Total No. of Printed Pages—23

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SCIENCE AND TECHNOLOGY

(FOR CANDIDATES WITH PRACTICAL MARKS)

Full Marks : 80
Pass Marks : 24

(FOR CANDIDATES WITHOUT PRACTICAL MARKS)

Full Marks : 100
Pass Marks : 30

Time : 3 hours

(FOR ALL CATEGORIES OF CANDIDATES)

General Instructions :

(i) This question paper comprises of three Sections A, B and C.

(ii) The candidates are advised to attempt all questions of Sections A, B and C separately.

(iii) Allocated marks are indicated against each.

(iv) Question Nos. **1** to **56** are to be answered by all Candidates.

(v) Question No. **57** is to be answered by **Candidates without Practical Marks**.

(vi) Questions meant for Visually Impaired Candidates should be answered by them only.

SECTION—A

(PHYSICS)

(*Marks* : 26)

Choose and write the correct answer from the following (any *four*) : 1×4=4

1. A material medium having the lowest optical density is

(A) water

(B) glass

(C) air

(D) diamond

2. The focal length of the eye lens increases when eye muscles

(A) are relaxed and lens becomes thinner

(B) contract and lens becomes thicker

(C) are relaxed and lens becomes thicker

(D) contract and lens becomes thinner

3. An instrument is connected in series in an electric circuit and has a low resistance. Name the instrument.

(A) Voltmeter

(B) Ammeter

(C) Electric meter

(D) Dioptremeter

4. The curved lines along which iron filings align themselves around a bar magnet are called

(A) magnetic field lines

(B) mechanical field lines

(C) electromagnetic field lines

(D) optical field lines

5. The space surrounding a bar magnet in which its influence in the form of magnetic force can be detected, is called

(A) magnetic lines

(B) magnetic force

(C) solenoid

(D) magnetic field

6. One watt-hour is equal to

(A) 36 J

(B) 360 J

(C) 3600 J

(D) 36000 J

7. Rainbow is formed due to

(A) diffraction of light

(B) refraction of light

(C) dispersion of light

(D) reflection of light

8. When a newspaper is seen through a lens, its print appears smaller. The nature of the lens is

(A) convex

(B) concave

(C) double convex

(D) concavo-convex

Answer the following short answer-type questions (any *four*) : 2×4=8

9. State the relationship between the focal length and the radius of curvature of a convex mirror. 1+1=2

10. *(a)* Which defect of vision does an aged person suffer if he or she cannot see far and near objects clearly? 1

(b) What type of lens should be used by him or her if he or she cannot read comfortably? 1

11. Name the factors which determine the electric resistance of a conductor. ½×4=2

12. No two magnetic field lines intersect each other. Why? 2

13. Give the characteristics of the image formed when the object is placed between the principal focus and the pole of a concave mirror. ½×4=2

14. *(a)* Name two common defects of human eye. 1

(b) Name the kinds of lens used for correcting the above defects. 1

15. What will be the total resistance of the circuit if four resistances of $2\,\Omega$ each are connected in a series circuit? 2

16. *(a)* What do you understand by the term 'ion current'? 1

(b) Give one application of Magnetic Resonance Imaging. 1

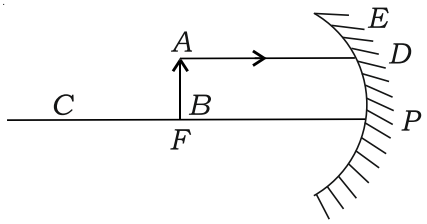
Answer the following short answer-type questions : 3×3=9

Answer *either* Part—A *or* Part—B from each question

Part—A

17. *(a)* The velocity of light in air is 3×10^8 m/s and in glass is 2×10^8 m/s. Find the refractive index of glass. 1½

(b) Draw this figure in your answer book and show the direction of ray of light after reflection : 1½



[For Visually Impaired Candidates only in lieu of Question No. 17*(b)*]

(b) Define power of a lens. What is its unit? 1½

Part—B

(c) State any six common characteristics of light. ½×6=3

Part—A

18. *(a)* Give three characteristics of a parallel circuit. 3

Part—B

(b) *(i)* Derive the mathematical expression of Ohm's law. Define SI unit of resistance. 1+1=2

