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2020 Science (Physics/Chemistry) 5076/01 Answer Key

Qn	Ans	Explanation
1	C	Order: nJ: 10^-9 mJ: 10^-3 J: 10^0 kJ: 10^3
2	B	Micrometer Screw Gauge: Sleeve reading: 6.5 Thimble reading: 27 Total: 6.5 + 0.27 = 6.77mm Vernier Calipers: Main Scale: 2 Vernier Scale: 7 Total: 2 + 0.7 = 2.7mm
3	C	Resultant force = mass x accel = 160 x 0.5 = 80N Thus, frictional force = driving force – resultant force = 240 – 80 = 160N
4	D	Inertia is dependent on the mass of an object. Since the mass does not change when you change locations, Mass, and hence, inertia, is the same for all locations.
5	D	Mass = Weight / grav field strength A: mass = 225/9 = 25kg B: mass = 150/10 = 15kg C: mass = 220/11 = 22kg D: mass = 125/25 = 5kg Thus, smallest mass is D.
6	D	Force = pressure x area Force acting from outside pressure = 50 000 x 0.16 = 8000N Force acting from inside pressure = 80 000 x 0.16 = 12800N Total force(not resultant force) = 8000 + 12800 = 20800N
7	C	Based of principle of conservation of energy, The total energy of a closed system is always constant.

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8	B	Since total energy is always the same, KE+ GPE+ EPE at Pos 1 = KE+ GPE+ EPE at Pos 2 0 + 9.0 +1.0 = 1.8 + 5.0 +EPE Thus, EPE at new pos = 10.0 – 6.8 = 3.2J
9	A	When a liquid is heated, the molecules do not expand. It is the spacing between molecules that increases that causes the substance to expand.
10	A	The keyword here is per square metre. Since the amount of heat lost they are looking for is per square meter, the area would not be a factor since they will only look at one section of the material.
11	C	As a substance solidifies, it is changing in state from liquid to solid. Hence, the temperature should be constant. However, heat is being lost to the surroundings as the potential energy between molecules is being lost.
12	A	In 10 seconds, the first wave travelled a total of 4 wavelengths worth. Thus, there were 4 complete oscillations in 10 seconds. Each oscillation(period) = 10 / 4 = 2.5s Thus, freq = 1/T = 1 / 2.5 = 0.4Hz
13	C	Since angle of incidence of 1st mirror(i_1) = 72°, angle of reflection of 1st mirror(r_1) = 72°. Using angle of a straight line and angles in a right angled triangle, We can see that angle of incidence of 2nd mirror(i_2) = 18°. This means angle of reflection of 2nd mirror(r_2) = 18°. If you check the total angle made between the ray entering and ray leaving, you will see that $i_1 + r_1 + i_2 + r_2 = 72+72+18+18= 180°$. Thus, the ray exiting the two mirrors is exactly parallel but in the opposite direction from the ray entering(think interior angles from E Math). Answer is 180°. See sketch below for visual representation.

