

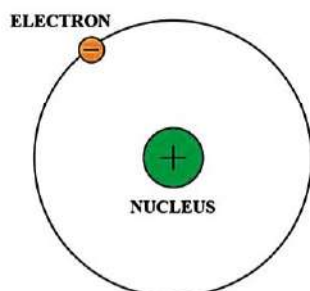
14th INTERNATIONAL KANGAROO SCIENCE CONTEST 2021

Junior Level (Class 9 & 10)

Time Allowed: 90 minutes

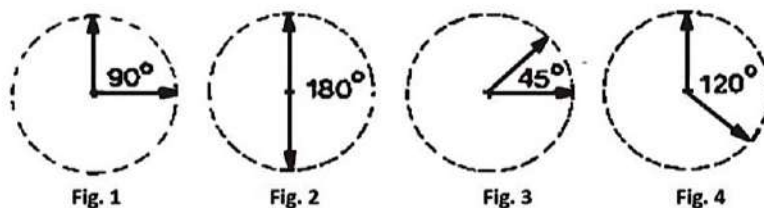
ALL QUESTIONS WORTH 4 POINTS

1. The electrons rotate around the nucleus because they are attracted by:



- A) Nuclear forces B) Electric forces C) Atomic forces
D) Mechanical forces E) Electrostatic attraction forces

2. Each of the following diagrams shows two forces of equal magnitude that act on a point particle. In which situation the magnitude of the net force is equal to that of the component forces?



- A) Fig. 1 B) Fig. 2 C) Fig. 3
D) Fig. 4 E) This is not possible

3. The atom is a particle known since long time. Which of the following scholars was the founder of the theory of atomism?



- A) Leucippus B) Anaximenes C) Thales
D) Pythagoras E) Aristotle

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4. Inside a liquid:

- A) The pressure decreases as the depth measured from the free surface of the liquid increases
- B) The pressure is the same at one meter inside the liquid, regardless of the nature of the liquid
- C) At one meter inside the liquid, the pressure is the same in any direction
- D) At one meter inside the liquid, the pressure is the same, regardless of the temperature of the liquid
- E) The pressure can be measured with a dynamometer

5. What are the correct coefficients (reading from left to right) when the chemical equation



is balanced?

- A) 1,4,8,1,4,8
- B) 1,8,4,1,8,4
- C) 4,8,1,8,4,1
- D) 4,1,8,4,1,8
- E) 1,8,4,4,8,1

6. A projectile is launched from the ground at a certain angle. Which of the following statements is true when air resistance is neglected?

- A) Its horizontal acceleration is 10 m/s^2
- B) Its vertical acceleration decreases during the flight
- C) Its vertical velocity is constant
- D) The maximum vertical displacement is called the range of the projectile
- E) The angle, relative to the ground, is the same on the way up as on the way down

7. Which one of the following is a chemical phenomenon?

- A) The expansion of railway line
- B) The electrostatic charging of particles
- C) The burning of wood
- D) The melting of sugar
- E) The dissolving of sugar

8. When light passes from a medium with a low refractive index to one with a higher refractive index, then:

- A) The speed of the light remains the same and the ray has the same direction
- B) The speed of the light increases and the ray bends towards the normal line
- C) The speed of the light decreases and the ray bends towards the normal line
- D) The speed of the light remains the same and the ray bends towards the normal line
- E) The speed of the light remains the same and the ray bends away from the normal line

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9. Which of the substances in the following reaction



exist in the *gaseous* phase under normal conditions?

- A) CaCO_3 and CaCl_2 B) CaCO_3 and H_2O
C) CaCl_2 and HCl D) H_2O and CO_2
E) HCl and CO_2

10. Two bodies that move in the same direction collide in a perfectly elastic collision. If the two bodies have equal masses, find which of the following statements is true after this collision.

- A) Their velocities will be equal
B) The two bodies will stop after collision
C) Their velocities will have equal magnitudes and opposite directions
D) One body will stop and the other will double its speed
E) The two bodies interchange their velocities

11. Which of the following sequences ranks the substances



in the ascending order of their boiling point?

- A) $\text{HF}, \text{CH}_3\text{OH}, \text{C}_2\text{H}_5\text{OH}, \text{H}_2\text{O}$ B) $\text{CH}_3\text{OH}, \text{C}_2\text{H}_5\text{OH}, \text{HF}, \text{H}_2\text{O}$
C) $\text{CH}_3\text{OH}, \text{HF}, \text{C}_2\text{H}_5\text{OH}, \text{H}_2\text{O}$ D) $\text{H}_2\text{O}, \text{HF}, \text{CH}_3\text{OH}, \text{C}_2\text{H}_5\text{OH}$
E) $\text{CH}_3\text{OH}, \text{HF}, \text{H}_2\text{O}, \text{C}_2\text{H}_5\text{OH}$

12. Which of the following is true about the electric potential?

- A) It is always equal to the electric field
B) It is a vector quantity
C) It is the amount of work energy needed to move a unit of electric charge (a Coulomb) from a reference point to the specific point in an electric field
D) It is zero when a charge is in an electric field
E) It is measured in Coulomb

