AIIMS

Medical Entrance Exam

Solved Paper 2013

Physics

1. To obtain a p-type germanium semiconductor, it must be doped with
(a) arsenic (b) antimony
(c) indium (d) phosphorous

2. Sound waves do not show the phenomenon of
(a) interference (b) diffraction
(c) refraction (d) polarisation

3. The magnifying power of a compound microscope is high if
(a) both the objective and the eyepiece has short focal lengths
(b) both the objective and the eyepiece have long focal lengths
(c) the objective has a short focal length and the eyepiece has a long focal length
(d) the objective has a long focal length and the eyepiece has a short focal length

4. 1 curie is
(a) 1 dps (b) 3×10^{10} dps
(c) 10^6 dps (d) 3.7×10^{10} dps

5. To double the covering range of a TV transmitter tower, its height should be made
(a) 2 times (b) 4 times
(c) $\sqrt{2}$ times (d) 8 times

6. An alternating voltage $V = V_0 \sin \omega t$ is applied across a circuit. As result $I = I_0 \sin(\omega t - \pi/2)$ flows in it. The power consumed per cycle is
(a) zero (b) $0.5\ V_0 I_0$
(c) $0.707\ V_0 I_0$ (d) $1.414\ V_0 I_0$

7. A slab consist of two portions of different materials of same thickness and having the conductivities K_1 and K_2. The equivalent thermal conductivity of the slab is
(a) $K_1 + K_2$
(b) $\dfrac{K_1 K_2}{K_1 + K_2}$
(c) $\dfrac{2K_1 K_2}{K_1 + K_2}$
(d) $\sqrt{K_1 + K_2}$

8. A prism is made up of material of refractive index $\sqrt{3}$. The angle of prism is A. If the angle of minimum deviation is equal to the angle of the prism, then the value of A is
(a) 30°
(b) 45°
(c) 60°
(d) 75°

9. The following table

A	B	X
0	0	1
1	0	1
0	1	1
1	1	0

is a truth table for
(a) NAND gate
(b) NOR gate
(c) XOR gate
(d) AND gate

10. The half-life of a radioactive substance is 10 days. This means that
(a) the substance completely disintegrates in 20 days
(b) the substance completely disintegrates in 40 days
(c) 1/8 part of the mass of the substance will be left intact at the end of 40 days
(d) 7/8 part of the mass of the substance disintegrates in 30 days

11. A source and an observer are moving towards each other with a speed equal to $v/2$, where v is the speed of sound. The source is emitting sound of frequency n. The frequency heard by one observer will be
(a) zero (b) n
(c) $\frac{n}{3}$ (d) $3n$

12. Velocity of sound waves in air is 330 m/s. For a particular sound in air, a path difference of 40 cm is equivalent to phase difference of 1.6π. The frequency of the wave is
(a) 165 Hz (b) 150 Hz
(c) 660 Hz (d) 330 Hz

13. The power factor of the circuit shown in figure is
(a) 0.2 (b) 0.4
(c) 0.8 (d) 0.6

14. A particle is executing linear simple harmonic motion of amplitude A. What fraction of the total energy is kinetic when the displacement is half the amplitude
(a) $\frac{1}{4}$ (b) $\frac{1}{2\sqrt{2}}$
(c) $\frac{1}{2}$ (d) $\frac{3}{4}$

15. Two simple harmonic motions are represented by $y_1 = 4\sin(4\pi t - \frac{\pi}{2})$ and $y_2 = 3\cos(4\pi t)$. The resultant amplitude is
(a) 7 (b) 1
(c) 5 (d) $2 + \sqrt{3}$

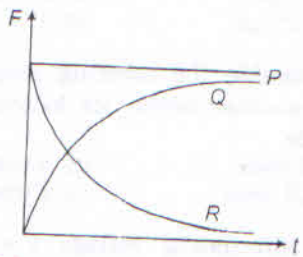
16. Three plates of common surface area A are connected as shown in figure. The effective capacitance will be

(a) $3\varepsilon_0 A/d$ (b) $\varepsilon_0 A/d$
(c) $2\varepsilon_0 A/d$ (d) $\frac{3}{2}\varepsilon_0 A/d$

17. When 20 J of work was done on gas, 40 J of heat energy was released. If the initial internal energy of the gas was 70 J, what is the final internal energy?
(a) 50 J (b) −150 J
(c) 90 J (d) 110 J

18. The value of g at a particular point is 9.8 ms^{-2}. Suppose the earth suddenly shrinks uniformly to half its present size without losing any mass. The value of g at the same point (distance of the point from the centre of earth does not change) will now be
(a) 9.8 ms^{-2} (b) 4.9 ms^{-2}
(c) 19.6 ms^{-2} (d) 39.2 ms^{-2}

19. A spherical ball is dropped in a long column of viscous liquid. Which of the following graphs represent the variation of
(i) gravitational force with time
(ii) viscous force with time
(iii) net force acting on the ball with time?



(a) Q,R,P (b) R,Q,P
(c) P,Q,R (d) R,P,Q

20. The Young's modulus of a wire of length L and radius r is y newton per square metre. If the length is reduced to $\frac{L}{2}$ and radius $\frac{L}{2}$. Its Young's modulus will be

(a) $\frac{y}{2}$ (b) Y

(c) 2Y (d) 4Y

21. A boy of mass m stands on one end of a wooden planck of length L and mass M. The plank is floating on water. If the boy walks from one end of the plank to the other end at a constant speed, the resulting displacement of the plank is given by

(a) $\frac{mL}{M}$ (b) $\frac{ML}{m}$

(c) $\frac{mL}{(M+m)}$ (d) $\frac{mL}{(M-m)}$

22. A sphere of solid material of relative density 9 has a concentric spherical cavity and just sinks in water. If the radius of sphere be R, then the radius of cavity (r) will be related to R as

(a) $r^3 = \frac{8}{9}R^3$

(b) $r^3 = \frac{2}{3}R^3$

(c) $r^3 = \frac{\sqrt{8}}{3}R^3$

(d) $r^3 = \sqrt{\frac{2}{3}}R^3$

23. Average value of kinetic energy and potential energy over entire time period in a SHM is

(a) $0, \frac{1}{2}m\omega^2A^2$

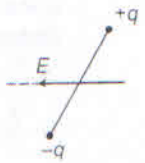
(b) $\frac{1}{2}m\omega^2A^2, 0$

(c) $\frac{1}{2}m\omega^2A^2, \frac{1}{2}m\omega^2A^2$

(d) $\frac{1}{4}m\omega^2A^2, \frac{1}{4}m\omega^2A^2$

24. In which of the states shown in figure, is potential energy of a electric dipole maximum?

(a) 

