

DESIGN OF THE QUESTION PAPER
SCIENCE AND TECHNOLOGY - CLASS X (THEORY)

Time : Three Hours

Max. Marks : 75

The weightages of the distribution of marks over different dimensions of the question paper shall be as follows :

1. Weightage to Learning Outcomes

S.No.	Learning Outcomes	Marks	Percentage of Marks
1.	Knowledge	30	40
2.	Understanding	37	50
3.	Application	08	10

2. Weightage to content/subject units

S.No.	Learning Outcomes	Marks
1.	Chemical Reactions and some important chemical compounds	06
2.	Energy	22
3.	Life Processes	19
4.	Natural Resources	18
5.	Our Environment	05
6.	Exploring Space	05

3. Weightage to forms of questions

S. No.	Form of Questions	Marks for each question	Number of questions	Total Marks
1.	Long Answer Type (LA)	5	4	20
2.	Short Answer Type SA-I	3	11	33
3.	Short Answer Type SA_II	2	07	14
4.	Very Short Answer Type (VSA)	1	08	08

TOTAL 30 75

Note : A weightage of 7 marks has been given to numerical questions.

The expected time for different types of questions would be as follows :

S.No.	Form of question	Expected time for each question (minutes)
1.	Long Answer Type (LA)	10-15
2.	Short Answer Type (SA-I)	6-8
3.	Short Answer Type (SA-II)	3-5
4.	Very Short Answer Type (VSA)	1-2

As the total time is calculated on the basis of the number of questions required to be answered and the length of their anticipated answers, it would, therefore, be advisable for the candidates to budget their time properly by cutting out the superfluous words and be within the expected time limits.

4. Scheme of Options : There will be no overall choice. However, there is an internal choice in few questions as per the following details :

- (a) Long Answer Questions (5 marks) : In any two questions.
- (b) Short Answer Questions (3 marks) : In any two questions.
- (c) Short Answer Questions (2 marks) : In any one question.

5. Weightage to Difficulty level of questions :

S. No.	Estimated Difficulty Level of Questions	Percentage
1.	Easy	15
2.	Average	70
3.	Difficult	15

A question may vary in difficulty level from individual to individual. As such, the approximation in respect of each question will be made by the paper-setter on the basis of general anticipation from the group as a whole. The provision is only to in make the paper balanced in its weightage rather than to determine the pattern of marking at any stage.

Note : There are two blue-prints based on this design followed by two separate sample question papers. While the design of the question papers will remain same, blue prints based on this design may change from year to year.

SAMPLE QUESTION PAPER I

Subject : Science and Technology

Paper : Theory

Class : X

Maximum Marks : 75

Time : Three Hours

BLUE PRINT I

Objective →	Knowledge			Understanding			Application			Total				
	LA	SA I	SA II	VSA	LA	SA I	SA II	VSA	LA		SA I	SA II	VSA	
Form of questions Content Unit ↓		I	II			I	II				I	II		
Chemical Reactions and Some Important Chemical Compounds				1(1)		3 (1)	2(1)							6(3)
Energy	5(1)	3(1)	2(1)	1(1)	5(1)					3(1)	2(1)			22(8)
Life Processes		6(2)		2(2)	5(1)		2(1)	1(1)		3(1)				19(8)
Natural Resources		3(1)	*	2(2)	5(1)	6(2)	2(1)							18(7)
Our Environment		3(1)					2(1)							5(2)
Exploring Space			2(1)			3(1)								5(2)
Sub Total	5(1)	15(5)	4(2)	6(6)	15(3)	12(4)	8(4)	2(2)		6(2)	2(1)			
Total		30 (14)				37 (13)				8(3)				75(30)

Science and Technology
Class X (Theory)
Sample Question Paper - I

Time : 3 Hours

Max Marks : 75

General Instructions :

1. *The question paper comprises of two sections, A and B. You are to attempt both the sections.*
2. *The candidates are advised to attempt all the questions of Section A separately and questions of Section B separately.*
3. *All questions are compulsory.*
4. *There is no overall choice. However, internal choice has been provided in some questions. You are to attempt only one option in such questions.*
5. *Marks allocated to every question are indicated against it.*
6. *Question numbers 1-5 in Section A and 21-23 in Section B are very short answer questions. These are to be answered in one word or one sentence.*
7. *Question numbers 6-10 in Section A and 24, 25 in Section B are short answer questions. These are to be answered in 30-40 words each.*
8. *Questions numbers 11-17 in Section A and 26-29 in Section B are also short answer questions. These are to be answered in 40-50 words each.*
9. *Question numbers 18-20 in Section A and 30 in Section B are long answer questions. These are to be answered in 70 words each.*

SECTION A

- Q1.** What is the effect of an increase in temperature on the rate of a chemical reaction ? 1
- Q2.** Name any two isotopes which readily undergo nuclear fission. 1
- Q3.** Name the functional groups present in : 1
- (a) CH_3COOH
- (b) CH_3COCH_3
- Q4.** Why does it take longer to burn wet wood ? 1
- Q5.** Why are Zirconium, Titanium and Chromium classified as strategic metals? 1
- Q6.** Define the terms
- (a) Astronomical Unit
- (b) Light year
- Give approximate value of each in SI units. 2

