UNIT-I

MECHANICS

1. **The motion of a particle round a fixed axis is**
   - **A)** translatory
   - **B)** rotary
   - **C)** circular
   - **D)** translatory as well as rotary

2. **The centre of gravity of a semi-circle lies at a distance of _____ from its base measured along the vertical radius.**
   - **A)** 3r/ 8
   - **B)** 4r/ 3π
   - **C)** 8r/3
   - **D)** 3r/4π

3. **Which of the following statement is correct?**
   - **A)** The kinetic energy of a body before impact is less than the kinetic energy of a body after impact.
   - **B)** The kinetic energy of a body before impact is more than the kinetic energy of a body after impact.
   - **C)** The kinetic energy of a body during impact remains constant.
   - **D)** The kinetic energy of a body before impact is equal to the kinetic energy of a body after impact.

4. **The principle of transmissibility of forces states that, when a force acts upon a body, its effect is**
   - **A)** different at different points on its line of action
   - **B)** same at every point on its line of action
   - **C)** minimum, if it acts at the centre of gravity of the body
   - **D)** maximum, if it acts at the centre of gravity of the body

5. **The minimum force required to slide a body of weight W on a rough horizontal plane is**
   - **A)** $W \sin\theta$
   - **B)** $W \tan\theta$
   - **C)** $W \cos\theta$
   - **D)** None of these

6. **The rate of change of momentum is directly proportional to the impressed force, and takes place in the same direction in which the force acts. This statement is known as**
   - **A)** Newton's first law of motion
   - **B)** Newton's third law of motion
   - **C)** Newton's second law of motion
   - **D)** none of these

7. **A body of weight W is required to move up on rough inclined plane whose angle of inclination with the horizontal is A) The effort applied parallel to the plane is given by (where $\mu = \tan\varphi$ = Coefficient of friction between the plane and the body.)**
   - **A)** $P = W \tan\alpha$
   - **B)** $P = W (\sin\alpha + \mu\cos$ **A)**
   - **C)** $P = W (\cos\alpha + \mu\sin$ **A)**
   - **D)** $P = W \tan(\alpha + \varphi)$

8. **The angular velocity (in rad / s) of a body rotating at N revolutions per minute is**
   - **A)** πN/60
   - **B)** 2πN/180
   - **C)** πN/180
   - **D)** 2πN/60

9. **The maximum efficiency of a lifting machine is**
   - **A)** V.R./m
   - **B)** 1/m × V.R.
   - **C)** m/V.R.
   - **D)** 1/m

1. (C) 2. (B) 3. (B) 4. (C) 5. (B) 6. (C) 7. (B) 8. (D) 9. (B)

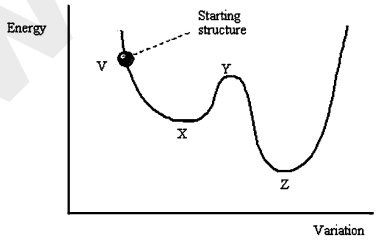
10. **A machine having an efficiency less than 50%, is known as**
    - **A)** non-reversible machine
    - **B)** neither reversible nor non-reversible machine
    - **C)** ideal machine
    - **D)** reversible machine

11. **Which of the following terms refers to the molecular modelling computational method that uses equations obeying the laws of classical physics?**
    - **A)** Quantum mechanics
    - **B)** Molecular calculations
    - **C)** Molecular mechanics
    - **D)** Quantum theory

12. **Which of the following terms refers to the molecular modelling computational method that uses quantum physics?**
    - **A)** Quantum mechanics
    - **B)** Molecular calculations
    - **C)** Molecular mechanics
    - **D)** Quantum theory

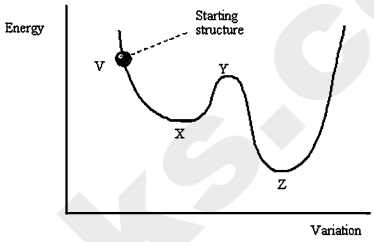
13. **Which of the following statements is true?**
    - **A)** Energy minimisation is carried out using quantum mechanics.
    - **B)** Energy minimisation is used to find a stable conformation for a molecule
    - **C)** Energy minimisation is carried out by varying only bond angles and bond lengths.
    - **D)** Energy minimisation stops when a structure is formed with a much greater stability than the previous one in the process.

14. **The following graph shows the stability of a molecule as its structure is varied during conformational analysis.**



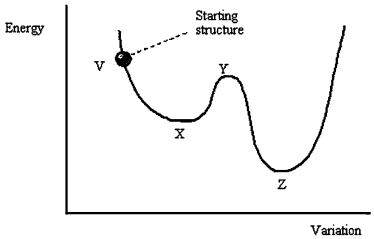
What term is used to describe the point on the graph marked X?
- **A)** Global energy minimum
- **B)** Transition state
- **C)** Local energy minimum
- **D)** Conformational minimum

15. **The following graph shows the stability of a molecule as its structure is varied during conformational analysis.**



What term is used to describe the point on the graph marked Z?
- **A)** Global energy minimum
- **B)** Transition state
- **C)** Local energy minimum
- **D)** Conformational minimum