(b) 

(c) 

(d) 

25. A car is travelling with a linear velocity v on a circular road of radius r. If it is increasing its speed at the rate of a m/s^2, then the resultant acceleration will be

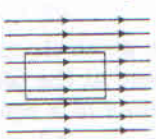
(a) $\sqrt{\frac{v^2}{r^2} - a^2}$

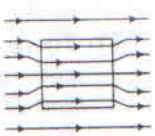
(b) $\sqrt{\frac{v^4}{r^2} + a^2}$

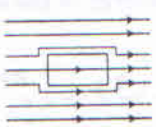
(c) $\sqrt{\frac{v^4}{r^2} - a^2}$

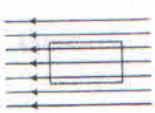
(d) $\sqrt{\frac{v^2}{r^2} + a^2}$

26. A uniform magnetic field parallel to the plane of paper, exsisted in space initially directed from left to right. When a bar of soft iron is placed in the field parallel to it, the lines of force passing through it will be represented by figure.

(a) 

(b) 

(c) 

(d) 

27. A body starts from rest and moves with a uniform acceleration. The ratio of the distance covered in the nth second to the distance covered in n second

(a) $\frac{2}{n}-\frac{1}{n^2}$ (b) $\frac{1}{n^2}-\frac{1}{n}$

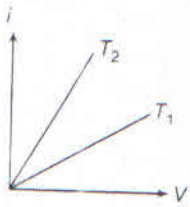
(c) $\frac{2}{n^2}-\frac{1}{n^2}$ (d) $\frac{2}{n}+\frac{1}{n^2}$

28. Wind blowing from South at 10 m/s but to a cyclist it appears to be blowing from the East at 10 m/s. The cyclist has a velocity

(a) $10\hat{i}-10\hat{j}$ (b) $10\hat{i}+10\hat{j}$

(c) $-10\hat{i}+10\hat{j}$ (d) $-10\hat{i}-10\hat{j}$

29. The current i and voltage V graphs for a given metallic wire at two different temperatures T_1 and T_2 are shown in the figure. It is concluded that



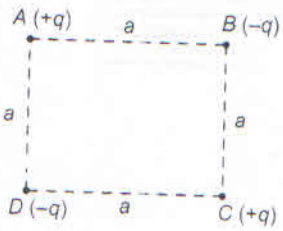
(a) $T_1 > T_2$ (b) $T_1 < T_2$ (c) $T_1 = T_2$ (d) $T_1 = 2T_2$

30. The internal resistance of primary cell is 4 Ω. It generates a current of 0.2 A in an external resistance of 21 Ω. The rate at which chemical energy is consumed is providing the current is

(a) 0.42 J/s (b) 0.24 J/s

(c) 5 J/s (d) 1 J/s

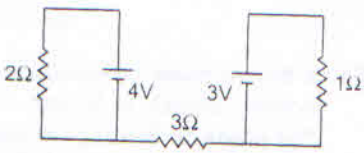
31. There are four point charges $+q$, $-q$, $+q$ and $-q$ are placed at the corners A, B, C, and D respectively of a square of side a. The potential energy of the system is $\frac{1}{4\pi\varepsilon_0}$ times.



(a) $\frac{q^2}{a}(-4+\sqrt{2})$ (b) $\frac{q^2}{2a}(-4+\sqrt{2})$

(c) $\frac{4q^2}{a}$ (d) $\frac{-4\sqrt{2}q^2}{a}$

32. The potential difference across the 3 Ω resistor shown in figure is



(a) zero (b) 1 V

(c) 3.5 V (d) 7 V

33. There are N cells in the circuit of figure. The emf and internal resistance of each cell is E and r respectively. The points A and B in the circuit divide the circuit into n and $(N-n)$ cells. The current in the circuit is

(a) E/r (b) nE/r

(c) NE/nr (d) zero

34. The earth's magnetic field at a certain place has a horizontal component of 0.3 G and total strength 0.5 G. Find angle of dip in $\tan^{-1}$.

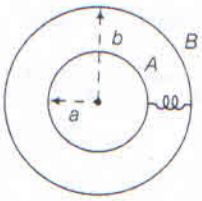
(a) $\delta=\tan^{-1}\frac{4}{3}$ (b) $\delta=\tan^{-1}\frac{3}{4}$

(c) $\delta=\tan^{-1}\frac{5}{3}$ (d) $\delta=\tan^{-1}\frac{3}{5}$

35. Two spherical conductors A and B of radii a and b $(b>a)$ are placed concentrically in air. The two arc connected by a copper wire as shown in figure. The equivalent capacitance of the system is

(a) $\frac{4\pi\varepsilon_0 ab}{b-a}$ (b) $4\pi\varepsilon_0(a+b)$

(c) $4\pi\varepsilon_0 b$ (d) $4\pi\varepsilon_0 a$



36. The magnetic flux linked with the coil varies with time as $\phi = 3t^2 + 4t + 9$. The magnitude of the induced emf of 2s is

(a) 9 V (b) 16 V (c) 3 V (d) 4 V

37. The force F is given by expression $F = A\cos(Bx) + C\sin(Dt)$, where x is the displacement and t is the time. Then dimension of $\frac{D}{B}$ are same as that of

(a) velocity $[LT^{-1}]$
(b) angular velocity $[T^{-1}]$
(c) ngular momentum $[ML^2T^{-1}]$
(d) velocity gradient $[T^{-1}]$

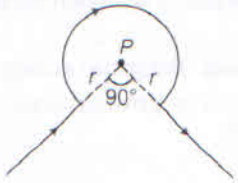
38. The thermo emf of a thermocouple varies with the temperature θ of the hot junction as

$$E = a\theta + b\theta^2 \text{ volt}$$

where the ratio (a/b) is 700°C. If the cold junction is kept at 0°C, then the neutral temperature is

