

**WORKSHOP ON CONTENT ENRICHMENT AND ACTIVITY SUPPLEMENTATION
ON THE EXISTING CURRICULUM IN SCIENCE AND MATHEMATICS
FOR SECONDARY SCHOOL TEACHERS OF LAKSHADWEEP**

May 23 - June 4, 1988

R E P O R T



REGIONAL COLLEGE OF EDUCATION, MYSORE-570 006

National Council of Educational Research and Training, New Delhi

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REPORT

**Department of Science
Regional College of Education
(National Council of Educational Research and Training)
Mysore 570006, Karnataka**

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REPORT

As a part of our efforts to improve the quality of science education in the Union Territory of Lakshadweep, the Regional College of Education, NCERT, Mysore planned a two week workshop on content enrichment and activity supplementation on the existing curriculum in Science and Mathematics for secondary school teachers of Lakshadweep. The workshop was organised by the Regional College of Education, Mysore during 23rd May 1988 to 4th June 1988. Thirty science and mathematics teachers (Appendix 1) from the Union Territory of Lakshadweep attended the workshop. The workshop was specifically designed for the teachers who are teaching science and mathematics in classes IX and X. Fifteen faculty members of RCE, Mysore from the disciplines of chemistry, physics, mathematics and biology were involved in the workshop as resource persons (Appendix 2). Since the teachers are teaching only one science subject at the 9th and 10th level, it was decided to orient the participants in one subject area only during the two week duration of the workshop. The thirty participants were accordingly divided into the respective subject groups : chemistry - 5; biology - 8; mathematics - 11; physics - 6. Both pretests and post tests in the subject areas were given to the teachers to evaluate their achievement in the programme (Appendix 3). The day-to-day programme of the workshop consisted of (a) Lecture cum discussion on the topics, (b) activities conducted by the school teachers (Appendix 4), (c) screening of films (Appendix 5), (d) improvisation of teaching aids.

The participants were given instructional materials (Appendix 6) on content enrichment and activities relevant to the teaching of the subject area at the 9th and 10th level. A visit to Central Food Technological Research Institute, Mysore, a leading institute of the CSIR, Government of India, was arranged for the participants in the afternoon of 1st June 1988. A general session on the teaching of integrated science and mathematics was held in the forenoon of 1st June 1988.

Dr.A.N.Maheshwari, Principal, Dr.A.C.Banerjee, Professor of Chemistry, Dr.V.Shankaram, Reader in Mathematics acquainted the participants with the national curriculum framework and the approach of teaching science and mathematics at the secondary level as per the New Education Policy. The participants were made aware of the future implications and relevance of teaching integrated science and mathematics in the context of general education as envisaged in the New Education Policy. The valedictory address was given by Dr.A.N.Maheshwari, Principal, RCE, Mysore on the concluding day on 4th June 1988. The subject co-ordinators of the biology/chemistry/physics and mathematics groups made special reference about the sincerity and positive attitude of the participants towards the learning and teaching of science and mathematics in the different subject areas.

Relevant part of the report of the workshop in the different subject areas are given below:

CHEMISTRY:

Five teachers were trained in the area of chemistry at the secondary level. (Class IX and X)

A. Units covered:

1. Chemical Equilibrium
2. Chemical kinetics
3. Acids and Bases
4. Oxidation and Reduction
5. Chemical bonding
6. Structure of atom
7. Organic chemistry

B. List of Activities: (Appendix 4)

C. List of Instructional Materials Supplied: (Appendix 6)

D. List of films screened: (Appendix 5)

E. Evaluation: (The pre and post-tests are given in appendix 3)

The pre-test and post-test scores for the five chemistry teachers were in the range 57-72% and 71-92% respectively. A positive improvement in the achievement of the participants were evident from the analysis of tests. The tests had questions mostly at the understanding and application level. The analysis of the pre-test indicate that the teachers had conceptual difficulties/misconceptions in the area of quantum numbers and orbitals, metallic bond, oxidising and reducing species, activation energy, equilibrium and rate, nomenclature of organic compounds. Most of the conceptual difficulties/misconceptions were clarified during the course of the workshop. However, the post-test results indicate that the teachers had still conceptual difficulties in the topics : activation energy, relation between rate and equilibrium.

PHYSICS:

Six teachers were trained in the area of physics at the secondary level. (Class IX and X)

A. Units covered:

1. Laws of motion
2. Forces in nature, work, energy and power
3. Sound, electronics
4. Electricity and magnetism, transmission of powers

B. List of activities: (Appendix 4)

C. List of Instructional Materials Supplied: (Appendix 6)

D. List of films screened: (Appendix 5)

E. Improvisation of Teaching Aids:

1. One motor-generator model using a condemned fluorescent tube choke.
2. One horse-shoe electromagnet using a condemned fluorescent tube choke.
3. One solenoid approximately 12cm long.

F. Evaluation: (The pre and post-tests are given in Appendix 3)

The pre and post-test scores of the six physics teachers were in the range 35-70% and 43-83% respectively. As can be seen from the scores of the pre-test, the teachers came with a poor understanding of the basic concepts in physics especially in mechanics and electricity-magnetism. The scores of the post-test show that the teachers have improved their content competence to some extent.

MATHEMATICS:

Eleven teachers were trained in the area of mathematics at the secondary level. (Class IX and X)

A. Units covered:

1. Number system and real valued functions.
2. Polynomials and Graph of linear equations and linear inequations.
3. Vectors, Matrices and Trigonometry
4. Statistics

B. List of Instructional Materials Supplied: (Appendix 6)

C. Evaluation:

The pretest and post test scores are given in Appendix 3. The pre and post test scores of the 11 mathematics teachers were in the range 37-59% and 50-81% respectively.

After analysing the answer scripts of the mathematics pre-test, it was found that the participants had basic difficulties regarding (1) irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{6}$, etc. (2) framing the linear equation for the sides of a given rectilinear figure, and (3) class intervals and frequency distribution. After analysing the answer scripts of the mathematics post-test, it was observed that the participants in general have performed much better than in the pre-test, though the post-test was of higher level than the pretest. But still it appears that they have difficulties in the concepts regarding the operations with the decimal numbers and irreducibility of polynomials over rationals.

BIOLOGY:

Eight teachers were trained in the area of Biology at the secondary level. (Class IX and X)

A. Units covered:

1. The cell
2. Metabolism - respiration
3. Breathing mechanism in the animal world
4. Nutrition - photosynthesis
5. Control and coordination - Reflex action, Endocrine glands
6. Reproduction - cell division
7. Growth in plants
8. Transport in plants
9. Mendel's Laws
10. DNA and genetic Engineering

B. List of Activities: (Appendix 4)

C. List of films screened: (Appendix 5)

D. Evaluation: The pre test and post test scores are given in Appendix3.

The pretest and post test scores of the eight biology teachers were in the range 40-66% and 50-88% respectively. The results of the pretest in general showed that the teachers were reasonably good in the content of biology. There is an improvement in their understanding during the course of the workshop as revealed from the post test performance.

APPENDIX I

LIST OF PARTICIPANTS

Chemistry:

1. N.Nandi Namboodiripad .
2. P.Thomas Yoyaku
3. B.B.Mohammed
4. S.Remadevi
5. P.G.Chandralekha

:

Biology:

1. P.Aboosalam Koya
2. B.Aboosala
3. S.Pookunhi Koya
4. K.A.Mohammed Koya
5. T.K.Abdul Khader
6. J.Thankamma
7. N.Jahnaveedevi
8. P.J.Kunbibibi

Physics:

1. P.M.Damodaram
2. K.Kunhi
3. V.Narayanan Namboodiri
4. P.V.Purushothaman
5. K.Raveendranath
6. P.Yousuf

Mathematics:

1. L.Syamala
2. B.V.Anil
3. P.Hamzakoya
4. A.C.Joy
5. P.Bharathan
6. T.Lakshmanan
7. Vijayan
8. B.Vijayamma
9. M.M.Hamzakoya
10. T.Chandran
11. S.Sivaprasad

APPENDIX 2

LIST OF RESOURCE PERSONS

Academic Coordinator of the Workshop : Dr.A.C.Banerjee

Chemistry:

1. *Dr.A.C.Banerjee, Professor of Chemistry*
2. *Dr.T.J.Vidyapati, Lecturer in Chemistry*
3. *Dr.B.S.Raghavendra, Lecturer in Chemistry*

Physics:

1. *Dr.Somnath Datta, Professor of Physics (Coordinator)*
2. *Dr.S.N.Prasad, Reader in Physics*
3. *Dr.R.Narayanan, Lecturer in Physics*
4. *Mr.N.R.Nagaraja Rao, Lecturer in Physics*

Mathematics:

1. *Dr.V.Shankaram, Reader in Mathematics (Coordinator)*
2. *Dr.G.Ravindra, Reader in Mathematics*
3. *Dr.N.M.Rao, Reader in Mathematics*
4. *Dr.K.Dorasami, Reader in Education*

Biology:

1. *Dr.N.Sreeramulu, Reader in Botany (Coordinator)*
2. *Dr.C.K.Ashok Kumar, Reader in Botany*
3. *Dr.M.Z.Siddiqui, Reader in Zoology*
4. *Dr.L.Srikantappa, Reader in Zoology*

APPENDIX 3

WORKSHOP ON CONTENT ENRICHMENT AND ACTIVITY SUPPLEMENTATION ON THE EXISTING CURRICULUM IN CHEMISTRY FOR SECONDARY SCHOOL TEACHERS OF LAKSHADWEEP

PRE-TEST IN CHEMISTRY

Time: 1 Hour

Max. Marks: 20

PART 'A'

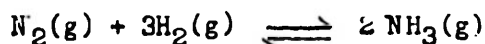
Indicate the answer to each question by encircling the alphabet of the correct alternative from amongst the ones given against the corresponding question. 15x1=15

1. Consider the following equilibrium



After equilibrium has been established the concentration of A is instantaneously increased but the volume and temperature remain constant. When equilibrium is re-established the rates of the forward and reverse reactions will be

- (a) equal to those at the initial equilibrium
 - (b) greater than at the initial equilibrium
 - (c) less than at the initial equilibrium
 - (d) the data is insufficient for any conclusion.
2. What are the main species present in the following solutions?
- (a) 0.0010 mol L⁻¹ nitric acid solution.
 - (b) 0.010 mol L⁻¹ acetic acid solution.
 - (c) 0.0010 mol L⁻¹ sodium hydroxide solution.
 - (d) 0.100 mol L⁻¹ ammonia solution.
3. Which one of the following statements is correct?
- (a) All acids are electrolytes.
 - (b) All acids are strong electrolytes.
 - (c) All strong acids are strong electrolytes
 - (d) All electrolytes are acids.
4. In the following reversible reaction, the forward reaction is exothermic



What will be the rate of the forward and reverse reaction if the reaction temperature is raised?

