COMMON P. G. ENTRANCE TEST – 2020

Test Booklet No. :

DEPT. OF HIGHER EDUCATION, GOVT. OF ODISHA

TEST BOOKLET

Subject Code 55 **Subject** MATERIAL SCIENCE

Time Allowed : ***90*** *Minutes* *Full Marks :* ***70***

: INSTRUCTIONS TO CANDIDATES :

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. You have to enter your **Hall Ticket No.** on the Test Booklet in the Box provided alongside. **DO NOT** write *anything else* on the Test Booklet.
3. **YOU ARE REQUIRED TO FILL UP & DARKEN HALL TICKET NO. & TEST BOOKLET NO. IN THE ANSWER SHEET AS WELL AS FILL UP TEST BOOKLET SERIAL NO. & ANSWER SHEET SERIAL NO. IN THE ATTENDANCE SHEET CAREFULLY. WRONGLY FILLED UP ANSWER SHEETS ARE LIABLE FOR REJECTION AT THE RISK OF THE CANDIDATE.**
4. **This Test Booklet contains 70 items (questions). Each item (question) comprises four responses (answers). You have to select the correct response (answer) which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct response (answer), you should mark (darken) the response (answer) which you consider the best. In any case, choose ONLY ONE response (answer) for each item (question).**
5. You have to mark (darken) all your responses (answers) **ONLY** on the **separate Answer Sheet** provided by **using BALL POINT PEN (BLUE OR BLACK)**. See instructions in the Answer Sheet.
6. All items (questions) carry equal marks. All items (questions) are compulsory. Your total marks will depend only on the number of correct responses (answers) marked by you in the Answer Sheet. **There is no negative marking**.
7. **After you have completed filling in all your responses (answers) on the Answer Sheet and after conclusion of the examination, you should hand over to the Invigilator the *Answer Sheet* issued to you. You are allowed to take with you the candidate's copy / second page of the Answer Sheet along with the Test Booklet, after completion of the examination, for your reference.**
8. Sheets for rough work are appended in the Test Booklet at the end.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

1. Which type of material expands and contract in response to an applied electric field ?

(A) Metals
(B) Smart material
(C) Nanomaterial
(D) Biomaterial

2. LPG mainly constitutes :

(A) Methane, ethane and hexane
(B) Ethane, hexane and nonane
(C) Methane, hexane and nonane
(D) Methane, butane and propane

3. Lower critical point for all steels is :

(A) 600 °C
(B) 653 °C
(C) 723 °C
(D) 913 °C

4. Epoxy resins are used as :

(A) Insecticides
(B) Pesticides
(C) Adhesives
(D) Detergents

5. Soap is a mixture of Na or K salts of :

(A) Dicarboxylic acids
(B) Monocarboxylic acids
(C) Glycerol
(D) Tricarboxylic acids

