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Physics, 2014 EC, natural science, entrance exam

Grade 12 · Physics · 2014 E.C.

Time allowed: 120 minutes **Questions:** 30 **Total marks:** 30

Name _____ Grade _____ ID No. _____ Date _____

1. Which of the following statements does NOT describe coherent light or interference of coherent light? (1)

A. Coherent light waves have the same frequency and wavelength.

B. In order for two waves to be coherent, they must be the same type of wave.

C. Sustainable interference pattern can be formed by two waves with variable phase difference.

D. Two waves which maintain a constant phase relationship can produce sustained interference.

2. Kirchhoffs junction rule is a consequence of conservation of (1)

A. electrical energy.

B. charge.

C. mass.

D. momentum.

3. Which one of the following statements describes the photoelectric effect interaction of radiation with matter? (1)

A. The intensity of radiation incident on a material can affect the energy of photoelectrons emitted from the metal surface.

B. In photoelectric effect, the photoelectron energy is directly proportional to the wavelength of incident radiation.

C. Any value of energy of photons (radiations) is capable of producing photoelectrons from a metal.

D. When radiation of certain frequency f, interact with atoms of a material, electrons will be emitted with energies proportional to the radiation energy.

4. An object is placed 25.0 cm in front of a concave mirror having focal length of 10.0 cm. The magnification Of the mirror is (1)

A. 2.5

B. 16.7

C. 0.67

D. 1.5

5. Which of the following statements distinguishes between random and systematic errors? (1)

A. Systematic error can be minimized by taking several readings and averaging; where as random error cannot be minimized.

B. Systematic error makes measured values to be always above or always below the true value; whereas random error causes measured vales to be sometimes above and sometimes below the true value.

C. Random error makes measured values to be always above or always below the true value; whereas systematic error causes measured values to be sometimes above and sometimes below the true value.

D. Random error makes measured values to be always above or always below the true value; whereas systematic error causes measured values to be sometimes above and sometimes below the true value.

6. Which of the following pair of vectors are collinear? (1)

A. 2i + 3j and -4i + 6j

B. 2i - 3j and -4i - j

C. 2i + 3j and -4i - 6j

D. i + j and -i + j

7. For an object moving in straight line, (1)

A. If the displacement changes by equal amount in equal time interval, the displacement-time graph is horizontal line.

B. The area of the region under the displacement-time graph and the slope of velocity-time graph are, respectively, the acceleration and displacement of the object.

C. If the velocity increases by equal amount in equal time interval, the velocity -time graph is straight line with positive slope and the acceleration-time graph is horizontal.

D. The slope of displacement-time graph and the area of the region under acceleration-time graph are, respectively, the acceleration and velocity Of the object.

8. Which of the following is true about satellite motion? (1)

A. A satellite moving closer to the Earth takes longer time to complete one revolution than a satellite farther from the Earth.

B. For two satellites moving around the Earth at equal orbital radius, a heavier satellite has larger speed than a lighter one.

C. For equal orbital radius, a satellite moving around the Earth has smaller speed than a satellite moving about moon.

D. A satellite closer to Earth is faster than a satellite farther from the Earth.

9. According to the work- energy theorem, (1)

A. work done by tension on an object tied to a string and moving a horizontal circle is negative.

B. work done by gravity on an object downward is negative.

C. work done by gravity on an object thrown upward and moving upward is negative.

D. work done by gravitational force on a satellite moving around the earth in a circular is positive.

10. A young double slit experiment consists of two narrow slits separated by 0.06 mm and 1.2 m away from a screen. If the slits are illuminated with a light of wavelength 563 nm, the location of the fourth bright fringe on the screen is (1)

A. 0.394 cm

B. 0.45 cm

C. 3.94 cm

D. 4.5 cm

11. An electric dipole consists of a negative charge —q placed at a point with 'x' and 'y' coordinates (—2, —2) and a positive charge +q at (2, 2). The dipole is placed in a uniform electric field directed 'E' in the positive direction. If the dipole axis makes an angle θ nith the field, which of the following is true about the dipole? (1)

A. The field rotates the dipole in the direction of decreasing the angle θ, until the dipole becomes parallel to the field.

