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. When the rays of light diverging from a point, after reflection either actually meet or appear to meet at some other point, then that point is called

(A) shadow

(B) reference point

(C) image

(D) point of incidence

2. Insulation of each electric wire is given a specific colour. Which colour represents live electrical wire according to the New International Convention?

(A) Yellow

(B) Blue

(C) Brown

(D) Green

3. The electric charge on an electron is

(A) $6 \cdot 25 \times 10^{-18}$ C

(B) $1 \cdot 6 \times 10^{-19}$ C

(C) $1 \cdot 6 \times 10^{-18}$ C

(D) $6 \cdot 25 \times 10^{-19}$ C

4. Which of the following is a conductor?

(A) Glass

(B) Chloroform

(C) Copper

(D) Air

5. The danger signals installed at the top of tall buildings are red in colour because the red light

(A) is scattered the most by smoke or fog

(B) is least scattered by smoke or fog

(C) is absorbed the most by smoke or fog

(D) moves fastest in air

6. The part of the human eye that controls the amount of light entering the eye is

(A) cornea

(B) retina

(C) choroid

(D) iris

7. 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

8. The most important safety method used for protecting home appliances from short circuiting or overloading is

(A) earthing

(B) use of fuse

(C) use of stabilizers

(D) use of electric meter

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

9. *(a)* What is meant by electromagnetic induction? 1

(b) On what principle does an electric generator work? 1

10. *(a)* What do you understand by the term 'Power of lens'? 1

(b) A convex lens has a focal length of 40 cm. Calculate its power. 1

11. *(a)* Define electric current. 1

(b) State the relation between the electric current, the charge moving through a conductor and the time in seconds. 1

12. What is presbyopia? Write any one cause of this defect. 1+1=2

13. What is the difference between Dispersion and Scattering of light? 1+1=2

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

15. Write two characteristics of magnetic field lines. 1+1=2

16. Define luminous body. Give any two examples of luminous bodies. 1+½+½=2

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

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

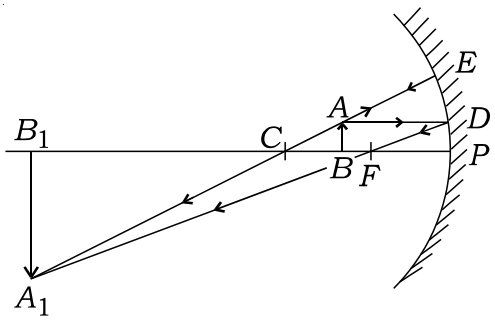
Part—A

17. *(a)* State Snell's laws of refraction of light. 2

(b) Why is a plane mirror not useful as a rear view mirror? 1

Part—B

(c) Observe the given diagram and answer the following questions :



(i) Name the points *C* and *F*. ½+½=1

(ii) State the nature of the image. ½+½=1

(iii) What is the size and position of the image? ½+½=1

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

(c) List three common characteristics of light. 3

Part—A

18. *(a)* What is the electric potential at a point in an electric field when 24 J of work is done in moving a charge of 84 C from infinity? 2

(b) Name a device and the form of energy responsible for generating continuous electric current. ½+½=1

Part—B

(c) Derive the mathematical expression of Ohm's law. Write the SI unit of resistance. 1+½=1½

(d) State three reasons why an electric circuit breaks. 1½

Part—A

19. *(a)* Give three differences between an electromagnet and a permanent magnet. 3

Part—B

(b) In the statement of Fleming's Left-Hand Rule, what do the following represent? 1+1+1=3

(i) The direction of the forefinger

(ii) The direction of the middle finger

(iii) The direction of the thumb

Answer the following long answer-type question : 5

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

Part—A

20. *(a)* Why does the sky appear blue? 2

(b) State three characteristics of an image formed in a plane mirror. 3

Part—B

(c) State the difference between overloading and short circuiting. 1+1=2

(d) Why does a glass prism cause dispersion of white light but not a glass slab? Explain with a diagram. 2+1=3

[For Visually Impaired Candidates only in lieu of Question No. 20*(d)*]

(d) *(i)* What is lateral displacement? 1

(ii) How is lateral displacement produced by an optical slab related to—

1. thickness of the optical slab;

2. angle of incidence? 1+1=2

Part—C

(e) Between retina and iris, which controls the amount of light entering the eye? 1