(a) 700°C
(b) 350°C
(c) 1400°C
(d) no neutral temperature is possible

39. The wire shown is figure carries a current of 32 A. If $r = 3.14$ cm, the magnetic field at point P will be



(a) 1.6×10^{-4} T (b) 3.2×10^{-4}T
(c) 4.8×10^{-4}T (d) 6.4×10^{-4}T

40. Carbon, silicon and germanium are semiconductors having four valance e^-. If their respective band gap energies between conduction and valence band are $(Eg)_C, (Eg)_{Si}, (Eg)_{Ge}$. Then

(a) $(E_g)_{Si} < (E_g)_{Ge} < (E_g)_C$
(b) $(E_g)_C < (E_g)_{Ge} > (E_g)_{Si}$
(c) $(E_g)_C > (E_g)_{Si} > (E_g)_{Ge}$
(d) $(E_g)_C = (E_g)_{Ge} = (E_g)_{Si}$

Directions (Q. Nos. 41 to 60) *In each of the following questions, two statement are given. One is assertion and the other is reason. Examine the statement carefully and mark the correct answer according to the instruction given below*

(a) If both the assertion and reason are true and reason explains the assertion.
(b) If both the assertion and reason are true but reason does not explain the assertion.
(c) If assertion is true but reason is false.
(d) If assertion is false but reason is true.

41. **Assertion** In an elastic collision between two bodies, the energy of each body is conserved.

Reason The total energy of an isolated system is conserved.

42. **Assertion** A body can be at rest even when it is under the action of any number of external forces.

Reason Vector sum of all the external forces is zero.

43. **Assertion** In a non-uniform circular motion, the acceleration of the particle is equal to sum of the tangential acceleration and the centripetal acceleration.

Reason The two acceleration are perpendicular to each other.

44. **Assertion** A body can have acceleration even if its velocity is zero at that instant of time.

Reason The body will be momentarily at rest when it reverses its direction of motion.

45. **Assertion** Work done in moving a charge between any two points in a uniform electric field is independent of the path followed by the charge, between these points.

Reason Electrostatic forces are non-conservative.

46. **Assertion** In a transistor amplifier, the output voltage is always out of phase with the input voltage.

Reason The emitter base junction is reverse biased and the base collector junction is forward biased.

47. **Assertion** In case of pure rolling, the force of friction becomes zero.

Reason The speed at the point of contact is zero.

48. **Assertion** Heat from the sun reaches the earth by convection.

Reason Air can be heated only by convection.

49. **Assertion** A wire carrying an electric current has no electric field around it.

Reason Rate of flow of electron's in one direction is equal to the rate of flow of protons in opposite direction.

50. **Assertion** If an electron and proton enter a perpendicular magnetic field with equal momentum, then radius of curve for electron is more than that of proton.

Reason Electron has less mass than proton.

51. **Assertion** The ratio $\frac{C_p}{C_V}$ is more for helium gas than for hydrogen gas.

Reason Atomic mass of helium is more than that of hydrogen.

52. **Assertion** Our ears cannot distinguish two notes, one produced by a violin and other by a guitar, if they have exactly same intensity and same frequency.

Reason When a musical instrument is played, it produces a fundamental note which is accompanied by a number of overtones called harmonics.

53. **Assertion** The de-Broglie wavelength equation has significance for any microscopic and submicroscopic particles.

Reason de-Broglie wavelength is inversely proportional to the mass of the object its velocity is constant.

54. **Assertion** In stationary wave, there is no transfer of energy.

Reason The ratio of kinetic energy to potential energy is independent of the position.

55. **Assertion** Electrons move from a region of higher potential to a region of lower potential.

Reason An electron has less potential energy at a point where potential is higher and *vice-versa*.

56. **Assertion** In a radioactive disintegration, an electron is emitted by the nucleus.

Reason Electron are present inside the nucleus.

57. **Assertion** A normal human eye can clearly see all the objects beyond a certain minimum distance.

Reason The human eye has the capacity to suitably adjust the focal length of its lens to a certain extent.

58. **Assertion** A satellite moving in a circular orbit around the earth has a total energy E_0, then its potential energy is $-E_0$.

Reason Potential energy of the body at a point in a gravitational field of orbit is $\frac{-GMm}{R}$.

59. **Assertion** If a liquid in a vessel is stirred and left to itself, the motion disappear after few minutes.

Reason The moving liquid exerts equal and opposite force.

60. **Assertion** At the centre of earth a body has centre of mass, but no centre of gravity.

Reason This is because $g = 0$ at the centre of earth.

Chemistry

1. Aspirin acts as an analgesic because it
   (a) inhibits the synthesis of prostaglandins which stimulates inflammation of the tissue
   (b) prevents the release of HCl in the stomach
   (c) prevents the interaction of histamine with its receptor
   (d) inhibit activities of enzymes

2. Starch is a mixture of two components, a water soluble component amylose (15-20%) and a water insoluble component amylopectin (80-85%). The aqueous solution of amylose gives a blue colour with iodine solution due to the formation of
   (a) amylose iodide
   (b) amylose iodate
   (c) inclusion complex
   (d) amylose tetraiodide complex

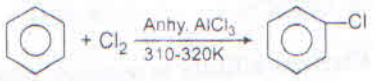
3. What reagent is used in the Hinsberg test of amines?
   (a) $(CH_3CO)_2O$ and pyridine
   (b) $C_6H_5SO_2Cl$ in *aq.* NaOH
   (c) $NaNO_2$ in *aq.* H_2SO_4
   (d) CH_3I (excess) followed by AgOH

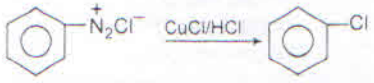
4. Aldol condensation between which of the following two compounds followed by dehydration gives methyl vinyl ketone?
   (a) Formaldehyde and acetone
   (b) Formaldehyde and acetaldehyde
   (c) Two molecules of acetone
   (d) Two molecules of acetaldehyde

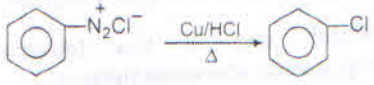
5. Grignard reagents and organolithium compounds on addition to dry ice separately, followed by hydrolysis gives
   (a) ketones and carboxylic acids respectively
   (b) carboxylic acids and ketones respectively
   (c) only carboxylic acids
   (d) only ketones

6. The strongest acid among the following is
   (a) *o*-methoxy phenol (b) *p*-methoxy phenol
   (c) *m*-methoxy phenol (d) phenol

7. On commercial scale phenol is obtained from chlorobenzene. The chlorobenzene needed for the purpose is prepared by Raschig's process. Which one of the following is Raschig's process?