6. Melamine is an example of :

(A) Thermosetting plastic
(B) Thermoplastic
(C) Elastomer
(D) Artificial polymer

7. Electromagnetic radiation with shortest wavelength is :

(A) UV rays (B) Infrared rays

(C) γ-rays (D) X-rays

8. Which of the following has gold like colour and is used for imitation jewellery ?

(A) Aluminium bronze (B) Silicon bronze

(C) Gun metal (D) Babbit metal

9. What is the wavelength associated with an electron having kinetic energy equal to 1 MeV ?

(A) 0.01227 $\mathring{A}$ (B) 0.0776 $\mathring{A}$

(C) 0.0007 nm (D) 0.1228 $\mathring{A}$

10. Which of the following is an extensive property ?

(A) Volume (B) Density

(C) Refractive index (D) Concentration

11. Electron sea exists in :

(A) Polar bond (B) Ionic bond

(C) Covalent bond (D) Metallic bond

12. The device which converts heat into mechanical work is :

(A) Motor (B) Generator

(C) Heat Engine (D) Energy converter

13. The Curie law ($\chi = C/T$) holds for :

(A) Diamagnetic substance

(B) Paramagentic substance

(C) Ferromagentic substance

(D) All substances

14. Hard magnetic material is characterized by :

(A) High coercive force and low residual magnetic induction

(B) Low coercive force and high residual magnetic induction

(C) Only low coercive force

(D) High coercive force and high residual magnetic induction

15. Aluminium is not good for die casting because :

(A) It is light and strong

(B) It takes longer time to cool

(C) It tends to react chemically with the die surface

(D) Its melting point is high and it expands on solidification

16. Colligative property purely depends upon the :

(A) Chemical nature of solute particles

(B) Number of solute particles

(C) Structural feature of solute particles

(D) None of these

17. Figure out the odd statement about ceramics in the following :

(A) Good insulators of heat and electricity

(B) Usually less desired than metals

(C) Ductile in nature

(D) Contains both metallic and nonmetallic elements

18. What is a n-type Si semiconductor (SC) ?

(A) A Si SC without impurities

(B) A Si SC with impurities from column IIIA and VA of the periodic table

(C) A Si SC with impurities from column IIIA of the periodic table

(D) A Si SC with impurities from column VA of the periodic table

19. Coordination number in simple cubic crystal structure is :

(A) 2 (B) 6

(C) 8 (D) 12

20. The atomic diameter of a BCC crystal (if a is lattice parameter) is :

(A) a (B) a/2

(C) $a/(4/\sqrt{3})$ (D) $a/(4/\sqrt{2})$

21. Dielectrics are basically :

(A) Insulators (B) Semiconductors

(C) Superconductors (D) Conductors

22. The charge carriers in superconductors are :

(A) Only electrons (B) Only holes

(C) Both electron and holes (D) Neutrons

23. An example of non-ionizing radiation is :

(A) X-rays (B) UV radiations

(C) α rays (D) β rays

24. Which of the following is a renewable source of energy and never cause atmospheric pollution ?

(A) Solar energy (B) Nuclear energy

(C) Coal (D) Wood

25. Which of the following solids exhibit long range order ?

(A) Crystalline solids (B) Amorphous solids

(C) Both (A) and (B) (D) None of these

26. Amorphous metals can be produced by _____.

(A) Melt spinning and mechanical alloying

(B) Chemical reduction

(C) Chemical precipitation

(D) None of these

27. Metallic glass was first invented by :

(A) Klement (B) Willens

(C) Duwez (D) All of them

28. Detrimental property of material for shock load application is :

(A) High density (B) Low toughness

(C) High strength (D) Low hardness

29. Which of these historical art work is an example of nanotechnology ?

(A) Lycurgus cup

(B) Medieval stained glass windows in churches

(C) Damascus steel swords

(D) All of these

30. Which of the following components is present in calomel electrode ?

(A) NH_4Cl (B) AgCl

(C) $Pt/H_2(g)$ (D) Hg_2Cl_2

31. During oxidation process electrons are :

(A) Lost (B) Gained

(C) Paired up (D) Remains same

32. Repeatable entity of a crystal structure is known as :

(A) Crystal (B) Lattice

(C) Unit cell (D) Miller indices

33. The windows of aeroplane are made from :

(A) PVC (B) PTFE

(C) PMMA (D) PC

34. At absolute temperature, an intrinsic semiconductor acts as a/an :

(A) Semiconductor (B) Insulator

(C) Conductor (D) Superconductor

35. Isoprene is a monomer of _____.

(A) Polyethylene (B) Bakelite

(C) Nylon 6,6 (D) Rubber

36. Which of the following is not an inorganic functional material ?

(A) Ferroelectric

(B) Reverse micelles

(C) Magnetic sensor

(D) Light detectors

37. Which of the following metals is used for galvanizing iron ?

(A) Al (B) Cu

(C) Fe (D) Zn

38. In spectroscopy, the transition from S1 to S0 state corresponds to :

(A) Non-radiative transition (C) Fluorescence

(B) Absorption (D) Phosphorescence

39 Which of the following is not a ferromagnetic material ?

(A) Zn (B) Fe

(C) Co (D) Ni

40. Copper is used for making electrical conductors because it is :

(A) Ductile (B) Corrosion resistance

(C) Low resistance (D) Cheap

41. Which transitions are studied by UV-vis spectrophotometer ?

(A) Rotational (B) Electronic

(C) Nuclear (D) Vibrational

42. The dielectric constant of a solid material is equal to _____.

(A) $\varepsilon_0 = \varepsilon_0/\varepsilon_r$ (B) $\varepsilon_r = \varepsilon\varepsilon_0$

(C) $\varepsilon_0 = \varepsilon\varepsilon_r$ (D) $\varepsilon_r = \varepsilon/\varepsilon_0$