- Q7.** Explain giving reasons :
- (i) Tartaric acid is a component of baking powder used in making cakes.
 - (ii) Gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ is used in the manufacture of cement. 2
- Q8.** Calculate the energy released (in MeV) when 1 kg mass is completely converted into energy. (Take $1 \text{ MeV} = 1.6 \times 10^{-13} \text{ J}$, $c = 3.0 \times 10^8 \text{ ms}^{-1}$) 2

OR

- When Uranium undergoes fission, 0.1% of the total mass is converted into energy. Calculate the total amount of energy released in joules during an explosion of an atom bomb which contains 5kg of Uranium.
- Q9.** When a copper wire is left in silver nitrate solution, it is observed that the solution turns bluish green.
- (a) Explain this observation.
 - (b) Write the balanced chemical equation to represent the change taking place. 2
- Q10.** State Right Hand Thumb rule to find the direction of the magnetic field around a current carrying straight conductor. How will this magnetic field be affected on-
- (a) increasing the current through the conductor?
 - (b) changing the direction of flow of current in the conductor? 2
- Q11.**
- (a) Name the product formed when methanol undergoes controlled oxidation.
 - (b) Describe with necessary chemical equations the test you would perform to identify the above product.
 - (c) Name the compound formed when ethanoic acid reacts with ethanol in the presence of concentrated sulphuric acid. 3

OR

- (a) Propanone can be manufactured from Cumene. Write the corresponding chemical equation.
 - (b) Name the compound formed when propanone is reduced. Which reducing agent is generally used in the process ?
 - (c) How is propanone converted to ethanoic acid?
- Q12.** Two identical resistors, each of resistance 10 ohms, are connected (i) in series (ii) in parallel, in turn, to a battery of 6 volts. Calculate the ratio of power consumed in the combination of resistors in two cases. 3
- Q13.** An aqueous solution has hydrogen ion concentration, $[\text{H}^+] = 1.0 \times 10^{-10} \text{ mol L}^{-1}$
- (a) Determine the pH of this solution.
 - (b) Is the solution acidic, basic or neutral?
 - (c) Will the pH of the above solution increase or decrease on adding a drop of 1M HCl to it ? Justify your answer. 3

- Q14.** Draw a labelled diagram of a dry cell. Write the chemical equations involved
- at the anode
 - at the cathode
- while the cell is working. 3

- Q15.** Distinguish between polar and equatorial orbits of artificial satellites. Which of the above two orbits is suitable for a
- geostationary satellite
 - satellite used for weather forecasting? 3

OR

How do we locate the position of the pole star in the sky? Why is the pole star so special?

- Q16.** (a) Draw a flow diagram illustrating the principle used in the manufacture of ammonia by Haber process.
- (b) Describe an activity to show that ammonia is basic and is highly soluble in water. 3

- Q17.** Explain giving reasons :
- Detergent made up of molecules in which branching is minimum are preferred these days.
 - In the manufacture of condensation polymers, each monomer should have at least two reactive sites. Why? Cite an example to support your answer. 3

- Q18.** Biogas technologies are gaining acceptance by both rural and urban population. Why? What is biogas? How is it obtained from cow dung? Draw a labelled diagram of a fixed dome type biogas plant. 5

OR

What is meant by the term 'refining of petroleum'? Draw a labelled diagram of petroleum distillation tower. Why is CNG considered an environment friendly fuel?

- Q19.** Name the lightest element. Why is its presence in the free state in the earth's atmosphere negligible? With a labelled diagram, describe how this element can be prepared in the laboratory. How is this element used in:
- Space programmes
 - Oil industry? 5

OR

- Name the chief ore of iron. How is it concentrated?
- Describe the extraction of iron from the concentrated ore with the help of
 - a labelled diagram of the furnace used.
 - necessary chemical equations representing the chemical changes occurring during the process.

c) How is the conversion of iron into iron oxide prevented during the extraction of iron ?

Q20. Explain Myopia with the help of suitable ray diagrams. How can this defect of vision be corrected ?

A boy uses spectacles of focal length —50 cm. Name the defect of vision he is suffering from. Compute the power of this lens. 5

SECTION B

Q21. What is the name given to a set of unpaired chromosomes of an organism? 1

Q22. What clue does the fossil Archeopteryx provide in regard to organic evolution? 1

Q23. What is meant by 'homologous organs'? 1

Q24. Differentiate between biodegradable and non-biodegradable pollutants. Classify the following under the above two categories 2

DDT, Paper, Cotton cloth, plastics

Q25. Name any two organs that are homologous to human hand. To which category of organs would you place wings of birds and wings of insects?

Q26. a) Draw a labelled diagram of a neuron.

b) Which part of the human brain is responsible for

i) intelligence and memory

ii) adjustment of movement of posture ? 3

Q27. Name the types of sex chromosomes present in

i) Human male and

ii) Human female

What will be the sex of the child produced if a sperm carrying 'Y' chromosome fertilizes the egg ? Name an insect in which similar type of sex determination takes place. 3

Q28. Draw a labelled diagram of the longitudinal section of pistil of a flower. What will happen to the pollen of mango flower if it falls in the stigma of guava flower? 3

Q29. Write the sequence of steps and processes in the primary and secondary treatments of the sewage before it is passed into the final (tertiary) step. 3