   (a) 

   (b) 

   (c) 

   (d) 

8. How many mL of 0.125 M Cr^{3+} must be reacted with 12.00 mL of 0.200 M MnO_4^- if the redox products are CrO_7^{2-} and Mn^{2+}?
   (a) 8 mL (b) 16 mL
   (c) 24 mL (d) 32 mL

9. At 300 K, 36 g of glucose present per litre in its solution has an osmotic pressure of 4.98 bar. If the osmotic pressure of solution is 1.52 bar at the same temperature, what would be its concentration?
   (a) $11 gL^{-1}$ (b) $22 gL^{-1}$
   (c) $36 gL^{-1}$ (d) $42 gL^{-1}$

10. The composition of a sample of wustite is $Fe_{0.93}O$. What percentage of the iron is present in the form of Fe (III)?
    (a) 5% (b) 7.08%
    (c) 15.05% (d) 23.6%

11. When acidified $K_2Cr_2O_7$ solution is added to Sn^{2+} salts, then Sn^{2+} changes to
    (a) Sn (b) Sn^{3+}
    (c) Sn^{4+} (d) Sn^+

12. What would be the expected product of the reaction of propyne with Br_2/H_2O if the mechanism of this reaction is analogous to that of propene?
    (a) 2-brompropenol (b) Bromoacetone
    (c) 2-bromo-2-propanol (d) Bromoprophenol

13. Which of the following carbocation would have the greatest stability?

(a) $CH_3-S-\overset{+}{C}H_2$ (b) $(CH_3)N\overset{+}{C}H_2$

(c) $CH_3O\overset{+}{C}H_2$ (d) $F\overset{+}{C}H_2$

14. Electron affinity is positive, when
(a) O changes into O^-
(b) O^- changes into O^{2-}
(c) O changes into O^+
(d) electron affinity is always negative

15. Which one of the following pairs represents stereoisomerism?
(a) Chain isomerism and rotational isomerism
(b) Structural isomerism and geometrical isomerism
(c) Linkage isomerism and geometrical isomerism
(d) Optical isomerism and geometrical isomerism

16. Using the data given below find out the strongest reducing agent.

$E^\circ_{Cr_2O_4/Cr^{3+}} = 1.33\ V, E^\circ_{Cl_2/Cl^-} = 1.36\ V,$

$E^\circ_{MnO_4^-/Mn^{2+}} = 1.51\ V, E^\circ_{Cr^{3+}/Cr} = -0.74\ V$

(a) Cl^- (b) Mn^{2+}
(c) Cr (d) Cr^{3+}

17. EMF of Daniell cell was found using different concentrations of Zn^{2+} ion and Cu^{2+} ion. A graph was then plotted between E_{cell} and $\log \frac{[Zn^{2+}]}{[Cu^{2+}]}$. The plot was found to be linear with intercept on E_{cell} axis equal to 1.10 V. E_{cell} for Zn / Zn^{2+} $(0.1\ M) || Cu^{2+} (0.01 M) | Cu$ will be
(a) 1.10 V (b) 1.0705 V
(c) 0.93 V (d) 0.078 V

18. Which of the following process is not responsible for the presence of electric charge on the sol particles?
(a) Electron capture by sol particles
(b) Adsorption of ionic species from solution
(c) Formation of Helmholtz electrical double layer
(d) Absorption of ionic species from solution

19. In the metallurgy of aluminium
(a) Al^{3+} is oxidised to Al (s)
(b) graphite anode is oxidised to carbon monoxide and carbon dioxide
(c) oxidation state of oxygen changes in the reaction at anode
(d) oxidation state of oxygen changes in the overall reaction involved in the process

20. In the preparation of HNO_3 we get NO gas by catalytic oxidaton of ammonia. The moles of NO produced by the oxidation of two moles of NH_3 will be
(a) 2 (b) 3
(c) 4 (d) 6

21. The reaction of P_4 with X leads selectively to P_4O_6. The X is
(a) dry O_2
(b) a mixture of O_2 and N_2
(c) moist O_2
(d) O_2 in presence of *aq.* NaOH

22. Which one of the following reactions of xenon compounds are not feasible?
(a) $3XeF_4 + 6H_2O \longrightarrow 2Xe + XeO_3 + 12HF + 1.5O_2$
(b) $2XeF_2 + 2H_2O \longrightarrow 2Xe + 4HF + O_2$
(c) $XeF_6 + RbF \longrightarrow Rb[XeF_7]$
(d) $XeO_3 + 6HF \longrightarrow XeF_6 + 3H_2O$

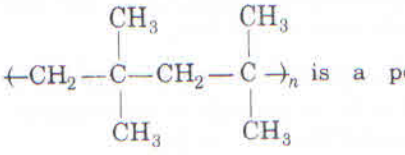
23. The thermal decomposition of HCOOH is a first order reaction with a rate constant of $2.4 \times 10^{-3} s^{-1}$ at certain temperature. Calculate how long will it take for three fourths of initial quantity of HCOOH to decompose?
(a) 578 s (b) 225 s
(c) 436 s (d) 57.8 s

24. Rate constant k of a reaction varies with temperature according to the equation $\log k = \text{constant} - \frac{E_a}{2.303\,R} \times \frac{1}{T}$; where, E_a is the energy of activation for the reaction. When a graph is plotted for $\log k$ *vs* $\frac{1}{T}$ a straight line with a slope -6670 k is obtained. The activation energy for this reaction will be ($R = 8.314\ JK^{-1}mol^{-1}$).
(a) 122.65 kJ mol^{-1}
(b) 127.71 kJ mol^{-1}
(c) 142.34 kJ mol^{-1}
(d) 150.00 kJ mol^{-1}

25. Which of the following statements is not correct about order of a reaction?
(a) The order of a reaction can be a fractional number
(b) Order of a reaction is exeperimentally determined quantity.
(c) The order of a reaction is always equl to the sum of the stoichiometric coefficients of reactants in the balanced chemical equation for a reaction
(d) The order of a reaction is the sum of the powers of molar concentrations of the reactants in the rate law expression