16. **The following graph shows the stability of a molecule as its structure is varied during conformational analysis.**



What term is used to describe the point on the graph marked Y?
- **A)** Global energy minimum
- **B)** Transition state
- **C)** Local energy minimum
- **D)** Conformational minimum

17. **If energy minimisation was carried out on a starting structure appearing as shown on the graph, at which point would energy minimisation stop?**
    - **A)** V **B)** X
    - **C)** Y **D)** Z

10. (A) 11. (C) 12. (A) 13. (B) 14. (C) 15. (A) 16. (B) 17. (B)

18. **Which of the following needs to be known before two drugs can be overlaid to compare their structures?**
   A) The pharmacophore of each drug
   B) The active conformation of each drug
   C) Both of the above
   D) Neither of the above

19. **Which of the following statements is true?**
   A) The most stable conformation of a drug is also the active conformation
   B) The active conformation is the most reactive conformation of a structure
   C) The active conformation is the conformation adopted by a drug when it binds to its target binding site
   D) The active conformation can be determined by conformational analysis

20. **Which of the following statements is not true of cyclic structures?**
   A) They are normally more rigid than acyclic structures
   B) They are locked into the active conformation
   C) They are useful in determining the active conformation of a series of related compounds
   D) They are normally more difficult to synthesise than acyclic molecules

21. **What is meant by docking?**
   A) The process by which two different structures are compared by molecular modelling
   B) The process by which a lead compound is simplified by removing excess functional groups
   C) The process by which drugs are fitted into their target binding sites using molecular modelling
   D) The process by which a pharmacophore is identified

22. **What is meant by *de novo* drug design?**
   A) The synthesis of a compound from simple starting materials
   B) The design of the synthesis required to generate a novel range of structures
   C) The design of a novel drug based on molecular modelling studies of a binding site
   D) The modification of a drug based on molecular modelling studies into how it binds to its target binding site

23. **Which of the following statements is true in *de novo* drug design?**
   A) The design of rigid molecules is superior to flexible ones
   B) Molecules should be designed to fit as snugly as possible into the target binding site
   C) Molecules that have to adopt an unstable conformation in order to bind should be rejected
   D) Desolvation energies can be ignored since they are likely to be the same for different molecules having the same pharmacophore

24. **Which of the following software programmes is used for automated *de novo* drug design?**
   A) DOCK
   B) LUDI
   C) CHEM3D
   D) CoMFA

25. **Which of the following statements is untrue when using molecular modelling to design a combinatorial library?**
   A) Pharmacophore triangles can be used to design a library
   B) The aim is to synthesise the minimum number of structures likely to produce the maximum number of pharmacophores
   C) Flexible structures should be analysed before rigid ones
   D) Structures should only be included in the library if they represent at least 10% additional new pharmacophores compared with the total represented by structures already present in the library.

18. (C) 19. (C) 20. (B) 21. (C) 22. (C) 23. (C) 24. (B) 25. (C)

26. Which of the following operations or calculations would generally be carried out using molecular mechanics?

A) Molecular orbital energies
B) Energy minimisation
C) Electrostatic potentials
D) Transition-state geometries

27. The unit of force in S.I. units is

A) kilogram **B)** newton
C) watt **D)** dyne
E) joule

28. The unit of work or energy in S.I. units is

A) newton **B)** pascal
C) kilogram meter **D)** watt
E) joule

29. The unit of power in S.I. units is

A) newton meter
B) watt
C) joule
D) kilogram meter/sec
E) pascal per sec

30. Forces are called concurrent when their lines of action meet in

A) one point
B) two points
C) plane
D) perpendicular planes
E) different planes

31. Forces are called coplanar when all of them acting on body lie in

A) one point
B) one plane
C) different planes
D) perpendicular planes
E) different points

32. A force acting on a body may

A) introduce internal stresses
B) balance the other forces acting on it
C) retard its motion
D) change its motion
E) all of the above

33. A number of forces acting at a point will be in equilibrium if their total sum is zero

A) two resolved parts in two directions at right angles are equal
B) sum of resolved parts in any two perpendicular directions are both zero
C) all of them are inclined equally
D) none of the above

34. Two non-collinear parallel equal forces acting in opposite direction balance each other

A) constitute a moment
B) constitute a couple
C) constitute a moment of couple
D) constitute a resultant couple

35. According to principle of moments

A) if a system of coplanar forces is in equilibrium, then their algebraic sum is zero
B) if a system of coplanar forces is in equilibrium, then the algebraic sum of their moments about any point in their plane is zero
C) the algebraic sum of the moments of any two forces about any point is equal to moment of their resultant about the same point
D) positive and negative couples can be balanced
E) none of the above

36. Which of the following is not a vector quantity

A) weight
B) velocity
C) acceleration
D) force
E) moment

37. What is the acceleration of the automobile at t = 2s?

A) 12 m/s^2 **B)** 16 m/s^2
C) 20 m/s^2 **D)** 24 m/s^2
E) 28 m/s^2

26. (B) 27. (B) 28. (E) 29. (B) 30. (A) 31. (B) 32. (E) 33. (C) 34. (B) 35. (B) 36. (A) 37. (D)