Q30. How do (i) temperature (ii) water and (iii) carbon dioxide affect the rate of photosynthesis? During which state of photosynthesis do the following occur :

a) Synthesis of ATP and DPH

b) Synthesis of Carbohydrates? 5

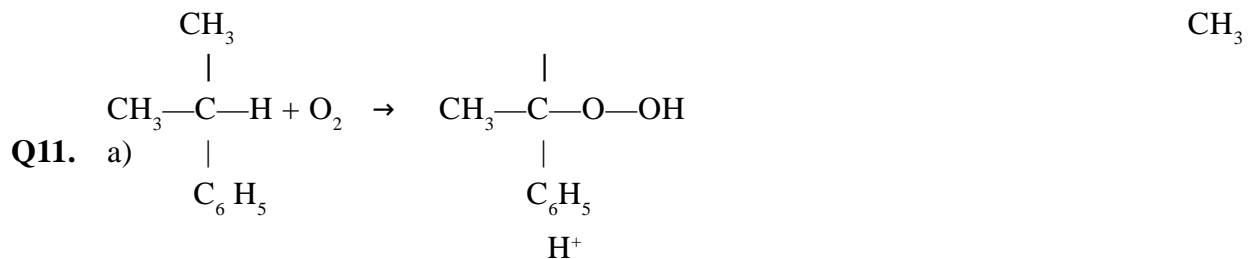
**SAMPLE QUESTION PAPER-I
(SCIENCE AND TECHNOLOGY)
MARKING SCHEME**

Q. NO.	VALUE POINTS	Marks
SECTION - A		
Q1.	Rate of reaction increases.	1
Q2.	^{235}U and ^{239}Pu	$\frac{1}{2}$, $\frac{1}{2}$
Q3.	a) Carboxyl group	$\frac{1}{2}$
	b) Ketonic group	$\frac{1}{2}$
Q4.	Water in the wet wood piece takes a lot of heat to get nonporised/Its ignition temperature is not reached easily.	1
Q5.	These are important for country's economy or its defence.	1
Q6.	a) <u>Astronomical unit</u> is the mean distance between the earth and the sun.	$\frac{1}{2}$
	1.A.U. = $1.5 \times 10^{11}\text{m}$	$\frac{1}{2}$
	b) <u>Light Year</u> is the distance travelled by light in one year.	$\frac{1}{2}$
	1 Light Year = 10^{16}m	$\frac{1}{2}$
Q7.	i) To reduce the taste of sodium carbonate which is bitter.	1
	ii) To delay the settling time of cement.	1
Q8.	$E = mc^2$	$\frac{1}{2}$
	$= 1 \text{ kg} \times (3 \times 10^8 \frac{\text{m}}{\text{s}})^2$	
	$= 9 \times 10^{16}\text{J}$	$\frac{1}{2}$
	$= \frac{9 \times 10^{16}\text{J}}{1.6 \times 10^{-13} \text{ J/Mev}}$	$\frac{1}{2}$
	$= 5.6 \times 10^{29} \text{ Mev}$	$\frac{1}{2}$
OR		
	$E = mc^2$	$\frac{1}{2}$
	$= \frac{5\text{kg}}{1000} \times (3 \times 10^8 \text{ m/s})^2$	$\frac{1}{2}$
	$= \frac{5 \times 9 \times 10^{16}}{10^3} = 4.5 \times 10^{14}\text{J}$	1
Q9.	(a) Copper beings more reactive than silver, displaces it from silver nitrate solution and forms copper nitrate which is bluish green in colour.	1
	b) $\text{Cu}_{(s)} + 2\text{Ag NO}_{3(aq)} \rightarrow 2\text{Ag}_{(s)} + \text{Cu} (\text{No}_3)_{2(aq)}$	1

Q. NO. **VALUE POINTS** **Marks**

Q10. Hold the straight conductor in your right hand such that the thumb points out in the direction of flow of current. Then the direction of curling of the fingers gives the direction of magnetic field lines around the conductor.

- a) increases the strength of the magnetic field 1/2
 b) the direction of magnetic field changes (strength remains the same) 1/2

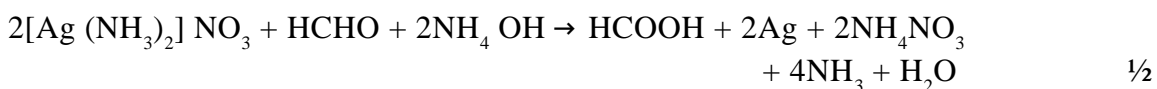


- b) i) Propan-2-one Propanone 1/2
 ii) Sodium Borohydride / NaBH₄ 1/2
 c) Propanone is oxidised to ethanoic acid on treating it with alkaline KMnO₄



OR

- a) Methanal 1/2
 b) Take 2ml of ammoniacal silver nitrate solution in a test tube. Add to it 3-4 drops of the product to be identified. Shake the contents of the tube. Heat the test tube in a hot water bath for 5-10 minutes. If a shining silver mirror is formed along the sides of the test tube, it indicates that the sample to be tested is methanal. 1



- c) ethyl ethanoate 1

Q12. i) When connected in series, the total resistance

$$r = R + R = 2R$$

$$P_1 = \frac{v^2}{r} = \frac{v^2}{2R} \quad 1/2$$

ii) When connected in parallel

$$\frac{1}{r} = \frac{1}{R} + \frac{1}{R} \quad \text{or} \quad \frac{1}{r} = \frac{2}{R} \quad \text{or} \quad r = \frac{R}{2}$$

