नोट		NOTE	
(I)	कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 23 हैं ।	(I)	Please check that this question paper contains 23 printed pages.
(II)	प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख्य-पृष्ठ पर लिखें ।	(II)	Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
(III)	कृपया जाँच कर लें कि इस प्रश्न-पत्र में 30 प्रश्न हैं ।	(III)	Please check that this question paper contains 30 questions.
(IV)	कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।	(IV)	Please write down the serial number of the question in the answer-book before attempting it.
(V)	इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा । 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे ।	(V)	15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

विज्ञान
SCIENCE

निर्धारित समय : 3 घण्टे   अधिकतम अंक : 80

Time allowed : 3 hours   *Maximum Marks : 80*

.31/4/1   1   P.T.C

General Instructions :

Read the following instructions very carefully and strictly follow them.

(i)   This question paper comprises **three** Sections — **A**, **B** and **C**. There are 30 questions in the question paper. **All** questions are compulsory.

(ii)   **Section A** – Questions no. **1** to **14** — all questions or part thereof are of one mark each. These questions comprise Multiple Choice Questions (MCQ), Very Short Answer (VSA) and Assertion–Reason type questions. Answer to these questions should be given in **one word** or **one sentence**.

(iii) **Section B** – Questions no. **15** to **24** are short answer type questions, carrying **3** marks each. Answer to these questions should not exceed **50** to **60** words.

(iv)   **Section C** – Questions no. **25** to **30** are long answer type questions, carrying **5** marks each. Answer to these questions should not exceed **80** to **90** words.

(v)   Answers should be brief and to the point. Also the above mentioned word limit be adhered to as far as possible.

(vi)   There is no overall choice in the question paper. However, an internal choice has been provided in some questions in each section. **Only one of the choices** in such questions have to be attempted.

(vii) In addition to this, separate instructions are given with each section and question, wherever necessary.

SECTION A

1. Write the number of valence electrons present in a nitrogen atom $\left(^{14}_{7}N\right)$.   1

2. Define the term induced electric current.   1

3. Answer question numbers 3(a) – 3(d) on the basis of your understanding of the following paragraph and the related studied concepts :

    Around the year 1800, only 30 elements were known. Dobereiner in 1817 and Newlands in 1866 tried to arrange the then known elements and framed laws which were rejected by the scientists. Even after the rejection of the proposed laws, many scientists continued to search for a pattern that correlated the properties of elements with their atomic masses.

The main credit for classifying elements goes to Mendeleev for his most important contribution to the early development of a Periodic table of elements wherein he arranged the elements on the basis of their fundamental property, the atomic mass and also on the similarity of chemical properties. The formulae of their hydrides and oxides were treated as basic criteria for the classification of the elements.

However, Mendeleev's classification also had some limitations as it could not assign the position to isotopes. He also left some gaps in the periodic table.

3(a) State Mendeleev's Periodic Law.   1

3(b) Why did Mendeleev leave some gaps in the Periodic table ?   1

3(c) If the letter 'R' was used to represent any of the elements in the group, then the hydride and oxide of carbon would respectively be represented as   1

(i) RH_4, RO

(ii) RH_4, RO_2

(iii) RH_2, RO_2

(iv) RH_2, RO

3(d) Isotopes are   1

(i) Atoms of an element with similar chemical properties but different atomic masses.

(ii) Atoms of different elements with similar chemical properties but different atomic masses.

(iii) Atoms of an element with different chemical properties but same atomic masses.

(iv) Atoms of different elements with different chemical properties but same atomic masses.

4. Answer question numbers 4(a) – 4(d) on the basis of your understanding of the following paragraph and the related studied concepts :

India today is facing the problem of overuse of resources, contamination of water and soil and lack of methods of processing the waste. The time has come for the world to say goodbye to "single-use plastics". Steps must be undertaken to develop environment-friendly substitutes, effective plastic waste collection and methods of its disposal.

Indore treated 15 lakh metric tonnes of waste in just 3 years, through biomining and bioremediation techniques. Bioremediation involves introducing microbes into a landfill to naturally 'break' it down and biomining involves using trommel machines to sift through the waste to separate the 'soil' and the waste component. The city managed to chip away 15 lakh metric tonnes of waste at a cost of around ₹ 10 crore. A similar experiment was successfully carried out in Ahmedabad also.