- (a) Increase
- (b) Decrease
- (c) remain same.

5. Consider the following statements about a chemical reaction. Which one is True?
- (a) The total number of molecules remain unchanged
 - (b) The total number of moles remain unchanged
 - (c) The total mass is not altered.
 - (d) The total number of reacting molecules is equal to the number of molecules of the product formed.
6. A mole is defined as
- (a) molecular weight expressed in grams
 - (b) molecular weight divided by 1 gm of H_2
 - (c) number of molecules contained in one litre of a gas at STP
 - (d) number of particles contained in 12 gm of carbon of atomic mass 12
7. An organic compound with the molecular formula C_3H_6O can be
- (a) carboxylic acid
 - (b) saturated alcohol
 - (c) unsaturated alcohol
 - (d) ester.
8. Which one of the following ^{on}hydrogenation yields propane
- (a) C_3H_6O
 - (b) C_3H_8
 - (c) C_3H_6
 - (d) C_4H_8
9. Hydrogenation reaction can be used to distinguish between
- (a) methanol and ethanol
 - (b) formic acid and acetic acid
 - (c) ethane and ethylene
 - (d) ethane and methane

10. Glucose and fructose may be readily distinguished from one another using
- (a) schiff's reagent
 - (b) molisch test
 - (c) fehling's test
 - (d) acetyl chloride.
11. Select the one in which bonding is ionic
- (a) A yellow solid that melts at 119°C to form a clear liquid. Both solid and liquid are poor conductors of electricity.
 - (b) A silvery solid that melts at 98°C to form a silvery liquid. Both solid and liquid are good conductors of electricity.
 - (c) A dark shiny solid that sublimates to form a purple vapour. It is a poor conductor of electricity and of heat.
 - (d) A white solid that melts at 772°C to form a colourless liquid. The solid does not conduct electricity, the liquid does.
12. Which of the following is the best description of metallic bonding?
- (a) Electrons are shared between two atoms
 - (b) Electrons are transferred from one atom to another
 - (c) Electrons are set free
 - (d) Molecules attract each other.
13. Which of the following is polar covalent
- (a) H_2
 - (b) NaBr
 - (c) HCl
 - (d) NaCl
14. Select the wrong statement
- (a) Oxidation and reduction processes occur simultaneously.
 - (b) Oxidation is an increase in oxidation state of an element
 - (c) Oxidising agent gets oxidised in a redox reaction
 - (d) Reduction is decrease in oxidation state of an element.

15. Oxidation state of Mn in KMnO_4 is

(a) +5

(b) +3

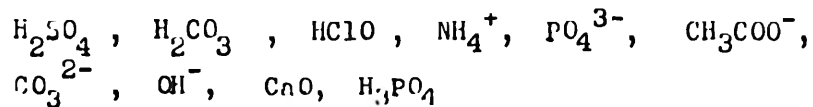
(c) +9

(d) +7

PART 'B'

Provide answers in brief for each of the following questions in the space provided.

1. Classify the following into strong-acid, weak-acid, strong-base, weak-base:



2. Will there be any H^+ ions in a 0.1 M NaOH solution? Give reasons.

3. Calculate the pH and H^+ ion concentration of a 0.01 M HCl solution.

4. In a chemical reaction once equilibrium is established in the reaction mixture, no more product will be formed no matter how long we wait. For example, in the production of ammonia from nitrogen and hydrogen, the yield of ammonia becomes constant (around 50%) once equilibrium is attained under optimum conditions with temperature (400°C), total pressure (400 atm) and iron catalyst. What will you do to increase the yield of ammonia?

5. Will the activation energy of a reaction change significantly if the reaction temperature is altered? Give reasons.

6. When crystals of lead nitrate are mixed with sodium iodide crystals, the reaction to form lead iodide is slow. List two ways by which the rate of the reaction can be increased.

7. Which of the following reaction mixtures will be the first to become colourless? Explain your answer.

(a) 500 ml of acidified 0.01 M potassium permanganate solution is mixed with 500 ml of 0.03 M sodium-oxalate solution.

(b) 500 ml of acidified 0.01 M potassium permanganate solution is mixed with 500 ml of 0.1 M sodium oxalate solution.

8. What is the relationship between the temperature of the reactants and the rate of the reaction? How do you account for the relationship?

9. Explain why the rate of a reaction changes in the presence of a catalyst.

10. In which of the following cases do you observe an enhanced rate of liberation of CO_2 ?

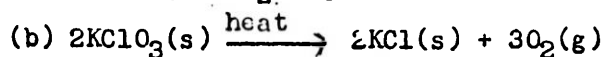
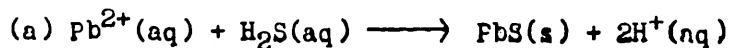
(a) 14 gm of marble chips and 150 ml of 2 M HCl

(b) 14 gm of powdered marble and 150 ml of 2 M HCl

Give reasons for your answer.

11. Why are oxidation and reduction necessarily simultaneous processes?

12. Decide whether or not the following are oxidation-reduction reactions. If so, state the reactant oxidised and the reactant reduced.



13. Explain why

- (a) solid iodine, I_2 , does not conduct electricity
- (b) solid sodium iodide, NaI , does not conduct electricity

14. Name the particles that carry the charge when electricity flows in the following substances.

- (a) Solid copper
- (b) Molten sodium chloride
- (c) An aqueous solution of copper(II) sulfate
- (d) Molten copper.

15. Copper metal can be obtained by heating copper(II) oxide with hydrogen.

- (a) What is oxidised?
- (b) What is the oxidiser?
- (c) What is reduced?
- (d) What is the reducer?

WORKSHOP ON CONTENT ENRICHMENT AND ACTIVITY SUPPLEMENTATION
OF THE EXISTING CURRICULUM IN CHEMISTRY FOR SECONDARY SCHOOL
TEACHERS OF LAKEASHADWEEP

POST-TEST 1 CHEMISTRY

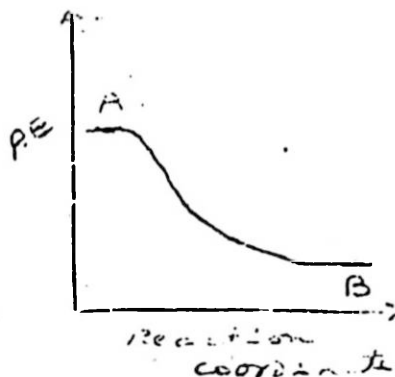
Time: 1 Hour

Max.Marks:45

PART 'A'

Indicate the answer to each question by encircling the alphabet of the correct alternative from amongst the ones given against the corresponding question.

- For the chemical reaction $A \rightarrow B$, if the initial concentration of A is 2.7 moles/litre and its concentration after 2 hours is 1.3 moles/litre, the average rate of this reaction is
 - 0.007 mole/litre per second
 - 0.7 mole/litre s^{-1}
 - 0.7 mole/litre hr^{-1}
 - 1.4 moles/litre
- As the temperature of reactants increase, the rate of reaction also increases because
 - frequency of collisions increases
 - energy of activation increases
 - energy of activation decreases
 - greater number of colliding particles have energy greater than energy of activation.
- Which of the following is true about the existence of A if the potential energy diagram for the reaction $A \rightarrow B$ looks like
 - A exists as such without forming B.
 - only half of A reacts to form B
 - A would not exist as it spontaneously form B.
 - none of the above are true.



Contd....2

4. The IUPAC name for the compound $\text{CH}_3\text{-CH(OH)-CH(Br)-CHO}$ is
- (a) 3-hydroxy-3-bromo butanal
(b) 3-Hydroxy-2-bromo butanal
(c) 2-Bromo-3-hydroxy-butanal
(d) 2-Hydroxy-3-bromo butan-4-al
5. When glucose is heated with Benedict's reagent, a red precipitate is obtained. This is due to the formation of
- (a) metallic copper
(b) gluconic acid
(c) cupric oxide
(d) cuprous oxide

The following information is for questions 6-8

- (i) Answer each question by indicating the most appropriate of the following responses:
- A - Greater than at the first equilibrium
B - Less than at the first equilibrium
C - same as at the first equilibrium
D - insufficient information provided to decide between possibilities
- (ii) Consider an equilibrium mixture of CO , Cl_2 , COCl_2 at 200°C and 1 atmosphere pressure present in chemical equilibrium:
- $$\text{CO(g)} + \text{Cl}_2\text{(g)} \rightleftharpoons \text{COCl}_2\text{(g)} + x \text{ cals (exothermic)}$$
- (iii) When answering the questions, do not assume any knowledge of this particular chemical equilibrium other than that provided by the above information or in the questions asked.
6. The mixture is cooled to 150°C (all the reactants and products are gases at this temp.), keeping the volume constant.
- When the system returns to equilibrium 150°C
- (a) the mass of COCl_2 present will be
(b) the rate at which COCl_2 is being formed will be
(c) The equilibrium value of $\frac{[\text{COCl}_2]}{[\text{CO}][\text{Cl}_2]}$ will be

Contd.....3

7. The volume of the system is halved by increasing pressure at constant temperature. When the system has returned to equilibrium,
- (a) The mass of COCl_2 present will be
 - (b) The concentration of COCl_2 present will be
 - (c) The mass of CO present will be
 - (d) The concentration of CO present will be
8. Some Cl_2 is removed from the system, the volume and the temperature being kept constant. When the system has returned to equilibrium.
- (a) The mass of CO will be
 - (b) The equilibrium value of $\frac{[\text{COCl}_2]}{[\text{CO}][\text{Cl}_2]}$ will be
 - (c) The rate at which CO is being formed will be
9. Inspect the following data

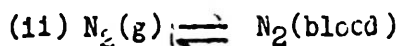
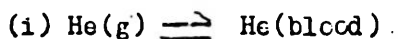
Substance	equilibrium vapour pressure at 20°C (kPa)
Water	2.34
acetone	12.16
ethanol	5.85

At 20°C , which one of the listed substances will evaporate the most in a sealed container before equilibrium is established?

10. The following data apply to helium and nitrogen dissolved in blood at 25°C .

$$\frac{[\text{He}(\text{blood})]_{\text{eq}}}{[\text{He}(\text{g})]_{\text{eq}}} = 0.0091, \quad \frac{[\text{N}_2(\text{blood})]_{\text{eq}}}{[\text{N}_2(\text{g})]_{\text{eq}}} = 0.015$$

- (a) Which of the following reactions proceeds further before equilibrium is attained?