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

(g) Give two functions of aqueous humour. 2

SECTION—B

(CHEMISTRY)

(*Marks* : 26)

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

21. When two elements or compounds react chemically to form a single new compound, the chemical reaction is called

(A) combination reaction

(B) decomposition reaction

(C) displacement reaction

(D) oxidation reaction

22. The acid present in sour milk or curd is

(A) acetic acid

(B) lactic acid

(C) formic acid

(D) uric acid

23. Endothermic reactions proceed with the

(A) evolution of heat energy

(B) absorption of heat energy

(C) evolution of light energy

(D) absorption of light energy

24. The law of octaves for the classification of elements was stated by

(A) Mendeleev

(B) Dobereiner

(C) Niels Bohr

(D) Newlands

25. Which of the following acid-base indicators will turn blue in basic or alkaline solutions?

(A) Methyl orange

(B) Phenolphthalein

(C) Blue litmus

(D) Red litmus

26. Which of the following forms the basis of the Modern Periodic Table?

(A) Atomic mass

(B) Atomic number

(C) Number of nucleons

(D) Atomic radius

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

27. *(a)* Define chemical equation. 1

(b) Balance the following chemical reaction : 1

$$Fe + H_2O \rightarrow Fe_3O_4 + H_2$$

28. Elements *A* and *B* have atomic numbers 16 and 20 respectively. Write the electronic configuration of *A* and *B*, and find out the groups to which they belong in the Periodic Table. ½+½+½+½=2

29. White silver chloride when left exposed to sunlight changes to grey. Write the chemical reaction involved and also mention the type of the chemical reaction. 1+1=2

30. Why are covalent compounds generally poor conductors of electricity? 2

31. In the Modern Periodic Table, which are the metals among the first ten elements? 2

32. *(a)* Write the general formula of alkenes. 1

(b) Give the names of two alkenes, one having three carbon atoms and the other having four carbon atoms. ½+½=1

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

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

Part—A

33. *(a)* *(i)* Aluminium and zinc are high up in the metal activity series, yet they resist corrosion. Why? 1

(ii) Give one example of chemical decomposition reaction that is carried out by—

1. Electric energy;

2. Heat energy. 1+1=2

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)* Define water of crystallisation. 1

(ii) Write the chemical name and chemical formula of a salt containing seven water of crystallisation. ½+½=1

(iii) Give an example for the reaction of a metal carbonate and an acid. 1

Part—B

(b) *(i)* How is bleaching powder prepared? Write the chemical equation. 1+1=2

(ii) Give any two uses of bleaching powder other than washing of clothes. ½+½=1

Part—A

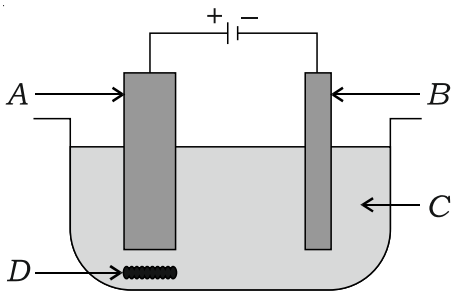
35. *(a)* *(i)* Name the following : ½×4=2

1. A non-metal which is the hardest substance
2. A metal which is liquid at room temperature
3. A metal which can be cut with a knife
4. A non-metal that has lustre

(ii) State the reason why aluminium oxide is called an amphoteric oxide. 1

Part—B

(b) In the given diagram of electrorefining of copper, the different parts are labelled as *A*, *B*, *C* and *D*. Observe carefully and answer the following questions :



Electrorefining of copper

(i) Which part is the anode? What is it made of? ½+½=1

(ii) Which part is the cathode? What is it made of? ½+½=1

(iii) Which part is the acidified copper sulphate solution? ½

(iv) Which part is the anode mud? ½

[For Visually Impaired Candidates only in lieu of Question No. 35*(b)*]

(b) State three differences in the physical properties of metals and non-metals. 3

Part—A

36. *(a)* *(i)* Define functional group. 1

(ii) Give the names of the following functional groups : ½×4=2

$$-OH,\ -COOH,\ -CHO,\ -\overset{|}{C}=O$$

Part—B

(b) *(i)* How is ethene prepared from ethanol? (Equation is not required.) What is the role of concentrated sulphuric acid in the above preparation? 1½+½=2

(ii) What is methylated spirit? 1

Answer the following long answer-type question : 5

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

Part—A

37. *(a)* An element, which is placed in 2nd group and 3rd period of the Periodic Table, burns in the presence of oxygen to form a basic oxide.