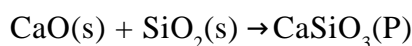
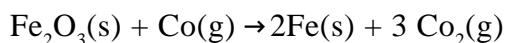
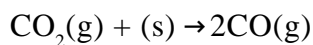
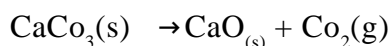
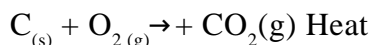
$$P_2 = \frac{v^2}{r} = \frac{v^2}{R/2} = \frac{2v^2}{R} \quad 1/2$$

$$\frac{P_2}{P_1} = \frac{2v^2/R}{v^2/2R} = \frac{2v^2}{R} \times \frac{2R}{v^2} = 4 \quad 1$$

Q. NO.	VALUE POINTS	Marks
Q16.	a) Manufacture of Ammonia : Flow Diagram Fig 14.10 Page 181 NCERT	1½
	b) Fountain Experiment : demonstrating the high solubility in water : Activity 14.5 Page 181 NCERT Text Book	1
	The turning of red litmus to blue solution shows that ammonia is alkaline.	½
Q17.	i) Molecules in which branching is minimum are degraded more easily by the microorganisms present in sewage discharge septic tanks thus they do not result in the pollution of water bodies.	1
	ii) For the growth of carbon chain	1
	$n\text{HO}-\text{CH}_2-\text{CH}_2-\text{OH} + n \text{HOOC}-(\text{CH}_2)_6-\text{COOH} \rightarrow$ $(+\text{O}-\text{CH}_2-\text{CH}_2-\text{O}-\text{CO}-(\text{CH}_2)_6-\text{CO}) \rightarrow n\text{H}_2\text{O}$	
	In the formation of polyester, both the reactants are bifunctional	½
Q18.	For being a self sustaining source of fuel and electricity.	½
	Biogas is a mixture of gases produced during decay of biomass in the absence of Oxygen.	½
	Slurry of cow dung and water is made in the mixing tank from where it is fed into a digester (a closed underground tank). In digester, the action of microorganism breaks down or decomposes the complex compounds of the biomass in the slurry. Biogas which is a mixture of methane. Carbon dioxide, hydrogen and hydrogen sulphide is produced.	2
	Fixed Dome Type Biogas Plant Page 96, Fig. 7.14 (a) NCERT Text Book	
	Diagram :	1
	Labelling :	1
	any four :	1 mark
	any two :	½ mark
OR		
	Fractional distillation of petroleum	1
	Diagram : Petroleum Distillation Tower Fig 7.15 Page 98 NCERT Text Book	1
	Labelling : any 4 products with correct temperatures	4x½=2
	Burning of CNG produces carbon dioxide and water with no polluting gases or particulate matter as by-products.	1
Q19.	a) Haematite	½
	<u>Hydraulic Washing</u> : The ore is concentrated by treating it with a stream of water to remove unwanted particles	½
	b) i) Lablled Diagram of Blast Furnace : Fig 14.6 Page 174 NCERT Text Book	1+½

Q. NO.	VALUE POINTS	Marks
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ii) Equations :



Slag

Molten slag floats over the molten iron and does not let oxygen come in contact with iron. 1/2

OR

Hydrogen 1

Hydrogen is a very reactive element. 1

Diagram : Laboratory Preparation of

Hydrogen : Fig 14.8 Page 179 NCERT Text Book 1

Labelling :

a) Liquid hydrogen has been used as a fuel in the rockets of American space programmes. 1/2

b) In the hydrogenation of vegetable oils at 473K in the presence of Ni. catalyst. 1/2

Q20. Fig 4.2 (a) The Myopic Eye, Page 48 NCERT Text Book. In Myopia, the image of a distant object is formed in front of the retina and not at the retina. Consequently a near sighted person can not focus clearly on an object farther away than the far point for the defective eye. 1/2

This defect can be corrected by using a concave lens of appropriate focal length. Which is able to bring the image of the object back on the retina itself. 1/2

Fig 4.2 : (b) Correction of Myopic eye by appropriate concave lens, Page 48 NCERT Text Book

Power of lens, $P = \frac{1}{f(m)}$ 1/2

$$P = -\frac{1}{50cm} = -\frac{1}{0.5m} = -2.0D$$

As P is negative, the lens used is a concave lens. Hence the defect of vision is Myopia. 1/2

SECTION-B

Q21. Haploid 1

Q. NO.	VALUE POINTS	Marks
Q22.	Birds have evolved from reptiles.	1
Q23.	Organs that show structural similarity / they develop in a similar fashion and perform different function.	1
Q24.	<u>Biodegradable pollutants</u> can be broken down by micro-organisms / bacteria while non-biodegradable can not.	1
	Non-biodegradable : DDT, Plastic	½
	Biodegradable : Paper, Cotton Cloth	½
Q25.	Forelimbs of frog, wings of a bird	½, ½
	Analogous organs.	1
Q26.	a) Labelled diagram of neuron : Fig 11.3 Page 145 NCERT Text Book	
	Diagram	1
	Labelling :	
	b) i) Fore brain	½
	ii) Hind brain	½
Q27	i) X and Y chromosomes in a human male	½
	ii) Only X chromosomes in a female.	½
	A male child will be produced	1
	Drosophila	1
Q28.	Fig 12.9 Page 153 NCERT Text Book : Fertilization in a flowering plant	1
	4 labels	1
	The pollen of mango will not germinate / will die / will perish	1
Q29.	<u>Primary</u> : Sewage passed through grinding mechanism, then passed through several settling chambers, neutralised with lime.	3x½=1½
	<u>Secondary</u> : Sent to USAB, anaerobic bacteria degrade the bio degradable material, removes foul odour/ releases methane	3x½=1½
Q30.	<u>Temperature</u> : Photosynthesis increases by initial rise in temperature but high temperature (40°C and above) inhibits photosynthesis. Photosynthesis involves enzyme action, low temperature inhibits enzyme action and high temperature destroys enzyme.	1½
	<u>Water</u> : Photosynthesis is low when water is deficient. Shortage of water leads to <u>Closure of Stomata</u> to reduce transpiration, closure of stomata reduce / stop entry of Co ₂ into the leaf.	3x½=1½
	<u>Carbon Dioxide</u> : Photosynthesis increases with more Co ₂ available upto a certain level. Above that level no effect, or even inhibits	1
	a) Light reaction	½
	b) Dark reaction	½