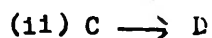
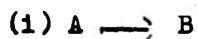


11. An oxidising agent is one which
- (a) donates electrons to one of the reactants
 - (b) takes away electrons from one of the reactants
 - (c) removes electrons from one of the reactants and adds them to another.
 - (d) donates electrons to one of the products.
12. When a substance is reduced
- (a) electrons are added to it
 - (b) electrons are removed from it
 - (c) electrons are neither added nor removed from it
 - (d) both (a) and (b)
13. Which of the following statements are true.
- (a) Oxidation means addition of electrons
 - (b) Chlorine atom gains electrons while combining with sodium
 - (c) A reducing agent is one which accepts electrons
 - (d) Iron articles are paired with aluminium to prevent oxidation.
14. Which of the following statements are False.
- (a) Adjacent atoms in a covalent molecule share electrons
 - (b) Metallic bond represents forces of attraction between metallic atoms.
 - (c) Ionic compounds conduct electricity both in solid and molten state.
 - (d) Polar compounds are insoluble in non-polar solvents.
15. Pick out the correct statements.
- (a) Bonding in non metals is covalent.
 - (b) Ionic compounds have high melting points.
 - (c) Metals are soft and lustrous.
 - (d) Forces of attraction in covalent molecules are stronger than in ionic compounds.

PART 'B'

Provide answers in brief for each of the following questions in the space provided.

1. For the two reactions



the following data were obtained

	time (hour)	Conc. of A (moles/lit)	Conc. of B (moles/lit)
(i)	0	0.1	0
	2	0.05	0.05
(ii)	0	0.10	0
	2	0.075	0.025

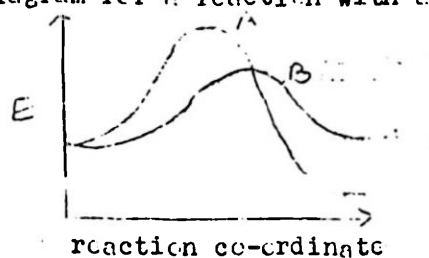
which reaction proceeds at a greater rate? What are the rates of formation of B & D ?

2. In general what happens to the rate of a reaction as the reaction progresses? Why?

To represent the general trend, make a rough sketch of reaction rate (Y-axis) versus time (X-axis)

3. An organic compound A with the composition $C_3H_4O_2$ dissolves in $NaHCO_3$ giving effervescence. It can be esterified with alcohol to form a mono ester. On treatment with bromine it forms a dibromide. Identify A.

4. Below is an energy diagram for a reaction with and without catalyst.



which path is used when the catalyst is used? why will the reaction occur by this path?

5. If two test-tubes one containing sugar solution and the other protein solution, how will you proceed to identify each.

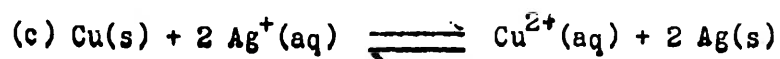
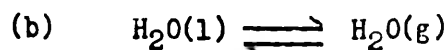
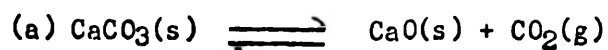
6. Calculate the pH of a 0.01 M KOH solution.

7. The dissociation constants of formic acid and acetic acid are 1.7×10^{-4} and 1.7×10^{-5} respectively. Which acid is stronger? Give reasons.

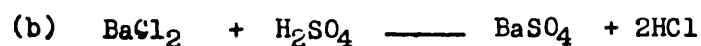
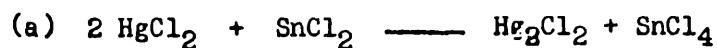
8. Write the chemical equations to represent the reactions involved in aqueous solutions of (i) acetic acid and (ii) ammonia. Identify the conjugate acids and bases in each case.

9. Mention four applications of equilibrium in daily life.

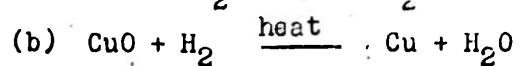
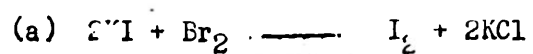
10. Write the equilibrium constant expressions for the following reactions/changes.



11. Classify the following reactions into redox and non-redox reactions. Give reasons for your answer.



12. Identify the oxidising and reducing agents in the following reactions.



13. Covalent compounds do not conduct electricity both in the solid and solution forms. Why ?

14. Metals are good conductors of electricity in solid state. Give reasons.

15. List four activities (experiments) for redox reactions.

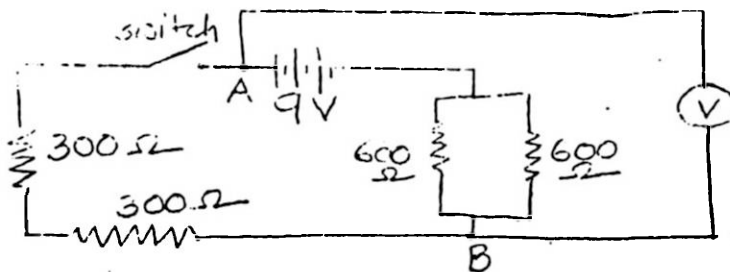
Pretest in Physics

for the secondary school teachers of Lakshadweep

PART I

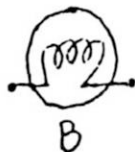
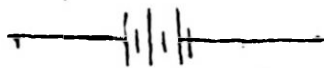
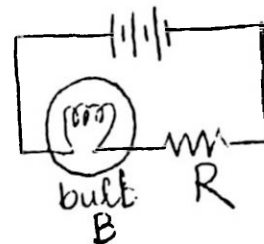
Date : 23.01.2018

Electricity and Magnetism

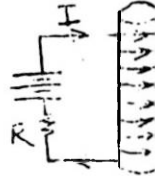


The switch is closed in the above circuit and the voltmeter (V) is connected between the points A and B as shown. What will be the reading in the voltmeter?

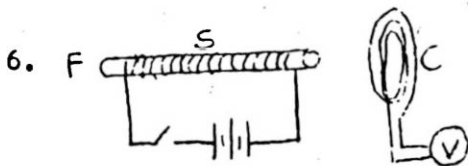
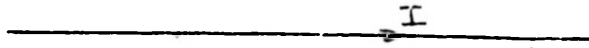
- a) 9 V
 - b) 6 V
 - c) 3 V
 - d) 0 V
2. The switch is opened in the above circuit. What is the reading in the voltmeter?
- a) 9 V
 - b) 6 V
 - c) 3 V
 - d) 0 V
3. We want to measure the voltage v across the light bulb B and the current I flowing through the circuit. You are given a voltmeter (V) and an ammeter (A). Show how you will connect them.



4. A solenoid is carrying current I as shown. It is carrying a d.c. current the direction of which appears anticlockwise when seen from top. Draw the magnetic lines of force approximately.

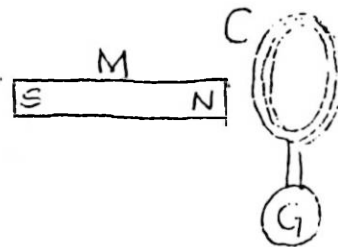


5. A straight wire is carrying d.c. current I amperes as shown. Draw the magnetic lines of force approximately.



S is a solenoid with a ferrite rod F inserted inside. Near the solenoid is a second coil C. The axis of the solenoid and the coil C are collinear. An e.m.f. will be generated in C (as indicated by a deflection of the voltmeter needle)

- at the moment when the switch is closed.
 - after the switch has been closed and a steady current has been established in S.
 - after the switch has been opened, because the ferrite rod has been fully magnetised.
 - There will never be deflection in the voltmeter because there is no contact between the battery and C.
7. A magnet M is held fixed. The coil C is connected to a galvanometer G. You can rotate or move the coil in any manner you like. Will any such movement cause the galvanometer needle to deflect? Briefly discuss.



PART I I

Forces in nature and work, power, energy

Four choices are given for each statement. Select the best and mark _____ to its left.

1. If the force of attraction between two masses is increased four times, the distance between them is
 - a) doubled
 - b) increased four times
 - c) halved
 - d) reduced four times

2. Minimum force required to lift a load of 10 Kg from a table top is
 - a) 10 N
 - b) 9.8 N
 - c) 19.8 N
 - d) 98 N

3. An engine has to pump 60 Kg water to a height of 10 m in a minute. The power of the engine should be atleast
 - a) 600 W
 - b) 6 W
 - c) 98 W
 - d) 9.8 W

4. Which of the following has both kinetic and potential energy?
 - a) main spring of a watch
 - b) a running train
 - c) stretched rubber band
 - d) flying aeroplane

5. A load of 100 Kg is to be lifted by a simple machine whose mechanical advantage is 2. The effort to be applied is
 - a) 100 Kg
 - b) 98 Kg
 - c) 50 Kg
 - d) 102 Kg

Fill in the blanks with suitable words:

6. _____ force holds a stamp pasted to an envelope.
7. A liquid rises _____ in a capillary, when its diameter is small.
8. Between a proton and an electron there exist forces of attraction which are _____ and _____.
9. Potential energy arises due to _____ and _____.
10. $100 \text{ J} = (\text{_____}) \text{ N} \times 20 \text{ m}$

PART III

Sound and Electronics

1. Pitch of a sound wave is related to
 - a) the number of waves per second received by the ear.
 - b) the number of waves reaching the ear per second
 - c) the number of waves passing a given point in unit time.
2. A vibrating tuning fork sounds louder when its stem is pressed against a table top. This is due to
 - a) the forced vibrations of the table.
 - b) the multiple reflection of the sound from the table
 - c) the transmission of the sound through the table.
3. The frequency of oscillation of a wire is increased
 - a) if a thicker wire of the same material is used.
 - b) if the tension on the wire is increased.
 - c) if the tension on the wire is decreased.

