

TEST CODE :



NGSE

CLASS 12

Time :
90 Minutes

National Genius Search Examination® : Advanced

Your NGSE Roll No Date of the Test _____

Student's Name

Signature of the Student	Signature of the Invigilator Check the correctness of the Roll No. with hall ticket.
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INSTRUCTIONS TO THE CANDIDATE

- DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO.**
- Fill and sign the Question cum Answer Booklet. Fill the information required in the answer sheet.
- Do not seek clarification on any item in the test booklet from anyone including the test invigilator or the centre supervisor. Use your best judgement.
- This booklet consists of two sections as given below :

No.	Subject	Question Nos	No.	Subject	Question Nos
1.	Mathematics	1-5	5.	Economics	21-25
2.	Physics	6-10	6.	Accountancy	26-30
3.	Chemistry	11-15	7.	Business Studies	31-35
4.	Biology	16-20			

Choose the same subjects that you have opted for NGSE-Mains and answer those two subjects only

- Use black/blue ball point pen only for writing the answers.
- Use of mathematical instruments /compass box is allowed. Calculators are not allowed but logarithmic tables are allowed.
- All questions are compulsory. Each question carries 10 marks. Negative marks are not awarded.
- Candidate should write the question numbers against each answer. No additional sheet will be supplied. No loose sheet should be attached to this Booklet. Return this booklet to the invigilator after the test.
- Failure to follow instructions and examination norms will lead to disqualification.

PLEASE WAIT FOR THE SIGNAL TO OPEN THE TEST BOOKLET

Open from this side →

SECTION – 1: MATHEMATICS

- If a function $f(x)$ satisfies the equation

$$f(x+1) + f(x-1) = \sqrt{3}f(x) \quad \forall x \in \mathbb{R}$$
 Show that $f(x)$ is a periodic function of period 12.
- Tangent at point P_1 [other than (0,0)] on the curve $y = x^3$ meets the curve again at P_2 . The tangent at P_2 meets the curve at P_3 and so on. Show that the abscissa of $P_1, P_2, P_3, \dots, P_n$ form a G. P. Also find the ratio (area $\Delta P_1, P_2, P_3$) / (area $\Delta P_2, P_3, P_4$).
- $$\int \frac{x^4 - x^3 + 5x^2 + x + 3}{(x+1)(x^2 - x + 1)^2} dx$$
- Prove the inequalities
 - The region of the z -plane for which $\left| \frac{z-a}{z+a} \right| = 1$ ($\text{Re } a \neq 0$) is y -axis
 - If $z = x + iy$ and $\omega = \frac{1-iz}{z-i}$, then $|\omega| = 1$ implies that, in the complex plane z lies on the real axis.
 - If $\omega = \left(\frac{z-i}{1+iz} \right)^n$, n integral, then prove ω lies on the unit circle for all n .
- The interior angles of a polygon are in arithmetic progression. The smallest angle is 120° and the common difference is 5. Find the number of sides of the polygon.
 - Find the least value of n for which $3 + 6 + 9 + \dots + n$ terms exceeds 1000.

SECTION – 2: PHYSICS

- A spherical conductor of radius 12 cm has a charge of 1.6×10^{-7} C distributed uniformly over its surface. What is the electric field (i) inside the sphere, (ii) just outside the sphere, (iii) at a point 18 cm from the centre of the sphere?
 - Connect three capacitors of $3\mu F, 3\mu F$ and $6\mu F$ such that their equivalent capacitance is $5\mu F$.
- An electric bulb rated for 500 W at 100 V is used in circuit having a 200 V supply. Calculate the resistance R that must be put in series with the bulb, so that the bulb delivers 500 W.
 - To increase the current sensitivity of a moving coil galvanometer by 540%, its resistance is increased so that the new resistance becomes twice its initial resistance. By what factor does its voltage sensitivity change?
- A square coil of the side 10 cm consists of 20 turns and carries a current of 12 A. The coil is suspended vertically and normal to the plane of the coil and makes an angle of 30° with the direction of a uniform horizontal magnetic field of magnitude 0.80 T. What is the magnitude of torque experienced by the coil?

- (b) The wires which connect the battery of an automobile to its starting motor carry a current of 300 A (for a short time). What is the force per unit length between the wires if they are 70 cm long and 1.5 cm apart? Is the force attractive or repulsive?
9. (a) When a current of 3 A flows through a primary coil, a magnetic flux of 30 milliweber is linked with the secondary coil. What is the mutual inductance between the pair of coils?
 (b) a sinusoidal voltage of peak value 283 v and frequency 50 Hz is applied to a series LCR circuit in which $R = 3 \Omega$, $L = 25.48mH$, and $C = 796\mu F$. Find (a) the impedance of the circuit, (b) the phase difference between the voltage across the source and the currents, (c) the power dissipated in the circuit, and (d) the power factor.
10. (a) Explain why does a convex lens behave as a converging lens when immersed in water ($\mu = 1.33$) and as a diverging lens, when immersed in carbon disulphide ($\mu = 1.6$).
 (b) Find the de-Broglie wavelength associated with an electron moving with a velocity $0.5 c$ and rest mass $= 9.1 \times 10^{-31} kg$.