(ii) How is electric current measured? 1

Part—A

19. *(a)* What is an electric motor? Write the principle on which electric motor is based. Give the function of a commutator. 1+1+1=3

Part—B

(b) Enumerate any three characteristics of a permanent magnet. 3

Answer the following long answer-type questions : 5

Answer *either* Part—A *or* Part—B *or* Part—C

Part—A

20. *(a)* What is lateral displacement? 1

(b) State the laws of refraction of light. 2

(c) Why is convex mirror preferred over plane mirror for rear view? 2

Part—B

(d) Between retina and iris, which acts like a photographic camera? 1

(e) Name the two types of nerve ending in the retina and also mention its characteristics. 2

(f) Give two functions of aqueous humour. 2

Part—C

(g) List three characteristics of magnetic field lines. 3

(h) When is a body said to be positively or negatively charged? ½+½=1

(i) How many electrons constitute one unit of electric charge? 1

SECTION—B

(CHEMISTRY)

(*Marks* : 26)

Choose and write the correct answer from the following (any *three*) : 1×3=3

21. Which one of the following can be used as an acid-base indicator by a visually impaired student?

(A) Litmus

(B) Turmeric

(C) Vanilla essence

(D) Methyl orange

22. Long form of Periodic Table was reconstructed by

(A) Moseley

(B) Niels Bohr

(C) J. J. Thomson

(D) Rutherford

23. Which among the following is double displacement reaction?

(A) $Pb + CuCl_2 \rightarrow PbCl_2 + Cu$

(B) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

(C) $C + O_2 \rightarrow CO_2$

(D) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

24. An element that is an essential constituent of all organic compounds belongs to

(A) Group 1

(B) Group 14

(C) Group 15

(D) Group 16

25. Oxidation is a process which involves

(A) addition of oxygen

(B) addition of hydrogen

(C) removal of oxygen

(D) removal of hydrogen

26. Which one of the following is a strong acid?

(A) Carbonic acid

(B) Sulphurous acid

(C) Nitrous acid

(D) Hydrochloric acid

Answer the following short answer-type questions (any *three*) : 2×3=6

27. Balance the following chemical reactions : 1+1=2

(a) $FeS_2 + O_2 \rightarrow Fe_2O_3 + SO_2$

(b) $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$

28. Identify the following elements whose electronic configurations are given below : ½×4=2

(He, Li, Na, K, Ca, Mg, Cl)

(a) 2, 8, 2

(b) 2, 8, 1

(c) 2, 8, 7

(d) 2, 1

29. What are isomers? Write the formulas of two isomers of butane. 1+1=2

30. What change in colour is observed when white silver chloride is left exposed to sunlight? State the type of chemical reaction in this change. 1+1=2

31. An element *P* belongs to Group 2 of the long form of the Periodic Table.

(a) How many valence electrons are there in *P*? 1

(b) What is the valency of *P*? Is *P* a metal or non-metal? ½+½=1

32. Identify the functional groups in the following : ½×4=2

(a) CH_3COOH

(b) $CH_3CH_2CH_2OH$

(c) CH_3COCH_3

(d) C_2H_5CHO

Answer the following short answer-type questions : 3×4=12

Answer *either* Part—A *or* Part—B from each question

Part—A

33. *(a)* When a shining strip of copper is placed in colourless silver nitrate solution, then silver metal and copper nitrate solution are formed.

(i) What type of reaction is this? 1

(ii) What is the colour of the solution after reaction? 1

(iii) Write a balanced chemical equation to represent the above reaction. 1

Part—B

(b) *(i)* What is the colour of ferrous sulphate crystals? ½

(ii) What is the change of colour on further heating? ½

(iii) Name the products formed on strongly heating of ferrous sulphate crystals. What type of chemical reaction occurs in this change? 1½+½=2

Part—A

34. *(a)* *(i)* Write the chemical formula of bleaching powder. 1

(ii) What happens when it is left exposed to air? 1

(iii) Give any two uses of bleaching powder. ½+½=1

Part—B

(b) *(i)* What do you mean by family of salts? 1

(ii) What is neutralization reaction? 1

(iii) Name two highly malleable metals. ½+½=1

Part—A

35. *(a)* Name a molecule of an element that has—

(i) one covalent bond;

(ii) two covalent bonds;