4(a) State two methods of effective plastic waste collection in your school.

1

4(b) Name any two uses of "single-use plastic" in daily life.

1

4(c) If we discontinue the use of plastic, how can an environment-friendly substitute be provided ?

1

4(d) Do you think microbes will work similarly in landfill sites as they work in the laboratory ? Justify your answer.

1

5. Which one of the following statements is correct about the human circulatory system ? 1

(A) Blood transports only oxygen and not carbon dioxide.

(B) Human heart has five chambers.

(C) Valves ensure that the blood does not flow backwards.

(D) Both oxygen-rich and oxygen-deficient blood gets mixed in the heart.

6. Anaerobic process 1

(A) takes place in yeast during fermentation.

(B) takes place in the presence of oxygen.

(C) produces only energy in the muscles of human beings.

(D) produces ethanol, oxygen and energy.

OR

Most of the digestion and absorption of the food takes place in the 1

(A) small intestine.

(B) liver.

(C) stomach.

(D) large intestine.

7. Fertilisation is the process of 1

(A) transfer of male gamete to female gamete.

(B) fusion of nuclei of male and female gamete.

(C) adhesion of male and female reproductive organs.

(D) the formation of gametes by a reproductive organ.

8. If a person has five resistors each of value $\frac{1}{5}$ Ω, then the maximum resistance he can obtain by connecting them is

1

(A) 1 Ω

(B) 5 Ω

(C) 10 Ω

(D) 25 Ω

OR

The resistance of a resistor is reduced to half of its initial value. In doing so, if other parameters of the circuit remain unchanged, the heating effects in the resistor will become

1

(A) two times.

(B) half.

(C) one-fourth.

(D) four times.

9. Fleming's Right-hand rule gives

1

(A) magnitude of the induced current.

(B) magnitude of the magnetic field.

(C) direction of the induced current.

(D) both, direction and magnitude of the induced current.

10. Which one of the following statements is **not** true about nuclear energy generation in a nuclear reactor ? 1

(A) Energy is obtained by a process called nuclear fission.

(B) The nucleus of Uranium is bombarded with high energy neutrons.

(C) A chain reaction is set in the process.

(D) In this process a tremendous amount of energy is released at a controlled rate.

OR

The biggest source of energy on Earth's surface is 1

(A) Biomass

(B) Solar radiations

(C) Tides

(D) Winds

11. Food web is constituted by 1

(A) relationship between the organisms and the environment.

(B) relationship between plants and animals.

(C) various interlinked food chains in an ecosystem.

(D) relationship between animals and environment.

12. Choose the **incorrect** statement from the following : 1

(A) Ozone is a molecule formed by three atoms of oxygen.

(B) Ozone shields the surface of the Earth from ultraviolet radiations.

(C) Ozone is deadly poisonous.

(D) Ozone gets decomposed by UV radiations.

For question numbers 13 and 14, two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

(a) Both (A) and (R) are true and (R) is the correct explanation of the assertion (A).

(b) Both (A) and (R) are true, but (R) is *not* the correct explanation of the assertion (A).

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true.

13. *Assertion (A)* : Following is a balanced chemical equation for the action of steam on iron :

$$3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$$

Reason (R) : The law of conservation of mass holds good for a chemical equation. 　　1

14. *Assertion (A)* : The sex of a child in human beings will be determined by the type of chromosome he/she inherits from the father.

Reason (R) : A child who inherits 'X' chromosome from his father would be a girl (XX), while a child who inherits a 'Y' chromosome from the father would be a boy (XY). 　　1

SECTION B

15. Lead nitrate solution is added to a test tube containing potassium iodide solution.

(a) Write the name and colour of the compound precipitated.

(b) Write the balanced chemical equation for the reaction involved.

(c) Name the type of this reaction justifying your answer. 　　3

OR

What happens when food materials containing fats and oils are left for a long time ? List two observable changes and suggest three ways by which this phenomenon can be prevented. 　　3

16. List three differentiating features between the processes of galvanisation and alloying.

3

OR

Compare in tabular form the reactivities of the following metals with cold and hot water :

(a) Sodium

(b) Calcium

3

(c) Magnesium

17. Carbon, a member of group 14, forms a large number of carbon compounds estimated to be about three million. Why is this property not exhibited by other elements of this group ? Explain.