4. If two tuning forks of frequencies N_1 and N_2 are sounded simultaneously, the beat frequency would be
- a) $N_1 - N_2$
 - b) $\frac{N_1 + N_2}{2}$
 - c) $\frac{N_1 - N_2}{2}$
 - d) $2(N_1 - N_2)$
5. A periodic transverse wave of frequency 15 Hz is travelling along a string. The distance between a crest and an adjacent trough is 1.50 m.
- a) What is the wavelength of the wave?
 - b) What is its speed through the string?
6. For hearing a distinct echo a minimum distance is required between the source of sound and the reflector. Explain briefly why.
7. A covalent-bonded structure is not favourable for electrical conduction because,
- a) in general there will be no free electrons available.
 - b) in general there will be no free ions available.
 - c) conduction is prevented due to the collision between electrons and holes.
8. An amplitude modulated carrier has
- a) the same amplitude and frequency as that of the original carrier
 - b) the same amplitude as the original carrier but a new frequency

- c) the same frequency as that of the original carrier.
 - d) the same amplitude as that of the original carrier.
9. High energy X-rays are produced when transitions occur
- a) at the outer electronic levels of the atom.
 - b) inside the nucleus of the atom
 - c) due to the deceleration of the incident electron.
 - d) at the inner electronic levels of the atom.
10. A diode detector basically performs the function of a
- a) rectifier
 - b) amplifier
 - c) resonator
 - d) filter
11. When P- and N-type semiconductors form a junction
- a) the holes and electrons separate away from the junction.
 - b) a few electrons from N side move toward the P-side and vice versa.
 - c) all the electrons and holes cross over.
 - d) none of the above things occur.
12. When a wave passes through a medium the distance between two successive points in the medium where the particles are in the same phase of vibration is known as _____.
13. In a p-n-p transistor the emitter-base junction is _____ biased and the _____ collector-base junction is _____ biased.

WHAT DO YOU THINK ABOUT FORCES AND GRAVITY?

We are trying to find out what students really think about some situations involving forces. This will help us to find ways of teaching physics which will make it easier for students to learn.

For each of the questions you are asked to select an answer and to write a short explanation of why you chose that answer.

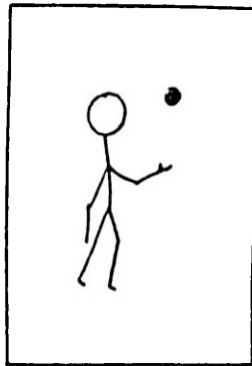
What class are you in? _____

What school are you in? _____

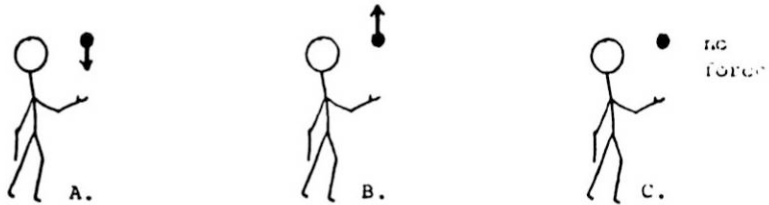
Male or female? _____

A person throws a ball straight up into the air just a small way.

Questions 1-3 are about the total force on the ball.



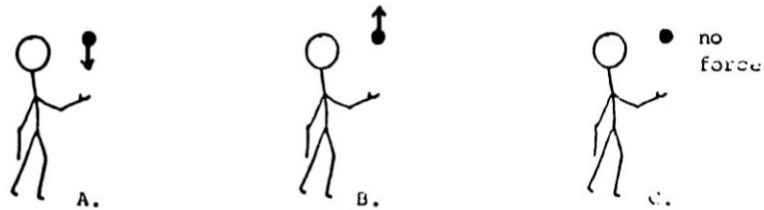
Q.1. If the ball is on the way up, then the force on the ball is shown by which arrow?



(a) Answer: _____ (write A, B, or C in the space)

(b) Why did you choose this answer? (please write your reasons)

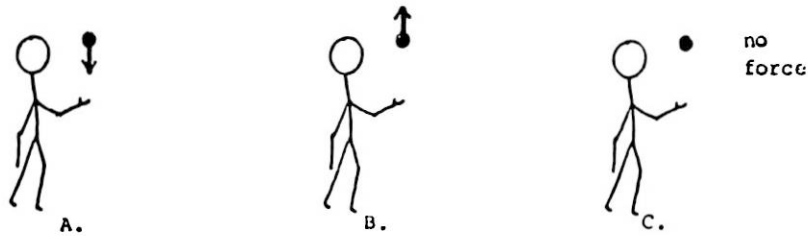
Q.2. If the ball is just at the top of its flight, then the force on the ball is shown by which arrow?



(a) Answer: _____

(b) Why did you choose this answer? _____

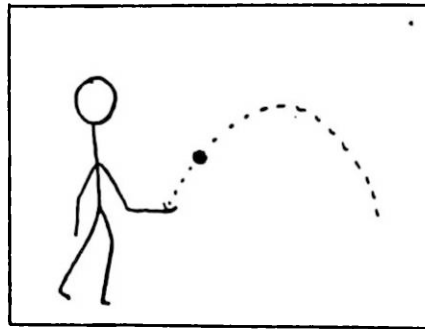
Q.3. If the ball is on the way down, then the force on the ball is shown by which arrow?



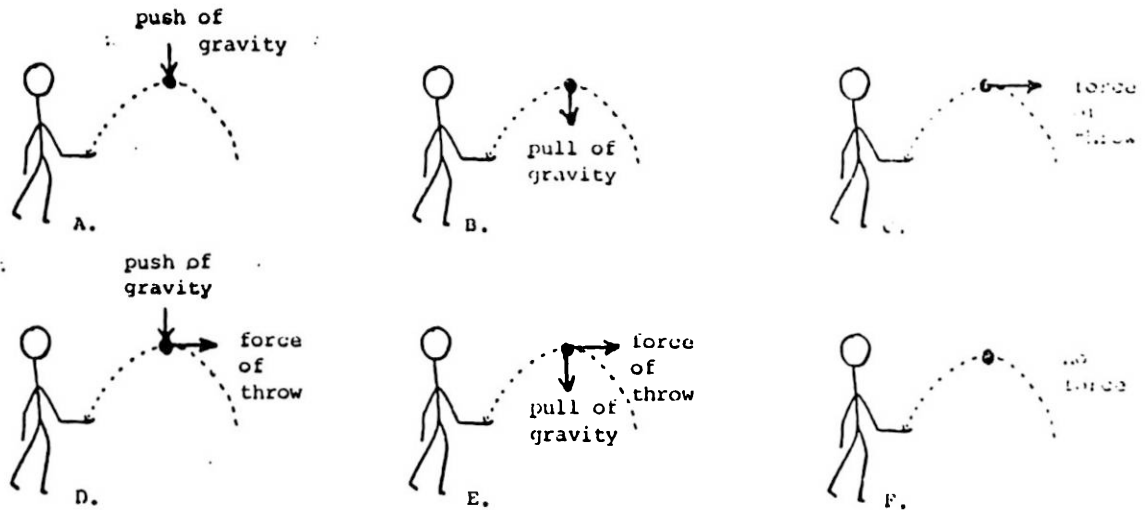
- (a) Answer: _____
- (b) Why did you choose this answer? _____
- _____
- _____
- _____
- _____

Questions 4 and 5

The person now throws the ball to someone else. This drawing shows the path the ball travels along. Questions 4 and 5 are about all the forces on the ball.



Q.4. When the ball is at its highest point, which of the drawings below best shows all the forces on the ball?

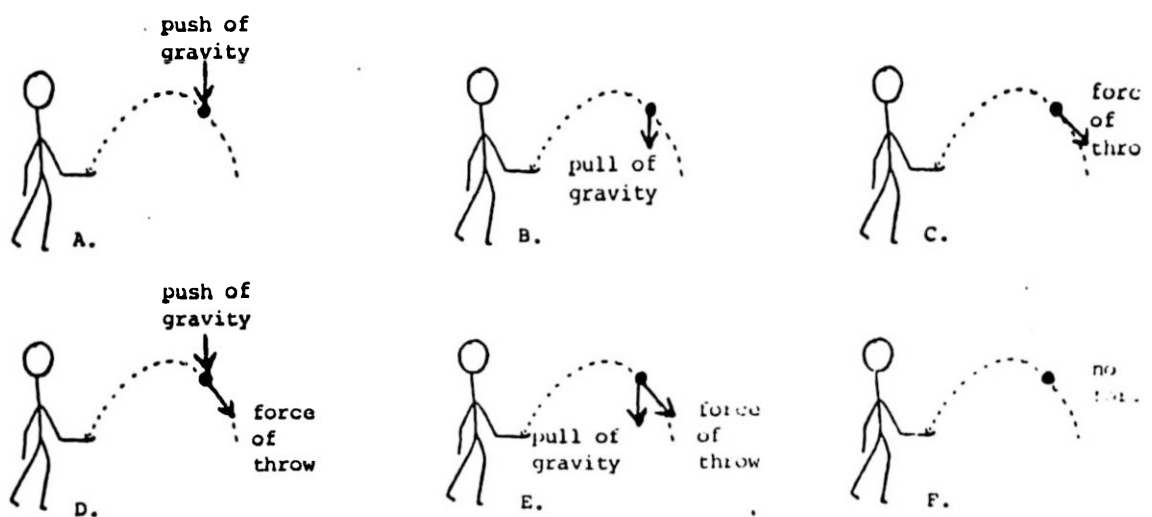


(a) Answer: _____

(a) why did you choose this answer? _____

(c) Are there any other forces on the ball which are not shown in the diagrams?
_____ (yes or no). If you answered yes, please describe the force or forces.

Q.5 When the ball is on the way down again, which of the drawings below best shows all the forces on the ball?



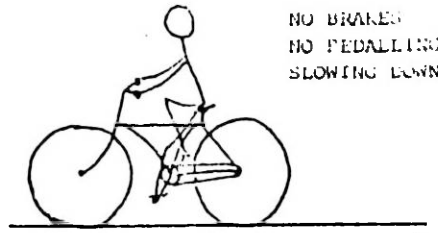
(a) Answer: _____

(b) Why did you choose this answer? _____

(c) Are there any other forces on the ball which are not shown in the diagrams?
_____ (yes or no). If you answered yes, please describe the force or forces.

Question 6.

A person is riding a bicycle. The person is not using the brakes or pedals and is slowing down.



Is there a force on the bicycle?

- A. Yes
- B. No

(a) Answer: _____

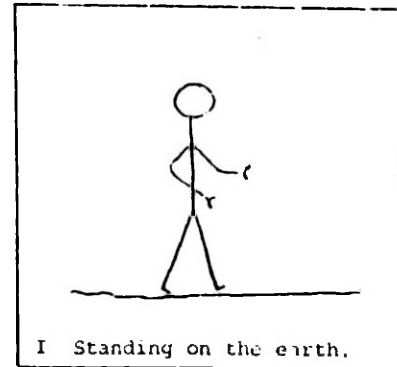
(b) Please explain your answer: _____

Questions 7 - 11

These questions are about whether there would be gravity in different places.

Q.7 Look at picture I. Is there any gravity when you are standing on the earth?