43. The unit of dipole moment per unit volume is :

(A) Coulomb/m (B) Coulomb/m^2

(C) Coulomb/m^3 (D) Coulomb

44. The elastic stress strain behaviour of rubber is :

(A) Linear

(B) Nonlinear

(C) Plastic

(D) No fixed relationship

45. Mild steel contains :

(A) Less than 0.3% carbon (B) 0.5 – 1.4% carbon

(C) 0.3-0.5% carbon (D) 3-4% carbon

46. Cemented carbide tools are not found to be suitable for cutting :

(A) Brass (B) Cast iron

(C) Aluminium (D) Steel

47. A material is said to be allotropic if it has :

(A) Fixed structure at all temperatures

(B) Atoms distributed in random pattern

(C) Different crystal structure at different temperatures

(D) Fixed structure at low temperatures

48. A semiconductor diode is made of :

(A) The junction of n and p-type semiconductor

(B) The junction of two n-type semiconductor

(C) The junction of two p-type semiconductor

(D) The junction of two non-doped semiconductor

49. Foundry crucible is made up of :

(A) Mild Steel (B) German Silver

(C) Lead (D) Graphite

50. Which of the following is added to steel to increase the corrosion resistance ?

(A) W and V (B) Zn and Pb

(C) Cr and Ni (D) S and P

51. For one mole of gas, relation between Cp and Cv is :

(A) $Cp = Cv$ (B) $Cp = Cv - R$

(C) $Cp = Cv + R$ (D) $Cp = Cv \times R$

52. The compressibility factor for ideal gas is :

(A) Zero (B) 1

(C) > 1 (D) < 1

53. Which among the following is not a physical property ?

(A) Melting Point (B) Boiling Point

(C) Solubility (D) Reactivity

54. Which of the following cannot be used as bio-materials ?

(A) Metals (B) Ceramics

(C) Polymers (D) None of these

55. The composite GFRP stands for :

(A) Glass Fiber Reinforced Polymer

(B) Gelatin Fiber Reinforced Polymer

(C) Graphite Fiber Reinforced Polymer

(D) Glass Fiber Reinforced Polyether

56. Corundum and Cryolite are important ores of which of the following metals ?

(A) Fe (B) Ag

(C) Sn (D) Al

57. Gun metal contains :

(A) 70% Cu and 30% Zn

(B) 90% Cu and 10% Sn

(C) 88% Cu and 10% Sn with 2% Zn

(D) 88% Cu and 10% Zn with 2% Sn

58. The property of a material by virtue of which it can be beaten or rolled into plates is called :

(A) Malleability (B) Ductility

(C) Plasticity (D) Elasticity

59. Shock resisting steels should possess :

(A) Low wear resistance (B) Low hardness

(C) Low tensile strength (D) Toughness

60. Age-hardening is related with :

(A) Stainless Steel (B) Duralumin

(C) German Silver (D) Gun metal

61. Solder in an alloy consisting of :

(A) Sn, Sb and Cu (B) Sn and Cu

(C) Sn and Pb (D) Zn and Pb

62. Which type of materials are used as bridges between human tissues and metals ?

(A) Polymeric Biomaterials (B) Ceramic Biomaterials

(C) Metallic Biomaterials (D) All of these

63. When magnetic field is removed, which type of materials maintain magnetic properties ?

(A) Diamagnetic Materials (B) Ferromagnetic materials

(C) Paramagnetic Materials (D) Electronic Materials

64. The secondary structure of protein is primarily maintained by :

(A) Van der Waals Force (B) Ionic Bond

(C) Hydrogen Bond (D) Covalent Bond

65. Which of the following is not involved in formation of photochemical smog ?

(A) NO (B) O_3

(C) C_XH_Y (D) SO_2

66. Raman effect is due to the collision of :

(A) Photon with molecule
(B) Photon with electron
(C) Electron with atom
(D) Electron with molecule

67. A device that converts sunlight into electrical energy is called :

(A) Light emitting diode
(B) Photovoltaic Cell
(C) Fuel Cells
(D) Galvanic Cell

68. The electrode for a battery must be :

(A) A semiconductor
(B) A good cunductor of electricity
(C) An insulator
(D) A bad conductor of electricity

69. Class of dielectric material which exhibit a hysteresis loop of polarization versus electric field is termed as :

(A) Conductor
(B) Ferrites
(C) Ferroelectrics
(D) Dipolar

70. When electric field is reduced to zero, the material still remain polarized and polarization vector has a certain value. This process is known as :

(A) Remanent Polarization
(B) Permanent Polarization
(C) Ionic Polarization
(D) Atomic Polarization

SPACE FOR ROUGH WORK