7423

Register Number | | | | | | |

SCIENCE (Theory) — Paper I
(Physics and Chemistry)

Time Allowed : $2\frac{1}{2}$ Hours] [Maximum Marks : 100

Instruction to candidates :

i) Use of logarithm table is permitted.

ii) Use diagrams, expressions and equations wherever necessary.

SECTION – A

PHYSICS

(Marks : 50)

I. Choose the correct alternative and write it against the question number in your answer-book : $10 \times 1 = 10$

1. The centre of gravity of a right cylinder is at a point

   a) $\frac{h}{4}$ from the base b) $\frac{h}{2}$ from the base

   c) $\frac{3h}{4}$ from the base d) anywhere on the surface.

2. A VHF radio station broadcasts at a frequency of 90 MHz. The wavelength of the wave broadcast by the station is

   a) 0·30 m b) 3·3 m

   c) 27×10^{15} m d) 12×10^{14} m.

3. In order to minimise the power loss, electric power should be transmitted at

   a) low voltage and high current b) high voltage and low current

   c) high voltage and high current d) low voltage and low current.

[Turn over

4. Electrical energy is converted into mechanical energy in a

a) dynamo b) transformer

c) motor d) microphone.

5. For a turbulent flow, the value of Reynolds number is

a) above 3000 b) below 2000

c) above 2000 d) below 3000.

6. Graphite is used in a Nuclear Reactor as

a) coolant b) fuel

c) moderator d) neutron reflector.

7. According to Prout's model the atoms of all elements are made up of

a) protons

b) protons and neutrons

c) protons, neutrons and electrons

d) hydrogen atom.

8. Natural radioactivity occurs in elements of atomic number greater than

a) 62 b) 82

c) 52 d) 42.

9. The gravitational force of attraction between two bodies of masses one kg each, separated by a distance of one metre is

a) $6 \cdot 67 \times 10^{-11}$ N b) $33 \cdot 35 \times 10^{-11}$ N

c) $3 \cdot 335 \times 10^{-7}$ N d) 2×10^{6} N.

10. The largest known Asteroid is

a) Milky way b) Andromeda

c) Ceres d) Meteors.

II. Answer any *five* of the following questions in *one* or *two* sentences each :

$5 \times 2 = 10$

11. Define a projectile.

12. Calculate the momentum of a particle associated with a wave of wavelength $2\mathring{A}$.

13. How will you increase the power of a D. C. motor ?

14. What is the cost of using a 100 W lamp for 6 hours a day at the rate of Rs. 2/- per unit ?

15. State Hooke's law.

16. The pen nib is split at the tip. Why ?

17. Calculate the radius of a nucleus of mass number 64.

18. What is the principle involved in producing *X*-rays ?

19. What is remote sensing ?

III. Answer any *five* of the following questions : $5 \times 3 = 15$

20. Define moment of inertia.

21. State the conditions for the stability of bodies.

22. What is greenhouse effect ?

23. The work function of a photosensitive material is $26{\cdot}5 \times 10^{-17}$ joule. Calculate the threshold frequency.

24. State Faraday's laws of electromagnetic induction.

25. Define surface tension.

26. Distinguish between Nuclear fission and Nuclear fusion.

27. Write any three properties of *X*-rays.

28. State Hubble's law.

[Turn over

IV. Answer any *three* of the following questions : $3 \times 5 = 15$

29. A body of mass 2 kg undergoes circular motion in a path of radius 1·4 m with an angular velocity of 3·14 rad s^{-1}. Calculate its centripetal acceleration and centripetal force.

30. Derive an expression for de-Broglie wavelength.

31. Describe the construction and working of an A. C. generator.

32. Explain the application of surface tension in day-to-day life.

33. Describe the construction and working of an atom bomb.

34. Explain induced radioactivity with examples.

SECTION – B

CHEMISTRY

(Marks : 50)

V. Choose the correct answer and write it against the question number in the answer-book : $10 \times 1 = 10$

35. The electron will enter the sub-shell for which ($n + l$) value is

a) lowest b) highest

c) both (a) and (b) d) none of these.

36. The number of molecules present in 17 gms of ammonia is

a) $6 \cdot 023 \times 10^{23}$ b) $6 \cdot 023 \times 10^{-23}$

c) $6 \cdot 023 \times 10^{22}$ d) $6 \cdot 022 \times 10^{-22}$.

37. Law of combining volume was given by

a) Gay Lussac b) Lavoisier

c) Berzelius d). Proust.

38. Active mass of substance is expressed in

a) mol dm^{-3} b) mol dm^{3}

c) mol^{-1} dm^{-3} d) mol^{-3} dm.

39. The process of extraction of pure metals from their ores is known as

a) Electrorefining b) Metallurgy

c) Enrichment d) Electrolysis.

40. Bronze is an alloy of

a) Zinc b) Copper

c) Nickel d) Iron.

41. Sodium silicate solution is also called as

a) Blue glass b) Water glass

c) Watch glass d) Crystal glass.

42. Rectified spirit consists of ..... alcohol.

a) 95·5% b) 95%

c) 98·5% d) 98%.

43. Formic acid is present in

a) Ants b) Vinegar

c) Butter d) None of these.

44. Poisonous gases can be removed by

a) the spray collector b) afforestation

c) filtration d) using a catalyst.

VI. Answer any *five* of the following questions in *one* or *two* sentences each :

$5 \times 2 = 10$

45. State Hund's rule.

46. State the law of multiple proportion.

47. What is the present day position of law of conservation of mass ?

48. Define law of mass action.

49. What is meant by hydraulic wash ?

50. What is the action of sulphur with sulphuric acid ? Give equation.

51. $C_2H_5OH + PCl_5 \rightarrow ? + ? + ?$

    Complete and balance the reaction.

52. Ether is a versatile solvent and medium for reaction. Give reason.

53. What are secondary pollutants ?

VII. Answer any *five* of the following questions in brief : $5 \times 3 = 15$

54. State Pauli's exclusion principle with an illustration.

55. Write a note on Sommerfeld's model of an atom.

56. A metal oxide has 60% of metal. Calculate the equivalent mass of the metal.

57. Calculate the volume of oxygen required for the complete combustion of 20 cm^3 of methane.

    $\left[\text{Hint : } CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}\right]$

58. What are the conditions for reversible reactions ?

59. Write any three uses of aluminium.

60. What is Williamson's ether synthesis ?

61. What is decarboxylation ? Give an example.

62. Give two tests for acetic acid.

VIII. Answer any *three* of the following questions in detail with necessary diagrams and equations wherever necessary : $3 \times 5 = 15$

63. State Avogadro's hypothesis. Apply it to deduce the relationship between vapour density and molecular mass.

64. Describe zone refining method for the purification of metals.

65. Explain Bessemerisation based on copper extraction.

66. How will you extract sulphur by Frasch process ?

67. What happens when

    a) ethanol is treated with acidic solution of potassium dichromate

    b) ethanol is burnt in air ?

68. How can we conserve energy ? Mention any 5 points.