26. Which of the following reagents would not be a good choice for reducing an aryl nitro compound to an amine?
(a) H_2 (excess)/Pt (b) $LiAlH_4$ in ether
(c) Fe and HCl (d) Sn and HCl

27. Which is the correct statement about birth control pills?
(a) Contain estrogen only
(b) Contain progesterone only
(c) Contain a mixture of estrogen and progesterone derivatives
(d) Progesterone enhances ovulation

28.  is a polymer having monomer units

(a)  (b) 
(c)  (d) 

29. Glycogen is a branched chain polymer of α-D-glucose units in which chain is formed by $C_1 - C_4$ glycosidic linkage whereas branching occurs by the formation of $C_1 - C_6$ glycosidic linkage. Structure of glycogen is similar to
(a) amylose
(b) amylopectin
(c) cellulose
(d) glucose

30. Each polypeptide in a protein has amino acids linked with each other in a specific sequence. This sequence of amino acids is said to be
(a) primary structure of proteins
(b) secondary structure of proteins
(c) tertiary structure of proteins
(d) quaternary structure of proteins

31. The anticodon transfer RNA for the messenger RNA codon GCA is
(a) TGA (b) GUT
(c) AGT (d) CGU

32. Which one of the following statements is wrong?
(a) Fuel obtained from plastic waste has high octane rating
(b) H_2O_2 with suitable catayst is now used in bleaching of paper
(c) Now-a-days ethanol is produced by one step oxidation of ethene in presence of ionic catalyst in aqueous medium
(d) The growth of fish gets inhibited, if the concentration of dissolved oxygen of water in over 6 ppm

33. The enthalpies of all elements in their standard states are
(a) unity
(b) zero
(c) < 0
(d) different for each element

34. 2 L of an ideal gas at a pressure of 10 atm expands isothermally into a vacuum until its total volume is 10 L. How much work is done in the expansion?
(a) 8 L-atm (b) 16.1 L-atm
(c) 24.0 L-atm (d) No work is done

35. Predict in which of the following entropy decreases.
(a) A liquid crystallizes into a solid
(b) Temperature of a crystalline solid is raised from 0 K to 115 K
(c) $2NaHCO_3(s) \longrightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$
(d) $H_2(g) \longrightarrow 2H(g)$

36. The number of unpaired electrons in a paramagnetic diatomic molecule of an element with atomic number 16 is
(a) 1 (b) 2
(c) 3 (d) 4

37. How many σ and π bonds are in SO_4^{2-} ion?
(a) 4, 2 (b) 3, 2
(c) 4, 3 (d) 3, 3

38. The shape of the orbital with the value of $l = 2, m = 0$ is
(a) spherical (b) double dumb-bell
(c) trigonal planar (d) square planar

39. For the reaction, 1 g mole of $CaCO_3$ is enclosed in 5 L container
$CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$
$K_p = 1.16$ at 1073 K then per cent dissociation of $CaCO_3$ is
(a) zero (b) 6.58%
(c) 65% (d) 100%

40. Ionic product of $Ni(OH)_2$ is 2.0×10^{-15}. Molar solubility of $Ni(OH)_2$ in 0.10 M NaOH will be
(a) 1.0×10^{-13} M
(b) 2.0×10^{-13} M
(c) 4.0×10^{-13} M
(d) 8.0×10^{-13} M

Directions (Q. 41 to 60) *In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choice.*
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

41. Assertion Neoprene can be further hardened by heating in presence of sulphur.

Reason Neoprene contains allylic double bonds which help in introducing sulphur bridges between different polymer chains.

42. Assertion Deoxyribose, $C_5H_{10}O_4$ is not a corbohydrate.

Reason Carbohydrates are hydrates of carbon so compounds which follow $C_x(H_2O)_y$ formula are carbohydrates.

43. Assertion Aniline does not undergo Friedel-Crafts reaction.

Reason Friedel-Crafts is an electrophilic substitution reaction.

44. Assertion In comparison to ethyl chloride it is difficult to carry out nucleophilic substitution on vinyl chloride.

Reason Vinyl group is electron donating.

45. Assertion Phenol forms 2,4, 6-tribromophenol on treatment with Br_2 in carbon disulphide at 273 K.

Reason Bromine polarises in carbon disulphide.

46. Assertion On cooling, the brown colour of nitrogen dioxide disappears.

Reason On cooling, NO_2 undergoes dimerisation resulting in the pairing of odd electrons of NO_2.

47. Assertion Na^+ and Al^{3+} are isoelectronic but the magnitude of ionic radius of Al^{3+} is less than that of Na^+.

Reason The magnitude of effective nuclear charge of the outer shell electrons in Al^{3+} is greater than that in Na^+.

48. Assertion $C_p - C_V = R$, for an ideal gas.

Reason R is the work done when temperature of one mole of an ideal gas is increased by 1°.

49. Assertion On addition of NH_4Cl to NH_4OH solution, pH decreases but remains greater than 7.

Reason Addition of NH_4^+ ion decreases ionisation of NH_4OH thus $[OH^-]$ is decreased, hence pH decreases.

50. **Assertion** The mobility of sodium ion is lower than that of potassium ion.

Reason The ionic mobilities depend on the effective radius of the ion.

51. **Assertion** On adding zinc pieces to aqueous $FeCl_3$ solution, colour changes from deep yellow to light green.

Reason Aqueous $FeCl_3$ is acidic and on adding Zn, nascent hydrogen is produced which reduces deep yellow $FeCl_3$ solution to light green $FeCl_2$ solution.

52. **Assertion** *p*-chlorobenzoic acid is stronger acid than benzoic acid.

Reason Chlorine has electron donating resonance (+ *R*) effect.

53. **Assertion** A free radical is paramagnetic species.

Reason A free radical is formed in homolytic fission of covalent bond.

54. **Assertion** Addition of one equivalent of HCl to 1,3-butadiene at 80°C gives 3-chloro-1-butene as major product.

Reason 3-chloro-1-butene is a kinetically controlled product.

55. **Assertion** Semiconductors are solids with conductivities in the intermediate range from $10^{-6} - 10^{4}$ ohm^{-1} m^{-1}.

Reason Intermediate conductivity in semiconductor is due to partially filled valence band.

56. **Assertion** When methanol is added to water boiling point of water increases.

Reason When a volatile solute is added to a volatile solvent, elevation in boiling point is observed.