- A. Yes
- B. No

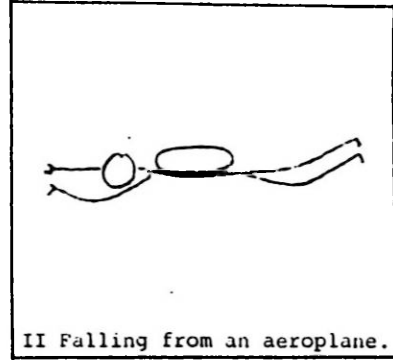


(a) Answer: _____

(b) Please explain your answer: _____

Q.8. Look at picture II. If someone falls from an aeroplane, is there any gravity?

- A. Yes, about the same as on the ground
- B. Yes, but much less than on the ground
- C. Yes, but much more than on the ground
- D. No, there is no gravity



(a) Answer: _____
(b) Please explain your answer: _____

Q.9 Look at picture III. If someone is standing on the moon, is there any gravity?

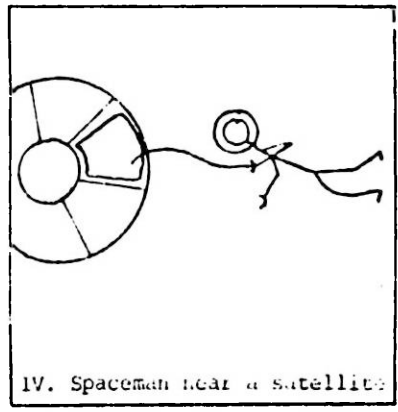
- A. Yes, but much more than on the earth
- B. Yes, about the same as on the earth
- C. Yes, but much less than on the earth
- D. No, there is no gravity



(a) Answer: _____
(b) Please explain your answer: _____

Q.10 Look at picture IV. The satellite is going around the earth. Is there any gravity up where the spaceman is?

- A. Yes
- B. No

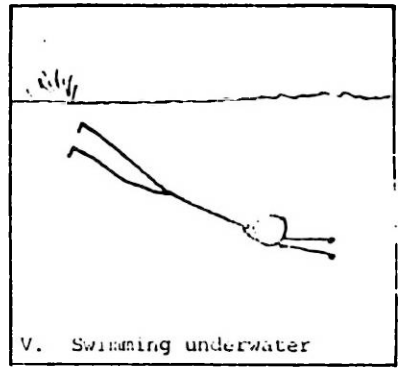


(a) Answer: _____

(b) Please explain your answer: _____

Q.11. Look at picture V. Is there any gravity when the person is swimming under water?

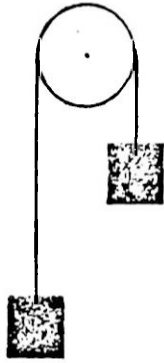
- A. Yes
- B. No
- C. Depends on whether the person is going up or down.



(a) Answer _____

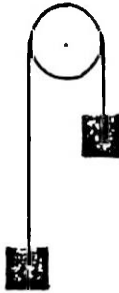
(b) Please explain your answer: _____

Question 12

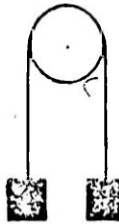


Two equal blocks are linked by a piece of string. The string is placed over a pulley, so the blocks are in the positions shown in the picture above.

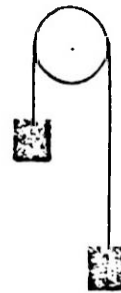
When we look at the blocks one minute later, which of the three pictures below best shows the positions of the blocks now?



A.



B.



C.

(a) Answer: _____

(b) Why did you choose this answer? _____

Thank you for your help.

(Post-Test)

SECTION A

1. Can you accelerate a car by pushing it while you are inside it? Explain your answer.
2. Sketch the (i) distance vs time, (ii) velocity vs time and (iii) acceleration vs time graphs for a stone which is thrown straight up into the air at time $t = 0$ and returns to the earth at time $t = T$.
3. A force of 5N gives a mass m_1 an acceleration of 8 m/sec^2 and a mass m_2 an acceleration of 24 m/sec^2 . What acceleration would it give the two when they are tied together to form a single mass?
4. A stone tied to a string is whirled in a vertical circle in uniform motion. Show the forces acting on it at the points L, T, R & B.
5. How fast must a plane fly in a vertical loop of radius 1 km if the pilot experiences no force from either the seat or the safety belt when he is at the top of the loop? (i.e. when he is 'weightless')
6. In what respects does the light from a laser source differ compared to that from a fluorescent lamp?

SECTION B

1. Trivalent impurities cause pure semi conductors to behave as
 - a) metallic conductors
 - b) insulators
 - c) semiconductors with increased conductivity
 - d) semiconductors with decreased conductivity
2. In a transistor
 - a) the emitter-base junction resistance is higher than the collector base junction resistance.
 - b) the emitter-base junction resistance is lower than the collector-base junction
 - c) both junctions have equal resistances
3. The resistance of a p-n junction diode under reverse bias is more than that under forward bias, because,
 - a) under reverse bias the majority and minority carriers on both sides recombine and hence no current flows.

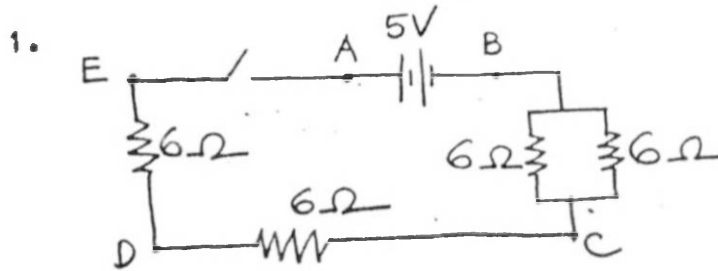
- b) under reverse bias the majority carriers do not contribute to conduction and hence the current is very low.
 - c) Both majority and minority carriers conduct and the currents tend to cancel. This causes the resistance to be more.
4. A crystal whose upper energy band is partly occupied by electrons behaves as
- a) a conductor
 - b) an insulator
 - c) an n-type semiconductor
 - d) a p-type semiconductor
5. The speed of waves in a stretched string depends upon
- a) the amplitude of the wave
 - b) the wavelength of the wave
 - c) the acceleration due to gravity
 - d) the tension in the string
6. The higher the frequency of a wave
- a) the smaller its speed
 - b) the shorter its wavelength
 - c) the larger its amplitude
 - d) the larger its period

SECTION C

1. Work is done usually against resistive forces viz. gravity, inertia and friction. Of these, maximum force is required to overcome
- a) inertia
 - b) gravity
 - c) sliding friction
 - d) rolling friction
2. A body is lifted to a height 10m using a
1. vertical ladder of height 10m
 2. inclined plane of M.A. 5
- Which of the following is true?
- a) work done in (1) is more than in (2)
 - b) work done in (2) is more than in (1)
 - c) work done in both cases is same.
 - d) none of the above is true

3. The difference between the output work and the input work in a machine is measured by the
- mechanical advantage
 - efficiency of the machine
 - energy used in overcoming friction
 - effort applied on the machine
4. Draw a diagram of a pulley system which has an ideal M.A. of 5. Carrying a load 100 kg. Locate the position of the effort and also find its magnitude.

SECTION D

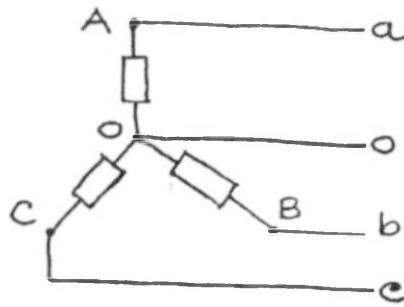


The switch is closed. Find

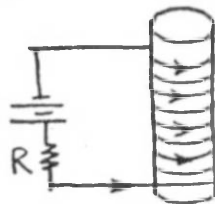
$$V_{AB}, V_{BC}, V_{CD}, V_{DE}$$

$$V_{AC}, V_{AD}, V_{AE}$$

2. Calculate the same things as in Prob.1 when the switch is open.
3. Now in the above circuit replace the d.c. source by an a.c. source, the voltage amplitude being $10\sqrt{2} = 14.1$ volts. Find the voltages (as measured by a voltmeter) mentioned in problem 1 when the switch is closed.
4. Do the same calculations as in Prob.3 when the switch is open.
5. A generator has 3 windings as shown by rectangular boxes, each winding generating the same voltage 100 V. Lines a, b, c are taken from the terminals of the windings, whereas the other terminals are connected to a common point O. Find
- V_{ao} , b) V_{bo} , c) V_{co} d) V_{ab} , e) V_{bc} f) V_{ca} for the following situations;
 - i) the generator is a d.c. generator
 - ii) it is an a.c. generator and voltages in all the windings are in phase.
 - iii) a.c. generator with the voltages in the three windings having a phase difference of 120° with respect to each other.



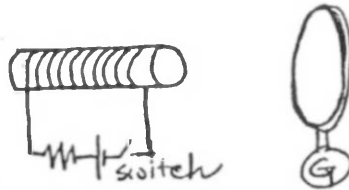
6. A solenoid is carrying current I as shown. It is carrying a d.c. current the direction of which appears anticlockwise when seen from top. Draw the magnetic lines of force approximately.



7. A straight wire is carrying d.c. current I amperes as shown. Draw the magnetic lines of force approximately.

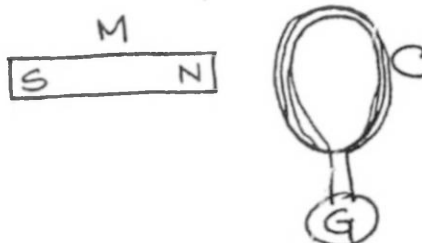


8.



S is a solenoid with a ferrite rod F inserted inside. Near the solenoid is a second coil C. The axis of the solenoid and the coil C are collinear. The a.m.f. will be generated in C (as indicated by a deflection of the voltmeter needle),

- at the moment when the switch is closed.
 - after the switch has been closed and a steady current has been established in S.
 - after the switch has been opened because the ferrite rod has been fully magnetised.
 - there will never be deflection in the voltmeter because there is no contact between the battery and C.
9. A magnet M is held fixed. The coil C is connected to a galvanometer G. You can rotate or move the coil in any manner you like. Will any such movement cause the galvanometer needle to deflect? Briefly discuss.



Pretest in Mathematics
for the Secondary School Teachers of Lakshadweep

All questions are compulsory.