13. A non-toxic, ductile and corrosion-resistant metal used in the food processing industry is:

- A) Cu B) Cr C) Zn
D) Pb E) Sn

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14. A body is suspended by a dynamometer attached to the ceiling of an elevator. When the elevator descends accelerated, it indicates 6 N, and when it ascends with the same acceleration, it indicates 14 N. Which of the following pairs shows the correct values of the mass of the body and the acceleration of the elevator?
- A) 1 Kg; 4 m/s² B) 4 Kg; 1 m/s² C) 2 Kg; 2 m/s²
D) 0.5 Kg; 8 m/s² E) 0.5 Kg; 2m/s²
15. Some propane is obtained by dehydrating 4 L of pure isopropyl alcohol
($\rho = 0.9 \text{ g/cm}^3$)
What volume of propane is released under normal conditions?
- A) 1344 mL B) 2.016 L C) 13.44 L
D) 2.52 L E) 1344 L
16. Choose the phrase that correctly finishes this statement:
"Electromotive force will be induced"
- A) In a conductor moving parallel to the field lines
B) If a magnet is inside an electromagnetic coil
C) In a conductive wire that is bent into a loop and is traversed by a time-constant magnetic flux
D) When a magnet is moved in or out of an electromagnetic coil
E) In any electromagnetic coil traversed by a time-constant magnetic field
17. Methyl alcohol is a very good fuel releasing approximately 7000 Kcal/Kg. How much heat is released when burning 20 moles of methyl alcohol?
Atomic masses: C - 12; H - 1; O - 16
- A) 140000 Kcal B) 448000 Kcal C) 4480 Kcal
D) 1400 Kcal E) 14000 MJ
18. Choose the phrase that correctly finishes this statement:
"A real object will form real images that will be"
- A) Behind plane mirror B) In front of concave mirror
C) Behind diverging lens D) In front of diverging lens
E) Behind converging lens

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19. Which of the following is a false statement?

- A) Saccharides are substances that provide energy to the human body
- B) Glucose is a sweet monosaccharide
- C) Proteins can have a construction role
- D) The hydrolysis of starch yields fructose
- E) Amino acids are not part of protein

20. When a planet orbits the Sun, identify which of the following will be conserved:

- A) The radius of the orbit
- B) The gravitational force
- C) The velocity
- D) The kinetic energy of the orbiting planet
- E) The kinetic moment

21. Which of the following series contains soluble proteins?



- A) Collagen, fibroin, albumin
- B) Albumin, globulin, myoglobin
- C) Haemoglobin, fibroin, keratin
- D) Collagen, fibroin, keratin
- E) Elastin, fibroin, keratin

22. Which of the following statements is true about the element ${}^{238}_{92}\text{U}$?

- A) Its atomic weight is 92
- B) It has 238 electrons when it is in neutral state
- C) It has 92 protons
- D) It has 92 neutrons
- E) 238 represents the number of protons and electrons in the atom

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23. Which of the following statements is false?

- A) Proteins are macromolecular compounds obtained by polycondensation of α -amino acids
- B) The ethanol molecule is formed by simple bonds between the component atoms
- C) Water-soluble vitamins are vitamins B and C
- D) Ethanol is soluble in water
- E) Fat-soluble vitamins dissolve in water

24. Two metal spheres of equal size, are electrified with charges of $12C$ and $-4C$, respectively, and are placed on an insulating plate. Later, they are brought into contact and then placed in the initial positions. How does the force of interaction between them changes?

- A) They start to repel each other with a force 3 times less than the first time
- B) Just like in the beginning they attract each other, but with a force 3 times higher
- C) Just like in the beginning they attract each other, but with a force 3 times smaller
- D) Just like in the beginning, they repel each other with equal forces.
- E) Just like in the beginning, they attract each other with equal forces.

25. Which of the following foods has the highest protein content?



A) Bananas



B) Peas



C) Onions



D) Cauliflower



E) Beans

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26. A 0.5Kg ball with a speed of 10.0 m/s is thrown perpendicularly at a wall. After striking the wall, the ball rebounds in the opposite direction with half of the initial speed. If the ball exerted onto the wall an average force of 750 N, what is the duration of the impact?

- A) 1 min B) 0.01 s C) 1 h
D) 1 ms E) 1 s

27. Which of the following foods has the highest fat content?

- A) Bananas B) Peas C) Peanuts
D) Soybeans E) Eggplants

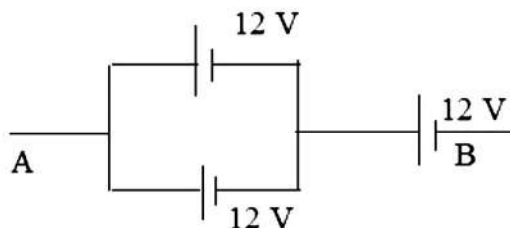
28. If a magnetic needle is placed above a conductor crossed by an electric current, then its direction will be:

- A) Towards the geographical south pole, regardless of the position of the conductor
B) Parallel to the conductor
C) Towards the geographical north pole, regardless of the position of the conductor
D) Radially, intersecting the conductor axis
E) Perpendicular to the wire

29. Choose the phrase that correctly finishes this statement:
"Sucrose is".

- A) a polysaccharide
B) a substance that by hydrolysis forms only glucose
C) a solid, amorphous, colourless substance
D) a substance that dissolves in water
E) a substance that cannot be enzymatically hydrolysed

30. What is electrical voltage U_{AB} in the following circuit?



- A) 24 V B) 18 V C) 36 V
D) 12 V E) 9 V

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