

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2017

APPLIED SCIENCE — I (Physics)

[Time : 1½ hours

(Maximum marks : 50)

PART — A

(Maximum marks : 4)

Marks

I Answer *all* questions in one or two sentences. Each question carries 2 marks

(a) Write the dimensional formula of pressure and coefficient of viscosity.

(b) Define Centre of Gravity.

(2 × 2 = 4)

PART — B

(Maximum marks : 16)

(Answer any *two* questions. Each full question carries 8 marks.)

- | | | |
|-----|---|---|
| II | (a) Derive an expression for the period of a simple pendulum using dimensional analysis. | 4 |
| | (b) State the law of conservation of momentum. Prove it in the case of collision of two bodies moving in the same direction. | 4 |
| III | (a) Derive the equation for the displacement of a uniformly accelerated body during the n^{th} second of its motion. | 4 |
| | (b) State and explain parallel and perpendicular axes theorems. | 4 |
| IV | (a) Derive an expression for the kinetic energy of a rolling disc. | 4 |
| | (b) Distinguish between stress and strain. Deduce the expression for Young's modulus. | 4 |

PART — C

(Maximum marks : 30)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT — I

- V (a) What is impulse ? Show that impulse is equal to change in momentum. 3
- (b) For a body projected upwards, derive an expression for
(i) the maximum height reached (ii) horizontal range. 6
- (c) A stone of mass 0.1 kg tied to the end of a string of length 0.2m is whirled in a horizontal circle with an angular velocity 2 rad/second. Find the linear velocity, centripetal acceleration and centripetal force. 6

OR

- VI (a) Write advantages of SI system over other systems of unit. 3
- (b) A machine gun of mass 10 kg fires 30 gm bullets at the rate of 6 bullets per second, each with velocity 400 m/s. Find the recoil velocity of the gun and what force must be applied to keep the gun in position ? 6
- (c) A boy can throw a ball 40 m vertically upwards. Find the greatest distance he can throw. 6

UNIT — II

- VII (a) State and explain Newton's law of gravitation. 3
- (b) A circular disc of mass 300 kg and diameter 4 m rotates with an angular velocity of 90 rpm. When a torque is applied, its velocity is reduced to 60 rpm in 30 seconds. Find the value of the torque. 6
- (c) Deduce expressions for Young's modulus, Rigidity modulus and Bulk modulus. 6

OR

- VIII (a) Define radius of gyration. Give its unit. 3
- (b) Deduce an expression for the orbital velocity of a satellite. What will be the velocity of the satellite, if its orbit is close to the surface of earth ? 6
- (c) A steel wire of length 4.7m and cross section $3.5 \times 10^{-5} \text{m}^2$ stretches by the same amount as a copper wire of length 3.5 m and cross section $4 \times 10^{-5} \text{m}^2$ under a given load. What is the ratio of Young's modulus of steel to that of copper ? 6

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
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APPLIED SCIENCE – I (Chemistry)

[Time : 1½ hours

(Maximum marks : 50)

PART — A

(Maximum marks : 4)

- | | Marks |
|---|-------|
| I Answer <i>all</i> questions in one or two sentences. Each question carries 2 marks. | |
| (a) Distinguish between atom and molecule. | 2 |
| (b) What is nanochemistry ? Give two examples of nanomaterial. | 2 |

PART — B

(Maximum marks : 16)

- | | |
|---|---|
| II Answer any <i>two</i> of the following questions. Each question carries 8 marks. | |
| (a) Calculate the weight of Zinc (at.wt.65.5) required to liberate 0.05g of hydrogen from sulphuric acid. | 4 |
| (b) Illustrate Arrhenius and Lewis concept of acids and bases. | 4 |
| III (a) Calculate the pH 0.001 N HCl and 0.001 N NaOH. | 4 |
| (b) How can hardness of water be removed by ion exchange method and by boiling ? | 4 |
| IV (a) With chemical equation explain sterilization by bleaching powder and by ozone. | 4 |
| (b) Explain HiPCO and CVD methods used for the synthesis of carbon nanotubes. | 4 |

PART — C

(Maximum marks : 30)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT — I

- | | |
|---|---|
| V (a) Explain radicals with examples. | 4 |
| (b) Illustrate redox reactions taking the reactions in Daniel cell as an example. | 4 |

- (c) What are the following ?
- | | | |
|-----------------------|-----------------|---|
| (i) Standard solution | (iii) End point | |
| (ii) Titration | (iv) Indicator | 4 |
- (d) Mention any two ways by which you express the concentration of a solution. 3

OR

- VI (a) Balance the following skeleton equation.
- $$\text{KM}_n\text{O}_4 + \text{HCl} \dots\dots\dots \text{KCl} + \text{M}_n\text{Cl}_2 + \text{H}_2 \quad 3$$
- (b) Calculate the equivalent weight of $\text{Ca}(\text{OH})_2$ from the following equation.
- $$\text{Ca}(\text{OH})_2 + 2\text{HCl} \dots\dots\dots \text{CaCl}_2 + 2\text{H}_2\text{O} \quad 4$$
- (c) Explain buffer solution. 4
- (d) Which indicators will you use for the following titrations.
- | | | |
|---|---|---|
| (i) $\text{HNO}_3 \times \text{K}_2\text{CO}_3$ | (iii) $\text{H}_2\text{C}_2\text{O}_4 \times \text{NaOH}$ | |
| (ii) $\text{HNO}_3 \times \text{KOH}$ | (iv) $\text{H}_2\text{C}_2\text{O}_4 \times \text{Na}_2\text{CO}_3$ | 4 |

UNIT — II

- VII (a) Mention any four characteristics of potable water. 4
- (b) Explain different types of hardness in water. 4
- (c) Give any four applications of nanomaterials. 4
- (d) Which are the different varieties of carbon nanotubes. 3

OR

- VIII (a) Which are the different steps involved in the purification of water. 3
- (b) Give any four properties of carbon nanotubes. 4
- (c) What are carbon nanotubes ? Give two applications. 4
- (d) Explain different filtration methods used for the purification of water. 4