To be filled by the candidate	Reserved for the Institute
Name : …………………………..…… Surname : …………………………… Examination town : ………………… Seat N°: ……….. Subject : ………………………………………………………………………	*Anonymous N° :* ………..

Reserved for the Institute Score :	✔ International and Intercultural GENERALIST ENGINEER COURSE ## PHYSICS	Reserved for the Institute *Anonymous N° :* : ………..

Directions: Each of the question or incomplete statements in this section is followed by four suggested answers. Select the best answer in each case.

1. The magnitude of the magnetic force acting on a current carrying conductor placed in a magnetic field of constant flux density with the plane of the conductor perpendicular to the field, can be increased by;
   A. Increasing current through the conductor and reducing its length
   B. Reducing current through the conductor of many turns
   C. Increasing current through the conductor and increasing its length
   D. Reducing the length of the conductor and using a stronger permanent magnet.

2. A physical quantity (Q) is defined by the equation:
$$Q = \frac{1}{2}LI^2$$
Where L = inductance and I= current
Q has the same units as
A. Charge
B. Energy
C. potential difference
D. Capacitance

3 The first six ionisation energies of four elements, A to D, are given. Which element is most likely to be in Group IV of the Periodic Table?

| ionisation energy / kJ mol^{-1}	1st	2nd	3rd	4th	5th	6th
A	494	4560	6940	9540	13400	16600
B	736	1450	7740	10500	13600	18000
C	1090	2350	4610	6220	37800	47000
D	1400	2860	4590	7480	9400	53200

4. Close to the surface of the Earth the gravitational field strength is uniform. A pair of unequal masses are joined by a light, stiff horizontal bar and suspended by a string from their centre of gravity as shown.
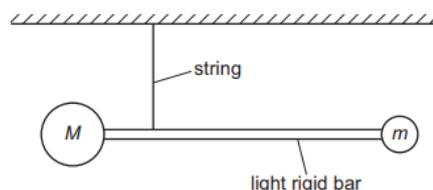
The supporting string is now cut and the system begins to fall. Air resistance is negligible. Which statement is correct?
A. The bar will remain horizontal as it falls.
B. The bar will rotate as it falls.
C. The resultant gravitational force will act at the centre of M.
D. The resultant gravitational force will act half-way between the centres of the two masses.

5 The diagram below shows the variation of the boiling points of the hydrogen halides.
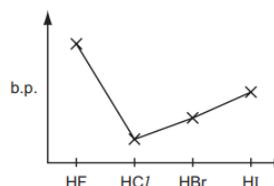
What explains the higher boiling point of hydrogen fluoride?
A. The bond energy of HF molecules is greater than in other hydrogen halides.
B. The effect of nuclear shielding is much reduced in fluorine which polarises the HF molecule.
C. The electronegativity of fluorine is much higher than for other elements in the group.
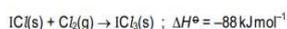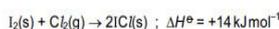D. There is hydrogen bonding between HF molecules.

it. This object lands on the ground 2.7 s the later. The height of the helicopter the moment the objects is dropped is

A. 6.2m
B. 14.9m
C. 16.3m
D. 35.7m

6. What current must be passed through a flat circular coil of 10 turns and radius 5.0 cm
    to produce a magnetic flux density of 2.0×10^{-4} T at its centre?
   A. 1.6A
   B. 3.2A
   C. 1.8A
   D. 3.6A

7. Iodine trichloride, ICl_3, is made by reacting iodine with chlorine.

$$I_2(s) + Cl_2(g) \rightarrow 2ICl(s) \; ; \; \Delta H^\ominus = +14\,kJ\,mol^{-1}$$

$$ICl(s) + Cl_2(g) \rightarrow ICl_3(s) \; ; \; \Delta H^\ominus = -88\,kJ\,mol^{-1}$$

By using the data above, what is the enthalpy change of the formation for solid iodine trichloride?