SECTION – 3: CHEMISTRY

11. (a) Chromium metal crystallizes with a body centred cubic lattice. The length of the unit cell edge is found to be 287 pm. Calculate the atomic radius. What would be the density of chromium in gm/cm^3 ?
 (b) A compound AB has rock salt type structure. The formula weight of AB is 6.023 Y amu and the closest A-B distance is $Y^{1/3}$ nm, where Y is an arbitrary number.
 (i) Find the density of the lattice.
 (ii) If the density of lattice is found to be $20 kg m^{-3}$, predict the type of defect.
12. (a) A sugar syrup of weight 214.2 g contains 34.2 g of sugar ($C_{12}H_{22}O_{11}$). Calculate:
 (i) molal concentration, and
 (ii) mole fraction of sugar in the syrup.
 (b) The conductivity of a 0.01 M solution of acetic acid at 298 K is $1.65 \times 10^{-4} S cm^{-1}$. Calculate
 (i) molar conductivity of the solution
 (ii) degree of dissociation of CH_3COOH
 (iii) dissociation constant for acetic acid
 Given that
 $\lambda^0(H^+) = 349.1$ and
 $\lambda^0(CH_3COO^-) = 40.9 S cm^2 mol^{-1}$.
13. (a) Two students use same stock solution of $ZnSO_4$ and a solution of $CuSO_4$. The e. m. f. of one cell is 0.03 V higher than the other. The concentration of $CuSO_4$ in the cells with higher e. m. f. value is 0.5 M. Find out the concentration $CuSO_4$ in the other cell.

(2.303 RT/F = 0.06)

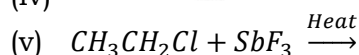
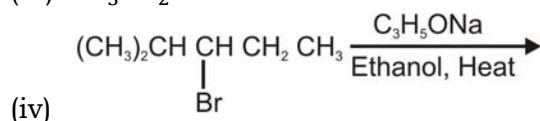
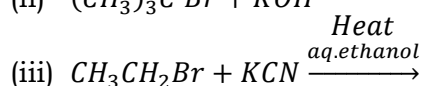
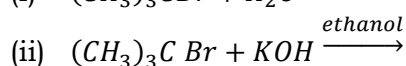
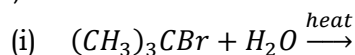
(b) The following data were obtained during the first order thermal decomposition of $N_2O_5(g)$ at constant volume.

$2N_2O_5(g)$	\rightarrow	$2N_2O_4(g)$	$+$	$O_2(g)$
time (s)		0		100
Total pressure (atm)		0.500		0.512

Calculate the rate constant.

14. (a) When a white crystalline compound X is heated with $K_2Cr_2O_7$ and concentrated H_2SO_4 , a reddish brown gas A is evolved. On passing A into caustic soda solution, a yellow coloured solution B is obtained. neutralizing the solution B with acetic acid on subsequent addition of lead acetate, a yellow precipitate C is formed. when X is heated with NaOH solution, a colourless gas is evolved and on passing this gas into K_2HgI_4 solution, a reddish brown precipitate D is formed. Identify A, B, C, D and X. write the equations of the reactions involved.

(b) Write the structure of the major organic product in each of the following:



15. (a) How will you convert the following?

(i) Acetone to 2-methyl-2-propanol.

(ii) Ethanol to lactic acid.

(iii) Formaldehyde to n-butane.

(iv) Acetone to phorone.

(v) Acetaldehyde to isopropyl alcohol

(b) Classify the following into monosaccharides and disaccharides. Ribose, 2-deoxyribose, maltose, galactose and lactose.

SECTION – 4: BIOLOGY

16. (a) Write briefly about:

(i) Fission

(ii) Budding

(iii) Fragmentation

(iv) Regeneration

(v) Spore formation

(b) Write a note on the development of endosperm. Mention the types with examples.

17. (a) Give a brief account of the changes in the following organs in different phases of the menstrual cycle:

- (i) Ovaries
 - (ii) Uterus
 - (iii) Fallopian tubes
- (b) What is placentation? Describe the various types of placentation with the help of diagrams and examples.
18. (a) Describe the physical structure and chemical nature of eukaryotic chromosome.
- (b) A man with brown eyes (B) is dominant to blue (b) and dark hair (R) dominant to red hair (r). A man with brown eyes and red hair, whose father was blue eyed, marries a woman with blue eyes and dark hair but whose mother was red haired. They have four children. Give the phenotype and genotypes of parents and children.
19. (a) A man with AB blood group has married a woman with O group. Show the possible genotypes and phenotypes of the progeny
- (b) Explain the process of DNA replication.
20. (a) How do palaeontological and embryological evidences support the idea of organic evolution?
- (b) Explain the mode of action of B-lymphocytes and T-lymphocytes.