SAMPLE QUESTION PAPER II

Subject : Science and Technology

Paper : Theory

Class : X

Maximum Marks : 75

Time : Three Hours

BLUE PRINT II

Objective →	Knowledge				Understanding				Application				Total
	LA	SA I	SA II	VSA	LA	SA I	SA II	VSA	LA	SA I	SA II	VSA	
Form of → questions Content Unit ↓			II			I	II				II		
Chemical Reactions and Some Important Chemical Compounds				1(1)		3(1)	2(1)						6(3)
Energy	5(1)		2(1)	1(1)	5(1)	6(2)		1(1)		2(1)			22(8)
Life Processes	5(1)	3(1)		1(1)		6(2)		1(1)	3(1)				19(7)
Natural Resources	5(1)	3(1)				6(2)		1(1)	3(1)				18(6)
Our Environment			2(1)				2(1)	1(1)					5(3)
Exploring Space			2(1)				2(1)	1(1)					5(3)
Sub Total													
Total			30 (11)			37 (16)				8(3)			75(30)

Science and Technology
Class X (Theory)
Sample Question Paper - II

Time : 3 Hours

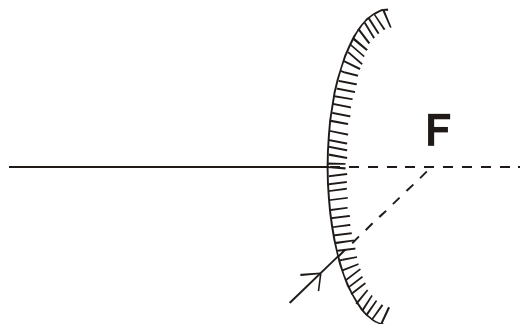
Max Marks : 75

General Instructions :

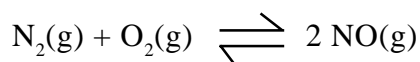
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9. *Question numbers 18-20 in Section A and 30 in Section B are long answer questions. These are to be answered in 70 words each.*

SECTION-A

- Q1.** Name one gaseous fossil fuel. 1
- Q2.** Complete the path of ray of light after reflection at the mirror in the given diagram : 1



- Q3.** Express one light year in terms of SI unit of distance- 1
- Q4.** Give an example of a photochemical reaction. 1
- Q5.** An organic compound is a constituent of beer, whisky and some cough syrup. It is produced by fermentation of sugar. Identify the organic compound. 1
- Q6.** Name any two Jovian Planets. Write their common features. 2
- Q7.** A current carrying straight conductor is placed in east-west direction. What will be the direction of the force experienced by this conductor due to earth's magnetic field ? How will this force get affected on :
- a) reversing the direction of flow of current?
- b) doubling the magnitude of current?
- Q8.** How do we obtain information about the interior of earth ? 2
- Q9.** What kind of energy transformation takes place in an electric motor? Name any two devices which use electric motor as an essential component in their working. 2
- Q10.** Write the equilibrium constant expression for the following chemical reaction : 2



What does a very small value of $K_e = 4.8 \times 10^{-31}$ for this reaction indicate?

- Q11.** An object of size 5cm is placed at a distance of 25 cm from the pole of a concave mirror of radius of curvature 30 cm. Calculate the distance and size of the image so formed. What will be the nature of the image?

OR

An object of size 3 cm is placed at a distance of 15 cm from a convex lens of focal length 10 cm. Calculate the distance and size of the image so formed. What will be the nature of the image?

- Q12.** Two electric lamps rated 100W, 220 V and 25W, 220V are connected in parallel to a 220V supply. Calculate the total electric current in the circuit. 3

OR

A metallic coil connected to a 220V supply, has a resistance of 110 ohms (while hot). How long will it take this coil to heat 1 kg of water from 20°C to 70°C? Assume that whole of heat produced by the coil is taken up by water.

(Sp. Heat capacity of water = 4186 J/kg°C) 3

- Q13.** Describe with chemical equations what happens when, 3
- i) Carbon-dioxide gas reacts with ammonical brine in Solvay process.
- ii) Bleaching powder is left exposed to the air containing carbon-di-oxide gas.
- iii) A mixture of finely powdered sand and sodium carbonate is heated in a tank furnace.