- ∴
∴) Tick the correct answer:
- i) The diameter of a cylinder is 24 cms and its height is 20 cms. Then the volume of the cylinder is
- a) $\frac{1}{3} \times 24 \times 24 \times 20$ cm
 - b) $\frac{22}{7} \times 12 \times 12 \times 20$ sq. cm.
 - c) $\frac{22}{7} \times 12 \times 12 \times 10$ cm³
 - d) None of the above
- ii) One of the base edges of a square pyramid is 18 cm long while its slant height is 41 cms. Then the height of the pyramid is
- a) $41 - 18 = 23$ cms
 - b) $\sqrt{23}$ cms
 - c) $\sqrt{41^2 - 18^2}$ cms
 - d) $\sqrt{41^2 - 9^2}$ cms
- iii) If l is the slant height, h is the height and r is the radius of a cone then,
- a) $l = h + r$
 - b) $r = \sqrt{l^2 - h^2}$
 - c) $l^2 + r^2 = h^2$
 - d) None of the above
- iv) The radii of two spheres are in the ratio 2:3. Then the volumes of these spheres are in the ratio
- a) 2:3
 - b) 4:9
 - c) 8:27
 - d) None of the above
- v) A rational number, when expressed as a decimal number is
- a) terminating or recurring
 - b) terminating only
 - c) recurring only
 - d) neither terminating nor recurring

- vi) Let $S = \{a \in R \mid \text{multiplicative inverse of } a \text{ is } a\}$.
Then the number of elements in S is
a) 1 b) 2 c) a finite number $\gg 3$
d) infinite
- vii) The score in a distribution obtained by the largest number of examinees is called
a) arithmetic mean b) median c) mode
- viii) In a negatively skewed distribution, the value of the arithmetic mean is
a) less than b) equal to c) greater than
the value of the median.
- ix) Which of the following measures is not expressed in the same units as the other three
a) standard deviation b) arithmetic mean
c) median d) variance
- x) Distribution A has a mean of 50 and a variance of 225, distribution B a mean of 65 and a standard deviation of 15. Which of the following statements about these distribution is true?
a) A is more variable than B.
b) A and B display equal amounts of variability
c) B is more variable than A.
- xi) Which one of the following is not a measure of dispersion in a test score distribution?
a) arithmetic mean b) sum of squares
c) standard deviation d) variance
- xii) Which one of the following measures is not obtained in the same way as the other three
a) mean deviation b) quartile deviation
c) standard deviation d) variance
- xiii) What is the length of the class intervals of the following distribution?

Class Interval	Frequency
40-45	2
35-40	5
30-35	3

a) 5 b) 4.5 c) 4 d) 6

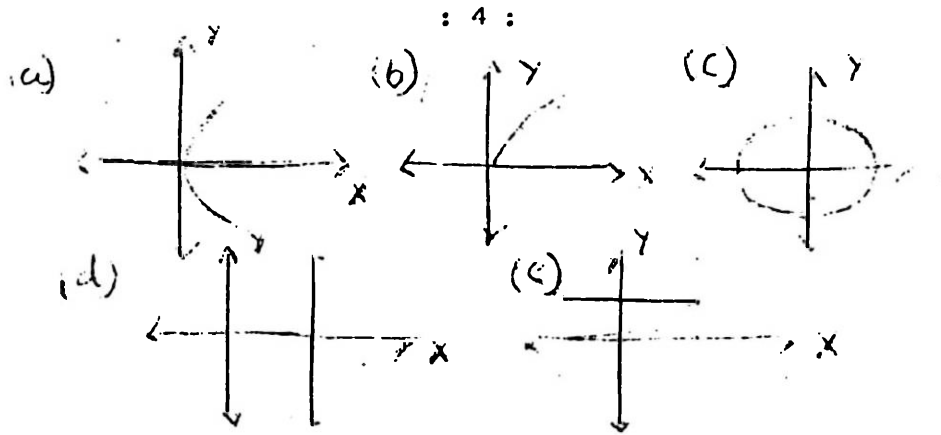
2. If $(2,-2)$, $(-2,3)$, $(3,-3)$, $(-3,2)$ represents a function, then i) find the value of $\frac{f(-2) + f(3)}{f(3) - f(2)}$,
ii) identify its domain and range.

- 3.. Represent the following as a line segment.
i) $5/9$ ii) $15/9$ iii) $\sqrt{2}$ iv) $\sqrt{3}$

4. Prove or disprove:
If p is a prime number, then \sqrt{p} is an irrational number.

5. Find the square root of 6.25

6. Which of the following graphs^s of a relation from X to Y represents a function. Justify your answer.



7. Consider a square with vertices A, B, C and D in the first quadrant of xy -plane. If $x+y = 1$ is the equation the side AB, write the equations of the sides BC, CD and DA.

8. Mark true or false.

- a) The graph of $f(x) = ax^2$, for every $a \in \mathbb{R}$ is a parabola. ()
- b) The graph of $f(x) = ax^2$ opens upwards if a is negative. ()
- c) The graph of $f(x) = ax^2$ opens downwards if a is positive. ()
- d) y -axis is the axis of the symmetry of the graph of $f(y) = y^2$. ()

- e) If the coefficients of a polynomial are real numbers, then its roots are real. (
- f) If $f(x)$ and $g(x)$ are two polynomials over real numbers, then
degree of $(f(x).g(x)) = \text{degree of } f(x) + \text{degree of } g(x)$ (
- g) If $f(x)$ and $g(x)$ are two polynomials over real numbers with degrees m and n , then
degree of $(f(x).g(x)) = mn.$ (
- h) If $f(x)$ and $g(x)$ are polynomials with real coefficients, then $f(x)/g(x)$ is a polynomial with real coefficients.
9. If $(x-2)$ and $(x+1)$ are factors of the polynomial $x^2 - px + qx + 12$ over the reals, find the value of p and q .
10. Let $f : A \rightarrow B$ denote a function from A into B .
Let $R =$ the set of reals
 $N =$ the set of natural numbers
 $Z =$ the set of integers
 $Z_e =$ the set of even integers
Identify which of the following relations are functions.
- i) $f : R \rightarrow R : f(x) = \pm \sqrt{x}$
- ii) $f : Z \rightarrow Z : f(x) = x/2$
- iii) $f : Z_e \rightarrow Z : f(x) = x/2$
- iv) $f : Z_e \rightarrow Z_e : f(x) = x/2$
- v) $f : R \rightarrow R : f(x) = -\sqrt{x}$
- vi) $f : R \rightarrow R : f(x) = \text{a polynomial over reals}$
11. What are the assumptions regarding the distribution of observations within the class interval?

Post Test in Mathematics for the
Secondary School Teachers of Lakshadweep

1. Tick the correct answer.

i) An irrational number when expressed as a decimal number is

- a) terminating or recurring
- b) terminating only
- c) recurring only
- d) neither terminating nor recurring

ii) Which of the following is a function $X \rightarrow Y$, where $x \in X, y \in Y$?

- a) $y = x^2$
- b) $y = \sqrt{x}$
- c) $x^2 + y^2 = a^2$
- d) $y^2 = x^2$

iii) If a matrix A satisfies $A^3 = I$, then

- a) A is idempotent matrix
- b) A is symmetric matrix
- c) A is nil potent matrix
- d) None of the above

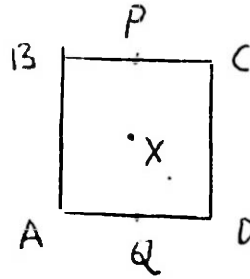
iv) A ladder reaches to a height of 15 ft. up a vertical wall. A man 6 ft tall can just stand upright with his head touching the ladder when he is 10 ft from the wall. Then the angle θ that the ladder makes with the ground is

- a) $\tan^{-1} \left(\frac{15}{10} \right)$
- b) $\sin^{-1} \left(\frac{15}{10} \right)$
- c) $\tan^{-1} \left(\frac{9}{10} \right)$
- d) $90^\circ - \tan^{-1} \left(\frac{9}{10} \right)$

v) The sum of two vectors $\begin{pmatrix} 3 \\ x \end{pmatrix}$ and $\begin{pmatrix} x \\ y \end{pmatrix}$ is given by

$$\begin{pmatrix} 3 \\ x \end{pmatrix} + \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 9 \\ 2 \end{pmatrix} \quad \text{Then}$$

- a) $x = 6, y = -4$
- b) $x = 6, y = 4$
- c) $x = -6, y = -4$
- d) None of the above



- vi) If X represents the centre of the square, P, is the midpoint of BC, and $\vec{AB} = \vec{a}$, $\vec{AD} = \vec{b}$
- Then the vector \vec{PX} is given by
- $\vec{a} + \vec{b}$
 - $-\frac{1}{2}\vec{a}$
 - $2\vec{a} - \vec{b}$
 - None of the above
- vii) Which one of the following measures of the dispersion is not obtained in same way as the other three?
- mean deviation
 - standard deviation
 - quartile deviation
 - variance
- viii) A group of 20 students took a test in mathematics. The mean score of the group was 60. The sum of squares was 500. What is the standard deviation?
- 2
 - 5
 - 10
 - 20
- ix) Distribution A has a mean of 110 and variance of 144, distribution B a mean of 50 and a standard deviation of 15. Which of the following statements about these distributions is true?
- A is more variable than B.
 - A and B display equal amounts of variability.
 - B is more variable than A.
- x) Which of the following values of $r(x,y)$ is indicative of the strongest linear relationship between x and y?
- 0.86
 - 0.93
 - 1.34
2. If $(1,-1), (2,3), (4,-1), (5,0)$ represents a function,
- find the value of $\frac{f(1) - f(5)}{f(2) + f(4)}$
 - Identify its domain and range.