SECTION – 5: ECONOMICS

21. What is microeconomics? Discuss total product, marginal product and average product curves.
22. What are monopolistic companies? What is its effect on marginal revenue and elasticity of demand?
23. What are the factors that control supply of money in an economy? Explain how these controls work?
24. Briefly explain the components of open economy macroeconomics.
25. Critically discuss the expected impact of Aadhar Cards on the Indian economy after 5 years?

SECTION – 6: ACCOUNTANCY

26. X, Y and Z are in partnership with capital of Rs. 1, 20, 000 (Credit), Rs 1, 00, 000 (Credit) and Rs. 8, 000 (Debit) respectively on 1st April, 20X1. Their partnership deed provide for the following.
- (a) 7.5% of profit to be transferred to General Reserve.
 - (b) Partners are to be only allowed interest on capital @ 5% p. a. and are to be charged interest on drawing @ 6% p. a.

- (c) Z is entitled to a salary of Rs. 7, 000.
 (d) X is entitled to a remuneration of 10% of the net profit before making any appropriation.
 (e) Y is also entitled to a commission of 8% of the net profit after making all appropriations.

During the year, X withdraw Rs 1, 000 at the beginning of every month, Y Rs. 1, 000 during the month and Z Rs. 1, 000 at the end of every month. On 1st Oct, 20X1 Z granted a loan of Rs. 6, 00, 000.

The manager is entitled to a salary of Rs. 1, 000 p. m. and a commission of 10% of net profits after charging his salary & commission.

The net profit of the firm for the year ended on 31st March, 20X2 before providing for any of the above adjustments was Rs. 1, 62, 000.]

Required: Prepare Profit and Loss Appropriation Account for the year ended on 31st March, 20X2.

27. X, Y and Z who are presently sharing profits & losses in the ratio of 5:3:2, decide to share future profits & losses in the ratio of 2:3:5 with effect from 1st April, 20X2. An extract of their Balance Sheet as at 31st March, 20X2 is as follows:

Liabilities	Rs.	Assets	Rs.
		Debtors	2,00,000
		Less: Provision	<u>10,000</u>
			1,90,000

Required: Show the accounting treatment in each of the following alternative cases:

- Case I It is decided that the debtors be valued at Rs. 1, 74, 000
 Case II It is decided that the provision for doubtful debts be increased by Rs. 16, 000.
 Case III It is decided that the provision for doubtful debts be increased to Rs. 16, 000.
 Case IV It is decided that the provision for doubtful be made upto 8% on debtors.
 Case V It is decided that the provision for doubtful debts be made upto 2% on debtors.
 Case VI It is decided that 98% debtors are good.
 Case VII It is decided that all debtors are good.
 Case VIII It is decided that the debtors be valued at book value less 5%.

28. A and B are partners sharing profits and losses in the ratio of 3 : 2. They admit C into partnership for 1/4th share. C brings in his requisite share of firm's goodwill in cash and Rs. 10, 000 for capital. The goodwill of the firm is valued at Rs. 4, 000. Goodwill already appears in the books at Rs. 500. Partners withdraw their share of goodwill. Give the necessary journal entries.

29. X, Y and Z share profits and losses in the ratio of 4 : 3 : 2 respectively. Y retires and X and Z decide to share future profits & losses in the ratio of 5 : 3. Then immediately W is admitted for 3/10th share of profits half of which was gifted by X and the remaining share was taken by W equally from X and Z. The Goodwill of the firm is valued at Rs. 21, 600. W brings in the required amount of goodwill. The profit for the

year after W's admission was Rs. 24, 000. Give the necessary journal entries to adjust goodwill and to distribute profits.

30. A limited company has a nominal capital of Rs. 2,50,000 in Rs. 10 shares. Of these 8, 000 shares were subscribed for by the public, and during the first year Rs. 5 per share were called up, payable Rs 2 on application Rs. 1 on allotment Re. 1 on first call and Re. 1 on second call. The amounts received in respect of these shares were as follows:

On 6, 000 shares the full amount called.

On 1, 250 shares Rs 4 per share.

On 500 shares Rs 3 per share.

On 250 shares Rs 2 per share.

Required: Give journal entries and prepare the Balance Sheet.

SECTION – 7: BUSINESS STUDIES

31. Critically discuss the importance of major principles of management in the current business environment in India?
32. Explain the factors affecting financial decision making in business?
33. Name the stock and commodity exchanges working in India with their domain of operations. Name the regulator of such exchanges and explain responsibilities
34. Who makes Initial Public Offerings (IPO) what are the advantages of in IPO?
35. Why both money markets and capital markets are essential for a growing economy?

END OF DOCUMENT

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