(i) Identify the element.

(ii) Write the electronic configuration and valency.

(iii) Write the balanced equation when it burns in the presence of air. 1+(½+½)+1=3

(b) Which bases are called alkalis? Give an example of an alkali. 1+1=2

Part—B

(c) State three differences between calcination and roasting. 3

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

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

Part—C

(e) Write the definition of salt. 1

(f) Classify the following salts as normal, acid and basic salts : ½×3=1½

(i) KCl

(ii) CH_3COONa

(iii) $FeSO_4$

(g) Name a molecule of an element that has—

(i) single covalent bond;

(ii) double covalent bond;

(iii) triple covalent bond. ½×3=1½

(h) Give the names of two chemical substances present in the soda-acid fire extinguisher. ½+½=1

SECTION—C

(BIOLOGY)

(*Marks* : 28)

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

38. First step of respiration is

(A) formation of pyruvate

(B) formation of oxygen

(C) formation of glucose

(D) formation of carbon dioxide

39. The mode of reproduction in spirogyra is

(A) multiple fission

(B) fragmentation

(C) binary fission

(D) budding

40. Which of the following endocrine glands secretes growth hormone?

(A) Adrenal

(B) Testes

(C) Ovary

(D) Pituitary

41. Which part of the alimentary canal receives bile from the liver?

(A) Stomach

(B) Small intestine

(C) Large intestine

(D) Oesophagus

42. Posture and balance of the body is controlled by

(A) cerebrum

(B) cerebellum

(C) medulla

(D) pons

43. Which among the following diseases is not sexually transmitted?

(A) Syphilis

(B) Hepatitis

(C) HIV-AIDS

(D) Gonorrhoea

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

44. Give the names of the three pairs of salivary glands in humans. Where do they open? 1½+½=2

45. Give reasons for the following : 1+1=2

(a) The lung alveoli are covered with blood capillaries.

(b) The wall of the trachea is supported by cartilage rings.

46. State the functions of sensory neuron and connector neuron. 1+1=2

47. What constitute the autonomic nervous system? Name the two subsystems in which it is subdivided. 1+½+½=2

48. In a complete flower, identify the following : ½×4=2

(a) Part that produces pollen grain

(b) Part that transfers male gamete to the female gamete

(c) Part that is sticky to trap the pollen grain

(d) Part that develops into a fruit

49. What is binary fission? Name two organisms which reproduce by this method. 1+½+½=2

50. *(a)* What is a gene? 1

(b) What do you mean by monohybrid cross? 1

51. Explain why the wings of a bird and the wings of a bat are not considered to be homologous. 2

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

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

Part—A

52. *(a)* Give three differences between aerobic and anaerobic respiration. 3

Part—B

(b) *(i)* Enumerate two functions of gastric HCl. 2

(ii) Name the pancreatic enzyme which digests proteins. 1

Part—A

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

(ii) What is the common name and the scientific name of the plant on which Mendel performed his experiment? ½+½=1

Part—B

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

Part—A

54. *(a)* Draw the diagram of a neuron and label the following on it : 1+½+½+½+½=3

Nucleus, Dendrites, Cell body and Axon

[For Visually Impaired Candidates only in lieu of Question No. 54*(a)*]

(a) Name the plant hormone which helps or promotes *(i)* cell division, *(ii)* growth of the stem and *(iii)* ripening of fruits. 1+1+1=3

Part—B

(b) How are nastic movements different from tropic movements in plants? (Three points only) 1+1+1=3

