Analytical Chemistry (1)

1. The composition of silica gel G is :–
   (a) Silica gel without binder (b) Silica gel + $CaSO_4$
   (c) Silica gel + Alumina (d) Silica gel + $MgSO_4$
2. Retention factor or retardation factor values range from.
   (a) 0 to 1 (b) 0 to 2 (c) +2 to –2 (d) +1 to –1
3. A student sets up a paper chromatogram and places a spot of food dye on the origin after 6 min, the solvent has moved 12 cm and a blue spot has advances 9 cm. After 14 min, the solvent has advanced a further 8 cm. How many cm from the origin is the blue spot likely to be.
   (a) 26 (b) 8 (c) 18 (d) 15
4. For a typical adsorbent such as silica gel, most popular pore diameter are:-
   (a) 10 and 50 Å (b) 60 and 100 Å (c) 100 and 150 Å (d) 150 and 200 Å
5. A gradient elution is one in which the composition of the solvent
   (a) remains constant
   (b) is changed continuously or in a series of steps
   (c) both (a) and (b)
   (d) None of the above
6. Which of the following cannot be used as an adsorbent in column adsorption chromatography?
   (a) Magnesium oxide (b) Silica gel
   (c) Activated alumina (d) Potassium permanganate
7. The layer chromatography is
   (a) partition chromatography is (b) electrical mobility of ionic species
   (c) adsorption chromatography (d) none of the above
8. In column switching chromatography
   (a) compounds trapped on one column are eluted to another column
   (b) one column is removed and replaced by another
   (c) the flow of the column is switched on and off repeatedly
   (d) none of these
9. Chromatography can be used to
   (a) form mixture (b) change of mixture composition
   (c) separate mixture into pure substance (d) all of these

10. In paper chromatographic separation of silver, lead and Hg the solvent front was 18 cm while front due these elements were respectively 16, 12 and 6 cm. What is the R_f value of all metals.

	R_fAg	R_fHg	R_fPb
(a)	0.88	0.33	0.66
(b)	0.808	0.303	0.606
(c)	88	33	66
(d)	9.0	4.0	6.0

11. Chromatographic analysis was first suggested by Tswett as an analytical tool for the separation of various pigments from plant extracts. This chromatographic technique was based on

(a) adsorption (b) absorption (c) partition (d) ion – exchange

12. Which of the following adsorbent used for column adsorption chromatography has maximum adsorptive power?

(a) silica gel (b) magnesium oxide (c) aluminium oxide (d) calcium carbonate

13. Which of the following solvents have maximum eluting power

(a) Pyridine (b) Acetone (c) Chloroform (d) Methanol

14. Which of the following is very effective for isolating separation and identifying small quantities of substances?

(a) Potentiometry (b) Chromatography (c) Solvent extraction (d) Conductometry

15. The isocratic elution in chromatography can be defined as

(a) elution under conditions of constant temperature and pressure

(b) elution under conditions of variable temperature and pressure

(c) elution under conditions of constant mobile phase composition

(d) elution under conditions of varying mobile phase composition

ANSWER KEY

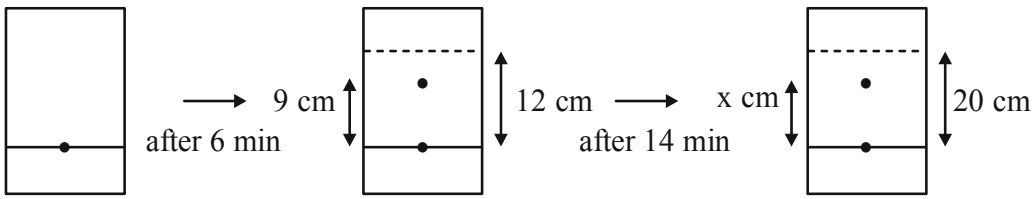
1. (b)	2. (a)	3. (d)	4. (b)	5. (b)	6. (d)	7. (c)
8. (a)	9. (c)	10. (a)	11. (a)	12. (c)	13. (a)	14. (b)
15. (c)						

SOLUTION

1. This grade of silica gel is suitable for making TLC plates. A binder Gypsum (G) is added to this grade of Silica gel which helps Silica gel to firmly settle on TLC plate.

It contains Silica gel and $CaSO_4$ as binder with Fluorescent.

2. R_f value varies always between 0 and 1. A high R_f (~0.92) value would refer to a substance that is very non – polar. Whereas a low R_f (0.10) value would refer to a substance that is very polar.

3. 

R_f value $= \frac{9}{12} = 0.75$

R_f value $= \frac{x}{20} = 0.75$

x = 15 cm

So, correct option is (d)

4. Pore diameter are 60 and 100 Å

So, correct option is (b)

5. A gradient elution is one in which altering of composition of mobile phase during the coarse of chromatography.

So, correct option is (b)

6. The given options are all examples of adsorbent in column adsorption except potassium permanganate. Some other adsorbents are starch and chromatographic purified siliceous earth.

So, correct option is (d)

7. Thin Layer Chromatography (TLC) typically uses silica or alumina as the stationary phase and mobile phase moves over an adsorbent. The solvent or solvent mixture (mobile phase) is drawn up the plate via capillary action, because different analytes ascend TLC plate at different rates, separation is achieved. So, TLC is adsorption chromatography.

So, correct option is (c)

8. In column switching chromatography, fractions from a primary column can be switched to two or more secondary columns, which in turn can be further diverted to additional columns or to the detector.

So, correct option is (a)

9. Chromatography can be used to separate mixture into pure substance.

So, correct option is (c)

10. $R_f = \frac{\text{distance travelled by solute}}{\text{distance travelled by solvent}}$

$R_f Ag = \frac{16}{18} = 0.88, \quad R_f Pb = \frac{12}{18} = 0.66, \quad R_f Hg = \frac{6}{18} = 0.33$

11. The first chromatographic technique proposed by Tswett was based on adsorption. The technique was developed to separate various coloured component of a plant extract.

So, correct option is (a)

12. The adsorptive power increases in the order:

Calcium Carbonate < Silica Gel < Magnesium Oxide < Aluminium Oxide.

So, correct option is (c)

13. Elutropic series for common solvents.

light petroleum < cyclohexane < CCl_4 < Toluene < Benzene < Chloroform < ethyl ether < ethyl acetate < acetone < n – propanol < ethanol < methanol < water < pyridine < organic acids < inorganic acids and bases.

So, pyridine has maximum eluting power.

So, correct option is (a)

14. Chromatography is very effective for isolating separation and identifying small quantities of substances.
So, correct option is (b)

15. The isocratic elution in chromatography can be defined as elution under conditions for constant mobile phase composition generally, it is used in reversed – phase chromatography.
So, correct option is (c)