**2017/EVEN/07/20/BSPH/**
**BSCH/BSZH–202/578**

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

EDUCATION

( Honours )

**( 2nd Semester )**

Course No. : BSED–202

*Full Marks* : 50
*Pass Marks* : 20

*Time* : 2 hours

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

Physics Honours students will answer BSPH–202, Chemistry Honours students will answer BSCH–202 and Zoology Honours students will answer BSZH–202

PHYSICS

Course No. : BSPH–202

**( Mathematical Physics, Geometrical Optics, Wave and Oscillation )**

**1.** *(a)* Define orthogonal and non-orthogonal coordinates. 5

*(b)* State and prove Stokes theorem. 5





**OR**

**2.** *(a)* Explain vector triple product with example. 5

*(b)* What are scalar and vector fields? 5

**3.** *(a)* Explain the important properties of matrix. 5

*(b)* Discuss the inverse of matrix. 5

**OR**

**4.** *(a)* Define beta and gamma functions. 5

*(b)* State and prove Fourier's theorem for sawtooth wave. 5

**5.** *(a)* What is cardinal point in lens? 3

*(b)* Find the expression of focal length of two thin lenses separated by a distance. 7

**OR**

**6.** *(a)* Describe various types of mono-chromatic aberration in detail. 5

*(b)* Explain achromatic combination of lens. 5

**7.** *(a)* What is eyepiece? Explain Huygens eyepiece. 5

*(b)* Explain the transverse magnification in lens. 5

**OR**

**8.** *(a)* What is spherical aberration? Describe one method to remove it. 5

*(b)* Write the advantages and disadvantages of Ramsden eyepiece. 5

**9.** *(a)* Define superposition of two simple harmonic motions. 5

*(b)* Find out the expression of damped vibration. 5

**OR**

**10.** *(a)* Write a note on energy in transverse vibration. 5

*(b)* Explain group velocity and phase velocity. 5





# CHEMISTRY

Course No. : BSCH–202

**1.** *(a)* Arrange the following halogen acids according to their increasing acid strength and give reasons supporting the order : 4

*(i)* $HClO_4$, HOCl, $HClO_3$, $HClO_2$

*(ii)* HOBr, HOCl, HOI

*(b)* Complete the following reactions : 4

*(i)* $XeF_6$ $SiO_2$ ?

*(ii)* $Cl_2O$ $H_2O$ ?

*(iii)* $BrO_2$ NaOH ?

*(iv)* Xe $O_2F_2$ $^{175\ C}$ ?

*(c)* How is hydrazine prepared in laboratory? Give the uses of hydrazine. 2

**OR**

**2.** *(a)* How can $XeF_6$ and $XeO_3$ be prepared? Discuss their structures. 4

*(b)* What happens, when—

*(i)* phosphorous is burnt in excess supply of air;

*(ii)* $H_3PO_3$ is heated;

*(iii)* hydrazine reacts with $HNO_2$? 3

*(c)* Draw the structure of the following compounds : 3

$H_3PO_4$; $HNO_2$; $P_4O_{10}$

**3.** *(a)* In a volumetric estimation of ferric ion, Fe (III), it requires 10 mL of 0·2 *N* $K_2Cr_2O_7$ to titrate 20 ml of sample solution. Calculate the amount of iron present in 100 mL of sample. 3

*(b)* Write down the theory and procedure of borax bead test. 4

*(c)* Give the theory of washing of precipitates. 3

**OR**

**4.** *(a)* In an iodometric estimation experiment, 25 mL of a $Cu^{2}$ solution of unknown strength consumed 20 mL of 0·05 *N* $Na_2S_2O_3$ solution. Find the strength of the $Cu^{2}$ solution in g.L $^{1}$ (atomic mass of Cu = 63·35 g). 3

*(b)* How do co-precipitation and post-precipitation create problem in gravimetric analysis? Explain with examples. How can these be overcome? 4

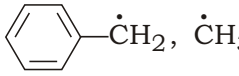




*(c)* Discuss the rules of group theory to set up multiplication table. 3

**5.** *(a)* Arrange the following in order of their stability : 3

*(i)* $CH_3—CH_2—\overset{\ominus}{C}H_2$, $CH_3—\underset{\displaystyle CH_3}{\overset{\ominus}{\underset{|}{C}}}—CH_3$, $CH_3—\overset{\ominus}{C}H—CH_3$

*(ii)*  $—\dot{C}H_2$, $\dot{C}H_3$, $CH_3—\dot{C}H—CH_3$

*(iii)* $\overset{\oplus}{C}H_2—NO_2$, $\overset{\oplus}{C}H_3$, $\overset{\oplus}{C}H_2—CHO$

*(b)* Define homolytic and heterolytic fissions with examples. 2

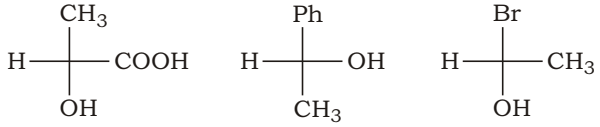
*(c)* Write a reaction for each of the following intermediates showing their formations : 5

Carbocation ; Carbanion ; Free radical ; Carbene ; Nitrene.