57. **Assertion** The Daniell cell becomes dead after some time.

Reason Oxidation potential of zinc anode decreases and that of copper increases.

58. **Assertion** The highest oxidation state of Os is + 8.

Reason Osmium is a 5 *d*-block element.

59. **Assertion** Toxic metal ions are removed by the chelating ligands.

Reason Chelate complexes tend to be more stable.

60. **Assertion** Formic acid reduces Tollen's reagent.

Reason Compounds containing —CHO group reduce Tollen's reagent.

Biology

1. Speciation of sympatric species is due to
   (a) geographic isolation
   (b) reproductive isolation
   (c) isolation/separation
   (d) migration

2. The application of synthetic plant hormone like IAA, IBA and NAA are best described as
   (a) prevent early fruit fall before harvesting and is used to produce parthenocarpic fruit
   (b) prevent early fruit fall only
   (c) to produce both seed less fruits and fruits with seeds
   (d) to produce larger fruit

3. Flame cells and Malpighian tubules are the analogous organ in
   (a) insects and arthropods respectively
   (b) arthropods and echinodermates respectively
   (c) helminths and arthropods with other insect respectively
   (d) arthropods and other insect with helminths respectively

4. Trochlear, trigeminal and glossopharyngeal nerve are respectively.
   (a) IX, V and IV
   (b) IV, V and IX
   (c) V, IV and IX
   (d) IV, V and IX

5. Who had proposed theory of cohesion and adhesion forces?
(a) Dixon and Jolly (1894)
(b) Dixon and Benson (1885)
(c) Dixon and Jolly (1950)
(d) Sir Jagdish Chandra Bose (1850)

6. Which one of the following useful organisms is not a part in production of curd/yoghurt?
(a) *S. thermophilus*
(b) *Lactobacillus bulgaricus*
(c) *Acetobactor aceti*
(d) *Streptococcus lactis*

7. The drugs, which do not develop physiological dependence is
(a) sedative and tranqualisers
(b) stimulational cocaine
(c) opiates
(d) hallucinogens

8. Organogenesis or morphogenesis in tissue culture is controlled/regulated by phytohormones the credit of this important discovery goes to
(a) Skoog and Miller (1957)
(b) Guha and Maheswari (1964)
(c) Calvin and Benson (1894)
(d) Halperin and Wetherall (1964)

9. A man whose father is a colourblind, marry a woman, who is a daughter of colourblind mother. The offspring of this couple will be
(a) all daughter and sons are colourblind
(b) 50% colourblind and 50% normal son
(c) carrier normal daughter and colourblind sons
(d) colourblind sons and normal daughter

10. In a child of 15 years age, plasma calcium level is diagnosed below optimum level. Which organ is malfunctioning?
(a) Thyroid gland
(b) Liver
(c) Parathyroid
(d) Posterior lobe of pituitary

11. Which one of the following best describe polygenic inheritance?
(a) ABO blood group in human and flower colour of *Mirabilis jalapa*
(b) Hair pigment of mouse and tongue rolling in humans
(c) Human eye colour and sickle-cell anaemia
(d) Human height and colour of skin and eyes

12. Go through the following table comparing the effect of sympathetic and parasympathetic nervous system. Which one is matched correctly?

	Features	Sympathetic Nervous System	Parasympathetic Nervous System
(a)	Pupil of eye	Dialates	Constricts
(b)	Heart rate	Decreases	Increases
(c)	Intestinal peristalsis movement	Stimulate	Inhibits
(d)	Salivary gland	Stimulate seceration	Inhibits seceratiin

13. Which one of the following set meaning is not different?
(a) Cistron — Triplet
(b) DNA profile — DNA type
(c) Gene pool — Genome
(d) Gene — Codon

14. How macula lutea and corpus luteum are related?
(a) Contribute in maintain pregnancy
(b) Both are a source of hormones
(c) Both are charaterised by their yellow colour
(d) Both are found in human ovaries

15. Which one as used/regarded as biofertiliser?
(a) A association between pteridophytes and cyanobacteria *Anabaena*
(b) A association between gymnosperms and *Nostoc*
(c) A association between legume and *Rhizobium*
(d) All of the above

16. The common characteristic showing by mushroom smut and rust
(a) is characterised by presence of basidiocarps
(b) is characterised by presence of ascocarps
(c) all are pathogen
(d) all are saprophytic in nature

17. A reptilian looks like house lizard is sitting on plant with its tail coiled around twig in your garden. Can you identify the animal?
(a) Garden lizard (*Calotes*) showing camouflage
(b) *Chamaeleon* showing protective colouration
(c) *Varanus* showing mimicry
(d) *Hemidactylus* showing sexual dimorphism

18. Different varieties of Indian mangoes are most popular in Western and some other European countries. The varieties with different flavour, colour, sugar and fleshy content is due to
(a) genetic diversity
(b) species diversity
(c) induced mutation
(d) hybridisation

19. *hn*RNA undergoes two additional process. Out of them in one process an unusual nucleotide (methyl GPT) is added to the 5′ end of molecule. What would you called this?
(a) Tailing (b) Splicing
(c) Termination (d) Capping

20. Which one exhibits the character of a protozoan during one phase of its life cycle and character of fungi in another phase of its life cycle?
(a) Water moulds (b) Psilophytes
(c) Slime moulds (d) Diatoms

21. Wernickes syndrome is generally common in alcoholic person; which is characterised by less mental activity and dual vision. It is caused by the deficiency of
(a) riboflavin (b) thiamine
(c) pyridoxine (d) retinol

22. Which one of the most common embryo sac in flowering plant?
(a) Monosporic, 8 nucleated and 7 celled
(b) Monosporic, 7 celled and 7 nucleated
(c) Bisporic, 8 nucleated and 7 celled
(d) Bisporic, 8 nucleated and 7 celled

23. Which type of immunoglobulin is/are abundantly found in foetus?
(a) IgE (b) IgG (c) IgM (d) IgD

24. The mandatory combination responsible for assembly of microtubules are
(a) Na^+ and Ca^{2+} (b) Mg^{2+} and Ca^{2+}
(c) Cl^- and Ca^{2-} (d) Na^+ and K^+