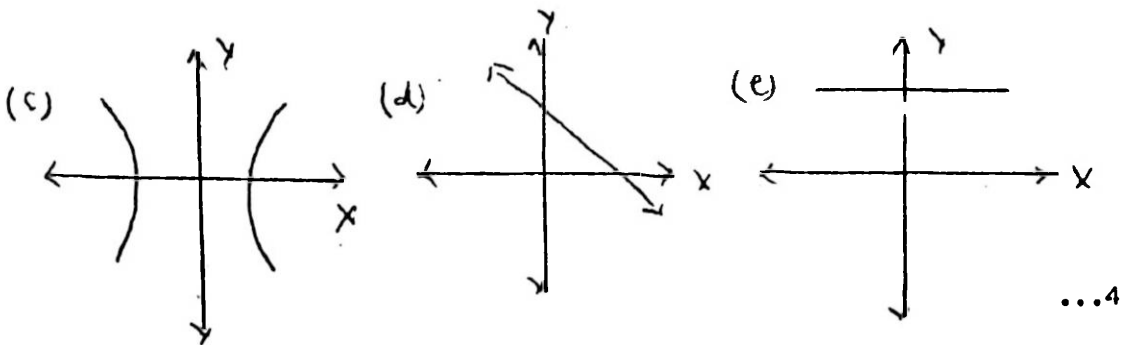
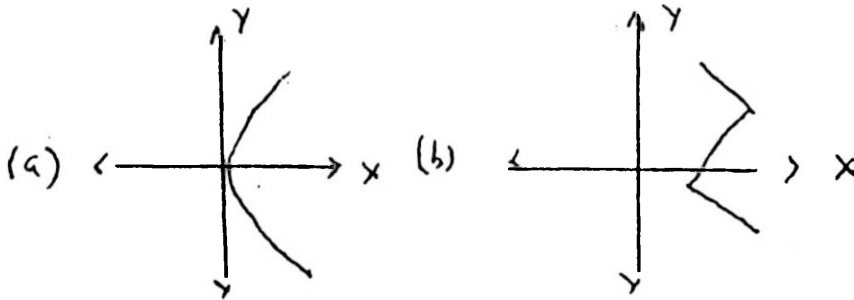
3. Plot the following on the real line

- a) $3/4$ b) $\sqrt{6}$ c) π d) $-\pi$

4. Can you represent $\frac{7}{20}$ and $\frac{7}{15}$ as terminating decimal? Give reasons.

5. Multiply 6.72 and 1.2. Give rationale for the method of multiplication adopted by you.

6. Which of the following graphs represent function $Y \rightarrow X$, when $X = R$, $Y = R$



(a)

(b)

(c)

(d)

(e)

7. Let $f: A \rightarrow B$ denote a function from A into B .
 Let R = the set of reals
 Q = the set of rationals
 Z = the set of integers
 N = the set $\{1, 2, 3, \dots\}$

Identify which of the following relations are functions.

- i) $f: R \rightarrow Q, f(x) = \pm\sqrt{x}$ ()
 ii) $f: Q \rightarrow Q, f(x) = +\sqrt{x}$ ()
 iii) $f: Z \rightarrow Q, f(x) = x + 2$ ()
 iv) $f: Q \rightarrow Z, f(x) = x + 2$ ()
 v) $f: Z \rightarrow N, f(x) = 3x$ ()
 vi) $f: N \rightarrow Z, f(x) = 3x + 1$ ()

8. Find A^2 if $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$

9. Express the matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 3 & 4 & 6 \\ 0 & 8 & 2 \end{bmatrix}$
 as the sum $A = B + C$ where B is symmetric and C is skew symmetric.

- Radio*
10. A tower stands on the top of a building 200 ft high. From a point 300 ft away from the base of the building, the tower subtends an angle of 10° . Find the height of the tower.
 (Given $\tan^{-1} \frac{2}{3} = 33.69$ and $\tan 43.69^\circ = .9552$)
11. Prove : If p is a prime number, then $x^{p-1} + x^{p-2} + \dots + x + 1$ is an irreducible polynomial.
12. Consider a square with vertices A, B, C & D in the first quadrant of xy - plane. If $x+y = 1$ is the equation of the side AB, write the equations of the sides BC, CD and DA.
13. Mark true or false.
- i) If $p(x)$ is an irreducible polynomial over \mathbb{Q} , then $k p(x)$ is irreducible over \mathbb{Q} , for every k in \mathbb{R} . ()
 - ii) Irreducible polynomials over \mathbb{Q} play decisive role in proving impossibility of trisecting 60° with ruler and compass. ()
 - iii) If $p(x)$ is irreducible over \mathbb{Q} , then $(x+1) p(x)$ is irreducible over \mathbb{Q} . ()
 - iv) The graph of $ax+b = 0$ contains atleast two points. ()
 - v) The graph of $y = ax^2$ is a parabola. ()
 - vi) If a polynomial is irreducible over \mathbb{R} , then it is irreducible over \mathbb{Q} . ()
 - vii) If a and b are algebraic numbers, then a^b is transcendental. ()
- ...6

- viii) If a and b are algebraic numbers, and b is irrational, $\sqrt[n]{a^b}$ is transcendental. ()
14. If the product of two roots of a quadratic polynomial $p(x)$ over \mathbb{R} is twice the sum of the roots, find the polynomial.
15. Give a set consisting of infinitely many transcendental numbers.
16. Prove or disprove:
Every linear polynomial over \mathbb{Q} is irreducible over \mathbb{Q} .
17. The median of the following scores is _____.
3,5,6,4,5,4,7,5
18. A class of 25 students was given a 15-item test. If the mean of this distribution is 10, the sum of the raw scores must be _____.
19. If $\text{CoV}(X,Y) = -3.00$, $\text{SD}(X) = 4$ and $\text{SD}(Y) = 6$, then $r(X,Y) = \underline{\hspace{2cm}}$
20. State the properties of the arithmetic mean.

101

WORKSHOP ON CONTENT ENRICHMENT AND ACTIVITY SUPPLEMENTATION
OF THE EXISTING CURRICULUM IN BIOLOGY-FOR SECONDARY SCHOOLS
TEACHERS OF LAKSHADWEEP

Marks: 50

Pretest

Time: 1 hour

PART 'A'

Select the appropriate answer and encircle for the following. 1:20

Choose the correct answer for the following:

- (1) The inwardly directed folds of the inner membrane of a mitochondrion are.
 - (a) microvilli
 - (b) mesosomes
 - (c) cristae
 - (d) fimbriae

- (2) The term heterochromatin refers to
 - (a) light staining regions of chromosomes
 - (b) dark staining regions of chromosomes
 - (c) chemical composition of the nucleolus
 - (d) different kinds of chromosomes

- (3) The nuclear envelope is present in
 - (a) all types of nuclei
 - (b) in prokaryotes only
 - (c) in eukaryotes only

- (4) The structures possessed by plant cells only but not by animal cells are
 - (a) chromosomes and cell wall
 - (b) nucleus and large vacuoles
 - (c) cell wall and large vacuoles
 - (d) Lysosomes and mitochondria

- (5) There were no plants of intermediate height in the F_1 generation, and all were tall, because.
 - (a) Mendel failed to record them
 - (b) their seeds failed to develop
 - (c) tallness was dominant.
 - (d) dwarfness was dominant

- (6) The phenotypic ratio in a dihybrid backcross is
- (a) 3:1
 - (b) 9:3:3:1
 - (c) 1:1
 - (d) 1:1:1:1
- (7) The function of gene replication is to
- (a) have as many copies of genes as possible
 - (b) distribute identical copies to daughter cells
 - (c) produce different types of RNA
 - (d) to synthesize proteins
- (8) Light reaction of photosynthesis takes place in
- (a) Thylakoids
 - (b) stroma
 - (c) oxysomes
 - (d) matrix
- (9) In photosynthesis O_2 is liberated due to
- (a) Hydrolysis of carbohydrate
 - (b) Breakdown of H_2O
 - (c) Breakdown of CO_2
 - (d) Reduction of CO_2
- (10) The phase of respiration which results in the formation of pyruvic acid is
- (a) Fermentation
 - (b) Glycolysis
 - (c) Krebscycle.
 - (d) oxidative phosphorylation
- (11) The end product of aerobic respiration is:
- (a) CO_2 & H_2O
 - (b) CO_2 & ethyl alcohol
 - (c) CO_2 & pyruvic acid
 - (d) CO_2 & citric acid

- (12) Glycolysis takes place in
- (a) cytoplasm
 - (b) mitochondria
 - (c) Ribosomes
 - (d) oxysomes
- (13) Plasma membrane is a
- (a) permeable membrane
 - (b) semipermeable membrane
 - (c) impermeable membrane
 - (d) non-functional membrane.
- (14) The absorption of ions or molecules of minerals against the concentration gradient utilising energy is called
- (a) Active absorption
 - (b) passive absorption
 - (c) imbibition
 - (d) plasmolysis
- (15) The meristematic tissue which forms the cork is
- (a) Cambium
 - (b) apical meristem
 - (c) Phellogen
 - (d) Procambium
- (16) The cambium and the meristematic cells which originate from the cambium are known as
- (a) Apical meristem
 - (b) Lateral meristem
 - (c) Procambium
 - (d) Protoderm
- (17) The monocotyledonous stems do not have
- (a) Xylem
 - (b) Phloem
 - (c) Cambium
 - (d) Ground tissue

- (18) Number of ATP moles produced when one glucose mole undergoes complete oxidation is
- (a) 30
 - (b) 8
 - (c) 38
 - (d) 2
- (19) The endocrine secretion is controlled by
- (a) nerve
 - (b) hormone
 - (c) blood
 - (d) enzymes
- (20) The essential endocrine gland for life is.
- (a) thyroid
 - (b) thymus
 - (c) Adrenal
 - (d) gonad
- (21) The part of a neuron which perceives external stimulus is
- (a) Axon
 - (b) Cyton
 - (c) Synapsis
 - (d) ganglion
- (22) The oxygen is carried in the body by
- (a) WBC
 - (b) RBC
 - (c) Platelets
 - (d) thrombocytes
- (23) The oxygen is carried in the blood in the form of
- (a) oxytocin
 - (b) oxyhaemoglobin
 - (c) haemoglobin
 - (d) haemocyanin
- (24) The prolactin is secreted by
- (a) Adrenal
 - (b) pituitary
 - (c) pancreas
 - (d) thyroid

PART 'B'

Answer briefly the following questions in the space provided.

- (1) What is cell theory?

- (2) Write three structural and functional peculiarities of lysosomes.

- (3) Explain the terms: Locus, allele, hybrid

- (4) What does the law of independent assortment state.

- (5) What is a hormone? Name three animal hormones.

- (6) Distinguish between endocrine and exocrine glands.

- (7) Mention the differences between nerve cord and notochord.

- (8) In what way the sympathetic nervous system is different from parasympathetic nervous system.

- (9) Distinguish between pinocytosis and phagocytosis.

- (10) In what respect do the meristematic cells differ from ordinary cells?

- (11) How does osmosis differ from diffusion?

(12) What are enzymes?

(13) How is oxidative phosphorylation different from photo phosphorylation.

Workshop on Content Enrichment and Activity
Supplementation on the existing curriculum
in Biology for Secondary School teachers of
Lakshadweep

Post-test

Date: 4.6.1988
Time: One hour

Max. Marks: 50

PART A

Select the appropriate answer and encircle for the following.

