## २. भौतिक विज्ञान (Physics)

# Test Specification Chart 2078

**Grade : 12** **Subject : Physics Theory (Phy. 102)**

| SN | Content Area | Working hour | Competency level: Remembering – MCQ No. of Questions | Remembering – MCQ Marks | Remembering – SAQ No. of Questions | Remembering – SAQ Marks | Understanding – MCQ No. of Questions | Understanding – MCQ Marks | Understanding – SAQ No. of Questions | Understanding – SAQ Marks | Understanding – LAQ No. of Questions | Understanding – LAQ Marks | Applying – MCQ No. of Questions | Applying – MCQ Marks | Applying – SAQ No. of Questions | Applying – SAQ Marks | Applying – LAQ No. of Questions | Applying – LAQ Marks | Higher Ability – MCQ No. of Questions | Higher Ability – MCQ Marks | Higher Ability – SAQ No. of Questions | Higher Ability – SAQ Marks | Higher Ability – LAQ No. of Questions | Higher Ability – LAQ Marks | Unit wise Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Mechanics | 22 | | | | | | | | | | | | | | | | | | | | | | | 13 |
| 2 | Heat and Thermodynamics | 12 | | | | | | | | | | | | | | | | | | | | | | | 7 |
| 3 | Wave and Optics | 26 | 2 | 2 | 2 | 10 | 5 | 5 | 1 | 5 | 1 | 8 | 3 | 1 | 2 | 10 | 1 | 8 | 1 | 1 | 3 | 15 | 1 | 8 | 15 |
| 4 | Electricity and Magnetism | 35 | | | | | | | | | | | | | | | | | | | | | | | 21 |
| 5 | Modern Physics | 33 | | | | | | | | | | | | | | | | | | | | | | | 19 |
| **Total Marks** | | **128** | **12** | | | | **18** | | | | | | **21** | | | | | | **24** | | | | | | **75** |

**Item format plan**

| S.N. | Type of item | Score per item | Total item | Total score | Time |
|---|---|---|---|---|---|
| 1 | Multiple Choice Questions | 1 | 11 | 11 | 25 minutes |
| 2 | Short Question Answer | 5 | 8 | 40 | 155 minutes |
| 3 | Long Question Answer | 8 | 3 | 24 | |
| | **Grand Total** | | **22** | **75** | **3 hours** |

**Remarks:**

- Item format in composite should be met as per the specification grid.
- Designated weightage in the combined cell should be met, but ±3 marks variation will be allowed within a unit/content area. But no unit can be nil.
- In the case of SAQ and LAQ, these should ensure that 1 mark will be assigned per element expected as correct response.
- The distribution of cognitive domain of questions should be nearly 15% knowledge/remembering, 25% understanding, 30% applying and 30% higher ability level, but ±5 percent variation will be allowed in overall question set.
- SAQ and LAQ can be structured (have two or more sub-items). SAQ and LAQ can be distributed to two or more cognitive behaviors.
- In such case these will be added to their respective cognitive behavior. In sum the distribution of cognitive behavior should be approximately to the required distribution. In case of SAQ there will be 2 "OR" questions and in case of LAQ there will be 2 "OR" question.

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## Model Question

## School Leaving Certificate Examination

2078

Grade: XII Subject: Physics Subject Code: 102

Full marks: 75 (11 marks Obj+ 64 marks Sub) Time: 3 Hours

**Group A: Multiple Choice Questions (11×1 = 11)** **Time 25 Minutes**

**Tick the correct answer.**

1. Which of the following is a correct formula for calculating radius of gyration of a rotating object?

   A) $k^2 = I/m$ B) $k = I/m$ C) $k = m/I$ D) $k = (I/m)^2$

2. A horizontal stream of air is blown under one of the pans of a beam balance as shown in the figure. What will be the effect of this on the pan?


   A) goes up. B) goes down C) remains unaffected D) rotates

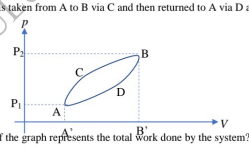
3. What will be the height of a capillary on the surface of the Moon if it is '*h*' on Earth?

   A) *h* B) *h*/6 C) 6*h* D) zero

4. What is the coefficient of performance of an ideal refrigerator working between ice point and room temperature (27°C)?

   A) 0 B) 0.1 C) 1 D) 10

5. A thermodynamic system is taken from A to B via C and then returned to A via D as shown in the p-V diagram.




The area of which segment of the graph represents the total work done by the system?

   A) $P_1ACBP_2P_1$ B) ACBB'A'A C) ACBDA D) ADBB'A'A

6. Which one of the following directly affects the quality of sound?

   A) shape of the source B) frequency C) intensity D) wave form

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7. A diffraction pattern is obtained using a beam of red light. What will be the effect on the diffraction pattern if the red light is replaced with white light?

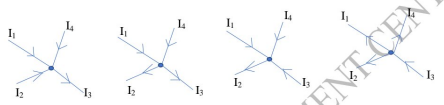
   A) All bright fringes become white.

   B) All bright fringes, except the central one, become white.

   C) All bright fringes become colourful.

   D) All bright fringes, except the central one, become colourful.

8. In which one of the following diagrams the currents are related by the equation $I_1 - I_2 = I_3 - I_4$?




   A) B) C) D)

9. A coil having N turns and cross-section area A carries current *I*. Which physical quantity does the product *NIA* represent?