- Q14.** Give Chemical tests to : 3
- i) detect the presence of ethanol.
 - ii) show that methanol contains an aldehyde group.
 - iii) show a saponification reaction.
- Q15.** An organic compound A having molecular formula $C_2H_4O_2$ reacts with sodium metal and evolves a gas B which readily catches fire. A also reacts with ethanol in the presence of concentrated sulphuric acid to form sweet smelling substance C used in making perfumes.
- i) Identify the compounds A, B and C.
 - ii) Write balanced chemical equations to represent the conversion of :
 - a) Compound A into Compound B
 - b) Compound A into Compound C
- Q16.** a) Explain the role of the following in the extraction of Aluminium from Bauxite ore : 3
- i) Cryolite.
 - ii) Inside lining of graphite of the electrolyte tank
- b) Also draw a labelled diagram of the tank used in the electrolytic reduction of Alumina.
- Q17.** Which two metals do not corrode easily ? Give an example in each case to support that: 3
- i) Corrosion of some metals is an advantage.
 - ii) Corrosion of a metal is serious problem.
- Q18.** Draw a labeled diagram of a nuclear reactor. Name its three main parts and explain the function of each. 5

OR

Draw a schematic diagram showing essential steps in a controlled chain reaction. What is enriched uranium? Why is it essential to use enriched Uranium for nuclear fission reaction? Name one more element other than U-235, which readily undergoes nuclear fission.

- Q19.** Draw a labelled diagram of an astronomical telescope. Write an expression for its: 5
- i) magnification in normal adjustment position.
 - ii) tube length in normal adjustment position.
- You are given four convex lenses of focal length 5cm, 20 cm, 50 cm and 100 cm. Which of the two lenses will you select for constructing an astronomical telescope and why?

- Q20.** a) Name the sulphur compound present as an impurity in natural gas.
b) What possible valencies are shown by sulphur in its compounds?
c) Draw a labelled diagram of the Frasch process used in the extraction of sulphur.

OR

- a) Why is sulphuric acid called the 'King of Chemicals'?
b) Describe with chemical equations how is sulphuric acid manufactured by 'Contact Process'.
c) Describe an activity to show that concentrated sulphuric acid is a powerful dehydrating agent.

SECTION-B

- Q21.** Name the type of chromosome in which the centromere is near the middle and the two arms are almost equal in length. 1
- Q22.** Which organ in human body produce haploid cells through the division of diploid cells? 1
- Q23.** Why do we categorise asbetosis as an occupational hazard? 1
- Q24.** How is acid rain formed? Mention any one of its harmful effects other than the corrosion of monuments? 2
- Q25.** Excessive nutrients in the sewage flowing into the water bodies may lead to the death of fishes and other aquatic animals. Why will it so happen? 2

OR

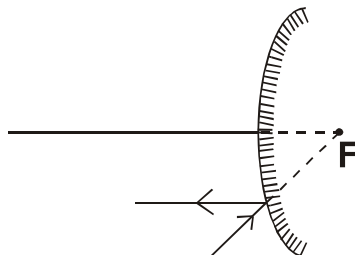
What is meant by the term 'Sustainable development'? Suggest any two ways to achieve it.

- Q26.** Write the effect of sympathetic nervous system on the following : 3
- i) Heart
 - ii) Blood vessels
 - iii) Bronchi
 - iv) Eyes
 - v) Gastric Bladder

- Q27.** Define transpiration. How does transpiration help in upward movement of water from roots to leaves? Draw the diagram of the part of the leaf from which transpiration takes place.
- Q28.** Why is blood circulation in human heart called double circulation ? Explain briefly. How is 'Pace maker' helpful to a heart patient? 3
- Q29.** Differentiate between breathing and respiration. Explain clearly how the air is inhaled and exhaled during breathing in humans. 3
- Q30.** What are two vital functions of the human kidney? Draw labelled diagram of human urinary system. Name the procedure used in the working of an artificial kidney. 5

MARKING SCHEME
SAMPLE QUESTION PAPER-II

SECTION A

Q. NO.	VALUE POINTS	Marks
Q1.	Natural Gas	1
Q2.		1
Q3.	One light year = 9.45×10^{16} m.	1
Q4.	Photosynthesis / Exposure of photographic film to sunlight.	1
Q5.	Ethanol / Ethyl alcohol	1
Q6.	Jupiter, Saturn, Neptune, Uranus (any two)	$\frac{1}{2}, \frac{1}{2}$
	i) These are all gaseous bodies	
	ii) These have ring systems around them.	
	iii) These have large number of moons. (any two)	$\frac{1}{2}, \frac{1}{2}$
Q7.	The direction of earth's magnetic field is from geographic south to north. The direction of electric current is east to west (say) The direction of force experienced by the current carrying conductor will be vertically upward	1
	a) On reversing the direction of current, the direction of the force experienced by the conductor is also reversed.	$\frac{1}{2}$
	b) The magnitude of force will get doubled on doubling the current.	$\frac{1}{2}$
Q8.	Through Seismic wave studies Seismic waves travel with different velocities in regions of different compositions By measuring the velocities of Seismic waves, Scientists gather information about various layers of the interior of the earth	1
Q9.	Electrical energy is converted into mechanical energy. Electric fan, Washing Machine, Refrigerator, Mixer, Blender (any two)	$\frac{1}{2}, \frac{1}{2}$