1. Dark reaction of photosynthesis takes place
 - a) in darkness only
 - b) in light only
 - c) irrespective of light or darkness
 - d) night only
2. The attraction between water molecules in Xylem sap is due to
 - a) cohesive force
 - b) adhesive force
 - c) root pressure
 - d) transpiration pull
3. Electron transport system in mitochondria takes place in
 - a) cristae
 - b) oxysomes
 - c) stroma
 - d) matrix
4. The number of ATP moles produced in glycolysis in the absence of oxygen is
 - a) 2
 - b) 8
 - c) Nil
 - d) 30
5. Translocation of photosynthetic products takes place through
 - a) xylem
 - b) sieve tubes
 - c) cortex
 - d) phloem parenchyma
6. The impulse in a neuron travels from
 - a) axon to cyton
 - b) cyton to axon
 - c) synapsis to axon
 - d) synapsis to synapsis

7. Acetylcholine is secreted by
 - a) axonites
 - b) dendrites
 - c) neurosecretory cell
 - d) muscle cells
8. Releasing factors (RF-) controls the activities of
 - a) thyroid
 - b) pituitary
 - c) adrenal
 - d) gonad
9. The gaseous exchange in the alveoli depends upon
 - a) gaseous partial pressure
 - b) number of RBC
 - c) the plasma of blood
 - d) number of alveoli
10. The vital breathing capacity depends upon the
 - a) enlargement of the body cavity
 - b) age of a man
 - c) height of a man
 - d) enlargement of thoracic cavity
11. Carbon-dioxide in the blood is found in the form of
 - a) free carbon-dioxide
 - b) H_2CO_3
 - c) H_3COOH
 - d) Oxyhemaeglobin
12. Secondary growth in thickness is characteristic of
 - a) monocots
 - b) dicots
 - c) algae
 - d) Bryophytes
13. Large number of scattered closed vascular bundles are characteristic of
 - a) monocots
 - b) dicots
 - c) algae
 - d) bryophytes
14. The meristematic tissue which forms the cork is
 - a) cambium
 - b) apical meristem
 - c) phellogen
 - d) procambium

15. The plant body of moss is
 - a) Gametophyte
 - b) Sporophyte
 - c) Diploid
 - d) Capsule
16. Safranin is used to stain
 - a) xylem and Sclerenchyma
 - b) Phloem and Cambium
 - c) Parenchyma and Collenchyma
 - d) Phloem and Collenchyma
17. Karyokinesis is the division of
 - a) Nucleus
 - b) Cytoplasm
 - c) Vacuole
 - d) Nucleolus
18. Cell plate formation is characteristic of
 - a) prophase
 - b) metaphase
 - c) anaphase
 - d) telophase
19. Secretory activity of the cell takes place with the help of
 - a) Lysosomes
 - b) Golgi body
 - c) Mitochondria
 - d) Centrosome
20. The diploid number of Klinefelter's syndrome is
 - a) 45
 - b) 46
 - c) 47
 - d) 48
21. During the pachytene stage of meiosis
 - a) the pairing of homologous chromosomes begins.
 - b) the pairing of homologous chromosomes is completed.
 - c) there is formation of chiasmata
 - d) the bivalents assume different configurations.
22. If father is colour blind and mother is homozygous normal
 - a) the sons will be colour blind.
 - b) the daughters will be colour blind.
 - c) all the children will be normal.
 - d) both sons and daughters will be colour blind.
23. If a person does not possess both the antigens and possess both the antibodies the blood group will be
 - a) A
 - b) B
 - c) AB
 - d) O

24. The ribosomes take active role in the synthesis of
- carbohydrates
 - proteins
 - Lipids
 - nucleic acids

PART B

Answer the following in the spaces provided: 13x2 =26

1. What is root pressure?

2. What is the role of ATP in plants?

3. What are the products of light reaction that are used up in the dark reaction of photosynthesis?

4. Write the difference between the Tropic hormones and releasing factors.
5. What is the difference between the Polarisation and Depolarisation during impulse conduction?
6. What do you mean by the Hormonal Feed Back mechanism.
7. What is alternation of generations?

8. Distinguish between metaphase and anaphase of mitosis.

9. In what respect do the meristematic cells differ from ordinary cells?

10. What does the law of independent assortment state?

11. Explain briefly the ultrastructure of Golgi body.

12. "Mitochondrion is the power house of the cell".
Justify the statement.

APPENDIX 4

LIST OF ACTIVITIES

Chemistry:

1. Equilibrium - (a) to study the $I_2(s) \rightleftharpoons I_2(aq)$ equilibrium in an aqueous solution of ethanol and water at room temperature, (b) to study the equilibrium $N_2O_4(g) \rightleftharpoons 2NO_2(g)$, (c) to study the chromate-dichromate equilibrium.
2. Acids and Bases - (a) to measure pH range using universal indicator and pH paper of rain water, tap water, distilled water, lemon, tomato, lime water, mud water, detergent solutions.
3. The rates of chemical reactions - (a) comparison of 'life time' of various reactions, (b) measurement of how fast reactions go - I, (c) measurement of how fast reactions go - II, (d) access of particles of reactants for each other, (e) concentration of reactants - I, (f) concentration of reactants - II, (g) temperature - I, (h) temperature - II, (i) surface area, (j) catalyst.
4. Organic Chemistry - Preparation and properties of (a) alkanes, (b) alkenes, (c) alkynes (d) alcohols, (e) carboxylic acids, (f) esters, (g) tests for carbohydrates and proteins.
5. Oxidation and Reduction - Reaction between (a) zinc and hydrochloric acid, (b) iron and copper sulphate solution, (c) copper and silver nitrate solution, (d) burning of magnesium in carbon dioxide, (e) chlorine water and potassium iodide solution, (f) potassium permanganate solution with acidified ferrous ammonium sulphate solution, (g) potassium permanganate and concentrated HCl, (h) potassium dichromate and concentrated HCl, (i) ferric nitrate solution and potassium iodide solution, (j) ferric nitrate solution and potassium chloride solution, (k) sulphur dioxide and hydrogen sulphide.
6. Chemical bonding - (a) polarity of water, (b) non-polar nature of carbon tetrachloride, (c) electrical conductivity of solutions of NaCl and KBr, (d) solubilities of polar substances in polar solvents, (e) solubilities of non-polar substances in non-polar solvents.

Physics:

1. *Laws of Motion - Simple experiments on 'frictionless' motion - uniform and non uniform.*
2. *Forces in nature, work, energy, power - (a) dynamic cart experiment - conversion of energy, (b) collision of steel spheres - conservation of energy and linear momentum, (c) demonstration of adhesive and cohesive forces and formation of droplets.*
3. *Sound, Electronics - (a) use of slinky for the study of waves and wave motion, (b) Ripple Tank experiment - reflection, refraction, diffraction and interference.*
4. *Electricity and Magnetism, transmission of power - (a) simple d.c. circuit - measurement of voltage and current, (b) simple a.c. circuit - measurement of voltage and current, (c) measurement of resistance of ana current flowing through light bulbs, torch light bulbs and 100W, 60W, 40W bulbs, (d) equivalence between a bar magnet and a solenoid. (e) magnetic field and lines of force generated by a solenoid, (f) electromagnetic induction - how it can be produced and detected, (g) electromagnetic induction in space around a coil connected to the output Jack of a tape recorder, (h) simple a.c. generator, (i) simple a.c. motor.*

Biology:

1. *Respiration - (a) CO₂ is evolved during respiration (i) using germinating seeds, (ii) using flower buds, (iii) using grass hoppers. (b) breathing capacity (in terms of water displacement) in human beings, (c) fermentation using toddy and sugar solution, (d) Rate of respiration under different conditions (heat and cold), (e) heat is evolved during respiration.*
2. *Cell and cell division - (a) shape and size of cells (staining and mounting) using (i) onion ped, (ii) epidermal peel of Tradescantia, (iii) guard cells of Solanum, (iv) blood cells, (v) organisms in pond water, (b) mitosis - using onion root tips, (c) meiosis - using testes of grass hoppers and flower buds of Rhaeo.*

3. *Photosynthesis - (a) chlorophyll necessary for photosynthesis - using variegated leaf, (b) CO₂ absorption during photosynthesis in a water plant - using Bromothymol blue, (c) observation of starch grains, (d) substitutions of Mg in chlorophyll by Cu atom.*
4. *Reproduction - (a) Reproduction in plants - (i) archegonia and antheridia of moss, (ii) gametophyte of fern, (iii) transverse sections of dicot and monocot stem, (iv) secondary growth in dicot stem, (b) reproduction in animals, (i) dissection and display of reproductive system in rats.*
5. *Endocrine glands - dissection of rat to show endocrine glands.*
6. *Blood - (i) study of R B C and W B C of garden lizard, (ii) blood groups in man.*
7. *Transport in plants - (i) transpiration pull, (ii) Balsam plant experiment, (iii) ringing and girdling experiment.*
8. *Study of fresh water ecosystem.*
9. *Study of taxonomy and animal behaviour.*

APPENDIX 5

LIST OF FILMS

Chemistry:

Chem study film on :

1. Introduction to reaction kinetics
2. Equilibrium
3. Electrochemical cells
4. Hydrogen atom - a quantum mechanical model
5. Acid Base Indicators

Physics:

1. PSSC films on (i) inertia, (ii) inertial mass, (iii) frames of reference, (iv) straight line kinematics, (v) forces, (vi) filmstrip on Newton's Third Law.
2. PSSC films - (i) forces, (ii) simple machines - pulley, (iii) simple machines - inclined plane, (iv) matter and energy.
3. PSSC films (i) simple waves, (ii) Ripple tank and wave phenomena.

Biology:

1. Cell structural unit of life
2. Mitosis, Meiosis - DNA
3. Mendel's Laws
4. Development of chick
5. Microbiology

APPENDIX 6

LIST OF INSTRUCTIONAL MATERIALS SUPPLIED TO PARTICIPANTS

Chemistry:

- | | |
|--|----------|
| 1. Detailed procedure for activities on chemical kinetics, organic chemistry | 20 pages |
| 2. Oxidation - Reduction reaction | 20 pages |
| 3. Chemical Equilibrium | 43 pages |
| 4. Acids and Bases | 33 pages |

Physics:

1. Article by Prof.S.Datta on Newton's Laws.
2. Material prepared on "Angle of Contact and Capillary rise"
3. Copy of PSSC experiment on Ripple Tank.
4. Material on Semiconductors, PN junctions and Integrated circuits.
5. Low Cost Electromagnetic induction kits out of the condemned chokes of a Fluorescent Tube (RCE publication 1986)
6. Household Electricity (RCE publication under UNESCO project).
7. Physics Resource Material, Vol.II (RCE publication, 1974).

Mathematics:

1. Number System
2. Statistics
3. Linear Inequations
4. Linear Equations