(iii) three covalent bonds. 1+1+1=3

Part—B

(b) *(i)* Give the general name of the class of compounds having the general formula C_nH_{2n-2}. Write the name of any member of this homologous series. 1+1=2

(ii) What is methylated spirit? 1

Part—A

36. *(a)* *(i)* A non-metal *X* exists in two different forms *Y* and *Z*. *Y* is the hardest natural substance, whereas *Z* is a good conductor of electricity. Identify *X*, *Y* and *Z*. 1½

(ii) State the reason why sodium and potassium metals are kept immersed under kerosene oil. 1

(iii) Give an example of a metal which is a liquid at room temperature. ½

Part—B

(b) State any three differences between calcination and roasting. 3

Answer the following long answer-type questions : 5

Answer *either* Part—A *or* Part—B *or* Part—C

Part—A

37. *(a)* Why is pure gold not used to make ornaments? 1

(b) How is gold hardened to make ornaments? What do you mean by 22 K gold? 1+1=2

(c) Give the composition and use of brass and bronze. 1+1=2

Part—B

(d) What changes do you observe when a strip of iron metal is placed in copper sulphate solution? 3

(e) Define exothermic reaction with a chemical equation. 1+1=2

Part—C

(f) Define catenation. 1

(g) Write the names of two alkanes, one having three carbon atoms and the other having four carbon atoms. ½+½=1

(h) What are Groups and Periods in the Periodic Table? ½+½=1

(i) What happens when metal carbonate reacts with an acid? 1

(j) Which gas is evolved when zinc granules are heated with conc. sodium hydroxide solution? 1

SECTION—C

(BIOLOGY)

(*Marks* : 28)

Choose and write the correct answer from the following (any *three*) : 1×3=3

38. The inner lining of stomach is protected by which one of the following from hydrochloric acid?

(A) Pepsin

(B) Mucus

(C) Salivary amylase

(D) Bile

39. Which of the following endocrine glands is unpaired?

(A) Pituitary

(B) Adrenal

(C) Testis

(D) Ovary

40. Platelets help in

(A) transport of oxygen

(B) transport of carbon dioxide

(C) clotting of blood

(D) pumping of blood

41. The main function of the plant hormone abscisic acid is to

(A) increase the length of the cells

(B) promote cell division

(C) inhibit growth

(D) promote growth of stem and root

42. The male gamete from pollen tube fuses with egg to form

(A) polar nuclei

(B) embryo

(C) zygote

(D) endosperm

43. An organism which reproduces by the process of binary fission is

(A) Spirogyra

(B) Hydra

(C) Plasmodium

(D) Amoeba

Answer the following short answer-type questions (any *four*) : 2×4=8

44. Write any two points of differences between photo-synthesis and respiration. 2

45. Illustrate with the help of suitable diagram 'multiple fission' in Plasmodium. ½×4=2

[For Visually Impaired Candidates only in lieu of Question No. 45]

45. Define regeneration. Give two examples. 1+1=2

46. Name the four whorls of a typical angiospermic flower. ½×4=2

47. Define the term 'analogous organs'. Give two examples. 1+½+½=2

48. Write any two functions of blood. 2

49. *(a)* Name the coverings in brain and the fluid present in between. 1

(b) Name the two main constituents of the central nervous system in human beings. ½+½=1

50. *(a)* Name the technique used for propagating disease-free variety of plant. 1

(b) Name any two agencies through which cross-pollination takes place. 1

51. *(a)* Give the scientific name of the organism Mendel used for his experiment. 1

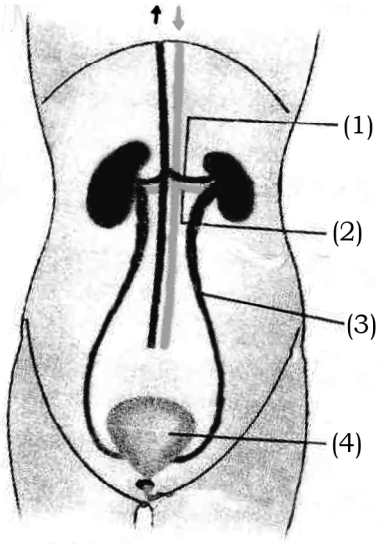
(b) Define fossils. 1

Answer the following short answer-type questions : 3×4=12

Answer *either* Part—A *or* Part—B from each question

Part—A

52. *(a)* *(i)* In the given diagram, name the parts (1), (2), (3) and (4) : ½×4=2