25. Which one plant movement is unidirectional?
(a) Phototaxis (b) Chemotaxis
(c) Both (a) and (b) (d) Thigmotrophism

26. The exchange of segments of two non-homologous pair of chromosomes is termed as
(a) crossing over (b) linkage
(c) transformation (d) translocation

27. Spirochaetes is/are
(a) a class of viruses
(b) myxobacteria
(c) spiral-shaped bacteria
(d) richittsias

28. SER and RER can be distinguished with its presence in
(a) protein synthesising cells
(b) protein and lipid synthesising cells
(c) carbohydrates and fat synthesising cells
(d) fat and protein synthesising cells

29. Human Immuno Virus (HIV) contain a protein coat and genetic material and is horse chestnut shaped
(a) double-stranded DNA
(b) single-stranded DNA
(c) single-stranded RNA
(d) double-stranded RNA

30. Root cambium is derived from
(a) primary meristem
(b) secondary meristem
(c) intercalary meristem
(d) apical meristem

31. Which one contain most reduced form of stem?
(a) Bulb (b) Rhizome
(c) Tuber (d) Twinner

32. Which enzyme complex is responsible for the reduction of molecular nitrogen to the level of NH_3 in root module of legume?
(a) Aminase (b) Nitrogenase
(c) Nitrate reductase (d) Nitrite reductase

33. The plants which can withstand with narrow and broad range of temperature tolerance respectively are
(a) monothermal and stenothermal
(b) stenothermal and monothermal
(c) stenothermal and eurythermal
(d) stenothermal and mesothermal

34. Desert can be converted into a lush green land by planting
(a) terrestrial plant (b) xerophytic plant
(c) halophytes (d) psammophytes

35. Which one is a source of commercially important product *Syzygium aromaticum*?
(a) Flower bud (b) Axillary bud
(c) Thalamus (d) Peduncle

36. When a fern plant is develped from its prothallus without fertilisation? This phenomenon is an example of
(a) parthenocarpy (b) apogamy
(c) apospory (d) organogenesis

37. Bruners gland are characteristic feature of
(a) jejunum of small intestine
(b) ileum
(c) duodenum
(d) fundic region of stomach

38. Which one dental formula represent a heterodont placental draught and tough animal?
(a) $I\frac{3}{3}, C\frac{1}{1}, PM\frac{4}{4}, M\frac{2}{3}$ (b) $I\frac{3}{3}, C\frac{1}{1}, PM\frac{3}{2}, M\frac{1}{1}$
(c) $I\frac{2}{1}, C\frac{0}{0}, PM\frac{3}{2}, M\frac{3}{3}$ (d) $I\frac{3}{3}, C\frac{1}{1}, PM\frac{4}{4}, M\frac{3}{3}$

39. Pollorum disease in fowls is caused by
(a) *Salmonella*
(b) *Clostridium*
(c) *Hemophilus*
(d) *Mycobacterium*

40. Green muffler play a important role against
(a) noise pollution
(b) radioactive pollution
(c) soil pollution
(d) air pollution

Directions (Q. Nos. 41-60) *These questions consist two statement each printed as Assertion and Reason. While answering these question, you are required to choose any one of the following four options.*
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
(c) Assertion is true, but Reason is false.
(d) Both Assertion and Reason are false.

41. **Assertion** Plasmids are single stranded extrachromosomal DNA.
Reason Plasmid are usually present in eukaryotic cells.

42. **Assertion** The megaspore mother cell divide by meiotic division to produce four spore.
Reason Megaspore Mother Cell (MMC) are diploid and megaspore are haploid.

43. **Assertion** Living organisms are considered as a close system.
Reason Energy of living organism can not be lost or gained from external environment.

44. **Assertion** Medulla is considered as a respiratory centre in animals.
Reason Rate of breathing is regulated by medulla because of the changes in O_2 content of blood.

45. **Assertion** Tropical rain forest are rich in flora and fauna along with microbes on this biosphere.
Reason The low latitude humid tropics harbour the rainforest ecosystems.

46. **Assertion** Erythroblastosis foetalis is disease related with Rh factor and may cause death of developing foetus inside womb.
Reason It cause massive destruction of erythrocytes in foetus that leads to anaemia and tissue damage of foetus.

47. **Assertion** Radial vascular bundle is the characteristic of majority of the roots including dicots and monocots.

Reason Monocot stem is characterised by colletral open vascular bundle.

48. **Assertion** Due to excessive use of fertiliser and pesticides the available capillary water turns to hypotonic is relation to cell sap.

Reason The water molecule as a result diffuse out of the cells due to endosmosis.

49. **Assertion** Amphibian heart consist of two auricle and one ventricle.

Reason The deoxygenated blood is returned to heart through sinus venosus.

50. **Assertion** Humans are considered advanced from all its primates relatives because of the larger cranial capacity and high intelligence.

Reason A lumber curve is present in man which is also present in apes.

51. **Assertion** Chromosomes are divided into heterochromatin and euchromatin part.

Reason Heterochromatin are those regions of chromosome that remain condensed during interphase and rest of the non-condensed chromosome are called euchromatin.

52. **Assertion** Tongue is a gustatoreceptor.

Reason Receptors for gustatosensation are located in taste bud.

53. **Assertion** Aflatoxin are commercially produced by a species of aspergilli.

Reason These toxin are useful to mankind.

54. **Assertion** Mosses are might have originated from algae.

Reason Protonema of bryophytes is similar to some green algae.

55. **Assertion** Cartilage and bone are flexible and rigid connective tissue.

Reason Blood is a connective tissue.

56. **Assertion** Cell wall is generally absent in animal cell.

Reason Animal cells are covered by a cell membrane.

57. **Assertion** Holoblastic cleavage with almost equal sized blastomeres is a characteristics feature of placental mammals.

Reason Egg of most mammal including human are of centrolecithal type.

58. **Assertion** Most cells in human body release excessive amount of inflammatory chemicals which cause allergic reactions.

Reason Allergen present in environment on reaching human body stimulate mast cells in certain individuals.

59. **Assertion** In angiosperm, the conduction of water is more efficient because xylem contain vessels.

Reason Conduction of water by xylem vessels elements is an active process with energy supplied by xylem parenchyma rich in mitochondria.

60. **Assertion** Gram negative bacteria do not retain the stain when washed with alcohol.

Reason The outer membrane of Gram negative (–ve) bacteria contain lipopolysaccharides, a part of which is integrated into membrane lipid.

