light microscope.
2. Discuss basic working principles in Bio-safety laboratories. Write a short note on Thin layer chromatography. 15+10 = 25

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**PHYSIOLOGY (PRACTICAL)****HEMATOLOGICAL TECHNIQUES****SEC-1**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.***Answer any two questions from the following**

20×2 = 40

1. Haemoglobin concentration of the person is found to be 15 gm%, His RBC Count was 5 million/cu.mm, Packed cell value was 45%. Calculate MCH, MCV and MCHC from the above data. 20
2. Describe the principle and procedure for measurement of haemoglobin concentration by Sahli's Acid Hematin method. Discuss the importance of measurement of haemoglobin. 20
3. State the principle and describe the procedure for determination of Clotting Time (Capillary glass tube method) and Bleeding Time (DUKE Method). Discuss the importance of measurement of clotting and bleeding time. 20

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