**OR**

**6.** *(a)* Draw the constitutional isomer of *(i)* 1,4-dimethyl cyclohexane and *(ii)* 1,2-dimethyl cyclohexane. Identify the most stable isomer. 3

(b) Assign the R/S configuration to the following compounds : 3

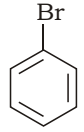



(c) How are ketoximes prepared? Explain the geometrical isomerism shown by ketoximes with examples. 4

**7.** (a) Explain the effects of substituents with examples. 3

(b) Identify *A*, *B*, *C*, *D*, *E* in the following reactions : 5

(i)  $\xrightarrow{NaNH_2}$ *A* $\xrightarrow{H^{\oplus}}$ *B*

(ii)  $\xrightarrow[ether]{Mg}$ *C*

(iii)  $\xrightarrow[h]{3Cl_2}$ *D*

(iv)  + $I_2$ $\xrightarrow[HNO_3]{[O]}$ *E*





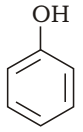
(c) Write one example of nucleophilic aromatic substitution. Give mechanism. 2

**OR**

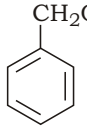
**8.** (a) What are hydroboration and oxy-mercuration? Explain with suitable examples. 5

(b) Complete the following reactions : 5

(i) $\begin{matrix} CH_2OH \\ | \\ CH_2OH \end{matrix}$ $\xrightarrow{PBr_3}$ ?

(ii)  $\xrightarrow{C_2H_5MgBr}$ ?

(iii)  $\xrightarrow{HCN}$ ?

(iv)  $\xrightarrow{CrO_3}$ ?

(v) $C_2H_5—O—C_2H_5$ $\xrightarrow{HI}$ ?

**9.** (a) What is enthalpy of a reaction? How can it be measured by using bomb calorimeter? 5

*(b)* Calculate the enthalpy of formation of $N_2O_5$ (g) on the basis of following data : 3

*(i)* $2NO(g) \quad O_2(g) \quad 2NO_2(g)$
$H \quad 114\ 0$ kJ

*(ii)* $4NO_2(g) \quad O_2(g) \quad 2N_2O_5(g)$
$H \quad 102\ 6$ kJ

*(iii)* $N_2(g) \quad O_2(g) \quad 2NO(g)$
$H \quad 180\ 4$ kJ

*(c)* Write the expression showing the relation of heat of reaction at constant pressure with constant volume. 2

**OR**

**10.** *(a)* Write short notes on the following : 6

*(i)* Software

*(ii)* Central Processing Unit (CPU)

*(iii)* Binary number

*(b)* Convert the following : 4

*(i)* $101011_2$ to decimal

*(ii)* $B_0AE_2$ to binary number

*(iii)* $54_{10}$ to decimal

*(iv)* $65_8$ to binary number





# ZOOLOGY

Course No. : BSZH–202

**( Non-chordates )**

**1.** *(a)* Describe the process of reproduction and alternation of generation in *Polystomella*. 5

*(b)* Exemplify asexual mode of reproduction in Protozoa. 5

**OR**

**2.** *(a)* Describe the histology of Porifera. 5

*(b)* Explain syconoid and rhagon-type of canal systems in Porifera with the help of suitable diagrams. 5

**3.** *(a)* Illustrate with diagrams—'Polymorphism in Siphonophora'. 7

*(b)* What are the theories of formation of coral reefs? 3

**OR**

**4.** *(a)* Outline the structure of *Schistosoma*. 3

*(b)* Give an account of the life cycle of *Schistosoma*. Write about its pathogenesis and control. 5+2=7

**5.** *(a)* Describe the structure of filarial worm. 4

*(b)* Explain the life history and pathogenicity of *Wuchereria bancrofti*. 6

**OR**

**6.** *(a)* What is clitellum? Write a note on segmentation in *Hirudinaria*. 2+2=4

*(b)* Describe the major components of the female reproductive system in leech with suitable diagram. 6

**7.** *(a)* Discuss about the appendages of prawn. 4

*(b)* How do insects exhibit social lives? 6

**OR**

**8.** *(a)* Mention the salient features of phylum Mollusca. 5

*(b)* Explain the phenomenon of torsion and detorsion in Mollusca. 5

**9.** *(a)* Classify phylum Echinodermata up to order. 4

*(b)* Explain the 'water vascular system' in echinoderms. 6





**OR**

**10.** *(a)* Briefly describe the larval forms of Crustacea. 5

*(b)* Illustrate the structure of Ctenophora. 5

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