[For Visually Impaired Candidates only in lieu of Question No. 52*(a)(i)*]

(i) Name the two types of Nastic movements. Also explain each. 1+1=2

(a) *(ii)* Name the two major components of normal human urine. 1

Part—B

(b) *(i)* Name the four main types of heterotrophic nutrition. ½×4=2

(ii) Name the vestigial part of human alimentary canal. 1

Part—A

53. *(a)* Name the animal hormone responsible for—

(i) regulating protein metabolism and body growth;

(ii) lowering blood sugar level;

(iii) regulating calcium and phosphorus metabolism. 1+1+1=3

Part—B

(b) Which endocrine gland is present in males but not in females? 1

(c) Name the endocrine gland associated with kidneys. 1

(d) Which gland secretes digestive enzymes as well as hormones? 1

Part—A

54. *(a)* Write the full forms of the following : 1×3=3

(i) MTP

(ii) IUCD

(iii) STD

Part—B

(b) Distinguish between external fertilization and internal fertilization giving an example of each. 1½+1½=3

Part—A

55. *(a)* *(i)* What do you understand by phenotype and genotype? 1+1=2

(ii) State the law of purity of gametes. 1

Part—B

(b) *(i)* Name the three pairs of salivary glands in humans. Where do they open? 1½+½=2

(ii) Which enzyme present in saliva breaks down starch? 1

Answer the following long answer-type questions : 5

Answer *either* Part—A *or* Part—B *or* Part—C

Part—A

56. *(a)* Name the process in plant where water is lost as water vapour. 1

(b) Give the names of four kinds of phloem elements. ½×4=2

(c) Mention the two important functions of lymph. 2

Part—B

(d) What is neuron? 1

(e) State the functions of sensory neuron, motor neuron and connector neuron. 1+1+1=3

(f) What is the directional movement of the plant in response to *(i)* light and *(ii)* chemical stimulus called? 1

Part—C

(g) Name the process by which the present diversity of plants and animals arose from the earliest and primitive organisms. 1

(h) How many pairs of *(i)* spinal nerves and *(ii)* cranial nerves are there in human beings? ½+½=1

(i) Name the instrument used to measure blood pressure in humans. 1

(j) Name the mechanism for *(i)* intake of fresh air from outside to the alveoli of lungs and *(ii)* removal of stale air from the alveoli of lungs to outside. ½+½=1

(k) Write two functions of stomata. ½+½=1

[For Candidates without Practical Marks]

57. I. Answer any *three* of the following questions : 2×3=6

(a) What is a lens? Name two broad classes of lens. 1+1=2

(b) What is dispersion of light? 2

(c) What is potential difference? Also give its SI unit. 1+1=2

(d) Give two points of differences between electro-magnet and permanent magnet. 2

(e) What do you understand by accommodation of the eye? 2

(f) What are the two kinds of reflection of light? 2

II. Answer any *three* of the following questions : 2×3=6

(a) What is chemical combination reaction? Also give one chemical equation for the above. 1+1=2

(b) What are acids and bases? 1+1=2

(c) *(i)* What is meant by water of crystallization? 1

(ii) Name one salt containing five molecules of water of crystallization. 1

(d) What are hydrocarbons? Give an example. 2

(e) *(i)* Define ore. 1

(ii) Name any two methods for concentration of ore. ½+½=1

(f) An element *E* has atomic number 17. Write the electronic configuration of *E*, and find out the Period and Group to which it belongs in the Periodic Table. ½+½+1=2

III. Answer any *four* of the following questions : 2×4=8

(a) *(i)* What is nutrition? 1

(ii) Define the term 'assimilation'. 1

(b) Give any two differences between aerobic respiration and anaerobic respiration. 2

(c) Name four plant hormones. ½×4=2

(d) Mention two functions of the large intestine. 2

(e) What is double circulation? 2

(f) Give the differences between variation and heredity. 2

(g) What are the two hormones secreted by thyroid gland? 1+1=2

(h) *(i)* What is dialysis? 1

(ii) Name the blood vessel which carries oxygenated blood from lungs to heart. 1

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