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		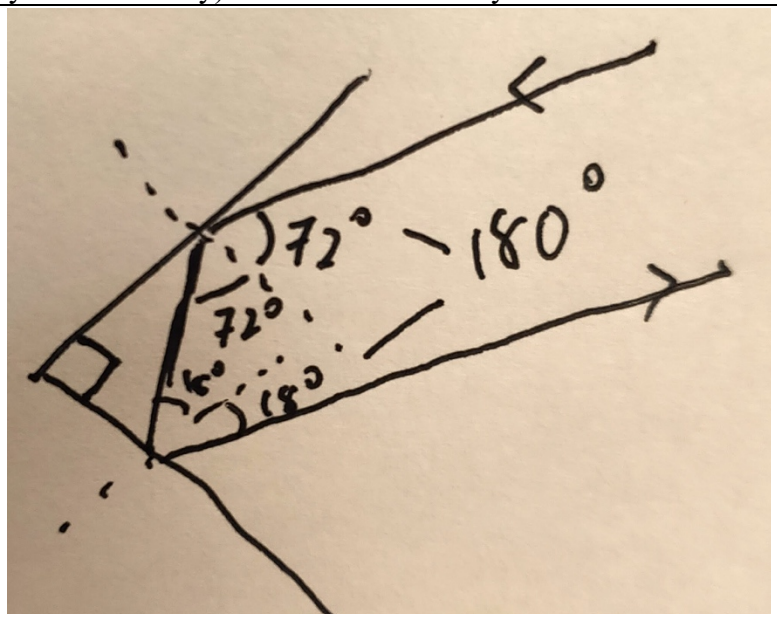
14	D	Speed of all EM waves is 3 x 10^8 m/s They are also all transverse waves.
15	B	Same note = same pitch and thus same frequency. Louder means higher amplitude.
16	D	Since the field lines repel each other, they have to be like charges. Since the direction of the field lines are coming out from the charges, both charges must be positive.
17	B	Q = It Q of batt = 800/1000 x 1 x 60 x 60 = 2880 t = Q/I = 2880 / 2 = 1440s = 0.4hrs
18	A	Resistance of wire = resistivity x length / area Resistivity of wire = resistance x area / length = 1.2 x 0.5 x 10^-6 / 2 = 3 x 10^-7 Resistance of second wire = resistivity x length / area = 3 x 10^-7 x 0.5 / (1 x 10^-6) = 0.15Ohm.
19	B	Since resistors are identical, Since V = IR and V is the same across parallel circuits, Since A3 has double the R, it should have half the I. Thus, only A2 = 4A, A3 = 2A fits.

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20	C	Since gas is soluble in water, any method that has the gas bubbled through water is not possible. It is less dense than air, thus rises and can be obtained via upward delivery.
21	A	To obtain crystals from a solution, we use either crystallization or evaporation
22	B	Since there is white ppt formed with barium nitrate, sulphate ion is present. Since white ppt forms with sodium hydroxide that does not dissolve in excess, calcium ion is present.
23	C	Isotopes have different number of neutrons, with the same number of electrons(and hence, electron shells)
24	C	Metals and non-metals form ionic compoinds. Ionic compounds generally have high melting point.
25	A	Since X has 4 valence electrons, and Y has 6 valence electrons, X will form a double bond with two different Ys, similar to CO2
26	B	Since Calcium Phosphate is $Ca_3(PO_4)_2$, And calcium ion is Ca^{2+}, Phosphate ion will be PO_4^{3-}
27	A	Mr of glucose = 180 Amt of glucose in 50cm3 of 0.4mol/dm3 soln = 50/1000 x 0.4 = 0.02mol Mass req = amt x Mr = 0.02 x 180 = 3.6g
28	D	Endothermic process means heat is absorbed from surroundings. This means temperature of surroundings will fall.
29	D	The only way to increase yield is to increase the amount of reactant (hydrogen peroxide) used. Thus, only D is correct as it is the only option that increases amount of H2O2.
30	B	Potassium iodide is oxidised to iodine. Thus, iron (III) chloride acts as an oxidizing agent. Potassium manganate is reduced to manganese ion(Mn2+). Thus, iron (II) chloride acts as a reducing agent.

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31	B	Acid reacts with metal to give salt and hydrogen gas. Acid reacts with carbonate to give salt, water and carbon dioxide.
32	A	Since XO is an amphoteric oxide, it can react(and hence neutralize) both acids and alkali. Thus, there will be a colour change for both acids and alkali.
33	A	In Grp I, the melting point decreases down the group. Thus, R is higher in the group than T, and thus has less electron shells.
34	A	Since X is unable to react with any of the oxides, it has the lowest reactivity. Y reacts with the most number of oxides, thus it has the highest reactivity. The trend from least reactive is X, Z, Y.
35	D	Limestone decomposes to give calcium oxide, which is used to remove acidic impurities.
36	D	Since oxygen is the only gas to react with copper, the air will experience a 20% reduction(as oxygen is 20% of air). Thus, volume decreases from 50cm3 to 40cm3.

Questions 37 – 40 have been removed from the 2020 syllabus.