A $-60\,kJ\,mol^{-1}$

B $-74\,kJ\,mol^{-1}$

C $-81\,kJ\,mol^{-1}$

D $-162\,kJ\,mol^{-1}$

8. The stopping potential in a discharge tube is 1.6V. The maximum speed in ms^{-1} of an electron from the cathode reaching the anode when a p.d of 3.2 V is applied between them is
   A. Zero
   B. 5.6×10^{11}
   C. 8.3×10^3
   D. 7.5×10^5

9. In the extraction of aluminium by electrolysis, why is it necessary to dissolve aluminium oxide in molten cryolite?

   A. to reduce the very high melting point of the electrolyte
   B. cryolite provides the ions needed to carry the current
   C. cryolite reacts with the aluminium oxide to form ions
   D. molten aluminium oxide alone would not conduct electricity

10. A sealed tank of gas contains a mixture of nitrogen and oxygen. The tank is at room temperature. What is the same for the particles of nitrogen and oxygen in the tank?
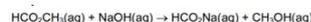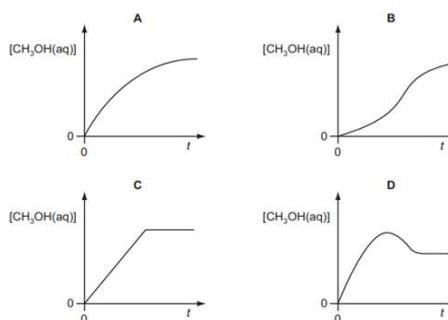   A. internal energy
   B. mean kinetic energy
   C. mean speed
   D. root mean square speed

11. A helicopter is rising vertically at a velocity of 7.2m s^{-1} when an object is released from

12. The reaction represented by the following equation was

$$HCO_2CH_3(aq) + NaOH(aq) \rightarrow HCO_2Na(aq) + CH_3OH(aq)$$

Which graph best shows the relationship between [$CH_3OH(aq)$] and t, the time from mixing of the reactants?

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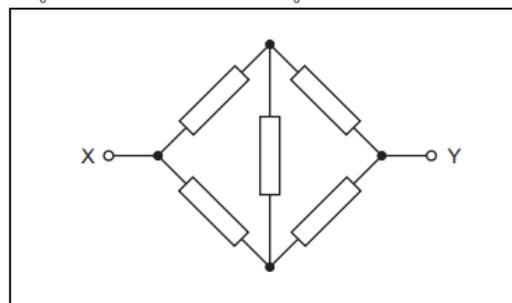
A potential difference of 10V is applied across XY. What current flows between X and Y?

   A. 2.0A
   B. 2.5A
   C. 4.0A
   D. 5.0A

15. Concentrated sulphuric acid is added to separate solid samples of sodium chloride, sodium bromide or sodium iodide. With which sample(s) does sulphuric acid act as an oxidising agent?

   A. sodium chloride only

B. sodium chloride and sodium bromide
C. sodium bromide and sodium iodide
D. sodium iodide only

16. Two long and parallel conducting wires, each carrying a current I are separated by a
   distance d. If d and I are both simultaneously made twice as large, the force per unit
   length between the wires
   A. decreases by a factor of 4
   B. decreases by a factor of 2
   C. increases by a factor of 2
   D. remains unchanged

17.   Conduction, convection and radiation are methods of energy transfer. Which of these
   statements is true about these methods of energy transfer?
   A. The net movement of energy is down a temperature gradient in all these processes
   B. The net movement of energy is up the temperature gradient in all these processes
   C. The movement of energy requires a material medium in all these processes.
   D. In all the processes, energy moves by the motion of heated matter.

18.
Which graph correctly describes a trend found in the halogen group?
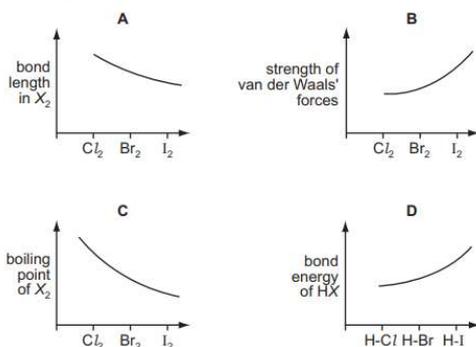
19. What is the de Broglie wavelength of an electron moving at a speed of $2.0 \times 10^7 \text{ms}^{-1}$
   A. 3.6×10^{-11} m
   B. 1.0×10^{-11} m
   C. 3.6×10^{-10} m
   D. 1.0×10^{-11} m

20.

Prop-2-en-1-ol (allyl alcohol) has the following structure.
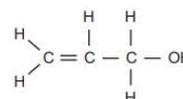
Which reagent would react with prop-2-en-1-ol to form a product that could exist as optical isomers?

A   bromine

B   hydrogen and nickel

C   phosphorus pentachloride

D   sodium