   A) magnetic flux of the coil B) magnetic flux density of the coil

   C) magnetic moment of the coil D) magnetic susceptibility of the coil

10. What happens to the neutral temperature if the cold junction of a thermocouple is decreased?

    A) increases B) decreases

    C) remains the same D) approaches inversion temperature

11. What is the point where the seismic waves start called?

    A) epicentre B) hypocentre C) metacentre D) seismic centre

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## Model Question

## School Leaving Certificate Examination

2078

Grade: XII Subject: Physics Subject Code: 102

Full marks: 75 (11 marks Obj+ 64 marks Sub) Time: 3 Hours

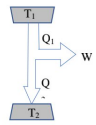
**Attempt all the questions.**

**Group B: Short Answer Questions (8×5 = 40)**

1. (i) Define 'surface tension'. [1]
   (ii) Establish a relation between surface tension and surface energy of a liquid. [2]
   (iii) Two spherical rain drops of equal size are falling vertically through air with a certain terminal velocity. If these two drops were to coalesce to form a single drop and fall with a new terminal velocity, explain how the terminal velocity of the new drop compares to the original terminal velocity. [2]
2. Angular speed of a rotating body is inversely proportional to its moment of inertia.
   (i) Define 'moment of inertia'. [1]
   (ii) Explain why angular velocity of the Earth increases when it comes closer to the Sun in its orbit. [2]
   (iii) If the Earth were to shrink suddenly, what would happened to the length of the day? Give reason. [2]

   OR

   (i) State Bernoulli principle. [1]
   (ii) Derive Bernoulli's equation. [2]
   (iii) You can squirt water from a garden hose a considerably greater distance by partially covering the opening with your thumb. Explain how this works. [2]
3. (i) Define 'harmonics' in music. [1]
   (ii) Calculate the frequency of a monotonous sound produced by a 30 cm long flute open at both ends and being played in the first harmonic. [Velocity of sound in air= 330 $ms^{-1}$] [2]
   (iii) The flute mentioned in question (ii) was being played by a passenger on a stationary bus. The bus then moves uniformly. Explain what change in the pitch of the flute sound, if any, a person sitting on a bench at the bus park will feel when the bus starts moving. [2]
4. (i) State the second law of thermodynamics. [1]
   (ii) A refrigerator transfers heat from a cold body to hot body. Does this not violate the second law of thermodynamics? Give reason. [2]
   (iii) In the given figure, a heat engine absorbs $Q_1$ amount of heat from a source at temperature $T_1$ and rejects $Q_2$ amount of heat to a sink at temperature $T_2$ doing some external work *W*.




   (a) Obtain an expression for the efficiency of this heat engine. [1]
   (b) Under what condition does the efficiency of such engine become zero percentage, if at all? [1]

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5. A student wants to measure the magnetic flux density between the poles of two weak bar magnets mounted on a steel yoke as shown in the figure. The magnitude of the flux density is between 0.02T and 0.04T.


(i) Define Magnetic flux density. [1]

(ii) One way of measuring the magnetic flux density could be the use of a Hall probe. Suggest one reason why Hall probe is not a suitable instrument to measure the magnetic flux density for the arrangement shown in the above figure. [1]

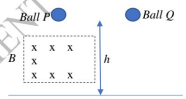
(iii) Another method of measuring the magnetic flux density for the arrangement shown in the above figure is to insert a current-carrying wire between the poles of the magnet. Explain how the magnetic flux density can be determined using this method. You are allowed to use any additional apparatus. [3]

6. (a) Law of electromagnetic induction can be expressed mathematically as $\varepsilon = -N\frac{d\varphi}{dt}$.

(b) (i) State what the symbols $\varepsilon$ and $\frac{d\varphi}{dt}$ represent in the equation. [2]

(ii) Explain the significance of the negative sign. [1]

(ii) Two identical copper balls are dropped from the same height as shown in the figure. Ball P passes through a region of uniform horizontal magnetic filed of flux density *B*.




Explain why ball P takes longer than ball Q to reach the ground. [2]

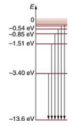
7. Ultraviolet radiation of frequency $1.5 \times 10^{15}$Hz is incident on the surface of an aluminium plate whose work function is $6.6\times10^{-19}$J.

(i) Show that the maximum speed of the electrons emitted from the surface of the aluminium is $8.6 \times 10^{5}$ms$^{-1}$. [3]

(ii) State and explain what change, if any, occurs to the maximum speed of the emitted electrons when the intensity of the ultraviolet radiation is increased. [2]

8. (i) State Bohr's postulates of atomic model. [3]

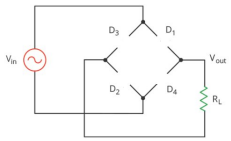
(ii) The figure shows Lymen series of energy transmission in hydrogen atom. Calculate the frequency of a photon emitted by an electron jumping from the second excited state to the ground level. [2]




OR

(i) Sketch the symbol of a p-n junction diode and indicate the polarity of its ends. [1]

(ii) Copy the outline of a diode bridge rectifier and complete it by adding diodes in the gaps. [2]






(ii) Explain what will happen if one of the four diodes is damaged so that it stops conducting totally in any direction. Sketch a graph to show how the pd across the Load $R_L$ would vary with time in this situation. [2]

**Section C: Long Answer Questions. (3 × 8 = 24)**

9. Earthquake sets rocks and buildings in motion. When a rock is subjected to compression, a restoring force develops inside it. This restoring force is given by an equation F= -Ax where x is displacement and A is a constant.

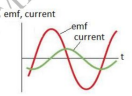
(i) Prove that this force will make the rock vibrate with simple harmonic motion. [2]

(ii) Show that the speed of an object undergoing simple harmonic motion is given by the expression v = $\pm\omega\sqrt{(A^2-x^2)}$ where the symbols carry standard meanings. [2]

(ii) Calculate the maximum speed of a building shaken by S-waves of 21Hz and amplitude 0.05m. [2]

(iv) Explain why tall buildings are more susceptible to damage by S-waves which generally have low frequency. [2]

10. The figure below shows the variation of emf and current with time in a typical LRC circuit.




(i) Explain whether the phase constant is postive or negative. [2]

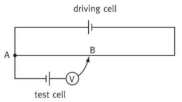
(ii) Sketch a phasor diagram for the given case. [2]

(iii) Is the circuit more inductive or capacitive? Explain. [2]

(iv) To increse the rate at which energy is transferred to the resistive load, should the inductance be increased or decreased? Justify your answer. [2]

OR

A student sets up a circuit as shown in the figure given below to measure the emf of a test cell.




