

## UG Even Semester (CBCS) Exam., May—2017

( Pass )

( 6th Semester )

Course No. : BSED-603A

Full Marks : 50Pass Marks : 20

Time : 2 hours

*The figures in the margin indicate full marks  
for the questions*

Physics Pass students will answer BSPP-603 and  
Chemistry Pass students will answer BSCP-603

## PHYSICS

( Pass )

Course No. : BSPP-603

**( Quantum Mechanics, Atomic and Nuclear  
Physics, Crystallography and Electronics )**Answer **one** question from each Unit

## UNIT—I

1. (a) Point out the origin of quantum mechanics. 3  
(b) Discuss the properties of matter waves. 7

J7/1971

( Turn Over )

2. (a) State and prove Heisenberg's uncertainty principle. 7  
(b) Discuss the complementary principle. 3

## UNIT—II

3. (a) Write down the effect of nuclear motion on atomic spectra. 7  
(b) Discuss the case of reduced mass. 3
4. (a) What is ionization potential? Find the expression for it. 2+5=7  
(b) State Moseley's law. 3

## UNIT—III

5. (a) State the law of successive disintegration. 3  
(b) Find the expression for size of nucleus. 7
6. (a) Write the construction and working of cyclotron. 7  
(b) Explain geo-magnetic effect. 3

## UNIT—IV

7. (a) Define Miller indices and explain its representation in crystal plane. 7

J7/1971

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( 3 )

- (b) Deduce the Miller indices of a plane which cuts off intercepts in the ratio  $1a:3b:2c$  along the three axes, where  $a$ ,  $b$  and  $c$  are primitives. 3
8. (a) Write down the different types of crystal structures. 5
- (b) Discuss the classification of crystals based on the nature of structures. 5
- UNIT—V
9. (a) Write down the characteristic curve of a vacuum diode. 7
- (b) Define space charge. 3
10. (a) Define NAND gate. Write its truth table and circuit symbol. 7
- (b) State de Morgan's theorem. 3

( 4 )

CHEMISTRY

( Pass )

Course No. : BSCP-603

1. (a) Derive the expression of the rate constant with time for a radioactive reaction. What is half-life period? Give expression. 5
- (b) Half-life period of radium (atomic mass 226) is 1600 years. What is the disintegration per second of 1 g of radium? 3
- (c) How many  $\alpha$  and  $\beta$  particles are emitted in the decay of  ${}^{238}_{92}\text{U}$  to  ${}^{206}_{82}\text{Pb}$ ? 2
- OR**
2. (a) Explain Born-Haber cycle to determine lattice energy of NaCl crystal. 4
- (b) At room temperature, Po crystallizes in PCC. If  $a = 3.36 \text{ \AA}$ , calculate the theoretical density of Po (molecular weight of Po  $209 \text{ g mol}^{-1}$ ). 3
- (c) What is point defect? Define Schottky and Frenkel defects with examples. 3

( 5 )

3. (a) Describe the preparation of Portland cement. Write down its approximate composition. 4
- (b) How is paper manufactured industrially? 3
- (c) Write down one method of preparation of mono and tricalcium phosphate. Give their uses. 3

OR

4. (a) Describe briefly the ozone-layer depletion and its effects on the environment. 4
- (b) What are greenhouse gases? How do greenhouse gases play a role in global warming? 3
- (c) Explain the causes and consequences of acid rain. 3
5. (a) Define epimerization and mutarotation of carbohydrates with suitable examples. 4
- (b) What happens, when D-glucose is treated with—
- (i) bromine water;
- (ii) HCN;
- (iii) HNO<sub>3</sub>? 3

J7/1971

( Turn Over )

( 6 )

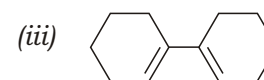
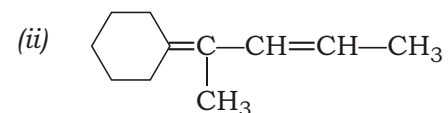
- (c) Describe the secondary structure of protein. 3

OR

6. (a) Write short notes on : 6
- (i) Carbonization of coal
- (ii) Synthetic petrol
- (iii) Cracking
- (b) Write the method of preparation of phenolphthalein and methyl orange. 4
7. (a) Write short notes on : 9
- (i) Column chromatography
- (ii) Paper chromatography
- (iii) Thin-layer chromatography
- (b) What is meant by R<sub>f</sub> value? 1

OR

8. (a) Using Woodward rule, calculate the <sub>max</sub> value of the following compounds : 3



J7/1971

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( 7 )

- (b) Calculate the molar absorptivity of a solution of concentration 0.05 M having path length 1 cm. The absorbance of the solution is 1.5. What would be the value of absorbance of the same solution with double concentration? 4
- (c) What are shielding and deshielding of protons? Explain with examples. 3
9. (a) Identify the extensive and intensive properties of the following : 2  
Mass, Density, Surface tension, Energy
- (b) What is molar heat capacity? Show how  $R$  is related to  $C_p$  and  $C_v$ . 3
- (c) Show the variation of free energy with temperature and pressure. 3
- (d) Calculate the free energy change ( $G$ ) which occurs when 1 mole of an ideal gas expands reversibly and isothermally at 37 °C from an initial volume of 55 dm<sup>3</sup> to 100 dm<sup>3</sup>. 2

OR

10. (a) Write short notes on : 4  
(i) Photoelectric effect  
(ii) Compton effect

( 8 )

- (b) Write down de Broglie hypothesis. The speed of an electron is  $1.2 \times 10^6$  m/s. What is its de Broglie wave length? 3
- (c) What is Heisenberg's uncertainty principle? Calculate the uncertainty in the velocity of an electron whose uncertainty in position is 0.1 nm. (Mass of electron =  $9.1 \times 10^{-31}$  kg,  $h = 6.63 \times 10^{-34}$  Js) 3

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