B. The field rotates it in the direction of increasing the angle θ, until the dipole is perpendicular to the filed.

C. It is in both translational and rotational equilibrium.

D. It travels in the direction of the electric field.

12. The electric potential at a distance of 2 cm from -1.6 change is (1)

A. 4.4V

B. -720V

C. -14.4V

D. 720V

13. Consider a long and tightly wound solen ind length L and N turghtly wound solenoid carrying current I, having length, which of the following describes the magnetic field produced by the solenoid? (1)

A. The magnetic field inside the solenoid is zero, whereas the field outside is perpendicular to the length of the solenoid.

B. The magnetic field inside the solenoid is constant and is parallel to the solenoid's axis, whereas the field outside is negligible.

C. The magnetic field inside the solenoid is uniform and perpendicular to the axis of the solenoid.

D. The magnetic field outside the solenoid is as strong as the field inside it.

14. According to the law of electromagnetic induction, (1)

A. the magnitude of emf induced in a circuit is directly proportional to the rate of change the magnetic flux crossing any surface bounded by the circuit.

B. a changing magnetic field parallel to the plane of a circuit induces an emf in it.

C. a constant magnetic flux crossing the surface of a circuit induced an emf in the circuit.

D. an emf is induced in a circuit when a constant magnetic field crosses its surface.

15. According to the Heisenberg's uncertainty principle,T (1)

A. the larger the position uncertainty, the larger the momentum uncetainty.

B. if the uncertainty in position decreases, the momentum uncertainty decreases, too.

C. the more precisely we measure the position of a particle; we become less precise of its momentum and vice versa.

D. we can measure both the position and momentum Of a particle simultaneously with unlimited precision.

16. The graph of nuclear binding energy per nucleon (BE/A) versus mass number (A) has its peak near an atomic weight A = 56. Which of the following statements is true about the graph? (1)

A. Uranium (A = 235), which has larger binding energy than iron 56), is more stable than iron.

B. Nucleus with larger number of neutron is more stable than nucleus of the same atom with smaller number of neutron.

C. For heavier nuclei (A > 56), the binding energy per nucleon decreases with the increase of mass number; implying that heavier atoms can increase their stabili b increasin their roton's number.

D. For smaller atoms (A < 56), the biding energy per nucleon generally increases with the increase of mass number; indicating that lighter atoms can increase stability through nuclear fission.

17. Which of the following statements is NOT correct about reflection and refraction of sound waves and their applications? (1)

A. In pre-natal scanning, reflection and refiraction of sound allows doctors to monitor the progress of a developing baby.

B. Reflection of sound (echo) is formed when sound enters a medium of varying densities.

C. Reflection and refiraction of sound are used to detect flaws in metals and to help people park their cars.

D. Refraction of sound is the change in its direction as it travels through a medium having different densities.

18. A torque τ rotates an object of mass m and moment of inertia I through an angle θ. The work done on the object by the torque is (1)

A. $I\theta$

B. $m\theta$

C. $\tau\theta$

D. τI

19. A satellite revolves around the earth in a circular orbit of radius r = 4 x 10^{16} m. The period of the satellite is (1)

A. 2.5 x 10^(19) s
B. 3.7 x 10^(26) s
C. 3.7 x 10^(27) s
D. 2.5 x 10^(18) s

20. One of the following statements is a correct description of the charging processes? (1)

A. During charging a neutral object by induction using a negatively charged rod, charge flows from the rod to the object.
B. When a neutral metallic sphere is charged by induction using a negatively charged rod, the sphere acquires a net negative charge.
C. When a positively charged object is momentarily brought into contact with a neutral metallic sphere. the sphere acquires a net positive charge.
D. When a plastic rod is rubbed with wool, the two objects acquire a net charge of the same region.