(a) Explain why he is unable to find a balance point and state the change he must make in order to achieve the balance. [2]

(b) State how he would recognize the balance point. [1]

(c) He obtained the balance point for distance 37.5cm using standard cell of emf 1.50V. And for the test cell, the balance distance AB was 25.0 cm. Calculate the emf of the test cell. [2]

(d) He could have used an ordinary voltmeter to measure the emf of the test cell directly. The student, however, argues that the above instrument is more precise than an ordinary voltmeter. Justify his logic. [2]

11. (a) Explain what is meant by quantization of charge. [2]

(b) In a Millikan's oil drop experiment, an oil drop of weight $1.5 \times 10^{-14}$N is held stationary between plates 10mm apart by applying a p.d. of 470V between the plates.



(i) State the condition necessary for the drop to remain stationary. Also, sketch the forces acting on the oil drop. [2]

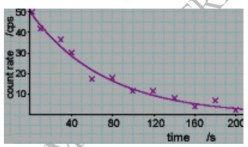
(ii) Calculate the charge on the oil-drop. [2]

(iii) Explain what would happen if the above oil drop is suddenly struck by a stray alpha particle. [2]

OR

(a) Derive an expression $N= N_o e^{-\lambda t}$ for a radioactive process where the symbols carry their standard meanings. [3]

(b) A student measured the activity of a sample of radioactive rock. Her results are presented in the graph.




(i) Explain why the data are scattered. [1]

(ii) Determine the half-life of this sample. [2]

(iii) How will the shape of this curve will change if she repeats the experiment with a sample with a larger decay constant. Give reason to your answer. [2]



Appendix

Text Matrix

| Area | Load | MCQ | SA | LA |
|---|---|---|---|---|
| Mechanics | 13 | 3 | 2 | 0 |
| Heat and thermodynamics | 7 | 2 | 1 | 0 |
| Waves and optics | 15 | 2 | 1 | 1 |
| Electricity and magnetism | 21 | 3 | 2 | 1 |
| Modern physics | 19 | 1 | 2 | 1 |

| Section A | Question | K | U | A | HA |
|---|---|---|---|---|---|
| | 1 | 1 | | | |
| | 2 | | 1 | | |
| | 3 | | | 1 | |
| | 4 | | | 1 | |
| | 5 | | 1 | | |
| | 6 | | 1 | | |
| | 7 | | | | 1 |
| | 8 | | | 1 | |
| | 9 | | 1 | | |
| | 10 | | 1 | | |
| | 11 | 1 | | | |
| | Total | 2 | 5 | 3 | 1 |

| | Question No | K | U | A | HA |
|---|---|---|---|---|---|
| Section B | 1 | 1 | 2 | | 2 |
| | 2 | 1 | | 2 | 2 |
| | 2 | 1 | | 2 | 2 |
| | 4 | 1 | 2 | 1 | 1 |
| | 5 | 1 | | | 4 |
| | 6 | 2 | 1 | | 2 |
| | 7 | | | 3 | 2 |
| | 8 | 3 | | 2 | |
| | | 10 | 5 | 10 | 15 |
| Section C | Question | K | U | A | H |
| | 9 | | | 4 | 4 |
| | 10 | | 4 | 2 | 2 |
| | 11 | | 4 | 2 | 2 |
| | | 0 | 8 | 8 | 8 |

Note: This is the test matrix prepared for this set only but for other sets of questions test matrix may be varied.

## 8. Biology (202)

### Specification grid 2078

**Grade: 12** **Subject: Biology Theory (Bio. 202)**

| SN | Content Area | Working hour | Competency level | | | | | | | | | | | | | | Unit wise Marks | Group wise score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Remembering | | | | Understanding | | | | Applying | | | | Higher Ability | | | | | |
| | | | MCQ | | SAQ | | MCQ | | SAQ | | LAQ | | MCQ | | SAQ | | LAQ | | | |
| | | | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | | |
| 1 | Plant Anatomy | 8 | | | | | | | | | | | | | | | | | 5 | |
| 2 | Plant Physiology | 20 | | | | | | | | | | | | | | | | | 11 | 37 |
| 3 | Embryology | 8 | | | | | | | | | | | | | | | | | 5 | |
| 4 | Genetics | 21 | | | | | | | | | | | | | | | | | 12 | |
| 5 | Biotechnology | 7 | | | | | | | | | | | | | | | | | 4 | |
| 6 | Applied Biology | 16 | 4 | 4 | 2 | 8 | 3 | 3 | 2 | 8 | 1 | 8 | 2 | 2 | 3 | 12 | 1 | 8 | 9 | 38 |
| 7 | Animal tissue | 8 | | | | | | | | | | | | | | | | | 5 | |
| 8 | Developmental Biology | 6 | | | | | | | | | | | | | | | | | 4 | |
| 9 | Human biology | 28 | | | | | | | | | | | | | | | | | 16 | |
| 10 | Human Population and Health Disorders | 6 | | | | | | | | | | | | | | | | | 4 | |
| **Total Marks** | | | **12** | | | | **19** | | | | **22** | | | | **22** | | | | **75** | **75** |

**Item format plan**

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| | **Grand Total** | | **23** | **75** | **3 hours** |



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- The distribution of cognitive domain of questions should be nearly 15% knowledge/remembering, 25% understanding, 30% applying and 30% higher ability level, but ±5 percent variation will be allowed in overall question set.
- SAQ and LAQ can be structured (have two or more sub-items). SAQ and LAQ can be distributed to two or more cognitive behaviors.
- In such case these will be added to their respective cognitive behavior. In sum the distribution of cognitive behavior should be approximately to the required distribution.
- Each group will consist of 4 SAQs questions with one "OR" question and 2 LAQs with one "OR" question. Botany portion will consist of 5 MCAQs and zoology portion consists of 6 MCAQs.