Part—A

55. *(a)* *(i)* What are fossils? What do you mean by relative dating? 1+1=2

(ii) Name an animal having very simple and photosensitive eyes. 1

Part—B

(b) *(i)* Define sexual reproduction. 1

(ii) List two functions performed by the testes in human beings. ½+½=1

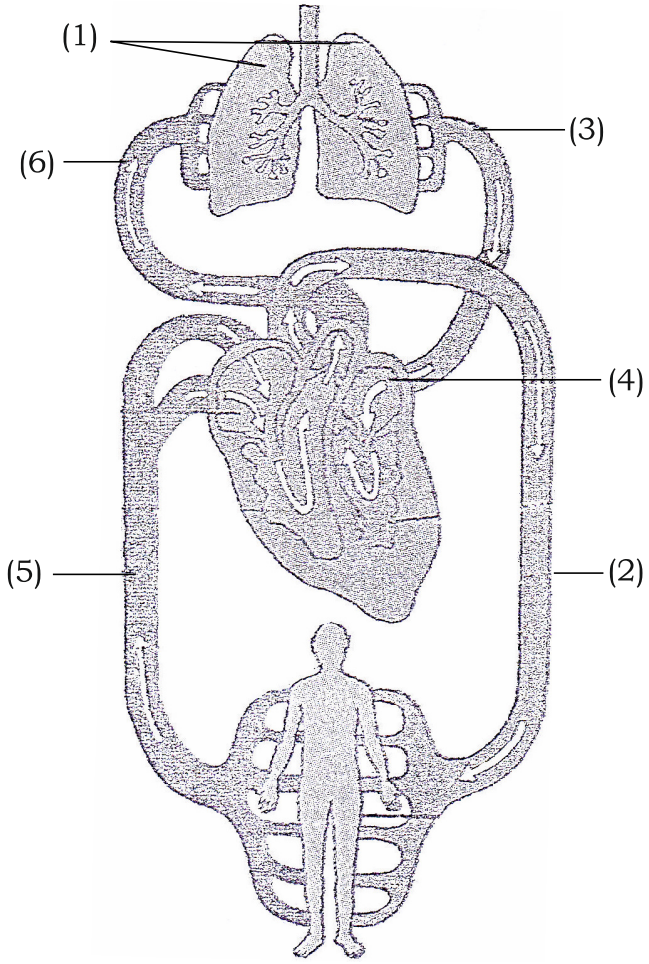
(iii) What changes are observed in the uterus if fertilisation does not occur? 1

Answer the following long answer-type question : 5

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

Part—A

56. *(a)* *(i)* In the given diagram, name the parts (1), (2), (3), (4), (5) and (6) : ½×6=3



[For Visually Impaired Candidates only in lieu of Question No. 56*(a)(i)*]

(i) Enumerate three functions of blood. 3

(a) *(ii)* What are stomata? Write two functions of stomata. 1+½+½=2

Part—B

(b) *(i)* What is nutrition? Name the four main types of heterotrophic nutrition. 1+½×4=3

(ii) Name the four elements of xylem. ½×4=2

Part—C

(c) Explain dental plaque and its harmful effects. 2

(d) What do you mean by pollination? Explain its types. 1+2=3

[For Candidates without Practical Marks]

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

(a) State any two uses of convex mirror. 1+1=2

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

(c) *(i)* Define the term 'refractive index'. 1

(ii) What is the speed of light in vacuum? 1

(d) What do you understand by the term 'reflection of light'? 2

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

(f) Give two uses of electromagnet. 2

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

(a) What is neutralisation reaction? Give one example. 1+1=2

(b) What is a strong acid? Give two examples. 1+½+½=2

(c) Write two differences between metals and non-metals. 1+1=2

(d) How does the number of valence electrons vary on moving *(i)* down a group and *(ii)* across a period? 1+1=2

(e) *(i)* What is organic chemistry? 1

(ii) Name the functional group present in the given compound : 1

CH_3CH_2OH

(f) Give two differences between soap and synthetic detergent. 1+1=2

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

(a) Give two differences between respiration and breathing. 1+1=2

(b) What are the two important functions performed by lymph? 1+1=2

(c) *(i)* Name the nitrogenous wastes in human beings. 1½

(ii) What name is given to the process of artificial removal of nitrogenous wastes from the blood? ½

(d) Define heredity. Name the scientist who is referred to as the 'father of genetics'. 1+1=2

(e) Explain the following terms : 1+1=2

(i) Placenta

(ii) Gestation

(f) Mention two functions of the large intestine. 1+1=2

(g) Write the full forms of the following : 1+1=2

(i) DNA

(ii) AIDS

(h) What is a bisexual flower? Give two examples. 1+½+½=2

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