21. A parallel plate capacitor is charged with a battery. The battery is thenm disconnected, and a dielectric material is inserted between the plates of the capacitor. Which of the following is correct about the effect of the dielectric? (1)

A. The potential difference between the plates remains the energy stored increases.
B. The charge on the plates decreases and the energy stored increases.
C. The electric field between the plates and the energy stored decrease.
D. The capacitance remains the same and the electric field between the plates increases.

22. Which one of the following statements is correct about the resistance of a conductor with a circular cross-section? (1)

A. At a given temperature, the resistance of copper and silver wires of them same length and diameter is the same.
B. The resistance of the conductor increases as its length increases and its diameter decreases.
C. The resistance of the conductor increases as its length and diameter increases.
D. The resistance of the conductor decreases as it is heated.

23. The primary coil of a transformer has 250 turns and its secondary coil consists of 1500 turns. If 220 V is applied to its primary coil, the voltage induced in the secondary coil, respectively, are (1)

A. 1320 V and 6
B. 1330 V and 60
C. 1330 V and 6
D. 1320 V and 60

24. A diode is an electronic component thatR (1)

A. is useful to covert a DC voltage to AC voltage,
B. allows electric current to pass through it in one direction.
C. allows the flow of current when its p-type region is connected to the negative terminal of a cell.
D. allows current to mass through it either from cathode to anode or from anode to cathode.

25. A student throws a ball vertically upward with a speed of 20 m/s. The maximum height reached by the ball and its velocity 30 s after it was thrown aret respectively (1)

A. 20 m and 30 m/s upward
B. 105 m and 50 m/s upward.
C. 15 and 10 m/s downward.
D. 20 and 10 m/s downward.

26. Which one of the following statements describes the difference between different types of friction? (1)

- **A.** For an object at rest on a horizontal surface, static friction increases with the increase of the applied force and reaches a maximum value just before slidin occurs.
- **B.** Limiting friction is the minimum value Of static friction that keeps an object stationary.
- **C.** If there is a constant force applied to a stationary object on a horizontal surface, the static friction becomes equal to the limiting friction.
- **D.** Limiting and kinetic frictions exist at the same time between two surfaces sliding over each other.

27. The apparent weight of a 60 kg student standing inside a lift is (1)

- **A.** 600 N when the lift accelerates with acceleration equal to gravilational acceleration.
- **B.** 600 N when the lift accelerates upward with 2 m/s^2.
- **C.** 480 N when the lift accelerates downward with 2 m/s^2.
- **D.** 720 N when the lift is at rest.

28. Which of the following statements describe the use of energy resources? (1)

- **A.** Solar energy produced by photovoltaic cells in free of greenhouse gases and has a very low running cost.
- **B.** Hydroelectric power generates a large amount of energy using small dam with little environmental impact and cheap initial cost of construction.
- **C.** Geothermal energy is the most accessible, environmental friendly and inexpensive source of energy.
- **D.** Wind energy, which is due to the pressure difference in space as the result of uneven sun heat, is a consistent and economical source of energy. Wind energy, which is due to the pressure difference in space as the result of uneven sun heat, is a consistent and economical source of energy.

29. According to the law of floatation, an object must displaces a volume of fluid (1)

- **A.** equal to the weight of undisplaced fluid.
- **B.** equal to its apparent weight.
- **C.** less than its own weight.
- **D.** equals to its own weight.

30. Which one of the following statements describes the unusual behavior of expansion of water? (1)

- **A.** The density of water at 0?C is less than its density at 4?C, since water molecules move further apart and form a second hydrogen bond with other water molecules.
- **B.** As a temperature of water increases above 4?C, its density increases since water molecules move further apart to form a second hydrogen bond with other molecules.
- **C.** At 0?C, water has larger density and smaller volume than its density and volume at 4?C.
- **D.** As a temperature of water increases from 0?c to 4?c, its density increases since one molecule of water forms one hydrogen bond with another molecule

— END OF EXAMINATION —