### Model Question – 2078

**Grade: XII** **Subject: Biology** **F.M.: 75**

**Attempt all questions.**

**Part: I [ Botany]**

**Group: A**

**Circle the correct answer from the given alternatives. (5 ×1 = 5)**

1. There are many types of chromosomal disorders in organisms, among them euploidy is very common in the population. Which one of the following conditions is true for euploidy?
   a. Addition or deletion of one or more chromosome in diploid chromosome
   b. Addition of one or more chromosome in diploid chromosome
   c. Deletion of one or more chromosome in diploid chromosome
   d. Addition or deletion of one set or more than one set of chromosomes in diploid chromosome
2. The formation of two male gametes is a peculiar feature in angiosperm. If the first male gamete is fused to oosphere, in which part does the second male gamete fuse?
   a. Synergids b. Egg cell c. Polar nuclei d. Antipodal cell
3. The given vascular bundle is highly specialised by centripetal protoxylem. What is it called?
   a. Exarch b. Endarch c. Mesarch d. Centrach

4. Which of the following plants is used as bio fertilizer?
   a. *Volvox* b. *Funaria* c. *Azolla* d. *Rhizopus*
5. When a plant cell is placed in hypertonic solution, it gets plasmolysed as shown in the diagram. Which of the following occupies the space between the cell wall and the shrunken protoplast in such plasmolysed cell?
   a. Water b. Hypertonic solution
   c. Isotonic solution d. Hypotonic solution




**Group –B Botany**

**Give short answers to the following questions. [4× 4 =16]**

1. The anatomical structure of vascular plant is given. Study the given diagram and answer the following questions. (1+3=4)
   (a) Write the main characteristics of the given layer Y.
   (b) Draw the given diagram and label the tissues which is responsible for secondary growth. Elaborate the activities of this tissue up to the formation of cambial ring.

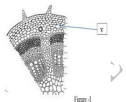



Figure 4

2. Write the salient features of a monocot embryo in reference to its development pattern with diagrams. (3+1=4)
3. "Micropropagation is an analytical and conventional bulk breeding technique for rapid cloning of desirable stock". Justify the statement by describing it briefly with the various stages of micropropagation technique in plants. (4)
4. What is genetic material? Describe the structure and functions of RNA. (1+2+1=4)

   OR

   What are plant growth hormones? Write the physiological functions of auxin. Mention its shortcoming of hyper use in crops.

**Group –C Botany**

**Give long answers to the following questions. [2 ×8=16]**

5. One of the Mendelian inheritances states that "The alleles of different traits can be segregated during gametogenesis and passed independently." State and explain the essential pattern of inheritance verifying the statement with examples showing cross up to second filial generation with chart and ratio. (1+ 3+2+2= 8)

   OR

   In *Drosophila*, an eye colour is X-linked. Explain. If white eye female *Drosophila* is crossed to red eye male *Drosophila*, what result do you expect? Analyse briefly with the help of crosses.
6. How are the Glycolysis and Krebs (TCA) cycle linked? Draw a detailed flow chart of the Krebs cycle? 4+ 4= 8

**Part: II (Zoology)**
**Group –A**

**Circle the correct answer from the given alternatives.** **(6 ×1 = 6)**

1. The parasympathetic nervous system releases a hormone acetylcholine. Which one of the following is activated by this hormone?
   a. Regulate the involuntary response
   b. Decrease the rate of heart beat
   c. Increase blood pressure
   d. Increase myocardial contractility
2. After the release of mature ovum from the ovary, the Graffian follicle changes into corpus luteum which is the source of female sex hormones. In the woman, what would be the condition of corpus luteum in absence of pregnancy?
   a. Secretes FSH and LH continuously
   b. Secretes oxytocin and relaxin
   c. Automatically degenerates after sometime
   d. Remains intact and active
3. Which of the following statement is more appropriate for early an amniocentesis test?
   a. It takes place between 15th and 20th weeks of pregnancy
   b. It may cause fetal injury and lethality
   c. It helps to detect fetal complications
   d. It may cause infertility
4. What are the main processes involved in gastrulation of a frog?
   a. Epiboly, involution, cleavage
   b. Epiboly, invagination, Involution
   c. Involution, epiboly, invagination
   d. Involution, invagination, cleavage
5. Blood cells are formed in the bone marrow. What is the process of formation of blood called?
   a. Haemopoiesis
   b. Haemolysis
   c. Lymphopoiesis
   d. Erythroblastosis
6. A person suddenly falls down and becomes unconscious. A doctor checked and said that it is due to inadequate blood supply to the brain. What would be the type of disorder?
   a. Asthma
   b. Syncope
   c. Heart attack
   d. Oedema





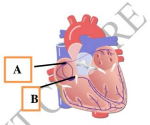
**Group –B** **Zoology**

**Give short answers to the following questions.** **4× 4 =16**

1. Compare and contrast areolar tissue and adipose tissue. 2+2=4
2. Describe the process of fertilization of an egg with reference a frog. 4

   OR

   Describe the various steps applied in poultry farming. 4
3. Study the given diagram and answer the following questions. 1+3=4
   (a) Label A and B.
   (b) Write any three differences between A and B.