General Knowledge & Aptitude

1. The most appropriate measure of a country's economic growth is its
   (a) Gross Domestic Product (GDP)
   (b) Net Domestic Product (NDP)
   (c) Net National Product (NNP)
   (d) Per Capita Product (PCP)

2. Who amongst the following is the regulator of Insurance sector in India?
   (a) IRDA (b) SEBI
   (c) AMFI (d) RBI

3. The Dakshinamurti idol of Shiva depicts him in which form?
   (a) Teacher (b) Dancing
   (c) Reclining (d) Meditating

4. The only Muslim woman to sit on the throne of Delhi was
   (a) Razia Sultan
   (b) Mumtaz Mahal
   (c) Hamida Banu Begum
   (d) Nurzahan

5. Which of the following organisations makes 'Doing Business Report' every year?
   (a) WTO (b) World Bank
   (c) UNCTAD (d) IMF

6. 'Mahatma Gandhi' returned to India, leaving South Africa forever in
   (a) 1915 (b) 1919
   (c) 1914 (d) 1916

7. Which one of the following is not a constitutional body?
   (a) Union Public Service Commission
   (b) State Public Service Commission
   (c) Finance Commission
   (d) Planning Commission

8. Article 340 of the Indian Constitution deals with
   (a) Finance Commission
   (b) Backward Classes Commission
   (c) Election Commission
   (d) Union Public Service Commission

9. The North-South and East-West corridors of the National Highway Development project meet at
   (a) Kanpur (b) Jhansi
   (c) Lucknow (d) Varanasi

10. How many languages are there in the Eight Schedule of the Constitution of India?
   (a) 22 (b) 16
   (c) 18 (d) 20

11. Which of the following longitudes is known as 'Standard Meridian' in India?
   (a) 87° 30' E (b) 85° 30' E
   (c) 84° 30'E (d) 82° 30' E

12. Joint Meeting of both Houses of Parliament is chaired by
   (a) Speakers of Lok Sabha
   (b) President of India
   (c) Chairman of Rajya Sabha
   (d) None of the above

13. A book 'Fault Lines' is written by
   (a) Raghuram Rajan
   (b) D Subba Rao
   (c) Vimal Jalan
   (d) Montek Singh Ahluwalia

14. Vitamin-K is necessary for
   (a) formation of prethrombin
   (b) prevention of pernicious anaemia
   (c) prevention of rickets
   (d) formation of DNA

15. The study related to the plants being used as vegetabel is called
   (a) Flori-culture
   (b) Pomology
   (c) Horticulture
   (d) Olericulture

16. A parallel port is most often used by a
   (a) mouse
   (b) monitor
   (c) printer
   (d) external storage device

17. CDMA stands for
(a) Code Division Multiple Access
(b) Code Divide Multiple Access
(c) Code Division Multiple Area
(d) Code Division Modify Access

18. Sanjukta panigrahi was famous for the dance
(a) Odissi (b) Manipuri
(c) Kathak (d) Bharatnatyam

19. Development of Goitre is mainly due to deficiency of
(a) sodium (b) iodine
(c) calcium (d) iron

20. Union Government has decided to set up a 4000 MW solar power project in Rajasthan at
(a) Jaisalmer (b) Baremer
(c) Dhaulpur (d) Sambher

Answers

Physics

1. (c)	2. (d)	3. (a)	4. (d)	5. (b)	6. (a)	7. (c)	8. (c)	9. (a)	10. (d)
11. (d)	12. (c)	13. (c)	14. (d)	15. (a)	16. (c)	17. (a)	18. (a)	19. (c)	20. (b)
21. (c)	22. (a)	23. (d)	24. (a)	25. (b)	26. (b)	27. (a)	28. (b)	29. (a)	30. (d)
31. (a)	32. (a)	33. (a)	34. (a)	35. (c)	36. (b)	37. (a)	38. (d)	39. (c)	40. (c)
41. (d)	42. (d)	43. (d)	44. (a)	45. (c)	46. (c)	47. (a)	48. (d)	49. (c)	50. (d)
51. (b)	52. (d)	53. (a)	54. (c)	55. (d)	56. (c)	57. (a)	58. (d)	59. (c)	60. (a)

Chemistry

(a)	2. (c)	3. (b)	4. (a)	5. (b)	6. (c)	7. (d)	8. (d)	9. (a)	10. (c)
(c)	12. (b)	13. (b)	14. (b)	15. (d)	16. (c)	17. (b)	18. (d)	19. (b)	20. (a)
21. (b)	22. (d)	23. (a)	24. (b)	25. (c)	26. (b)	27. (c)	28. (a)	29. (b)	30. (a)
31. (c)	32. (d)	33. (b)	34. (a)	35. (a)	36. (b)	37. (a)	38. (b)	39. (b)	40. (b)
41. (a)	42. (d)	43. (b)	44. (c)	45. (d)	46. (a)	47. (a)	48. (a)	49. (a)	50. (a)
51. (a)	[illegible] (b)	53. (b)	54. (a)	55. (c)	56. (d)	57. (a)	58. (b)	59. (a)	60. (b)

Biology

1. (b)	2. (a)	3. (c)	4. (d)	5. (a)	6. (c)	7. (b)	8. (a)	9. (c)	10. (c)
11. (d)	12. (a)	13. (b)	14. (c)	15. (d)	16. (a)	17. (b)	18. (a)	19. (d)	20. (c)
21. (b)	22. (a)	23. (b)	24. (b)	25. (c)	26. (d)	27. (c)	28. (d)	29. (c)	30. (b)
31. (a)	32. (b)	33. (c)	34. (d)	35. (a)	36. (b)	37. (c)	38. (d)	39. (a)	40. (a)
41. (d)	42. (b)	43. (d)	44. (a)	45. (a)	46. (a)	47. (c)	48. (d)	49. (a)	50. (b)
51. (a)	52. (a)	53. (c)	54. (a)	55. (b)	56. (b)	57. (c)	58. (a)	59. (c)	60. (a)

General Knowledge & Aptitude

1. (a)	2. (a)	3. (a)	4. (a)	5. (b)	6. (c)	7. (d)	8. (b)	9. (b)	10. (a)
11. (d)	12. (a)	13. (a)	14. (a)	15. (d)	16. (c)	17. (a)	18. (a)	19. (b)	20. (d)