Q. NO. **VALUE POINTS** **Marks**

Q10. $K_c = \frac{[\text{NO}]^2}{[\text{N}_2][\text{O}_2]}$ 1

N_2 and O_2 will be dominant species in the system at equilibrium. 1

Q11. $O = 5 \text{ cm}$

$u = -25 \text{ cm}$

$f = -\frac{30}{2} \text{ cm} = -15 \text{ cm}$

$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ 1/2

$\frac{1}{v} = -\frac{1}{u} + \frac{1}{f}$

$\frac{1}{v} = \frac{1}{25} - \frac{1}{15} = \frac{3-5}{75} = -\frac{2}{75}$ 1/2

$v = -\frac{75}{2} \text{ cm} = -37.5 \text{ cm}$ 1/2

$m = \frac{I}{O} = -\frac{v}{u} = -\frac{37.5 \text{ cm}}{25 \text{ cm}} = -1.5$ 1/2

$I = O \times -1.5 = 5 \text{ cm} \times -1.5 = -7.5 \text{ cm}$ 1/2

The minus sign indicates that the image formed is real and inverted. 1/2

OR

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ 1/2

$\frac{1}{10} = \frac{1}{v} + \frac{1}{15}$ 1/2

$\frac{1}{v} = \frac{1}{10} - \frac{1}{15} = \frac{3-2}{30} = \frac{1}{30}$ 1/2

$v = 30 \text{ cm}$ 1/2

$m = \frac{I}{O} = \frac{v}{u} = \frac{30 \text{ cm}}{-15 \text{ cm}} = -2$ 1/2

$\frac{I}{3 \text{ cm}} = -2$

$I = -6 \text{ cm}$

The negative sign indicates that the image formed is real and inverted. 1/2

Q. NO.	VALUE POINTS	Marks
Q12.	Resistance of the first lamp, $r_1 = \frac{v^2}{p_1} = \frac{220v \times 220v}{100w} = 484 \text{ ohms}$	1/2

	Resistance of the second Lamp, $r_2 = \frac{v^2}{p_2} = \frac{220v \times 220v}{25w} = 1936 \text{ ohms}$	1/2
--	---	-----

Total resistance of the combination when connected in parallel

	$R = \frac{r_1 r_2}{r_1 + r_2} = \frac{484 \text{ ohms} \times 1936 \text{ ohms}}{(484 + 1936) \text{ ohms}} = 387.2 \text{ ohms}$	1
--	--	---

	Current drawn from the battery $I = \frac{V}{R}$ $= \frac{220 \text{ v}}{387.2\Omega}$ $= \frac{25}{44} \text{ A}$	
--	--	--

OR

	Let it take t seconds to heat 1 kg of water from 20°C to 70°C	1/2
--	---	-----

	Energy consumed in t seconds = $\frac{V^2}{R} t$ $= \frac{220 \text{ v} \times 220v}{110\Omega} \times t \text{ joules}$ $= 440 t \text{ joules}$	1/2
--	---	-----

	Heat energy required by water = ms Δθ	1/2
--	---------------------------------------	-----

	$= 1\text{kg} \times \frac{4186 \text{ J}}{\text{kg}^0 \text{ C}} \times 50^\circ\text{C}$	
--	--	--

According to Law of conservation of Energy 440t joules = 4186 x 50 joules

	$t = \frac{4186 \times 50}{440}$ $= 476 \text{ seconds}$	1/2
--	---	-----

Q13.	i) Sodium hydrogen carbonate is formed	1/2
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	ii) It gradually loses its chlorine.	1/2
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	iii) Sodium Silicate is formed	1/2
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Q. NO.	VALUE POINTS	Marks
Q14	i) Add clean piece of sodium metal to 2ml of ethanol in a test tube. The evolved gas burns with a pop sound.	1
	ii) Add 3-4 drops of methanal to 2ml of ammoniacal silver nitrate solution. Heat the test tube. Shining silver mirror is formed along the side of the test tube.	
	iii) Take 2ml of ethyl ethanoate and 4 ml of sodium hydroxide solution in a boiling tube. Two distinct layers are formed as the two liquids are immiscible. Heat the mixture in a water bath at about 330K for about 20 minutes. Notice that the ester layer is decreased to saponification of ester layer to yield sodium ethanoate and ethanal both being soluble in water.	1
Q15.	i) A : Ethanoic acid / CH ₃ COOH	½
	B : Hydrogen / H ₂	½
	C : Ethylethanoate / CH ₃ COOC ₂ H ₅	½
	ii) (a) $2\text{C}_2\text{H}_5\text{OH} + 2\text{Na} \rightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2$	½
	(b) $\text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{COOH} \xrightarrow{\text{H}_2\text{SO}_4} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$	1
Q16.a)	i) A mixture of cryolite and alumina is a better conductor of electricity than molten alumina	½
	ii) The inside lining of graphite acts as a cathode and molten aluminium is produced at the cathode	½
	b) Fig. 14.5 Page 174 NCERT Text Book	1+1
Q17.	Gold, Silver	½, ½
	i) A thin layer of aluminium oxide formed forms a protective layer which protects the Aluminium metal underneath from further damage	1
	ii) Corrosion of iron is a serious problem. Every year enormous amount of money is spent to replace damaged iron	1
Q18.	Labelled Diagram of a Nuclear Reactor :	
	Fig 8.7 Page 114 NCERT Text Book	
	Diagram	1
	Labelling	1
	<u>Fuel rods</u> made of fissionable material like ²³⁵ U, Fission of which produces energy	½, ½
	<u>Control rods</u> made of cadmium which absorb some of the neutrons produced in fission reaction so that a controlled chain reaction is possible.	½, ½
<u>Moderator</u> like heavy water which slows down the neutrons to facilitate sustained chain reaction.	½, ½	