4. Overpopulation is a major issue in the development of the nation. Highlight the socio-economic problems caused by overpopulation and mention how to solve such problems. 2+2=4

**Group –C**

**Give long answers to the following questions.** **[2 × 8=16]**

5. Mention the causative agent, mode of transmission, symptoms and control measures of tuberculosis in the community. (1+2+3+ 2 =8)
6. Draw a labelled diagram of the alimentary canal of a human being. Explain the mechanism of the digestion of foods that a person under takes. What would happen in digestion when the pancreas is removed? (3+4+1)

   OR

   Draw a labelled drawing of respiratory system of a human being. Why and how oxygen and carbon dioxide are exchanged rapidly in the lungs? What would happen if a person moves to high altitude? Write your views on how to solve it. (2 +4+ 1+1 =8)

**"Best of luck"**





## 14.Chemistry

### Test Specification Chart 2078

**Grade: 12** **Subject: Chemistry Theory (Che. 302)**

| SN | Content Area | Working hour | Competency level | | | | | | | | | | | | | | | | | | Unit wise Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Remembering | | | | Understanding | | | | Applying | | | | Higher Ability | | | | | | |
| | | | MCQ | | SAQ | | MCQ | | SAQ | | LAQ | | MCQ | | SAQ | | LAQ | | MCQ | | SAQ | | LAQ | | |
| | | | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | |
| 1 | Physical chemistry | 40 | 2 | 2 | 2 | 10 | 5 | 5 | 1 | 5 | 1 | 8 | 3 | 3 | 2 | 10 | 1 | 8 | 1 | 1 | 3 | 15 | 1 | 8 | 22 |
| 2 | Inorganic chemistry | 20 | | | | | | | | | | | | | | | | | | | | | | | 12 |
| 3 | Organic chemistry | 55 | | | | | | | | | | | | | | | | | | | | | | | 33 |
| 4 | Applied chemistry | 13 | | | | | | | | | | | | | | | | | | | | | | | 8 |
| | **Total** | **128** | | | **12** | | | | **18** | | | | | | **21** | | | | | | **24** | | | | **75** |

**Item format plan**

| S.N. | Type of item | Score per item | Total item | Total score | Time |
|---|---|---|---|---|---|
| 1 | Multiple Choice Questions | 1 | 11 | 11 | 25 minutes |
| 2 | Short Question Answer | 5 | 8 | 40 | 155 minutes |
| 3 | Long Question Answer | 8 | 3 | 24 | |
| | **Grand Total** | | **22** | **75** | **3 hours** |

**Remarks:**

- Item format in composite should be met as per the specification grid.
- Designated weightage in the combined cell should be met, but ±3 marks variation will be allowed within a unit/content area. But no unit can be nil.
- In the case of SAQ and LAQ, these should ensure that 1 mark will be assigned per element expected as correct response.
- The distribution of cognitive domain of questions should be nearly 15% knowledge/remembering, 25% understanding, 30% applying and 30% higher ability level, but ±5 percent variation will be allowed in overall question set.
- SAQ and LAQ can be structured (have two or more sub-items). SAQ and LAQ can be distributed to two or more cognitive behaviors.
- In such case these will be added to their respective cognitive behavior. In sum the distribution of cognitive behavior should be approximately to the required distribution. In case of SAQ there will be 2 "OR" questions and in case of LAQ there will be 2 "OR" question.





**Model Question**
**School Leaving Certificate Examination**
2078

Grade: XII Subject: Chemistry Subject Code: 302
Full marks: 75 (11 marks Obj+ 64 marks Sub) Time: 3 Hours

**Group A: Multiple Choice Questions (11×1 = 11)** **Time 25 Minutes**

**Tick the correct answer.**

1. What is the equivalent weight of $H_3PO_3$ in the reaction; $2NaOH + H_3PO_3 \rightarrow Na_2HPO_3 + 2H_2O$
   A) 2M B) M/1 C) M/2 D) M/3
2. The solubility product of chalk is $9.3 \times 10^{-8}$. What is its solubility in gram per liter?
   A) $3.04 \times 10^{-1}$ B) $3.04 \times 10^{-2}$ C) $3.04 \times 10^{-3}$ D) $3.04 \times 10^{-4}$
3. What is the concentration of $N_2O_5$ in the following first order reaction in which the rate is $2.4 \times 10^{-5}$ mol/L and rate constant is $3.0 \times 10^{-5} S^{-1}$?
   $2N_2O_5 \longrightarrow 4NO_2 + O_2$
   A) 0.04 B) 0.8 C) 1.2 D) 1.4
4. What happens when the lead storage battery is discharged?
   A) $SO_2$ is evolved B) $PbSO_4$ is consumed
   C) Lead is formed D) $H_2SO_4$ is consumed
5. What is the general electronic configuration of transition metal?
   A) $(n-1)s^2p^6d^{1-10}ns^{0-2}$ B) $(n-1)s^2p^6ns^2np^1$ C) $(n-1)s^2p^6d^5ns^1$ D)$(n-1)s^2p^6ns^1$
6. Which of the following ore is concentrated by forth-flotation process?
   A) Hematite B) Siderite C) Galena D) Malachite
7. Which of the following products is obtained when nitrobenzene is electrolytically reduced?
   A) P-aminophenol B) azobenzene C) azoxybenzene D) hydrazobenzene
8. Which of the following compounds is pi-bonded organo-metallic compound which has ethene as one of its component and is the first synthesized organometallic compound?
   A) Zeise's salt B) Ferrocene C) Dibenzene chromium D) Tetraethyl tin

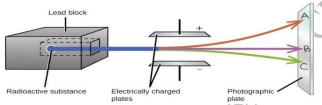
9. What effect does calcium sulphate have on cement?

A) Retards setting action B) Acts as flux C) Imparts color D) Reduces strength

10. Removal of which of the following leads to higher fiber-fiber bonding strength in paper? .

A) Softwood B) Hardwood C) Lignin D) Pulp

11. In the figure given below which one is correct?




A) Alpha rays deviate towards A, beta rays deviate towards C and gamma rays direct towards B.

B) Alpha rays direct towards B, beta rays deviate towards C and gamma rays towards A.

C) Alpha rays deviate towards C, beta rays direct towards B and gamma rays towards A.

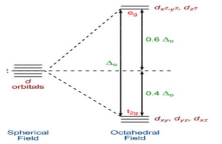
D Alpha rays deviate towards C, beta rays deviate towards A and gamma rays direct towards B.