3

18. A cheetah, on seeing a prey, moves towards him at a very high speed. What causes the movement of his muscles ? How does the chemistry of cellular components of muscles change during this event ?

3

19. Define geotropism. Draw a labelled diagram of a plant showing geotropic movements of its parts.

3

20. Define the term evolution. "Evolution cannot be equated with progress." Justify this statement.

3

OR

"During the course of evolution, organs or features may be adapted for new functions." Explain this fact by choosing an appropriate example.

3

21. A concave mirror is used for image formation for different positions of an object. What inferences can be drawn about the following when an object is placed at a distance of 10 cm from the pole of a concave mirror of focal length 15 cm ?

(a) Position of the image

(b) Size of the image

(c) Nature of the image

Draw a labelled ray diagram to justify your inferences.

3

22. The refractive index of a medium 'x' with respect to a medium 'y' is 2/3 and the refractive index of medium 'y' with respect to medium 'z' is 4/3. Find the refractive index of medium 'z' with respect to medium 'x'. If the speed of light in medium 'x' is 3×10^8 ms^{-1}, calculate the speed of light in medium 'y'.

3

23. A person may suffer from both myopia and hypermetropia defects.

(a) What is this condition called ?

(b) When does it happen ?

(c) Name the type of lens often required by the persons suffering from this defect. Draw labelled diagram of such lenses.

3

24. How will you use two identical glass prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light ? Draw and label the ray diagram.

3

SECTION C

25. A cloth strip dipped in onion juice is used for testing a liquid 'X'. The liquid 'X' changes its odour. Which type of an indicator is onion juice ? The liquid 'X' turns blue litmus red. List the observations the liquid 'X' will show on reacting with the following :

(a) Zinc granules

(b) Solid sodium carbonate

Write the chemical equations for the reactions involved.

5

OR

Define water of crystallisation. Give the chemical formula for two compounds as examples. How can it be proved that the water of crystallisation makes a difference in the state and colour of the compounds ?

5

26. (a) (i) Write two properties of gold which make it the most suitable metal for ornaments.

      (ii) Name two metals which are the best conductors of heat.

      (iii) Name two metals which melt when you keep them on your palm.

   (b) Explain the formation of ionic compound CaO with electron-dot structure. Atomic numbers of calcium and oxygen are 20 and 8 respectively.

      5

27. (a) Why is nutrition necessary for the human body ?

   (b) What causes movement of food inside the alimentary canal ?

   (c) Why is small intestine in herbivores longer than in carnivores ?

   (d) What will happen if mucus is not secreted by the gastric glands ?   5

28. Draw a neat diagram showing fertilisation in a flower and label (a) Pollen tube, (b) Male germ cell and (c) Female germ cell, on it. Explain the process of fertilisation in a flower. What happens to the (i) ovary and (ii) ovule after fertilisation ?

      5

OR

   (a) What is puberty ?

   (b) Describe in brief the functions of the following parts in the human male reproductive system :

      (i) Testes

      (ii) Seminal vesicle

      (iii) Vas deferens

      (iv) Urethra

   (c) Why are testes located outside the abdominal cavity ?

   (d) State how sperms move towards the female germ cell.

29. Draw a schematic diagram of a circuit consisting of a battery of 3 cells of 2 V each, a combination of three resistors of $10\ \Omega$, $20\ \Omega$ and $30\ \Omega$ connected in parallel, a plug key and an ammeter, all connected in series. Use this circuit to find the value of the following :

(a) Current through each resistor

(b) Total current in the circuit

(c) Total effective resistance of the circuit

5
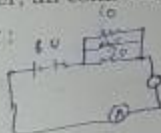
OR

Two identical resistors, each of resistance $15\ \Omega$, are connected in (i) series, and (ii) parallel, in turn to a battery of 6 V. Calculate the ratio of the power consumed in the combination of resistors in each case.

5

30. (a) State Fleming's Left-hand rule.

(b) List three characteristic features of the electric current used in our homes.

(c) What is a fuse ? Why is it called a safety device ?

(d) Why is it necessary to earth metallic electric appliances ?

5

.31/4/1

23