Q. NO.	VALUE POINTS	Marks
Q19.	Diagram : Page 51, Fig 4.7 NCERT Text Book	
	Diagram	2
	Labelling : objective, Eye piece	½, ½
	$m = \frac{fo}{fe}$	½
	$L = fo + fe$	½
	Objective : 100 cm focal length, Eyepiece : 5 cm focal length	½
	To have maximum magnifying power	½
Q20.	a) Hydrogen sulphide	1
	b) 2, 4, 6	1
	c) Fig 14.2 Page 183 NCERT Text Book : Frasch Process	
	Diagram :	1
	Labelling : compressed air, superheated water, Molten Sulphur and air, sulphur beds	4x½=2

OR

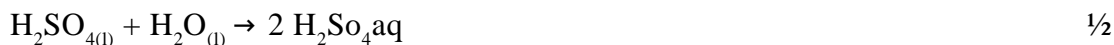
- a) Because it is used in the manufacture of a large number of substances like fertilizers, paints, synthetic fibres and detergents.
- b) i) SO_2 is produced by burning sulphur in air $\text{S(s)} + \text{O}_2(\text{g}) \rightarrow \text{SO}_2(\text{g})$ ½
- ii) SO_2 is mixed with more air and passed over a catalyst vanadium oxide heated to 723 K whereby SO_3 is formed.



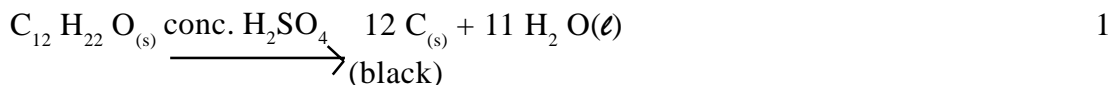
- iii) SO_3 is dissolved in conc H_2SO_4 , whereby oleum is formed.



- iv) Oleum is then diluted with water to get H_2SO_4 of desired strength.



- c) Put some sugar in a test tube. Add a few drops of conc. H_2SO_4 to it. Sugar turns black. The acid removes water leaving behind a black residue of carbon 1



SECTION - B

Q21.	Metacentric	1
Q22.	Testes / ovary	1

Q. NO.	VALUE POINTS	Marks
Q23.	People working in asbestos using industry may suffer from cancer due to asbestos dust present in air.	½, ½
Q24.	Oxides of Nitrogen and sulphur present in the atmosphere dissolve in the rain water to form nitric acid and sulphuric acid. The rain carrying such oxides is called <u>acid rain</u> Soil is degraded leading to a decline in forest / agricultural productivity.	1 1
Q25.	Nutrients lead to excessive growth of phytoplankton, algal bloom which deplete the Oxygen dissolved in water. When the phytoplanktons die, they get putrefied. This consumes most oxygen of water resulting in the death of fish and other aquatic animals.	1 1

OR

Sustainable development means to maintain a balance between environment and development to meet the needs of present generation without fore closing the options for future generation

1. Conservation
 2. Maximising recycling and efficient use of resources
 3. Adopt technologies which are environmentally sound (any two) ½, ½
- Q26. Heart : increases concentration and rhythm
Blood vessels : Constriction
Bronchi : Dilator
Eyes : Dilation of pupil
Gastric Secretion : Inhibition
Urmary Bladder : Relaxation 6x½=3
- Q27. Transpiration is the loss of water in the vapour form from leaf into the atmosphere. 1
Evaporation of water from cells of the leaf creates suction force, which pulls the water upward from the xylem cells, of the stem / root. 1
Diagram : Fig. 9.12 Stomata Page 128 NCERT Text Book 1
- Q28. For making one complete round, the blood passes through the heart trivce ½
Deoxygenated blood from the body received in right atrium, with the contraction of the heart it is forced into right ventricle and next into lungs (for oxygenation) (pulmonary lung circulation), the oxygenated blood is returned into the heart (left atrium and then into left ventricle), which forces the blood to the whole body to return once again into the right atrium (body circulation) 1½
Pace maker takes the place of specialised muscle cells that inititate heart beat. 1

Q. NO.	VALUE POINTS	Marks
Q29.	<u>Breathing</u> is movement of air into and outside the lungs.	
	<u>Respiration</u> : The entire process of receiving the oxygen and its utilization in the body cells to produce energy	$\frac{1}{2} + \frac{1}{2}$
	<u>Inhalation</u> : Diaphragm contracts (pulled down), Rib raised by muscles, Thoracic cavity expands, Air pressure (inside lungs) decreased and the air from outside rushes in.	$2 \times \frac{1}{2} = 1$
	<u>Exhalation</u> : Diaphragm relaxes, Ribs lowered, Thoracic cavity compressed, Air forced out..	$2 \times \frac{1}{2} = 1$
Q30.	a) 1. To clean the blood of metabolic wastes.	1
	2. To maintain normal levels of water and mineral ions in body fluids	1
	b) <u>Diagram</u> : Human Urinary system fig. 10.14 Page 140 NCERT Text Book	
	<u>Labelling</u> :	1
	The procedure used is called <u>dialysis</u>	1