3. The figure shows the octahedral distortion of d-block orbital in the presence of ligand.




a. Why does octahedral distortion occur in the presence of ligand? Explain on the basis of CFT. (2)

b. On the basis of the given distortion, how can you explain $[Cu(H_2O)6]^{++}$ is blue colored complex. (1)

c. Out of $Fe^{++}$ and $Fe^{+++}$ which one is more stable? Explain on the basis of distortion seen in the above figure. (1)

d. Why do such elements which give such splitting show good catalytic properties? (1)

4. X is an ore of a metal M. X on calcination gives black precipitate (W) of metal oxide which belongs to group II of basic radical in qualitative analysis. X on roasting gives the metal (M) and a gas as major byproduct. The gas when passed through an acidified $K_2Cr_2O_7$ solution turns green.

a. Identify the metal X. (1)

b. Write the reaction involved during calcination of X. (1)

c. Write the action of the gas on acidified $K_2Cr_2O_7$. (1)

d. Convert metal X into it's vitriol. (2)

5. The given table shows the compounds and their molecular formula. How can you convert P to Q, where Q is a compound in which two methyl groups are substituted at adjacent carbons? How is P obtained from T, where T is secondary alcohol? Write the reactions involved in the conversion of P into R and S? [5x1=5]

| Compounds | Molecular formula |
|---|---|
| P | $C_3H_7Br$ |
| Q | $C_6H_{14}$ |
| R | $CH_2O$ |
| S | $C_2H_4O$ |
| T | $C_3H_8O$ |

OR

An aromatic compound [A] in which one chlorine atom is substituted at benzene ring. When the compound [A] is heated with 2, 2, 2-trichloro ethanal in presence of conc. $H_2SO_4$ gives an insecticide [B]. The compound [A] when treated with an acid chloride containing two carbon atoms in the presence of anhydrous $AlCl_3$ gives [C].







**Model Question**

**School Leaving Certificate Examination**

2078

Grade: XII Subject: Chemistry Subject Code: 302

Full marks: 75 (11 marks Obj + 64 marks Sub) Time: 3 Hours

**Attempt all the questions.**

**Group B: Short Answer Questions (8×5 = 40)**

1. Standard solution of $Na_2CO_3$ is used to determine the strength of $H_2SO_4$ during Titration.

A) How is the completion of the reaction in this titration detected? Is the solution prepared from $Na_2CO_3$ primary standard? Why? [1+1]

B) 2.16 g of pure $Na_2CO_3$ is added to 400 ml deci-normal solution of $H_2SO_4$. How many grams of $H_2SO_4$ is further required to neutralize the resultant solution completely? [3]

OR

A) Derive the relation $k = \log\frac{2.303}{t}\log\frac{a}{a-x}$. Show that for the first order reaction the time required for half the change (half life period) is independent of the initial concentration. (2+1)

B) A first order reaction is 50% completed in $1.26\times10^{145}$. How much time would it take for 90% completion? (2)

2. Study the following data for the thermodynamic process $H_2O$ (l) ⟶ $H_2O$ (s) at different temperatures and at 1 atmospheric pressure.

| Condition | Temperature | Entropy change in J/Kmol$^{-1}$ | |
|---|---|---|---|
| | | Entropy of system | Entropy of surrounding |
| 1 | $-1^0$C | -25.68 | +25.72 |
| 2 | $0^0$C | -26.55 | +26.88 |
| 3 | $+1^0$C | -27.62 | +27.42 |

a. Calculate the total entropy of the universe at given condition 3. (1)

b. Can we predict the spontaneity of the given reaction at $0^0$C? (1)

c. Calculate the equilibrium constant for the fusion of ice at $1^0$C. What is the effect of temperature for the entropy change of reaction? (2+1)







a. Identify B and C. (1 +1)

b. Reaction of aq. NaOH on the compound [A] is more difficult than with chloroethane, justify with a suitable explanation. (2)

c. How would you obtain compound A from benzene diazonium chloride? (1)

6. A list of compounds are given as follows:

| p-hydroxyazobenzene, $C_6H_5N_2Cl$, $C_6H_5NH_2$, $C_6H_5NO_2$, $C_6H_6$ |
|---|

From the above list of compounds, prepare a sequence of reaction chain with suitable conditions and reactions. (1+1+1+1+1)

7. Write down the isomeric alcohols of $C_3H_8O$ and their IUPAC name. How would you apply Victor Meyer's test to distinguish these isomers? (2+3)

8. A) Define condensation polymerization. Write the molecular structures of monomers of Bakelite. (1+2)

B) Differentiate between OPC and PPC cement. (2)

**Group C: Long Answer Questions (3 × 8 = 24)**

9. (A) What amount of $Zn(OH)_2$ will be precipitated out at $25^0$C if 100 ml of 0.22gm NaOH is added to 1 liter of a saturated solution of $Zn(OH)_2$? Precipitate is obtained in this reaction , why? [Solubility product of $Zn(OH)_2$ at $25^0$C is $1.8\times10^{-14}$.] (4+1)

(B) Potassium hydroxide having pH 8 is diluted 1000 times. Calculate the pH of the diluted base. (3)

OR

(A) Calculate heat of formation of ethyl alcohol from the given data. (4)

| | |
|---|---|
| Heat of combustion of ethyl alcohol | -330 kcal |
| Heat of formation of Carbondioxide | -94 kcal |
| Heat of formation of water | -68.5 kcal |

(B) The standard electrode potential for the following electrode reaction at standard state is given.

Cu(s) ⟶ $Cu^{++}$(aq) + 2e$^-$……$E^0$ $Cu^{++}$/Cu= +0.34V

$Ag^+$(aq) + e$^-$ ⟶ Ag(s) ……$E^0$ $Ag^+$/Ag=+0.80V

a. Write the cell notation indicating anode and cathode. (1)

b. With 1M solution of ion at $25^0$C and 1atm. pressure, what will be the cell potential? (1)

c. Calculate the free energy change in the reaction. (1)

d. Can we store $AgNO_3$ solution in a copper vessel? (1)

10. (A) A primary alcohol with molecular wt. 46 is boiled with sodium hydroxide and iodine. When the same alcohol is heated with ethanoic acid in presence of conc. $H_2SO_4$, one of the derivatives of carboxylic acid is obtained. Write the reactions involved in both conditions. What would be the product obtained when the same alcohol is heated with conc.$H_2SO_4$? How would you distinguish the above alcohol from methanol? [1+1+1+1+1=5]

(B) An aromatic compound known as oil of mirabane is prepared from benzene.

a. What product would you obtain when the compound is electrolyzed in acidic medium? (1)

b. Give the complete reaction for the conversion of the compound into yellow dye. (2)

11.

(A) An organic compound is used in the given figure to preserve museum specimens and also to prepare urinary antiseptics.

a. Write the reaction when the compound is heated with concentrated sodium hydroxide. (1)

b. Draw the structure of urinary antiseptic (1)

c. Write the chemical reaction that would occur when the given preservative is treated with phenol in acidic medium. (2)

d. How would you obtain the preservative from methanol? (1)

(B) A carbonyl compound with molecular formula $C_3H_6O$ (it does not give silver mirror test) has treated with a compound Y which gives Z. Z on hydrolysis in acidic medium gives 2-hydroxy-2-methyl propanoic acid. Identify the carbonyl compound, Y and Z with proper reactions. [1+1+1]

OR

(A) Starting from compound P, how do the reactions proceed ahead to obtain T which gives benzene where R is aniline? Complete the reaction sequence with suitable conditions. [5x1=5]


(B) Arrange the given compounds according to their ascending order of acidic strength and justify your order.

$CH_3CH_2COOH$, $C_6H_5COOH$, $ClCH_2CH_2COOH$

[1+1+1]

*The End*







Appendix

Test Matrix

| SN | Chapter | Area/TH | Weightage (TH) | MCQ | SAQ | LAQ |
|---|---|---|---|---|---|---|
| 1 | Volumetric analysis | Physical Chemistry 40 (22 Marks) | 8 | 1 | 1 | |
| 2 | Ionic equilibrium | | 10 | 1 | | 1 |
| 3 | Chemical kinetics | | 7 | 1 | 1 | |
| 4 | Thermodynamics | | 8 | | 1 | (3) |
| 5 | Electrochemistry | | 7 | 1 | | (5) |
| 6 | Transition metal | Inorganic 20 (12 Marks) | 5 | 1 | 1 | |
| 7 | Heavy metal | | 15 | 1 | 1 | |
| 8 | Haloalkanes | Organic Chemistry 55 (33 Marks) | 8 | | 1 | |
| 9 | Haloarenes | | 3 | | 1 | |
| 10 | Alcohols | | 7 | | | (5) |
| 11 | Phenols | | 4 | | 1 | |
| 12 | Ethers | | 2 | | | |
| 13 | Aldehydes and ketones | | 10 | | | 1 |
| 14 | Carboxylic acids | | 9 | | | 1 |
| 15 | Nitro compounds | | 3 | 1 | | |
| 16 | Amino compounds | | 7 | | 1 | (3) |
| 17 | Organometallic compounds | | 2 | 1 | | |
| 18 | Chemistry in service to mankind | Applied Chemistry 13 (8 Marks) | 4 | | (3) | |
| 19 | Cement | | 4 | 1 | (2) | |
| 20 | Paper and pulp | | 3 | 1 | | |
| 21 | Nuclear chemistry | | 2 | 1 | | |
| | Total | 128 (75 Marks) | 128 | 11 | 40 | 24 |

Note: This is the test matrix prepared for this set only but for other sets of questions test matrix may be varied.







## 28. Computer Science (428)

**Specification grid 2077**

**Grade: 12** **Subject: Computer Science Theory (Com. 428)**

| SN | Content Area | Working hour | Competency level | | | | | | | | | | | | | | Content Area /Unit wise Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Remembering | | | | Understanding | | | | | | Applying | | | | Higher Ability | | | | | | |
| | | | MC Q | | SA Q | | MC Q | | SA Q | | LA Q | | MC Q | | SA Q | | LA Q | | MC Q | | SA Q | | LA Q | |
| | | | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | |
| 1 | Database Management System (DBMS) | 12 | 3 | 3 | 1 | 5 | 2 | 2 | 2 | 10 | - | - | 2 | 2 | 1 | 5 | 1 | 8 | 2 | 2 | 1 | 5 | 1 | 8 | 8 |
| 2 | Data communication and Networking | 15 | | | | | | | | | | | | | | | | | | | | | | | 9 |
| 3 | Web Technology II | 12 | | | | | | | | | | | | | | | | | | | | | | | 8 |
| 4 | Programming in C | 12 | | | | | | | | | | | | | | | | | | | | | | | 8 |
| 5 | Object-oriented Programming (OOP) | 10 | | | | | | | | | | | | | | | | | | | | | | | 6 |
| 6 | Software Process Model (SPM) | 10 | | | | | | | | | | | | | | | | | | | | | | | 6 |
| 7 | Recent Trends in Technology | 9 | | | | | | | | | | | | | | | | | | | | | | | 5 |
| **Total Marks** | | **80** | **8** | | | | **12** | | | | | | **15** | | | | | | **15** | | | | | | **50** |







**Item format plan**

| S.N. | Type of item | Score per item | Total item | Total score | Time |
|---|---|---|---|---|---|
| 1 | Multiple Choice Questions | 1 | 9 | 9 | 25 minutes |
| 2 | Short Question Answer | 5 | 5 | 25 | 95 minutes |
| 3 | Long Question Answer | 8 | 2 | 16 | |
| | **Grand Total** | | **16** | **50** | **2 hours** |

**Remarks:**

- Item format in composite should be met as per the specification grid.
- Designated weightage in the combined cell should be met, but ±3 marks variation will be allowed within a unit/content area. But no unit can be nil.
- In the case of SAQ and LAQ, these should ensure that 1 mark will be assigned per element expected as correct response.
- The distribution of cognitive domain of questions should be nearly 15% knowledge/remembering, 25% understanding, 30% applying and 30% higher ability level, but ±5 percent variation will be allowed in overall question set.
- SAQ and LAQ can be structured (have two or more sub-items). SAQ and LAQ can be distributed to two or more cognitive behaviors.
- In such case these will be added to their respective cognitive behavior. In sum the distribution of cognitive behavior should be approximately to the required distribution. In case of SAQ there will be 2 "OR" questions and in case of LAQ there will be 2 "OR" question.

**Model Question**
**School Leaving Certificate Examination**
**2078**

Grade: Grade XII Subject: Computer Science (Th) Subject code: 428
Full Marks: 50 (9 marks Obj + 41 Marks Sub) Time: 2 Hours

**Group A: Multiple Choice questions (9 x 1=9)** **Time: 20 minutes**

**Tick the correct answer.**

1. Which of the statements are used in DDL?
   A) Create, alter and drop B) Create, insert and select
   C) Insert, update and delete D) Delete, alter and drop
2. With SQL, how do you select all the records from a table named "Persons" where the value of the column "FirstName" ends with an "a"?
   A) SELECT * FROM Persons WHERE FirstName='a'
   B) SELECT * FROM Persons WHERE FirstName LIKE 'a%'
   C) SELECT * FROM Persons WHERE FirstName LIKE '%a'
   D) SELECT * FROM Persons WHERE FirstName='%a%'
3. Which of the following statements is true about a star network topology?
   A) Each device is connected to a switch or hub
   B) Each device is connected to each other
   C) Each device is connected in a trunk
   D) Each device is connected to a terminal
4. Which of the following is the correct syntax to display "Stay Safe" in an alert box using JavaScript?
   A) alert-box("Stay Safe"); B) confirm("Stay Safe");
   C) msgbox("Stay safe"); D) alert("Stay Safe");
5. What is the use of <A> tag?
   A) To insert an image B) To create a link
   C) To create a hyperlink D) To create a list



6. What is the output of given C program?

```
void main(){
  char str1[] = "FIRST"; char str2[20]; strcpy(str2,str1);
  printf("%s %s ",str1,str2); printf("%d", (str1!=str2));
  printf("%d", strcmp(str1,str2)); }
```

   A) FIRST FIRST 0 0 B) FIRST FIRST 1 1
   C) FIRST FIRST 1 0 D) FIRST FIRST 0 1
7. Where is a class derived in inheritance?
   A) Superclass B) Subclass C) Subsetclass D) Relativeclass
8. Which of these is the correct order of the SDLC?
   A) Analysis, Design, Coding, Testing, Implementation
   B) Analysis, Design, Testing, Implementation, Coding
   C) Implementation, Coding, Analysis, Design, Testing
   D) Design, Testing, Implementation, Coding, Analysis
9. Why is cloud computing popular nowadays?
   A) Cost-sharing and easily accessible
   B) As modern technology and costly
   C) Accessible and freely available
   D) Affordable to all



**Model Question**
**School Leaving Certificate Examination**
**2078**

Grade: Grade XII Subject: Computer Science (Th) Subject code: 232
Full Marks: 50 (9 marks Obj + 41 Marks Sub) Time: 2 Hours

**Group B: Short Answer Questions (5 x 5=25)**

1. Explain 2NF and 3NF with examples.

   OR

   Demonstrate the basic DML statement with an example.
2. Write a function to add any two numbers in Javascript.

   OR

   Demonstrate the external CSS implemented in the web page.
3. Describe any five features of OOPs.
4. What are the different stages of software planning? Describe.
5. Define the concept of AI and IoT. (2+3)

**Group C: Long Answer Questions (2 x 8=16)**

6. How do you implement the Class C IP address in the local area network? Describe.
7. Write a program to enter ten integer numbers into an array, sort and display them in ascending order.

   OR

   Write a program to read the marks of any 5 students in a subject and count how many students are pass and fail.



Appendix

**Test Matrix**

| SN | Content Area | Working hour | Competency level | | | | | | | | | | | | | | | | | | | | Content Area /Unit wise Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Remembering | | | | Understanding | | | | | | Applying | | | | | | Higher Ability | | | | | | |
| | | | MC Q | | SA Q | | MC Q | | SA Q | | LA Q | | MC Q | | SA Q | | LA Q | | MC Q | | SA Q | | LA Q | | |
| | | | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | No. of Questions | Marks | |
| 1 | Database Management System (DBMS) | 12 | 1 | 1 | | | 1 | 1 | | | | | | | | | | | 1 | 1 | 1 | 5 | | | 8 |
| 2 | Data communication and Networking | 15 | | | | | 1 | 1 | | | | | | | | | 1 | 8 | | | | | | | 9 |
| 3 | Web Technology II | 12 | 1 | 1 | | | | | | | | | 1 | 1 | 1 | 5 | | | | | | | | | 8 |
| 4 | Programming in C | 12 | | | | | | | | | | | | | | | | | 1 | 1 | | | 1 | 8 | 8 |
| 5 | Object-oriented Programming (OOP) | 10 | | | 1 | 5 | | | | | | | 1 | 1 | | | | | | | | | | | 6 |
| 6 | Software Process Model (SPM) | 10 | 1 | 1 | | | | | 1 | 5 | | | | | | | | | | | | | | | 6 |
| 7 | Recent Trends in Technology | 9 | | | | | | | 1 | 5 | | | | | | | | | | | | | | | 5 |
| **Total Marks** | | **80** | **8** | | | | **12** | | | | | | **15** | | | | | | **15** | | | | | | **50** |

Note: This is the test matrix prepared for this set only but for other sets of questions test matrix may be varied.